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Effect of Technological Intervention on the Economics of *Vanaraja* Chicken Rearing in West Siang District of Arunachal Pradesh, India

Moloy Sarmah Baruah[1*], Chitrangad Singh Raghav[2] and Homeswar Kalita[3]

[1]*Assistant Chief Technical Officer, (Animal Science), ICAR-KVK West Siang, ICAR-Research Complex for NEH Region, Arunachal Pradesh Centre, Basar, India*
[2]*Sr. Scientist and Head, ICAR-KVK West Siang, ICAR-Research Complex for NEH Region, Arunachal Pradesh Centre, Basar, India*
[3]*Joint Director, ICAR-Research Complex for NEH Region, Arunachal Pradesh Centre, Basar, India*

*Corresponding author's Email: drmoloysb@gmail.com

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ABSTRACT

The present investigation was conducted to evaluate the comparative economics of two methods of *Vanaraja* chicken rearing under backyard system i.e. improved technologies demonstrated under Front Line Demonstration (FLD) and Farmer's Practice (FP) traditionally adopted by the farmers. All together 120 farmers from 12 randomly selected villages of West Siang district of Arunachal Pradesh having experience of poultry rearing for more than two years were selected for FLD. The study (from August, 2015 to July, 2017) reveals that, the technologies demonstrated in FLDs recorded higher body weight gain of male chickens (2300g) over FP (1800g) at 20 weeks of age, which was 27.78% higher than that of Farmers' Practice. Mean annual egg production under FLD was recorded as 110 numbers which was 37.50% higher than that of FP (80). The estimated technology gap in body weight gain was recorded as 200 g/bird, whereas for egg production it was 20 numbers/bird. The extension gap of body weight gains and egg production was recorded as 500 g/bird and 30 numbers/bird, respectively with a technology index of 8% in body weight gain and 15.38% in egg production. The benefit cost (B: C) ratio for *Vanaraja* chicken rearing under FLD and Farmers' Practice was recorded as 2.62:1 and 1.71:1, respectively which indicated that under improved rearing techniques demonstrated under FLD *Vanaraja* chicken gives much more profit than that of rearing techniques under FP. Non availability of improved germplasm of poultry (93.33%) was given the top ranking while weak market linkage to dispose the produce (35.00%) was given as bottom ranking in the constraints matrix ranking in poultry production. Under client satisfaction index over the performance of FLD analysis reveals 63.33% of high satisfaction index over the performance of FLDs while 27.50% respondent expressed medium level of satisfaction and only 9.17% respondent expressed low level of satisfaction index.

Key words: Backyard poultry, Front line demonstration, *Vanaraja*, Benefit cost ratio

INTRODUCTION

The state Arunachal Pradesh of India is ethnically and culturally akin to South East Asia and agriculture is the prime source of livelihood for the rural population in this region. Although, cereals dominate the cropping pattern in this region, livestock and poultry also plays an important role in the mixed farming systems adopted traditionally by the farmers. Poultry are the birds that include fowl, turkey, duck, goose, ostrich, guinea fowl and etc. which render not only economic amenities but also contribute significantly to human food as a primary supplier of meat and egg (Sarma et al., 2017). Among various poultry species backyard poultry plays an important economic, nutritional and socio-cultural role in the rural livelihood of this region. For this region without backyard poultry farming it is quite impossible meet up the demand and production gap of meat and eggs. As most of the farmers of this region is either landless or marginal, therefore commercial poultry farming cannot provide the

required protein at affordable rate to the people (Singh et al., 2016). Though, backyard poultry contributes many livelihood indicators of rural people, but it is reared with a little or no bushiness motive. Farmers used to keep a very small flock size of birds managed as a supplementary enterprise with zero or negligible input investment (Awasthi et al., 2015). To uplift this situation of backyard poultry farming a Front Line Demonstration (FLD) was conducted by Krishi Vigyan Kendra West Siang on backyard poultry production with improved strain *Vanaraja* developed by project directorate of poultry, Hyderabad especially meant for rural backyard poultry production. FLD is a concept of field demonstration evolved by the Indian council of agricultural research, with an objective of demonstrating newly released production technologies and their management practices in the farmers' field under different agro-climatic regions and farming situations. By keeping the above point in view, the present study was designed to explore the contribution of FLD on backyard poultry farming in terms of income generation along with its economic structure and to determine the effectiveness and satisfaction level of the farmers in terms of their traditional farming practices.

