EMPOWERING TRIBAL HOUSEHOLDS THROUGH BACKYARD POULTRY FARMING PRODUCTION TECHNOLOGY UNDER TSP PROJECT BY KVK SIROHI

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ABSTRACT

Backyard poultry farming in Sirohi district plays a crucial role in improving the livelihoods of tribal and rural households, where landholding is small, and income sources are limited.The Tribal Sub Plan (TSP) project implemented through Krishi Vigyan Kendra, Sirohi, by ATARI, Jodhpur,has focused on livelihood security and nutritional improvement through backyard poultry farming.egg production is directly related to the cumulative present status of birds. Years with higher survival and bird numbers (2020-21 and 2023-24) showed comparatively higher egg production, whereas years with reduced bird population (2021-22 and 2022-23) recorded lower eggproduction output.RIR birds generally exhibited superior growth performance compared to Pratapdhan across most clusters, particularly in clusters showing significant and highly significant differences.**egg production is strongly influenced by cumulative bird population**, which is in turn affected by survival rate, management practices and duration of production. The highest egg production values recorded in the 2023-24 clusters may be attributed to better adaptation of birds over time, stabilized management practices, and sustained laying performance.

Key words: Growth performance, Pratapdhan, poultry, RIR (Rhode Island Red), egg production

Introduction

Backyard poultry farming in Sirohi district plays a crucial role in improving the livelihoods of tribal and rural households, where landholding is small, and income sources are limited. This low-cost, sustainable activity provides a regular supply of eggs and meat, contributing to nutritional security while generating additional income. Introduction of improved breeds like RIR and Pratapdhan under the Tribal Sub-Plan (TSP) project has transformed traditional poultry into a profitable venture. In rural areas, backyard poultry rearing activity is considered to be one of the women's exclusive work, and the women are liable for the care and management of the birds (Deka *et al*., 2014). In a backyard farming system, farmers usually rear native type chicken having low egg and meat production potential. The traditional backyard poultry rearers usually keep 5-25 non-descript poultry birds producing 60-80 eggs/annum (Shinde and Srivastava, 2006; Sethi, 2007). Low weight gain, low egg production, high mortality due to low genetic potential, and low nutrition level are the common constraints to adopting backyard poultry farming as a profitable venture. Genetic improvement in local stock may be time-consuming, but the improvement will be permanent (Dinesh *et al*., 2018). Women, in particular, have been empowered through this intervention, as poultry farming requires minimal investment, can be managed within household premises and provides them with independent income and decision-making power, and also promotes gender equality and socio-economic upliftment in remote tribal areas of Sirohi.

Rhode Island Red (RIR) is a brown-eggerdual-purpose chicken breed withdeep red or mahogany plumage colour and yellow shanks and beak, giving them a distinctive appearance (Khan *et al*., 2016). On average, an RIR hen produces around 150-180 brown eggs per year, with an egg weight of 55-60 grams. The breed also provides good-quality meat, with birds reaching 1.5 to 2 kg live weight in 6 months under rural conditions. These birds are highly preferred by people for day-to-day consumption, traditional rituals and sacrifices (Mahapatra *et al*., 1999; Rangnekar and Rangnekar, 1999).

The Pratapdhan breed is a dual-purpose bird resembling native Rajasthan poultry. This breed, a cross of Mewari, coloured broiler and Rhode Island Red, is favoured by farmers for its superior egg production (150-160 eggs annually) compared to indigenous breeds. Additionally, Pratapdhan birds exhibit higher bodyweights, with males ranging from 1.4 to 3 kg and females from 1.2 to 2.7 kg, making them suitable for small-scale poultry production (AICRP Annual Report 2021-22).

Technology intervention

The Tribal Sub Plan (TSP) project implemented through Krishi Vigyan Kendra, Sirohi, by ATARI, Jodhpur has focused on livelihood security and nutritional improvement through backyard poultry farming. From 2021 to 2025, Rhode Island Red (RIR) and Pratapdhan poultry chicks were demonstrated to tribal households to enhance income and protein intake. This study evaluates the impact of these interventions in terms of growth performance, production performance, and economics. Apart from distributing poultry chicks, selected farmers were also provided with scientifically designed poultry cage houses to promote improved backyard poultry practices. These cages ensured better bird management, protection from

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predators, and improved biosecurity. The provision of housing significantly reduced mortality rates and enhanced egg production efficiency, thereby improving overall profitability and sustainability of poultry farming in tribal households.

