



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2020; 8(2): 1411-1415

© 2020 JEZS

Received: 18-01-2020

Accepted: 20-02-2020

Nripendra Pratap Singh

Research Scholar, Livestock
Production Management Section,
ICAR- National Dairy Research
Institute, Karnal, Haryana,
India

Ninad Bhatt

Research Scholar, Livestock
Production Management Section,
ICAR- National Dairy Research
Institute, Karnal, Haryana,
India

Sheikh Mohd. Usman

Research Scholar, Livestock
Production Management Section,
ICAR-Indian Veterinary
Research Institute (IVRI),
Izatnagar, Bareilly, Uttar
Pradesh, India

Pramod Chaudhary

Research Scholar, Division of
Animal Nutrition, ICAR-Indian
Veterinary Research Institute
(IVRI), Izatnagar, Bareilly,
Uttar Pradesh, India

Corresponding Author:**Nripendra Pratap Singh**

Research Scholar, Livestock
Production Management Section,
ICAR- National Dairy Research
Institute, Karnal, Haryana,
India

A detailed review on backyard poultry production and management in India

Nripendra Pratap Singh, Ninad Bhatt, Sheikh Mohd. Usman and Pramod Chaudhary

Abstract

The current review is an attempt to assess the condition of backyard poultry in India and its various management techniques practiced in India. There is not really any prerequisite of foundation arrangement required for backyard poultry farming and is mostly popular in backward and resource-deprived areas of India and provides rural families with good source of income, healthy food sources i.e. meat and eggs, alleviates women status in rural society and provide employment to needy, and also reduces the demand and supply gap of poultry meat and eggs. Significant limitations of backyard poultry farming in India are high death rate in chicks because of a frequent disease outbreaks, absence of framework, lower potential of desi chickens, absence of scientific information, predation, hunger, climate change and fluctuating feed supply and price all throughout year. Being the best option for the marginal and small farmers to their backup salary with very small input this farming needs an upliftment. Along these lines the sole goal of this review is to concentrate on different parts of backyard poultry farming in provincial India including essential understandings, it's favorable circumstances and some specialized tips for better management practices which the authors think will raise more mindfulness among researchers, farmers and Government associations.

Keywords: Backyard poultry, desi breeds, improved breeds, scavengeable feed resource base

Introduction

Livestock sector has gotten one of the quickest developing fragments in Indian agribusiness as of late, and inside livestock sector, the poultry production in India keeps on displaying overwhelming development inspite of a few difficulties experienced throughout the years. Poultry is one of the quickest developing fragments of the farming area in India with around 8% development rate per annum. The poultry segment in India has experienced a change in perspective in structure and activity which has been its change from a backyard activity into a significant business agri based industry over a time of four decades. Currently the total poultry population in our country is 851.81 Million numbers out of which 317.07 Million is backyard poultry and egg production is around 103.93 billion during 2018-19 (BAHS 2019) ^[1]. Backyard poultry production has shown a tremendous growth rate of 45.79% from last census as compared to commercial poultry which has increased only by 4.5%. The current per capita availability (2018-19) is around 79 eggs per year (BAHS 2019) ^[1]. The poultry meat production is estimated to be 4.06 million tones (BAHS 2019) ^[1] which is around 50% of total meat production. However, it is lower than the suggested level of consumption of 180 eggs and 10.8 kg poultry meat per person per annum by Indian Council Medical Research. The poultry husbandry has involved a vital position both in giving work just as in contributing a significant extent to the national GDP. It has been seen that the interest for the animal protein source is on the rise in developing countries (Raveloson, 1990) ^[2]. Village or backyard poultry can be profitably promoted in rural territories, as the huge commercial poultry production keeps on being amassed in urban and peri -urban areas which has demonstrated to be amazing asset for eradication of malnutrition, mitigation of rural poverty and creation of lucrative employment in vast rural areas. Market considers show costs per kg live weight for backyard birds can be 50 – 100% higher than that of commercially produced birds (Singh and Pani, 1986) ^[3]. In current scenario there is great surge in demand of desi or indigenous poultry breed in urban areas due to its rich flavor which are mostly reared in backyard system (Conroy *et al.*, 2005) ^[4]. In spite of the fact that backyard poultry is the most intense hotspot for backup salaries for landless poor ranchers, it has consistently been dismissed. There are plenty of facts to express the role of rural backyard poultry husbandry in uplifting the food and nutrition

security of the poorest households and reducing the livelihood insecurity (Dolberg, 2004; Otte, 2006; Ahuja and Sen, 2007) [5-7].