MATERIALS AND METHODS

FLD with improved package of practices were conducted from August, 2015 to July, 2017 at 12 randomly selected villages of West Siang district of Arunachal Pradesh, India, namely Sago, Lipunamchi, Gori I, Gori II, Gori III, Regi, Pagi, Disi, Bam I, Bam II, Nyodu and Dali with 5 farm family from each village, covering 60 farm family altogether. Twenty numbers of Day Old Chicks (DOC) of *Vanaraja* were provided to the each of those 60 farm families from the hatchery unit of Indian council of agricultural research complex for North Eastern Hill region, Arunachal Pradesh centre. Another 60 farmers using their own practice (farmer's practice) for rearing *Vanaraja* poultry taken from the same hatchery unit were randomly contacted for collecting data to study the comparative performance of FLD and Farmer's Practice (FP). Prior to the distribution of DOC where FLD was conducted, vocational training was given to the selected farmers regarding scientific rearing techniques of *Vanaraja* chicken and demonstrated improved package of practices which has been illustrated in Table 1. Under FLD programme, day old Vanaraja chicks were kept in brooding up to 6 weeks of age and simultaneously vaccinated with Ranikhet disease vaccine (F strain/ La Sota strain) on 7th day and booster dose on 28th day of age. Infectious bursal disease vaccine (MB strain) was done on 14th day and booster dose on 35th day of age. Multivitamin suspension was given to all the chicks during the first 10 days. Up to 6 weeks of age, chicks were fed with broiler chicken starter diet with a provision of *ad libitum* fresh and clean water. After brooding, chicks were let loose at backyard environment after proper acclimatization. The primary data were collected for day old to 18 months of age of the birds. The body weights for both male and female birds were estimated separately at the age of 20 weeks. Similarly, average annual egg production was estimated by calculating the numbers of eggs produced by the female birds up to one year. Performance of *Vanaraja* chicken under FLD and FPs were estimated by taking the average for both body weight and egg production for estimating the growth performance and economic returns. Finally, the technology gap, extension gap and technology index for *Vanaraja* poultry rearing were calculated by using the formula defined by Samui et al. (2000).

Technology gap = Potential yield – Demonstration yield.

Extension gap = Demonstration yield – Yield of FP.

Technology index (%) = {(Potential yield - Demonstration yield) / Potential yield} × 100

Table 1. Package of practices followed in the FLDs and FP for *Vanaraja* chicken in West Siang district of Arunachal Pradesh, India

Serial Number	Inputs/Package of practices provided to the farmers	Front Line Demonstration	Farmers' Practice
1.	Vanaraja chicks (Day Old Chicks)	Twenty numbers of *Vanaraja* Day Old Chicks.	Farmers procured Day Old Chicks of *Vanaraja* chicken by own.
2.	Technological knowledge of poultry rearing	Through training and demonstration.	Untrained, traditional knowledge.
3.	Vaccinations	As per schedule.	Not followed as per schedule.
4.	Medication	Mostly as preventive doses.	Indiscriminate used.
5.	Housing	Scientific design with locally available materials.	Not scientific, overcrowded, improper ventilation.
6.	Feeds	Commercial balanced feeds up to 6 weeks of age.	Not balanced, mostly broken rice and sometime little quantity of broiler starter feeds mixed with broken rice.

The estimated cost of rearing was calculated by adding the variable cost i.e. cost of DOC, feed cost, vaccine cost, medicine cost, labour cost and fixed cost i.e. land, poultry shed and equipment cost. The return was calculated by adding the incomes from the sale of eggs, sale of cocks and spent hens. Unit wise economic analysis was also done for FLD and FP. To determine the cost and returns from backyard poultry production gross margin analysis was used as per the method described by Oladunni and Fatuase (2014). The Gross Margin (GM) was estimated with the help of following equations:

GM = TVP – TVC Where, TVP = Total value of production, TVC = Total variable cost

If GM > 0, the backyard poultry enterprise is considered profitable. Based on the above facts, to know the economic viability benefit cost ratio was calculated by dividing the gross income/bird by net cost of production/bird. After that matrix ranking techniques was utilized to identify the constraints faced by the farmers in poultry farming. Farmers were also asked to rank the constraints they perceived as limiting factor for poultry farming in order of preference. An interview schedule was also prepared to know the farmers' satisfaction level for the technology demonstrated through FLD and based on that, client satisfaction index was calculated by the following formula.

Client satisfaction index = (Individual score obtained/ Maximum score possible) ×100.

All the data generated were tabulated and subjected to statistical analysis (wherever required) as per the method of Snedecor and Cochran (1994).

Zoonotic diseases management

Exposure to zoonotic diseases is always persist for the backyard poultry owner or handler if proper hygiene practices are not followed in the farm. Hygienic practices, such as avoiding of consumption of food or water within the farm premises, hand washing after handling the birds or their excrement were strictly followed throughout the study.