Materials and Methods

District and KVK Profile

Sirohi district is situated at the Southern–West part of Rajasthan between parallels of 24^0 20' and 25^0 17' North Latitude and 720 16'and 730 10' East longitude. The district has an area of 5139 sq. kms. It covers about 1.52 per cent of the total area of Rajasthan state. Sirohi district falls in two agro-climatic zones, i.e. Zone IIb (Transitional Plains of Luni basin): which covers Sirohi, Sheoganj and Reodar blocks having irrigated, normal soil, rain-fed, medium to deep soil, and Zone IVa (Semi-Humid Southern plain Zone) covers Pindwara and Abu road blocks of Sirohi district having medium-textured shallow to moderate deep soil. The scheduled tribe comprises 28.22 per cent of the district population.

About the cluster of villages

The program covered five years (2021-2025) across selected clusters of tribal villages. A total of 10 clusters of villages were selected based on specific criteria, including the need for livelihood support, land holding capacity of farmers and the presence of predominantly tribal population (90 % and above under the TSP category). Each beneficiary household received 20 vaccinated RIR and Pratapdhan chicks of 6 weeks old along with technical training on feeding, housing, and health management, as presented in Table 1. KVK has provided 5900 units of Pratapdhan and RIR poultry through demonstration under TSP budget by ICAR, ATARI, Jodhpur. The villages were selected onthe basis of tribal households, namely Awal, Girwar, Thandiberry, Nitora, Bahadurpura, Telpikhera, Khara, Vavarlifali.

Table 1: Cluster of Village for distribution of chicks to the beneficiary farmers

S.No.	Year	Cluster of villages	No. of Farmers in each cluster	Number of chicks distributed (20 chicks/ beneficiary)
1.	2020-21	Awal	25	500
		Girwar	25	500
2.	2021-22	Thandiberry	25	500
		Girwar	25	500
3.	2022-23	Nitora	25	500
		Bahadurpura	25	500
4.	2023-24	Nitora	35	700
		Telpikhera	35	700
5.	2024-25	Khara	35	700
		Vavarlifali	40	800
	Total		295	5900

Statistical analysis

All the data collected on growth and production parameters of Pratapdhan and RIR (Rhode Island Red) were analyzed by comparing mean Z test with standard error for growth performance, and average was calculated for other parameter. The results have been tabulated accordingly by using SPSS 20.0

Results and Discussion

The production performance data presented in Table 2 reveal clear year-wise variations in average egg production, which closely correspond with the cumulative present status of birds across different years. The findings indicate that flock strength and survivability play a decisive role in determining overall egg output under cluster-based backyard poultry production systems.

Table 2: Average egg production for the year 2025 for each selected cluster

S. No.	Year	Number of chicks distributed (20 chicks/ beneficiary)	Present status (2025) (Cumulative)	Avg. Egg production
1.	2020-21	500	1075	114560
		500	1120	131440
2.	2021-22	500	978	90256
		500	870	81792
3.	2022-23	500	775	75760
		500	752	74184
4.	2023-24	700	942	85696
		700	882	81296
5.	2024-25	700	782	73680
		800	902	79016

During 2020-21, the highest average egg production (114,560 and 131,440 eggs) was recorded which coincided with the maximum cumulative present status of birds (1075 and 1120). This suggests that improved survival and better establishment of birds during the initial phase significantly enhanced production performance. Similar trends have been reported by Islam *et al.* (2014): who observed that higher flock retention directly contributes to increased egg production in backyard poultry systems.

A substantial decline in average egg production was observed during 2021-22, where egg output reduced to 90,256 and 81,792 eggs, corresponding with a reduction in cumulative bird strength (978 and 870). The further decline during 2022-23 (75,760 and 74,184 eggs) reflects the compounded effect of lower bird survival over successive years. According to Mandal *et al.* (2016): mortality caused by disease incidence, nutritional stress and climatic extremes is a major constraint affecting egg production performance in rural poultry enterprises.

In 2023-24, although a higher number of chicks (700 per cluster) were distributed, average egg production improved only moderately (85,696 and 81,296 eggs). This indicates partial recovery in production performance, likely due to improved farmer experience, gradual adaptation of birds to local environments, and improved health management practices. Gupta *et al*. (2018) reported that continuous extension support and farmer training significantly improve productivity outcomes in community-based poultry programs.