What is backyard poultry production?

Mandal *et al.*, 2006a [8] described backyard poultry production system as a low input or no input business and is characterized by indigenous night shelter system (Dana, 1998; Saha, 2003) [9-10], scavenging system (Okot, 1990; Raveloson, 1990) [11, 2], with little supplementary feeding (Rangnekar *et al.*, 1996; Dana, 1998; Saha, 2003) [41, 9-10], natural hatching of chicks (Singh and Pani, 1986) [3], poor productivity of birds (Agbede *et al.*, 1995; Rashid *et al.*, 1995) [12-13], local marketing (Rehman, 1995; Dana, 1998; Saha, 2003) [14, 9-10] and no health care practice (Dana, 1998; Saha, 2003) [9-10]. The rural family poultry or village poultry system is known as backyard poultry in India. It can also be considered as a type of organic farming as birds are raised all natural conditions. It can also be considered as an eco-friendly approach as it provides manure for farmer's field and also controls pests in field (Selvam, 2004) [15].

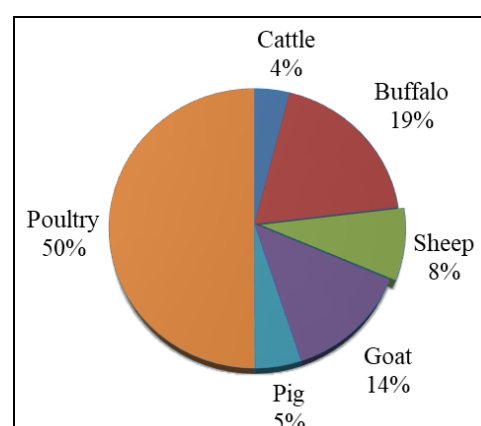
Backyard poultry in Indian context

Backyard poultry production in India is an older farming practice, been practiced since decades. It has been a great source of protein and an additional income for the rural oppressed farmers (Raveloson, 1990) [2]. But currently with better government policies and better field level extension workers, backyard poultry has shown good growth since last decade and it can further be pushed forward to provide better livelihood and nourishment to rural poor. India has tremendous potential in organic poultry because of the existence of traditional backyard system. India has nearly 70% of its population living in rural areas. However, in the present scenario most of the commercial poultry production is concentrated in urban and peri-urban areas. Just 25% population living in urban areas consumes about 75-80% of eggs and poultry meat. Indigenous poultry are in great demand in urban market as well as in their habitats, as they are considered tastier than commercial broiler chicken, this make backyard poultry a profitable business. Free range and small scale semi commercial back-yard poultry production can be advantageously promoted in rural areas, as the large commercial poultry production continues to be concentrated in urban and peri-urban locations. It can be used as a powerful tool for alleviation of rural poverty, eradication of malnutrition and creation of gainful employment in vast rural areas (Deka, 2013) [16]. Poultry production provides to the 5 million people direct or indirect employment in India (CARI, 2011) [17]. India is the home for many breeds of native chicken like Kadak Nath, Aseel, Nicobari, Danki, Tellicherry, Haringhata Black etc., which are still popular among the rural and tribal areas for back yard/ free range farming (Chatterjee and Rajkumar, 2015) [18]. The native chicken varieties adopted in free-range backyard conditions for centuries contribute about 11% of total egg production in India (Kumaresan *et al.*, 2008) [19]. Due to their low productivity, their contribution to the total egg output was almost static for the last few decades (Table.1) (BAHS, 2019) [1].