Ethical approval

The study was conducted without affecting the birds' general wellbeing. Approval was taken from concern authority.

RESULTS AND DISCUSSION

Rearing expenditure of Vanaraja chicken under FLD and FP are presented in table 2. The estimated cost of rearing of 20 *Vanaraja* chickens under FLD and FP for 18 months of age are presented in table 2.

Table 2. Estimated rearing cost of 20 Vanaraja chickens under Front Line Demonstration and Farmers' Practice for *Vanaraja* chicken in West Siang district of Arunachal Pradesh, India

S. No.	Particulars	Cost of rearing (Rupees)	
		Front Line Demonstration	Farmers' Practice
1	**Variable cost**		
a.	Cost of a day old chicks (Per chick cost is rupees 40.00)	800.00 (15.26%)	800.00 (17.76%)
b.	Cost of feed up to 42 days of age		
i	Under front line demonstration 1.2 kg of broiler starter/bird i.e. 24 kg @ Rupees 40.00 per kg	960.00 (18.31%)	-
ii	Under farmers' Practice 10 kg of broken rice mixed with little broiler starter @ Rupees 25.00 per kg for 20 numbers chicks	-	250.00 (5.55%)
c	Cost of vaccine @ Rupees 1.60 per chick	32.00 (0.61%)	32.00 (0.71%)
d	Under front line demonstration cost of medicine, feed supplement @ Rupees 3.75 per chick	75.00 (1.43%)	-
e	Under farmers' practice cost of medicine, feed supplement @ Rupees 2.40 per chick	-	48.00 (1.07%)
f	For both the flock (Front Line Demonstration and Farmers' Practice) cost of labour @ 20 hours per month = 2.5 Man-days × 18 months = 45 man-days × Rupees 150.00 per Man-day = Rupees 6750.00	3375.00 (64.38%)	3375.00 (74.91%)
	Total variable cost	5242.00	4505.00
2	**Fixed cost**		
a	Land	Available with the farmers	Available with the farmers
b	Low cost poultry shed made with locally available material	1000.00	1000.00
c	Depreciation cost on poultry shed @ 33.33 % per year	499.95 (8.71%)	499.95 (10.63%)
d	Drinker/ Feeder	Locally made	Locally made
	Total fixed cost	499.95	499.95
3	Total cost/value of production	5741.95	5004.95
4	Cost of production per bird (D/20)	287.10	250.25

Table 3. Growth performance of *Vanaraja* chicken under front line demonstration and farmers' practice in West Siang district of Arunachal Pradesh, India

Numbers of demonstration	Numbers of birds/ demonstration	Mortality rate after 21 weeks (%)		Body weight of male at 20 weeks (g)		Average annual egg production (Numbers)		% Increase in		Technology gap in		Extension gap		Technology index (%)	
		FLD	FP	FLD	FP	FLD	FP	Body weight over FP	Egg production over FP	Body weight gain (g/bird)	Egg production (numbers/bird)	Body wt. gain (g/bird)	Egg production (numbers/bird)	Body weight gain	Egg production
120	20	15	40	2300	1800	110	80	27.78	37.50	200	20	500	30	8.0	15.38

FLD: Front Line Demonstration, FP: Farmers Practice

Table 4. Per unit return from *Vanaraja* chickens under front line demonstration and farmers' practice in West Siang district of Arunachal Pradesh, India

S. No.	Particulars	Front line demonstration	Amount (Rupees)	Farmers' practice	Amount (Rupees)
1	Income from sale of eggs (from 9 females under FLD and 7 females under FP)	Average annual egg production 110 eggs/hen i.e. 990 numbers of eggs @ Rupees 8/egg	7920.00	Average annual egg production 80 eggs/hen *i.e.* 560 nos. of eggs @ Rupees 8/egg	4480.00
2	Sale of cocks (8 under FLD and 5 under FP)	Average weight: 2.23Kg. Total weight: 17.84Kg @ Rupees 300/Kg	5352.00	Average weight: 1.80 Kg. Total weight: 9.0 Kg @ Rs. 300/Kg	2700.00
3	Sale of spent hens (9 females under FLD and 7 females under FP)	Rupees 200/ hen	1800.00	Rs. 200/ hen	1400.00
4	Total gross return	-	15072.00	-	8580.00
5	Gross income/bird	-	753.60	-	429.00
6	Net return (Gross income- production cost)	-	9330.05	-	3875.05
7	Net return / bird	-	466.50	-	193.75
8	Gross Margin	-	499.95	-	499.95
9	Benefit: cost Ratio	-	2.62:1	-	1.71:1

