

Impact of scientific interventions on transition of backyard poultry to Rural Poultry Enterprise in Island Ecosystem

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Abstract

Rural poultry farming plays an important role in livelihood security, nutritional improvement, and women empowerment in island ecosystems. The present study highlights a successful case study of scientific poultry entrepreneurship developed by Smt. Rajeshwari, a rural woman farmer from South Andaman, through adoption of scientific poultry management practices and mini-incubator technology. Economic analysis of the enterprise revealed strong profitability and scope for scaling up rural poultry production in the Andaman and Nicobar Islands. The enterprise was established with a semi-intensive wire-meshed poultry shed, feeder and watering facilities, and a 2,500 setter-capacity mini-incubator. A parental stock of 2,400 birds was maintained under scientific management practices including vaccination, balanced feeding, incubation management, and brooding care. The enterprise recorded annual gross returns of ₹45.58 lakh against an annual production cost of ₹22.60 lakh, resulting in a net annual return of ₹22.97 lakh with a Benefit-Cost ratio of 2.02. The enterprise generated regular income through sale of meat birds, chicks, and eggs. Scientific incubation enabled year-round chick production, overcoming limitations of natural brooding systems prevalent in rural areas. The case study demonstrates that scientific poultry enterprises can significantly improve livelihood opportunities, employment generation, nutritional security, and women empowerment in island ecosystems. The study also highlights the importance of institutional support, scientific management, and technological interventions in promoting sustainable poultry entrepreneurship under geographically isolated island conditions.

Key words: *Island ecosystem, Scientific interventions, Rural poultry, Mini incubator, women entrepreneurship, Economic analysis*

Introduction

Poultry is one of the fastest growing sectors in India. During 2000 and 2020, India's rural poultry meat and egg production grew at 9.2 percent and 7.2 percent of annual average rate of growth, respectively (Gulati *et al.*, 2023). Similarly, the Andaman and Nicobar archipelago possess scope for rural poultry enterprises growth due to consistent and increasing demand for poultry meat and eggs, favourable climatic conditions, and growing market opportunities. In the Andaman and Nicobar Islands (ANI), backyard poultry farming (BPF) engages more than three fourth of rural households (Choudhury *et al.*, 2010). Traditionally rural poultry rearing in rural areas of the islands is generally characterized by low-input backyard systems with poor productivity, low hatchability, high mortality, and irregular chick availability (Mandal *et al.*, 2006; Pathak and Nath, 2013). Farmers largely depend upon natural brooding, which restricts chick production to

a few cycles annually and limits commercial expansion. Moreover, limited scientific management, poor housing, inadequate vaccination, and nutritional deficiencies further constrain its productivity and profitability. Considering the significant role of rural poultry in the livelihood and nutritional security of island farmers, there is need for scientific rural poultry entrepreneurship involving semi-intensive management, scientific feeding, disease control and mini-incubator technology (Sarkar and Golam, 2009; Magothe *et al.*, 2012; Pathi *et al.*, 2016) to significantly enhance production efficiency and income generation in island ecosystems. Mini incubators facilitate continuous chick production, improve hatchability, and enable farmers to expand poultry enterprises beyond traditional backyard systems (Sujatha and Shardul Vikram Lal, 2020; Sujatha *et al.*, 2022). Such interventions are particularly important in geographically isolated regions like the Andaman and Nicobar Islands, where local production can reduce dependence on imported

poultry chicks from mainland India. From lens of gender empowerment it is observed that women farmers from tribal system to developed countries ecosystem played a major role in poultry production and observed same in island ecosystems (Swarnam *et al.*, 2025; Sujatha *et al.*, 2022; Martinez and Quinlan 2019). Promotion of scientific poultry enterprises among rural women can contribute towards financial inclusion, self-employment, and livelihood resilience. However, documentation of successful island-based poultry entrepreneurship models remains limited. Therefore, the present article documents a successful case study of Smt. Rajeshwari, a woman poultry entrepreneur from South Andaman, who adopted scientific rural poultry management practices and mini-incubator technology to establish a profitable rural poultry enterprise. The study highlights the economic viability and potential of scientific rural poultry enterprises for sustainable self-employment in island ecosystems.

