**SCIENTIFIC BACKYARD POULTRY REARING TECHNOLOGY:
AN APPROACH TO AWARENESS AND ADOPTION OF TECHNOLOGY FOR
LIVELIHOOD DEVELOPMENT OF RURAL FARMERS IN SIKKIM, INDIA**

Nath B.G., Pathak P.K., Mohanty A.K., Researchers
ICAR-Research Complex for NEH Region, Sikkim Centre, Sikkim, India
E-mail: drbichitra.nath@gmail.com

ABSTRACT

A backyard poultry improvement technology programme based on scientific management practices with high yielding breed of chickens was desired by the rural communities of Sikkim to improve their income. For implementation of this programme, partnership with various line departments and extension agencies were chosen deliberately. Scaling out was realized through participatory approaches, use of trainers from the communities, locally managed feed with diminutive commercial feed, market orientation and credit facilities, collaborating with and influencing Govt and Non Govt Organizations (NGOs). The average profit from improved poultry keeping was US\$451.83 per household per annum for a 50 bird enterprise. This programme contributed to increased awareness, development of leadership and entrepreneurial skills, increased status of trainers and investments in other businesses.

KEYWORDS

Awareness; Backyard poultry; Impact; Indigenous; Adoption.

In Sikkim, more than 70% people are from agricultural background and 80% of these people keep livestock of different species as a supplementary source of income (Nath *et al.*, 2012a). The state is shifting its focus towards organic agriculture where the role of livestock and poultry sector shall be of paramount importance particularly to supply the organic manure. Therefore unless the livestock growers are supported well to effectively convert the 'know- how' into 'do-how', the livestock sector shall not be playing its role efficiently. The enormous demand of poultry in the state is due to increase flow of tourist every year (Pathak *et al.*, 2013). A wide gap exists between demand and supply of poultry products. To meet the demand, majority of the poultry birds were imported from neighbour state West Bengal. In the field of poultry development, emphasis is laid on the development of high laying layers, dual purpose breeds and fast growing broilers and promotion of private entrepreneurship by providing required inputs to the producers including credits, training, processing and marketing facilities ensuring remunerative prices to the producers (Bhutia, 2012).

Village chickens provide cheap, readily harvestable protein-enriched white meat and eggs with high quality, digestible protein for immediate home consumption and sale for income generation (Mapiye and Sibanda 2005; Miao 2005). It has enabled farmers to purchase household property, pay the school fees of their children, meet their basic needs, build houses, establish solar power and buy a few cows, among others. In Sikkim, farmers used to rear Desi bird (Pathak *et al.*, 2013), but the production had been low due to poor management practices. The main objective of the programme was to increase the production of poultry which reduce the poverty of rural farmers especially woman headed households.

Farmers of Sikkim realised to improve their chicken production and increase their earnings. They were interested in high yielding breed of poultry than their local chickens; however, they also valued the ease of management and disease resistance of their indigenous breed. Poultry Development Project (PDP) in Hyderabad, India had carried out a lot of research in the past on improving the productivity of local chickens, including cross-breeding with exotic birds. They had tested their technologies in farmers' poultry farm. Based on those experiences, some improved breed of backyard chickens were proposed to start poultry farming in rural areas. It combines all the good traits of the various strains, that is, can lay for a long time (more than 12 months) and with characteristics of disease resistance, high growth rate and starting to lay eggs earlier as compare to local Desi chickens. As recommended by PDP on Hyderabad, Indian Council of Agricultural Research (ICAR),

Sikkim centre introduced two high yielding backyard poultry breed Vanaraja and Gramapriya in Sikkim. These two improved breeds have their following characteristics (Pathak and Nath, 2013):

- Natural and attractive- multi- color feather pattern;
- High general immune competence, so perform better under adverse condition;
- Perform better even with poor quality diets;
- Grow faster and produce more eggs than Desi hen;
- Produce brown eggs like Desi hen.

The birds have tender meat (the fat pattern in meat), making it highly desirable. The performance of Vanaraja and Gramapriya birds in backyard system was presented in Table 1.