During 2024-25, average egg production again declined slightly (73,680 and 79,016 eggs): despite increased chick distribution (up to 800). The cumulative present status of birds (782 and 902) suggests that increasing the number of chicks alone does not ensure enhanced production unless accompanied by improved survival rates and efficient management practices. This observation is consistent with the findings of Ochieng *et al.* (2020): who emphasized that sustainable egg production in low input poultry systems depends more on bird survival and productivity than on initial flock size.

Overall, the results clearly demonstrate that production performance, measured in terms of average egg production,

Table 3: Comparative average live body weight (N=500) of Pratapdhan and RIR poultry birds for each cluster

S.No.	Cluster	Age (Weeks)	RIR	Pratapdhan	Level of significance
1.	Cluster-1	20 weeks	1636^{a}±12.6	1522^{b}±16.8	*
2.	Cluster- 2	20 weeks	1582^{a}±15.9	1612^{b}±20.9	*
3.	Cluster-3	20 weeks	2032^{a}±22.1	1742^{b}±15.4	**
4.	Cluster-4	20 weeks	1842^{a}±11.2	1760^{b}±14.8	NS
5.	Cluster-5	20 weeks	2112^{a}±21.2	1862^{b}±22.1	**
6.	Cluster-6	20 weeks	1942±20.8	1882±17.5	NS
7.	Cluster-7	20 weeks	1636±12.8	1552±16.4	NS
8.	Cluster-8	20 weeks	1662±14.1	1442±18.6	*
9.	Cluster-9	20 weeks	1712±15.4	1662±15.9	NS
10.	Cluster-10	20 weeks	1856±17.9	1776±18.2	NS

is strongly influenced by cumulative bird population and survival efficiency. The study highlights the importance of strengthening health care interventions, improving nutritional supplementation and enhancing farmer capacity building to sustain higher levels of egg production in backyard poultry production systems.

The data presented in Table 3 reveal significant variations in live body weight between Rhode Island Red (RIR) and Pratapdhan birds at 20 weeks of age across different clusters. Overall, RIR birds exhibited comparatively higher body weights than Pratapdhan in most clusters, with statistically significant (P<0.05) and highly significant (P<0.01) differences observed in Clusters 1, 3, 5 and 8. This indicates a superior growth performance of RIR under the prevailing cluster-specific management and environmental conditions.

Highly significant differences in Clusters 3 and 5, where RIR birds recorded markedly higher body weights (2032 ± 22.1 g and 2112 ± 21.2 g, respectively) compared to Pratapdhan, suggest that RIR possesses better genetic potential for growth and feed utilization. Similar findings have been reported by Singh *et al.* (2018) and Kumar *et al*. (2020): who observed higher body weights in RIR due to its well-established selection for dual-purpose traits and adaptability to semi-intensive systems.

In Cluster 1 and Cluster 8, the significant superiority of RIR birds may be attributed to better management practices, feed availability and disease control measures. Growth performance in poultry is strongly influenced by environmental and nutritional factors interacting with genotype, as reported by Niranjan *et al.* (2014) and Padhi (2016). These factors possibly enhanced the expression of growth potential in RIR birds in these clusters.

Conversely, non-significant differences observed in Clusters 4, 6, 7, 9 and 10 indicate that Pratapdhan birds performed comparably to RIR under certain field conditions. Pratapdhan, being a hardy improved backyard poultry strain, is known for its adaptability, disease resistance and stable performance under low-input systems. Similar observations have been reported by Ahuja *et al*. (2019) and Chatterjee *et al*. (2021): who emphasized that indigenous improved varieties can perform on par with exotic breeds when management and environmental stressors limit genetic expression.

The occasional higher body weight of Pratapdhan in Cluster 2, despite being statistically significant, highlights the role of location-specific factors such as farmer management skills, feed supplementation and climatic suitability. According to Gondwe and Wollny (2007): genotype × environment interaction plays a crucial role in determining growth performance in backyard poultry systems.

Overall, the findings suggest that while RIR birds generally outperform Pratapdhan in terms of body weight at 20 weeks, Pratapdhan demonstrates consistent and stable performance across multiple clusters, making it suitable for backyard and low-input production systems. These results support the recommendation that breed selection should be cluster-specific, considering local resources, farmer capacity, and production objectives.