Table 1: Average Yield rate for eggs from Backyard Poultry (2018-19)

Fowls(nos./year)		Duck(nos./year)	
Desi Fowls	Improved Fowls	Desi Ducks	Improved Ducks
108.99	226.2	110.97	178.71

Conservation of indigenous poultry breeds would be encouraged for producing poultry birds suitable for backyard poultry (National Livestock Policy 2013, GOI). 75% of Indian poultry produce is being consumed by 25% population. Share of poultry meat in India is highest as compared to other species (Fig.1) (BAHS, 2019) [1]. It has been estimated that under moderate growth scenario of 6% per annum in the Country's GDP, by 2030, the demand for meat and eggs is likely to shoot up to 5.9 and 9.5 mmt, respectively (CARI, 2011) [17]. Indian backyard population has increased by 45.70% in the last decade from 217.4 to 317.07 million (BAHS, 2019) [1]. It is a fact that China's 76% of total egg comes from rural backyard production. Hence, India requires both mass production as well as production by masses (Kumaresan *et al.*, 2008) [19]. Thus with the help of appropriate approach and technology, the backyard system of poultry rearing can also be transformed to a successful organic venture.



Advantages of backyard poultry farming

Some of the advantages of backyard poultry farming are: - 1. Negligible feed cost (Pathak and Nath 2013) [20]. 2. Minimum land, labour and capital (Rath *et al.*, 2015) [21]. 3. Provides income to the rural households (women) (Okitoi *et al.*, 2007; Das *et al.*, 2008) [22-23]. 4. Integrates well with other agricultural operations. 5. Manure (15 chickens' produce around 1- 1.2 kg of manure/ day). 6. Better price 7. Generate employment in rural areas and help in checking migration of people to urban areas. 8. High skill not required. 9. Availability of egg & meat even in remote rural areas (Panda *et al.*, 2008) [24]. 10. Conservation of native germplasm. 11. Alleviates malnutrition (Mapiye *et al.*, 2008) [25]. 11. Fulfill the increasing demand of protein (Khan and Bidabadi, 2004; Ali, 2007) [26, 42].

Backyard poultry breeds

In rural areas of India, chicken reared in backyard are mostly Desi type with low egg and meat production (Ghosh *et al.*, 2005) [27] and there is need of introduction of improved dual purpose bird having capacity to lay more eggs and gain higher body weight than the local or *Desi* birds. Specific varieties of birds are available for rearing for meat or eggs and few varieties for both (dual purpose). Having realized the importance of backyard rural poultry farming in India, several research organizations have developed different backyard chicken varieties which are presented in Table 2. The two rural chicken varieties i.e. Vanaraja and Gramapriya developed by the Directorate of Poultry Research (DPR) have reached throughout the length and breadth of the nation. The birds are performing extremely well in low input system.

Table 2: Different improved breed of backyard chicken

Name	Feather Pattern	Purpose	Organization
Gramapriya	Multicolour	Dual	DPR, Hyderabad
CARI-Nirbhic	Multicolour	Dual	CARI, Izatnagar
CARI-Shyama	Mixed colour	Dual	CARI, Izatnagar
CARI Debendra	Multicolour	Dual	CARI, Izatnagar
CARI Upcari	Multicolour	Egg	CARI, Izatnagar
CARI Hitcari	Multicolour	Egg	CARI, Izatnagar
Vanaraja	Multicolour	Dual	DPR, Hyderabad
Giriraja	Multicolour	Egg	CVASc, Bangalore
Swarnadhara	Multicolour	Dual	CVASc, Bangalore
Gramalaxmi	Mixed brown	Egg	KAU, Mannuthy
Nicobari	Black and white	Egg	CARI, Portblair

Management of backyard poultry

Poultry can be reared for egg production in small numbers (10-20) in free range conditions if plenty of natural feed resources are available. But if the local demand is for meat, they can be reared in large number under intensive/ semi-intensive conditions by providing all inputs similar to commercial broilers. These birds need to be reared under proper nursery management up to 6 weeks and later they may be released in free range after 6 weeks of age.