Table 1 – Comparative performance of Vanaraja, Gramapriya and Local chicken under backyard system of rearing

Parameter	Performance		
	Vanaraja	Gramapriya	Local chicken
Mortality to 10 weeks	Less than 5%	Less than 5%	Less than 4%
Mortality to 20 weeks	Less than 10%	Less than 12%	Less than 8%
Mortality during laying stage	Less than 12%	Less than 15%	Less than 10%
Average age at first lay (days)	152	145	184
Average body weight at first lay (g)	2.30	2.18	1.25
Average annual egg production (nos.)	171	178	60
Colour of egg	Tinted	Tinted	Tinted
Average Egg weight at 40th weeks (g)	51	49	41

Source: Pathak and Nath, 2013.

For improving the rural poultry farming with improved birds, ICAR Sikkim Centre, Tadong was taking the following important steps:

- Survey for data collection regarding status of poultry production;
- Selection of interested farmers to start poultry farming through survey;
- Formation of different self help groups (SHGs) in different areas;
- Arrange training programmes for farmers on technology dissemination of information about the housing, feeding (home mixing of poultry feeds), general management and health care;
- Under different projects, ICAR supplied Vanaraja and Gramapriya chicks to selected farmers;
- Cost–benefit analysis and disseminated the modern poultry farming technologies to other farmers.

Firstly, farmers were encouraged to form self help groups (SHGs) to enable the technology to reach as many farmers at a reasonable cost in a short period. Throughout the various sponsored projects, ICAR conducted training programmes to build the capacity of the groups, train them in group dynamics and ensure they were able to manage themselves. Supervisory visits were carried out regularly to support the work done.

Scientific technology for backyard poultry. In Sikkim, farmers reared poultry with traditional method. Chicks were placed in a box like structure made of locally available bamboo and wood. No deep litter system of poultry farming was practiced by majority of the farmers. The new technology is relatively knowledge-intensive, since it represents a commutation of changes from previous ways of managing poultry that farmers were used to. Introduced scientific backyard poultry rearing technology in the state was presented in Table 2. Farmers were advised to start poultry farming by constructing a low cost poultry houses having well ventilation, with home grown feeding materials with a small amount of concentrate feed and taking more interest on management practices.

In Sikkim, the temperature during the daytime ranges from 150 C to 280 C, while during winter the minimum temperature is as low as 6 to 70 C (Nath *et al.*, 2013). Poultry chicks mainly die due to cold stress, therefore, winter management of poultry is of utmost important. So, farmers were advised to pour rice husks, wooden dust etc on the ground to

form a deep litter. During the first week, the husks are covered with paper to prevent chicks from eating the husks, which can block their digestive tract. In order to teach the chicks to feed, chick feed is spread on the paper. After three days, feed is provided in new and unused plastic trays or feeding troughs. A cheap source of heat for the chicks is provided through homemade brooder. When the chicks are small, they need to be kept together and close to the heat source through the construction of a round enclosure in the room.

Table 2 – Introduced scientific backyard poultry rearing technology, farmers adaptation and constraints for adaptation of technology

New technology	Source of technology	Adaptation	Constraints for adaptation	Adapters
High yielding breed of chicks, Vanaraja and gramapriya	PDP in Hyderabad, India	High growth rate and more number of egg laying birds to increase poultry production	Non availability of chicks	Farmers
Brooding (warming) chicks	ICAR	Home made brooder with low cost	Adopted as introduced	Farmers
Deep litter system	–	Pour rice husks, wooden dust etc on the ground to form a deep litter	Adopted as introduced	Farmers
Improved poultry houses	ICAR	Local materials were used where possible. Members assisted elderly and child-headed households	Insufficient space, High labour cost	Farmers
Feed mixing using local ingredients	ICAR	Transportation of feeds was done in bulk together with neighbouring farmers	High feed cost	Farmers
Vaccination	Veterinary Department	Collective purchases were organized by groups, maintaining the cold chain	Non available	Farmers

Other improved management techniques were taught to improve feeding, housing, healthcare and general husbandry. Improved feeds consisted of mixtures of locally available high-quality ingredients such as maize bran, millet and wheat. It was advised to supply commercial feed up to 28 days of old and later keep under backyard system. Farmers were able to produce some of the ingredients of the feed, thereby producing feed cheaper than commercial types. The use of vaccines against Newcastle disease has the potential of greatly reducing chicken mortality, resulting in more birds and increased incomes for rural households (Copland and Alders, 2005). Vaccination of birds against infectious diseases like New Castle disease, fowl pox and infectious bursal disease (IBD) should be practiced timely. Under Poultry seed project, a demonstrations poultry unit was established in ICAR Sikkim Centre and more and more farmers have been visiting that farms and observed the scientific management practices of poultry.