Results and Discussion

Establishment of Scientific Poultry Enterprise

Table 1. Fixed Cost of Poultry enterprise

Sl. No.	Particulars	Total Cost (₹.)	Shelf Life (years)	Annual Depreciation (₹.)
1	Semi-intensive wire-meshed poultry shed	300000	10	30000
2	Feeder and watering facilities	50000	5	10000
3	Mini incubator (2,500 setter capacity)	150000	12	12500
	Total Fixed Cost	500000		52500

Smt. Rajeshwari established a semi-intensive scientific rural poultry enterprise. The total capital investment of the enterprise was estimated at ₹5.00 lakh, which mainly consisted of poultry sheds (60%), feeding facilities (10%), and remaining for a mini-incubator having 2,500 setter capacity (Table 1). Scientific management practices including balanced feeding, vaccination, brooding care,

Methodology

The present study was conducted as a case study approach in South Andaman district of the Andaman and Nicobar Islands. Primary data related to investment patterns, production practices, costs, returns, incubation management, and enterprise performance were collected through personal interviews and field observations. Economic analysis was carried out using tabular analysis and cost-benefit analysis. Fixed costs included investment on semi intensive poultry shed, feeder and watering facilities, and mini-incubator. Variable costs included feed, medicines, labour, electricity, miscellaneous expenditure, and depreciation costs. Gross returns were estimated from sale of chicks, meat birds, and eggs. Net returns and Benefit-Cost ratio were calculated to assess profitability of the enterprise. The poultry enterprise consisted of 2,400 parental stock birds maintained under semi-intensive management system with scientific feeding, vaccination, and incubation practices. Hatchability performance, chick survival, and annual production flow were analysed to evaluate enterprise sustainability.

and scientific incubation management were adopted for improving productivity and reducing mortality.

The enterprise maintained an initial parental stock of 2,400 birds. After accounting for mortality during rearing, 2,160 birds survived, out of which 1,200 birds were retained monthly as parental stock from the fifth month onwards (Table 2). The remaining birds were marketed for meat production.

Table 2. Production Flow and Enterprise Assumptions

Particulars	Value
Initial parental stock reared (number of birds)	2,400
Mortality during rearing	10%
Surviving birds after mortality	2,160
Birds retained monthly as parental stock from 5th month onward	1,200
Marketable Surplus of birds available for sale per month	960
Mean live bird weight (kg)	1.2
Live bird sale price (₹/kg)	500
Sale value per bird (₹)	600
Average eggs produced/day	120
Monthly egg production	3600
Eggs used for incubation/month	2500
Hatchability	80%
Chicks hatched/month	2000
Chick mortality during brooding and rearing	10%
Saleable chicks after mortality	600
Eggs sold/month	1,100
Egg sale price	18

Production Performance

The enterprise demonstrated substantial production efficiency under scientific management conditions. Average egg production was recorded at 120 eggs per day, resulting in monthly egg production of 3,600 eggs. Out of these, 2,500 eggs were utilized for incubation every month. Hatchability of 80 per cent was achieved through mini-incubator technology, resulting in production of 2,000 chicks monthly. Farmer reported that after accounting for chick mortality during brooding and rearing, 600 saleable chicks were marketed every month. In addition, 1,100 eggs were sold monthly for direct consumption. Scientific incubation enabled continuous year-round chick production, which is generally not possible under traditional natural brooding systems. The findings clearly indicate that mini-incubator technology

can substantially improve chick production efficiency and enterprise scalability in island ecosystems (Kumaresan *et al.*, 2008).

Economic Analysis

Economic analysis revealed strong profitability and commercial viability of the scientific poultry enterprise. The annual feed expenditure constituted the major cost component amounting to ₹12.00 lakh, followed by labour cost and medicines (Table 3). Total annual production cost of the enterprise was estimated at ₹22.60 lakh. It is important to note that costs are relatively higher than for mainland due to high transportation and labour cost. Feed costs (58%) contribute most to this cost. This finding concurs with findings of other studies on poultry farming (Mallick *et al.*, 2020; Thirumalaisamy *et al.*, 2016; Adepoju, 2008 and Yusuf and Malomo 2007).