Types of Backyard poultry production system in India

1. Scavenging back yard poultry

No specific feeding is required in this system. Few numbers of hens (5-20) are reared by each family (mostly women). Birds are in free range during day time and are housed during night time. Not an occupation but a supplemented household activity for the families. Four types of germplasm developed for scavenging system are CARI Nirbheek, CARI Shyama, CARI Hitcari and CARI Upcari.

2. Semi scavenging back yard poultry

Small poultry flocks that are being raised partly under an intensive system of management and partly under free range system with the scavenged feed accounting for a substantial part of the total feed consumed. Low input, low cost birds with improved productivity recommended. Small size poultry farm started under this system, capacity upto 50 to 100 birds. It fulfills the requirement of part time self-employment. Suitable Germplasm for Semi scavenging system are Giriraja, Vanaraja, CARI debendra and Gramapriya.

Incubation and hatching management

Indigenous birds lay eggs three times a year. Lays 10-20 eggs in a single clutch and 65% of them hatch into chicks. Women collect the egg place them all in the nest for hatching. Women keep special care for preparation of warm nest for the eggs by placing a straw on bamboo or broken earthen pot. The nesting place was generally located in isolated dark corner of the house to avoid any disturbance. Generally (8-10) eggs were set under each broody hen and after 21 days, chicks were hatched out (Mandal *et al.*, 2006b) ^[28]. Nest is placed at height to keep eggs safe and away from predators. When the chicks make noise this make the farmer know the hatching has taken place and help the chicks to come out of shell if required. After hatching, the chicks were generally removed on the second or third day from the broody hens and allowed to scavenge with their mother.

Brooding management

Chicks need brooding during initial 6 weeks of age to

maintain the required body temperature and to protect from predators. Keep the nest with chicks and hen inside house or safe place to keep them warm. In first week of hatching chicks are fed finely ground rice and clean water. Mother keeps guard of chicks from adult poultry and other potential threats.

Housing

Birds are kept in kachha house prepared by using locally available materials viz., wood, mud, broken bricks, tiles, wire net (Kusina and Kusina, 1999; Mandal *et al.*, 2006b) ^[29, 28]. Women spend some time on poultry, all they have to provide a night shelter and release them in the morning to scavenge. To avoid predators they keep poultry on roof or inside house (Dana, 1998; Saha, 2003) ^[9-10]. As such no specific housing is required, only a night shelter is required. Litter material is also not provided.

Feeding management

The size and profitability of the rural flock at last rely upon the human populace and its family unit waste and harvest residues, and on the accessibility of other scavengeable feed resources. There is a reasonable connection between nutrition and egg production (FAO, 2004) ^[30]. A study in Bangladesh clearly indicated that egg production depends on season's availability of feed (Ter, 1986) ^[31]. Roberts and Senaratne (1992) ^[32], Gunaratne *et al.*, 1993; 1994 ^[33-34], Roberts *et al.*, 1994 ^[35] and Roberts, 1999 ^[36] have researched and classified the feed resources available for scavenging poultry in Southeast Asia, which they named the Scavengeable Feed Resource Base (SFRB). The SFRB was defined as the total amount of food products available to all scavenging animals in a given area. It depends on the number of households, the types of food crops grown and their crop cultivating and crop processing methods, as well as on the climatic conditions that determine the rate of decomposition of the food products. The SFRB include termites, grain from sowing, harvesting by-products, snails, worms, fodder tree leaves, insects, seeds, grass, grain from sowing, harvesting by-products, water-plants and non-traditional feed materials. Methods of estimating SFRB the value of the SFRB can be estimated by weighing the amount of daily food product/household waste generated by each family as parameter "H", which is then divided by the proportion of food product/household waste found in the crop of the scavenging bird (assessed visually) as parameter "p" (Roberts, 1999). This is then multiplied by the percentage of households that keep chickens (parameter "c"):

- $SFRB = H/p(c)$

This was clearly illustrated in a Sri Lankan study (Gunaratne

et al., 1994) [34], where results showed that the total biomass of the scavenging population was proportional to the SFRB. The maximum productive size of the village flock depends on the SFRB (Tadelle and Ogle, 2000) [37]. To keep the flock size in balance with the available SFRB, it is necessary to set fewer eggs for incubation, cull unproductive birds and sell stock as soon as they are saleable. Supplementing the available SFRB with other feed resources can improve the overall quality of the nutrition of the flock and reduce chick mortality (Tadelle *et al.*, 2002) [38].