Awareness and spread of technology. Awareness creation is often the first step in disseminating a technology package, and to a large extent, the level of awareness could determine the level of adoption of the technology (Jegade *et al.*, 2007). ICAR was trying to disseminate the technology through participatory methods and involved farmers in the process of technology development. It did not take a ready-made technology to backyard poultry, but provided the knowledge and skills to farmers to engage technology promotion and adoption process using locally available materials where possible. The emphasis on training of farmers and development of a pool of local trainers was an important methodological consideration for purposes of continuity and sustainability (Roothaert *et al.*, 2011). The use of self help groups (SHGs) as an entry point to the community allowed involving many farmers, especially at the time of sensitization and training.

Initially, farmers were selected and trained them on scientific poultry farming practices and supplied 50 nos' improved breed of poultry chicks to each farmer. Sometimes, 250 nos' of chicks were supplied to each SHG (Consisting 8-10 farmers). As the vaccines were available for 500/1000 birds in the market, therefore individual farmers were advised to purchase vaccines and medicines collectively that can reduce the cost as well reduce the

chance of expiry. The second stage focused on strengthening community structures that were established in the first stage. There had been much demand and increasing numbers of farmers. ICAR continued to strengthen the extension capacities on supervision and training extension.

ICAR prepared the extension literature in the form of folders, leaflets, pamphlets, handouts, technical bulletins etc and distributed to various line departments as well as farmers. The communication channels like radio, doordarshan, news papers, farm journals, farm magazines also being utilized by the departments for passing the information among wide range of people. ICAR organized exposure visits to selected farmers so as to share lessons and experiences. The participants appreciated what fellow farmers were doing. Participants started improving their farms by using the knowledge learnt during the exposure visits. The exact number of new adopters of the improve breed of backyard poultry chicken innovation in the state was unknown, but was estimated to be involve more and more households.

Adoption level and its constraints. Technology adoption was important component that enhance productivity in the sub-sector (Jegade *et al.*, 2007). Nath *et al.* (2012b) studied the adoption level of scientific backyard poultry rearing practices in north district of Sikkim and found that the overall adoption was 39.06 %. They observed that housing (43.2%) was highly adopted followed by feeding (41.6%), marketing (40.0%), general management (39.2%) and health care practices (36.8%). The level of adoption of the technologies had remained average which was depending on farmers' personal as well as social and economic condition. Nath *et al.* (2012b) observed that age, flock size, training received, credit facility had a positive and significant relationship with adoption level of backyard poultry farming. They found that education had negative correlation which was opposite to the findings of Rahman (2007).

Table 3 – Economic analysis of 50 nos (20 male+30 female) high yielding chicken

n/n	Rate	Rupees	(US\$)
A) Expenditure			
1) Cost of chicks	Rs. 35/- per chick x 50	1750	29.31
2) Cost of brooder, feed trough, water trough etc	Rs. 15/- per chick x 50	750	12.56
3) Cost of medicines	Rs. 5/- per chick x 50	250	4.18
4) Cost of vaccines	Rs. 3/- per chick x 50	150	2.51
5) Cost of electricity	Rs. 3/- per chick x 50	150	2.51
6) Cost of feed			
For male (20):			
a) Day 1 to up to 6 week	3.5 kg/ chicks x Rs. 25/- per kg x 20	1750	29.31
b) 6 weeks to 13 weeks	4 kg/chicken x Rs. 25/- per kg x 18*	1800	30.15
For female (30)			
a) Day 1 to up to 6 week	3.5 kg/chicks x Rs. 25/- per kg x 30	2625	43.96
b) 6 weeks to 72 weeks	40kg/chicken x Rs. 25/-per kg x 27*	27000	452.25
7) Miscellaneous cost	Rs. 5/ per chicks x 50	250	4.18
Total expenditure		36475	610.95
B) Return			
a) Sale of male birds	2.25 kgx Rs. 200/- per kg x 18	8100	135.67
b) Sale of eggs	155nos/Rs. 10/ per egg x 27	41850	700.98
c) Sale of female birds	2.5 kg x Rs. 200/- per kg x 27	13500	226.12
Gross return		63450	1062.78
Total profit (B-A)		26975	451.83
Cost Benefit ratio	1:1.73		

* Mortality rate 10%; since the birds kept in backyard system, so feeds are supplied as supplementary source after 6 weeks to reduce the feed cost; 1 Rupee= 0.01675 US\$.