Table 5. Matrix ranking of constraints of poultry farming in West Siang district of Arunachal Pradesh, India

S. No.	Constraints	Respondent (n=120)	(%)	Matrix ranking
1.	Non availability of improved germplasm of poultry	112	93.33	I
2.	Mortality due to disease outbreak	105	87.50	II
3.	Non availability of quality feeds	100	83.33	III
4.	High cost of concentrate feeds	96	80.00	IV
5.	Low productive performance of native birds	89	74.17	V
6.	Early chick mortality due to cold stress	82	68.33	VI
7.	Lack of investment capacity of the farmers	65	54.17	VII
8.	Weak market linkage to dispose the produce in right price	42	35.00	VIII

Table 6. Client satisfaction index over the performance of *Vanaraja* chicken under Front Line Demonstration (n=120) in West Siang district of Arunachal Pradesh, India

Number	Percent	Satisfaction level
76	63.33	High
33	27.50	Medium
11	9.17	Low

During the study it was found that under FLD, the cost of labour accounted the highest (64.38%) of rearing cost followed by cost of feed (18.31%), chicks (15.26%), depreciation cost on poultry shed (8.71%), cost of medicine, feed supplement (1.43%) and cost of vaccine (0.61%). Similarly, in case of FP the expenses for the labour is also highest (74.91%) among the other expenses of rearing. The expenses for the cost of feed, chicks, poultry shed depreciation cost, cost of medicine and feed supplement, cost of vaccine accounted 5.55, 17.76, 10.63, 1.07 and 0.71 % respectively.

This finding was in accordance with the findings of Uddin et al. (2013) and Islam et al. (2015) who also reported that labour cost estimated to be the highest in backyard poultry rearing. Present finding is contradictory with the finding of Nath et al. (2013), where he reported that feed cost (90.95%) constituted the highest expenditure for *Vanaraja* chicken under backyard rearing condition. In the present study the total production cost under FLD was found to be higher (Rupees 5741.95) than that of the production cost under FP (Rupees 5004.95) which might be due to the higher cost of feed and medicine, feed supplement. Growth performance of *Vanaraja* chicken under FLD and FP are presented in table 3.

The mortality after 21 weeks of age was recorded as 15% under FLD while in PF it was recorded as 40%. Average body weight of male birds under FLD was observed as 2300g which was 27.78% higher than that of FP (1800g). The average annual egg production was found to be 110 numbers, which was 37.50% higher than that of FP (80 numbers). These results are in close conformity with the results of Paul et al. (2005) and Singh et al. (2018). The lower mortality, higher production of meat and eggs under FLD might be due to the adoption of better and scientific management practices than that of FP (Das et al., 2014). On an average in the present study, the technology and extension gap for body weight gain were recorded as 200g/bird and 500g/bird, respectively while in case of egg production these values were 20 and 30 numbers/bird, respectively.

To minimize the extension gap, during the period of FLD emphasis was given to educate the farmers through trainings, demonstration for the adoption of scientific backyard poultry production techniques. The technology gap observed both in body weight gain and egg production may be due to primarily the dissimilarity in the awareness among the farmers regarding scientific poultry farming and secondarily the farming situation of the study area. Hence, location specific recommendation appears to be the prime need to minimize the technology gap of production level of a particular technology in different climatic situations.

The technology index value for body weight gain and egg production were recorded as 8.00% and 15.38%, respectively. The technology index recorded in the recant study indicates the feasibility of the demonstrated technology at the farmers' level. The lower technology index value indicates more feasibility of the technology. Similar type of observation was also reported by Kant (2017). The average per unit return from *Vanaraja* chickens under FLD and FP were presented in Table 4.

The chickens under FLD fetched higher net return (Rupees 466.50) with higher benefit cost ratio (2.62:1) as compared to the net return (Rupees 193.75) and benefit cost ratio (1.71:1) under FP. Singh et al. (2015) also reported the similar type of observation of higher returns in FLDs on improved technologies. Higher profitability and economic viability of the poultry birds in FLD might be due to the fact that farmers under FLD adopted almost all the scientific technologies demonstrated under FLD for which inherent genetic potential of the *Vanaraja* birds were almost expressed which was mostly missing in traditional farming practices adopted by the farmers. Throughout the study constraints faced by the farmers were studied and were presented in the form of matrix ranking in Table 5. From the table 5 it is indicated that non availability of improved germplasm of poultry (93.33%) was given the top ranking followed by mortality due to disease outbreak (87.50%), mortality due to disease outbreak (87.50%), non-availability of quality feeds (83.33%), high cost of concentrate feeds (80.00%), low productive performance of native birds (74.17%), early chick mortality due to cold stress (68.33%), lack of investment capacity of the farmers (54.17%) and weak market linkage to dispose the produce at right price (35.00%) were the major constraints in poultry production. Similar trends of ranking have also been reported by Sarkar (2005).