In addition to scavenging, all the poultry owners offered a handful of broken wheat rice, bajra, maize etc. to their birds. In first week of hatching chicks are fed finely ground rice and clean water. Feeder and waterer can be made of bamboo, card board, boxes etc. and it is important to ensure easy access of feed to all the birds. Fresh and clean water should be available at all times.

Constraints of backyard poultry

Mortality due to higher incidences of disease and outbreaks was one of the major constraints in backyard poultry production (Mandal *et al.*, 2006b) [28]. The most important disease that affects birds under free range farming is the Newcastle (Ranikhet) disease (Horst, 1988; Mandal *et al.*, 2006b) [39, 28]. Various other constraints are lack of financial support and high cost of inputs/chicks (Mandal *et al.*, 2006a) [8], lack of technical know-how (Deka, 2013) [16], lack of feed ingredient, low hatchability/ early chick mortality/ non-availability of day old chicks round the year (Deka, 2013) [16], lack of deworming and vaccination of the birds (Khandait *et al.*, 2011) [40], attack of predators and early chick mortality/ non-availability of day old chicks round.

Suggestions for obtaining high returns from backyard poultry farming

Some of the suggestions are: - a) Protect birds from predators, to avoid predator's poultry can be kept on roof or inside house. b) Provide additional concentrate feed if available. c) Provide clean and fresh drinking water. d) Provide optimum space to avoid overcrowding and disease spread. e) Proper vaccination, de-worming and veterinary care. f) Regular disinfection of poultry house and surrounding. g) Need for flexibility in communication and extension strategies to take account of differences (e.g. between districts, villages and groups; a 'one size fits all' approach is not appropriate). h) For appropriate flock size scavengable feed resource base method should be applied.

Conclusion

The rural poultry owners had poor knowledge about feeding, breeding and management practice, which led to poor performance of the birds. Therefore, extension programmes in backyard poultry farming should commensurate so that the poultry owners become more knowledgeable and skillful about the new technologies as well as the recommended practices and can maximize the productivity and consequently the income. The focus, therefore, would be to provide appropriate support to this sector in the form of financial assistance, genetic stocks and improved technologies, scientific advice, extension/awareness, particularly on bio security measures. Improved variety and crosses of local birds with superior germ plasm are well adapted to local agro-climatic condition and should be incorporated in the farming system.