The constraints for adopting the scientific poultry rearing technology were presented in Table 2. In Sikkim majority of the backyard poultry farmers faced problem like non-availability

of high yielding breed of poultry chicks, mortality of day old chicks/young birds, high rate of morbidity, inability to diagnose sick birds (Nath et al., 2012b). Non-availability of medicines and vaccines resulted in the devastation of the poultry flock by diseases particularly Newcastle disease. Non availability of credit facility was another challenge for majority of the poor farmers to adopt technologies. Farmers articulated a need to continue to access improved expertise, mainly on poultry management and livestock treatment.

Socio-economic impact. Measuring economic performance (Ewbank et al., 2007) presented a challenge given the diversity of products that farmers generated – individual predilection dictated the extent to which farmers marketed either eggs or chicks of varying ages. The cost of expenditure and gross return for improved birds was presented in Table 3. The average income was recorded as Rs 63450 (US\$ 1062.78) for a 50 bird enterprise. In three years observations by ICAR, the average profit of individual farmers was increased from US\$ 268.76 to US\$ 451.83 per annum. These results can be considered very positive and contrasting as compared with the average additional incomes of US\$48 reported in a 12-year programme in Bangladesh (Riise et al., 2005) and US\$ 62 in a 10-year programme in Uganda (Roothaert et al., 2011).

Fixed costs include the cost of constructing the chicken house, feeders and drinkers, lanterns and pots for brooding chicks and various tools for cleaning (Roothaert et al., 2011). The total cost of expenditure for 50 birds was Rs. 36,475 (US\$ 610.95), which, given the average start-up period of four months reported by farmers, means that it takes nearly six months of operation to recover the total expenditure. The cost benefit was estimated as 1.73. Women were the main beneficiaries (Nath et al., 2012a), in recognition of the significant role they play in food production enterprises. Food security and quality have also improved in that farmers can now eat eggs five times a week and chicken thrice a week.

Training and knowledge was not only related to poultry technologies, but also related to gender awareness, leadership skills and management issues (Roothaert et al., 2011). As a result majority of trained farmers (forming SHGs) are familiar with management of savings by opening bank accounts. Through their own savings, farmers started up their own income generating enterprises on their farms, thus improving their living status.

By introducing scientific backyard chicken rearing technology, there is integration and diversification of farm production for increased household food production and incomes. Poultry farming has enabled farmers to make use of chicken manure to improve the soil fertility of their farms, and as such will continue improving the environment through nutrient recycling. Crop harvest had also increased and improved in quality and size.

Way ahead for technology dissemination. In the areas that the technology has been understood and applied, more awareness creation should be left in the hands of trained farmers (Roothaert et al., 2011). To effectively run this, training needs for farmers should be reviewed regularly and training provided. ICAR gives much emphasis to successfully integrate the transfer of technology programmes with the similar activities of other line departments/ organizations functioning in the state. ICAR maintains close functional, collaborative and coordinative linkages with various development departments, financing institutions and voluntary organizations operating in the area for launching various programmes effectively which will help to create long-term sustainability. This linkage and integration is being carried out with active support of the host institution in terms of human resources, training facilities, other infrastructure facilities, various outreach programmes etc.

CONCLUSION

Technical knowledge and skills imparted by training created response among participants to improve traditional cultivation practices, initiate new enterprises and generate additional income in their house holds, homestead gardens, livestock farming and small scale enterprises. It has brought revolutionary changes among farmers to effectively recycle available farm wastes through vermicomposting technology. The blending of traditional knowledge with the modern methods as suggested by the ICAR helped to rejuvenate old practices and to evolve locally adoptable and sustainable technologies. The functional

linkages established by ICAR with state government helped for common planning, joint execution, monitoring and purposeful evaluation of rural livelihood developmental programmes in Sikkim. ICAR is in the fore-front to make the good farm families better, poor ones good so as to raise their socio-economic status.

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