During **2**024-25, clusters with 700 and 800 chicks recorded cumulative bird strengths of 782 and 902, respectively. The equivalent egg production values were Rs. 18.42 lakh and Rs. 19.75 lakh. Although bird numbers were relatively higher in the second cluster, egg production returns remained moderate. Overall, egg production exhibited year-wise and cluster-wise variability, closely associated with cumulative bird strength.

The data presented in Table 4 indicate a clear year-wise variation in egg production value across clusters, which closely correspond with the cumulative present status of birds. At a fixed egg price of Rs. 25 per egg, egg production expressed in monetary terms provides a reliable indicator of productivity and economic returns from backyard poultry interventions.

During 2020-21, the cumulative present status of birds was highest (1075 and 1120): resulting in the maximum egg production values of Rs. 28,64,000 and Rs. 32,86,000 per cluster. This highlights that higher bird survival and flock strength significantly enhance egg output and overall returns. Similar findings were reported by Rajkumar *et al.* (2013): who observed that egg production in improved poultry systems is strongly influenced by survivability and effective early-stage management.

A notable decline in egg production was observed during 2021-22 and 2022-23, coinciding with a gradual reduction in the cumulative present status of birds (978 to 752). The egg production value dropped to Rs. 20,44,800 - Rs. 22,56,400 in 2021-22 and further declined to Rs. 18,54,600 to Rs.18,94,000 in 2022-23. This decrease may be attributed to factors such as increased mortality, disease incidence, nutritional deficiencies, or environmental stress. According to Kumaresan *et al*. (2008): village poultry systems are highly sensitive to health and feed-related constraints, which directly affect bird survival and egg production efficiency.

In 2023-24, despite the distribution of a higher number of chicks (700 per cluster): egg production values improved moderately (Rs. 20,32,400 to 21,42,400). Although cumulative

Table 4: Economic performance of each cluster during 2025

S. No.	Year	Number of chicks distributed (20 chicks/ beneficiary)	Present status (2025) (Cumulative)	Egg Production (Rs)/cluster (Year 2025) Egg Price: 25 Rs./ egg
1.	2020-21	500	1075	28,64,000
		500	1120	32,86,000
2.	2021-22	500	978	22,56,400
		500	870	20,44,800
3.	2022-23	500	775	18,94,000
		500	752	18,54,600
4.	2023-24	700	942	21,42,400
		700	882	20,32,400
5.	2024-25	700	782	18,42,000
		800	902	19,75,400

bird numbers remained lower than the peak observed in 2020-21, this improvement suggests enhanced farmer awareness, better vaccination practices, and gradual adaptation of birds to local conditions. Rath *et al*. (2015) emphasized that improved management practices and farmer training significantly contribute to productivity gains in backyard poultry programs over time.

During 2024-25, egg production values again showed a slight decline (Rs.18,42,000 to Rs.19,75,400): even with an increased chick distribution of up to 800 in one cluster. The cumulative present status of birds (782 and 902) suggests that increased chick distribution alone is insufficient to ensure higher egg production unless accompanied by improved survival and efficient management practices. This observation aligns with the findings of Dolberg (2008): who reported that sustainability of backyard poultry enterprises depends more on bird retention and productivity rather than initial flock size.

Overall, the results clearly demonstrate that egg production is directly proportional to the cumulative present status of birds, and economic returns from backyard poultry interventions are strongly influenced by survival rate, management efficiency and farmer capacity. Strengthening extension services, ensuring timely health interventions, and improving nutritional support are therefore essential for maximizing egg production and income generation from such poultry development programs.

Conclusion

The TSP-based poultry development program in Sirohi has demonstrated a successful model for enhancing income, improving nutrition, and promoting sustainability in tribal areas of the district. Scaling up such interventions, coupled with strong extension support and training, can significantly contribute to rural development and resilience against poverty. Backyard poultry farming could be an important tool for sustainable livelihood and food security for tribal households. Pratapdhan and RIR both breeds proved to be beneficial as due to their colourful appearance, brown shelled eggs, and meat acceptance proved them to be widely accepted among local consumers. However, the performance of both breed in field level was found to be equivalent.

Conflict of interest

The authors declare no conflit of interest.

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