References

1. BAHS. Basic Animal Husbandry Statistics-2019. Department of Animal Husbandry, Dairying and Fisheries. Ministry of Agriculture, Government of India, Available from, 2019. <http://dadf.gov.in/sites/default/files/BAHS%20%28Basic%20Animal%20Husbandry%20Statistics-2019%29.pdf>
2. Raveloson C. Situation et contraintes de l'aviculture villageoise à Madagascar In: CTA Seminar Proceedings, Smallholder Rural Poultry Production, Thessaloniki, Greece. 1990; (2):135-138.
3. Singh DP, Pani PK. Aseel's background and foreground, Poultry Guide, Feb. 1986, 53-60.
4. Conroy C, Sparks N, Chandrasekaran D, Sharma A, Shindey D, Singh A. Improving backyard poultry-keeping: a case study from India. Agricultural Research & Extension Network, 2005, 146.
5. Dolberg Frands. Review of Household Poultry Production as a Tool in Poverty Reduction with Focus on Bangladesh and India, in Ahuja, Vinod (Editor), Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment, National Dairy Development Board, India and Pro-Poor Livestock Policy Facility (South Asia Hub) of FAO, 2004.
6. Otte, Joachim. The Hen Which Lays the Golden Eggs: Why Backyard Poultry are so popular? PPLPI Feature. 2006. www.fao.org/ag/pplpi.html.
7. Ahuja Vinod, Sen A. Viability and future of small-scale commercial poultry production in developing countries, paper presented at International Conference on Poultry in the 21st Century: Avian Influenza and Beyond Bangkok, 2007, 5-7.
8. Mandal AB, Tyagi PK, Shrivastav AK. Research Priorities in Poultry Nutrition and Feed Technology to 2020. In: Sasidhar, P.V.K. (Ed.). Poultry Research Priorities to 2020, Proceedings of National Seminar, November 2-3, Central Avian Research Institute, Izatnagar. 2006a; 96-114.
9. Dana SS. Animal husbandry practices among Santal and Lodha tribes of Medinipur district of West Bengal. Ph.D. Thesis, Division of Extension Education, IVRI, Izatnagar, 1998.
10. Saha D. Status of rural poultry production in North 24 Parganas district of West Bengal. M.V.Sc. Thesis, Division of Extension Education, IVRI, Izatnagar, 2003.
11. Okot MW. A cooperative approach to small-holder poultry production in Uganda. In: CTA Seminar Proceedings, Smallholder Rural Poultry Production, Thessaloniki, Greece. 1990; (2):249-253.
12. Agbede GB, Teguaia A, Manjeli Y. Survey on traditional poultry production in Cameroon. Tropicicultura. 1995; 13(1):22-24.
13. Rashid N, Barua A, Bulbul SM. A study on the performance of Khaki Campbell, Desi and Khaki, Campbell X Desi ducks with and without extra feeding under rural condition of Bangladesh, Asian Australas. J. Anim. Sci. 1995; (8):375-378.
14. Rehman S. A study of social and economic aspects of livestock owning Gujjar and Bakarwal tribe of Jammu and Kashmir. Ph.D. Thesis, Division of Extension Education, IVRI, Izatnagar, 1995.
15. Selvam S. An economic analysis of free range poultry rearing by rural women. Indian Journal of Poultry Science. 2004; 39(1):75-77.