Client satisfaction index over the performance of FLD was calculated based on the response received from the farmers and presented in Table 6. Majority (63.33%) of the respondents expressed their high level of satisfaction regarding the performance of FLDs, while 27.50% expressed medium level of satisfaction and only 9.17% expressed low level of satisfaction index. Farmers

under higher and medium level of satisfaction with respect to performance of demonstrated technology indicate stronger persuasion, physical and mental involvement in the FLD which in turn would led to higher adoption. Similar observation was also recorded by Kant (2017).

DECLARATIONS

Author`s contributions

Sarmah Baruah M. performed the experiment and wrote the paper. Singh Raghav C. and Kalita H. analysed the data.

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Competing interests

The authors declare that they have no competing interests.

REFERENCES

Awasthi PK, Apoorwa T and Raghuwanshi NK (2015). Poverty reduction through strengthening backyard poultry farming in Central India: An economic analysis. International Journal of Food, Agriculture and Veterinary Sciences, 5 (1):11-17.

Das PK, Ghosh PR, Pradhan S, Roy B and Mazumdar D (2014). Benefit-cost analysis of Rhode Island Red chicken rearing in backyard on the basis of egg production performance. Veterinary World, 7(8): 605-609. DOI: 10.14202/vetworld.2014.605-609.

Islam R, Nath P, Bharati A and Borah R (2015). Analysis of benefit-cost (B:C) ratio of *Vanaraja* and local chicken of Assam under backyard system of rearing . Journal of Research in Agriculture and Animal Science, 3 (7):7-10.

Kant N (2017). Impact of front line demonstration on growth performance of dual purpose poultry chick (*Kuroilers*) under back yard poultry farming system. Technofame, 1:83-88.

Nath BG, Pathak PK and Mohanty AK (2013). Scientific backyard poultry rearing technology: an approach to awareness and adoption of technology for livelihood development of rural farmers in Sikkim, India. Russian Journal of Agriculture and Socio-Economic Science, 22(3): 38-43. DOI:10.18551/rjoas.2013-10.05

Oladunni ME and Fatuase AI (2014). Economic analysis of backyard poultry farming in Akoko North West Local Government area of Ondo State, Nageria. Global Journal of Biology, Agriculture and Health Sciences, 3(1): 141-147.

Paul N and Sharma VP (2005). Knowledge of poultry farming practices among the poultry farmers of Jammu. Indian Research Journal of Extension Education, 5(2 and 3): 67-71.

Samui SK, Maitra S, Roy DK, Mandal AK and Saha D (2000). Evaluation of front line demonstration on groundnut. Journal of Indian society of coastal agriculture Research, 18(2):180-183.

Sarkar K (2005). Duck farming for resource-poor farmers in Bangladesh. In: Proceeding of the 4th International Poultry Show and Seminar, Dhaka, Bangladesh. World's Poultry Science Association, Bangladesh Branch, Dhaka, 130-141.

Sarma M, Islam R, Borah MK, Sharma P, Mahanta JD, Kalita N and Bhattacharyya BN (2017). Comparative performance of *Vanaraja*, *Srinidhi* and *Desi* chicken under traditional system among tribal community of Assam. Indian Journal of Animal Research, B-3391:1-3. DOI: 10.18805/ijar.B-3391.

Singh M, Mollier RT, Rajesh G, Nguillie AM, Rajkhawa DJ, Rajkumar U, Paswan C and Chatterjee RN (2018). Backyard poultry farming with *Vanaraja* and *Srinidhi*: proven technology for dubling the tribal farmers' income in Nagaland. Indian Farming, 68(01): 80-82.

Singh NK, Pande K, Sahu RP, Shobha and Vijay Avinashilingam NA (2015). Success story of backyard poultry farming in Bageshwar district. Indian Farmers Digest, 48(4): 19-21.

Singh NK, Sahu RP and Mukherjee A (2016). A case study of backyard poultry farming in Bageshwar district of Uttarakhand. Technofame, 5(1): 95-98.

Snedecor GW and Cochran WG (1994). Statistical Methods, 6th edition, (Oxford and IBH Publishing Co., Calcutta, India).

Uddin MT, Islam MM, Salam S and Yasmin S (2013). Economics of native poultry rearing in the coastal regions of Bangladesh. Bangladesh Journal of Animal Science, 42(1) 49-56. DOI: http://dx.doi.org/10.3329/bjas.v42i1.15781