Table 3. Annual Cost Components of Rural Poultry Enterprise

Sl. No.	Particulars	Cost (₹/month)	Cost (₹/Year)
1	Feed cost (₹ 1 lakh/month)	1,00,000	1200000
2	Medicines and vaccination (₹ 15000 per month)	15,000	180000
3	Electricity charges (₹ 3500 per month)	3,500	42000
4	Hired labour (1 semi-skilled labourer)	19,058	228696
5	Miscellaneous expenditure	10,000	120000
6	Procurement of initial parental stock	132000	132000
7	Rental value of owned land (1 acre)	1000	12000
8	Depreciation on poultry shed	2500	30000
9	Depreciation on feeder and watering facilities	833	10000
10	Depreciation on mini incubator	1042	12500
11	Imputed family labour cost	24414	292968
Gross Annual Cost		188347	2260164

The enterprise generated annual gross returns of ₹45.58 lakh through sale of chicks, meat birds, and eggs (Table 4). Meat bird sale contributed the highest share of

enterprise income, followed by chick sales and egg sales. Net annual return was estimated at ₹22.97 lakh with a Benefit-Cost ratio of 2.02, indicating high economic viability of scientific poultry entrepreneurship (Table 5).

Table 4. Annual Returns from Poultry Enterprise

Sl. No.	Particulars	Quantity	Rate (₹.)	Value (₹.)	Annual Gross return
1	Sale of chicks	600	100	60000	720000
2	Sale of meat birds @ 150 kg per week	600	500	300000	3600000
3	Sale of eggs per month	1100	18	19800	237600
Gross Annual Returns				379800	4557600

The results demonstrate that scientific poultry enterprises can provide substantial income generation opportunities for rural households in island ecosystems. Continuous chick production through mini-incubators

significantly improved enterprise profitability and reduced dependence on external chick supply sources. As batch size increases the BCR will increase due to economies of scale.

Table 5. Net Returns and Profitability

Particulars	Amount (₹.)
Total Gross Return	4557600
Total Annual Cost	2260164
Net Annual Return	2297436
Benefit-Cost Ratio	2.02

Scope of Scientific Poultry Entrepreneurship in Island Ecosystem

Generally, poultry farmers face two main barriers, viz., production and marketing problems (Roy A., 2017). In Island ecosystems, these problems become more severe where transportation are uncertain and sporadic, and markets are also sparse, poor connected and unregulated. Despite of the challenges, Island possess significant scope for expansion of scientific poultry enterprises due to increasing consumer demand for fresh poultry meat and eggs, tourism growth, and dependence on mainland supply chains. Poultry products transported from mainland India often involve higher transportation costs and quality deterioration risks. But the cost of production may be reduced by own feed manufacturing or mixing, using labor-saving devices and efficient use of labour, reducing mortality by flowing scientific rural poultry health management practices, culling unproductive birds and following proper replacement policy to achieve highest possible egg production to harvest premium prices of eggs in the Island market (Kumar and Rai., 2006). Local scientific poultry enterprises can therefore play an important role in improving food security and reducing market dependence. Scientific poultry enterprises can also contribute towards women empowerment and rural employment generation (Desta., 2021 and Kumar *et al.*, 2021). Since poultry farming requires relatively smaller land area and moderate investment compared to other livestock enterprises, it is suitable for small and marginal farmers. Integration of mini-incubator technology, vaccination, scientific feeding, and improved housing can substantially enhance productivity and profitability. The case study of Smt. Rajeshwari demonstrates that scientific rural poultry entrepreneurship can successfully transform traditional backyard poultry systems into commercially viable enterprises under island conditions. Institutional support from research organizations, extension agencies, and financial institutions can further accelerate adoption of scientific poultry enterprises in island ecosystems.

Conclusion

The present case study highlights the successful establishment of a scientific rural poultry enterprise by Smt. Rajeshwari in South Andaman through adoption of mini-incubator technology and scientific poultry management practices. Economic analysis revealed strong profitability with annual net returns of ₹22.97 lakh and a

Benefit-Cost ratio of 2.02. Continuous chick production, improved hatchability, and scientific management substantially enhanced enterprise sustainability and income generation. The study demonstrates that scientific poultry entrepreneurship possesses immense potential for livelihood improvement, women empowerment, employment generation, and nutritional security in island ecosystems. Promotion of such enterprises through institutional support, training, and technological interventions can contribute significantly towards sustainable rural development in the Andaman and Nicobar Islands. To conclude, rural poultry is economically viable enterprise in Island ecosystem, however there is a need of developing and popularizing improved varieties of rural poultry suitable for backyard farming, scientific skill training and development of farmers specifically on feeding, housing and disease prevention as well as management.

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