16. Deka, Pankaj, Borgohain, Rupam, Deka, Binapani. Status and constraints of backyard poultry farming amongst tribal community of Jorhat district in Assam. *Asian J. Animal Sci.* 2013; 8(2):86-91.
17. CARI. CARI perspective plan-Vision-2030. ICAR-Central Avian Research Institute.20011. Available from: <https://icar.org.in/cari/vision/CARI%20VISION%202030.pdf>
18. Chatterjee RN, Rajkumar U. An overview of poultry production in India. *Indian J. Anim. Health.* 2015; 54:89-108.
19. Kumaresan A, Bujarbaruah KM, Pathak KA, Chettri B, Ahmed SK, Haunshi S. Analysis of a village chicken production system and performance of improved dual purpose chickens under a subtropical hill agro- ecosystem in India, *Trop. Anim. Health Pro.* 2008; (40):395-402.
20. Pathak PK, Nath BG. Rural poultry farming with improved breed of backyard chicken. *J. World's Poultr. Res.* 2013; 3:24-27.
21. Rath KR, Mandal KD, Panda P. Backyard poultry farming in India: a call for skill upliftment. *Res J Recent Sci.* 2015; 4:1-5.
22. Okitoi LO, Ondwasy HO, Obali MP. Gender issues in poultry production in rural household of Western Kenya. *Livestock Res. Rural Dev.* 2007; 19:205-210.
23. Das SC, Chowdhury SD, Khatun MA, Nishibori M, Isobe N, Yoshimura Y. Poultry production profile and expected future projection in Bangladesh, *World's Poultry Science Journal.* 2008; 64(1):99-117.
24. Panda AK, Raju MVLN, Rama Rao SV. Poultry production in India: opportunities and challenges ahead. *Poult. Line.* 2008; 8:11-14.
25. Mapiye C, Mwale M, Mupangwa JF, Chimonyo M, Foti R, Mutenje MJ. A research review of village chicken production constraints and opportunities in Zimbabwe. *Asian-Australas J. Anim. Sci.* 2008; 21:1680-1688.
26. Khan AA, Bidabadi FS. Livestock Revolution in India: Its Impact and Policy Response, *South Asia Res.* 2004; 24(2):99-122.
27. Ghosh MK, Ahmed FA, Buragohain R, Pathak PK, Bhattacharya M. Growth performance of Vanaraja birds in high altitude areas of Arunachal Pradesh under Backyard system of management. XXII Annual conference and National Symposium, Indian Poultry Science Association, Project Directorate on Poultry, Hyderabad, from. 2005; 198:2-4
28. Mandal MK, Khandekar N, Khandekar P. Backyard poultry farming in Bareilly district of Uttar Pradesh, India: An analysis. *Livestock Research for Rural Development.* 2006b; 18:101.
29. Kusina JF, Kusina NT. Feasibility study of agricultural and household activities as they relate to livestock production in Guruve District of Mashonaland central province with emphasis on village chicken production. Household Agricultural Support Programme Report, Harare, Zimbabwe, 1999.
30. FAO. Small-Scale Poultry Production Technical Guide. FAO Animal Production and Health. 2004. ISSN 1810-1119(available at <http://www.fao.org/3/a-y5169e.pdf>). Rome (Italy).
31. Ter Horst K. Poultry Management in rural areas of developing countries: Matching technical demands with social facts. Unpublished report, Department of Livestock Services, Ministry of Livestock and Fisheries, Bangladesh, 1986.
32. Roberts JA, Senaratne R. The successful introduction of hybrid egg laying chickens into a Sri Lankan village. *Proceedings 19th World Poultry Congress, Amsterdam.* 1992; 1:818-821.
33. Gunaratne SP, Chandrasiri ADN, Hemalatha WAPM, Roberts JA. Feed resource base for scavenging village chickens in Sri Lanka. *Tropical Animal Health and Production.* 1993; 26:249-257.
34. Gunaratne SP, Chandrasiri ADN, Wickramaratne SHG, Roberts JA. The utilisation of scavenging feed resource base for village chicken production. *Proceedings Seventh Asian Australasian Association for Animal Production Congress, Bali, Indonesia.* 1994; 2:67-68.
35. Roberts JA, Gunaratne SP, Wickramaratne SHG, Chandrasiri ADN. *Proceedings of the Seventh Asian-Australasian Association for Animal Production Congress, Bali, Indonesia.* 1994; 2:34-35.
36. Roberts JA. Utilisation of Poultry Feed Resources by Smallholders in the Villages of Developing Countries. In F. Dolberg & P.H. Petersen, eds. *Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality.* *Proceedings workshop, March 22-26, 1999, Tune Landboskole, Denmark.* Available at, 1999, 311-336. <http://www.husdyr.kvl.dk/hm/php/tune99/28roberts.htm>.
37. Tadelle D, Ogle B. Nutritional status of village poultry in the central highlands of Ethiopia as assessed by analyses of crop contents. *Ethiopian J. Agric. Sci.* 2000; 17:47-57.
38. Tadelle D, Nigusie, D, Alemu Y, Peters KJ. The feed resource base and its potentials for increased poultry production in Ethiopia. *World's Poultry Science Journal,* 2002; 58(01):77-87. doi:10.1079/wps20020009
39. Horst P. Native fowl as reservoir for genomes and major genes with direct and indirect effects on productive adaptability. *Proceedings of World's Poultry Congress.* Nagoya, Japan. 1988; 18:99-105.
40. Khandait VN, Gawande SH, Lohakare AC, Dhenge SA. Adoption level and constraints in backyard poultry rearing practices at Bhandra district of Maharashtra (India). *Res. J. Agric. Sci.* 2011; 2(1):110-113.
41. Rangnekar D, Rangnekar S. Traditional poultry production system - A need for fresh look from rural development perspective. *XX World's Poultry Congress, New Delhi.* 1996; 2(5):405-408.
42. Ali J. Livestock sector development and implications for rural poverty alleviation in India, *Livest. Res. Rural Dev.* 2007; 19(2).