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Climate-Resilient Poultry Farming in Central India: Measuring Adoption through the Climate Resilient Adoption Index

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Abstract
Climate change poses serious challenges to smallholder poultry farming, especially in agro-climatically diverse regions like Madhya Pradesh, India. This study assessed the adoption of climate-resilient poultry practices among 110 farmers across 11 agro-climatic zones using a multi-stage random sampling method. Twenty-two practices were identified and scored using a three-point adoption scale. A Climate Resilient Adoption Index (CRAI) was calculated to classify adoption levels. Results showed moderate overall adoption (mean CRAI: 42.48%), with highest uptake in resilient breeds and heat stress management, and lowest in cold-weather feeding. Most respondents fell in the medium adoption category, reflecting partial awareness and limited access to resources and information. Socio-economic constraints and technical gaps were key barriers. The findings underscore the need for targeted training, improved extension services, and supportive policies to strengthen climate resilience in poultry production systems.

Keywords: Climate-resilient poultry farming, adoption index, agro-climatic zones, smallholder farmers, climate change adaptation

1. Introduction

Climate change poses a serious threat to global agriculture, especially to smallholder livestock production systems that are highly sensitive to variations in temperature, rainfall, and extreme weather events (Thornton *et al*., 2007; IPCC, 2022; Mottet *et al*., 2017) [1-3]. Poultry farming, an important component of mixed farming systems, offers livelihood support, nutritional security, and income generation for millions of rural households in India (Ahuja and Sen, 2007) [4]. However, the productivity and sustainability of poultry systems are increasingly being challenged by climate-induced stressors such as heatwaves, disease outbreaks, and resource scarcity (Sejian *et al*., 2018) [5].

In India, the poultry sector is expanding rapidly, contributing significantly to the agricultural GDP. Madhya Pradesh, with its diverse agro-climatic zones, provides a conducive environment for backyard, small-scale, and commercial poultry production. However, the sector remains vulnerable to climate variability, particularly in terms of heat stress, poor housing, inadequate feeding, and disease management practices. These challenges necessitate the promotion and adoption of climate-resilient poultry farming practices, which can mitigate the adverse impacts of climate change and enhance adaptive capacity at the grassroots level (Rao *et al*., 2016) [6].

Adoption of such practices depends on multiple factors, including farmer awareness, accessibility of technologies, institutional support, and socio-economic conditions. Several climate-resilient interventions such as improved housing, heat stress management, disease control, weather forecasting use and resilient feeding strategies have been identified through research and field trials (FAO, 2020) [7]. However, the extent to which these practices are adopted by farmers, especially in climate-sensitive regions like Madhya Pradesh, remains under-explored. In this context, the present study aims to assess the extent of adoption of climate-resilient poultry farming practices among farmers across the 11 agro-climatic zones of Madhya Pradesh.

It also seeks to compute a Climate Resilient Adoption Index (CRAI) to quantify adoption levels and categorize respondents accordingly. The findings are expected to inform policy, extension strategies, and program planning for promoting climate-smart livestock farming in vulnerable regions.

2. Materials and Methods

A multi-stage random sampling technique was employed for the study to ensure representation across the diverse agro-climatic zones of Madhya Pradesh. In the first stage, one district was randomly selected from each of the 11 agro-climatic zones of Madhya Pradesh, resulting in a total of 11 districts. In the second stage, two blocks were randomly selected from each chosen district. One village was randomly selected from each block, resulting in 22 villages. Finally, 05 poultry farmers were selected from each village, ensuring inclusion based on pre-defined selection criteria related to production system, experience and flock size, as detailed in Table 1.

Table 1: Selection criteria for respondents

S. No	Production system	Experience (years)	Flock size
01	Poultry	05	50-100

Total N=110 Respondents

Thus, in total, 110 poultry farmers were selected, as the respondents for this study. The extent of adoption was calculated on the basis of total score secured by the respondents. Responses were asked on three-point continuum *viz* 2 for fully adopted, 1 for partially adopted and 0 for non-adoption of technology. Climate resilient practices of poultry (22 practices) production systems were identified via review literature, expert consultation and finalized after pilot study. Based on total scores, the respondents were classified into three categories i.e., low, medium and high by using mean and standard deviation. The Climate resilient adoption index (Godara *et al.*, 2018) [8] was calculated by using following formula:-

$$\text{Climate Resilient Adoption index} = \frac{\text{Total obtained score}}{\text{Total obtainable score}} \times 100$$

3. Results

3.1 The adoption of climate-resilient practices among poultry farmers

The analysis of 110 respondents regarding adoption of 22 climate resilient practices among poultry production system (Table 2) revealed that the first rank was given to promote backyard poultry breeds with better adaptability to climate variability with adoption score of 196, followed by select hardy and dual-purpose breeds suitable to local agro-climatic conditions (173), equal adoption index was given to maintain optimum bird density to reduce overcrowding and heat build-up and schedule feeding during cooler parts of the day during heat stress with adoption score of 170. Lowest adoption score of 27 was given to provide high-energy, easily digestible feed during cold weather.

Table 2: Distribution of respondent according to adoption of practices and its score for poultry production system (N=110)

S. No	Climate Resilient Practices	Fully Adopted (2)	Partially Adopted (1)	Not Adopted (0)	Adoption Score	Rank
1	Provide high-energy, easily digestible feed during cold weather	06 (5.45)	15 (13.64)	89 (80.91)	27	XXII
2	Include electrolytes, vitamins (A, D, E and C) and minerals in drinking water during heat stress	23 (20.91)	39 (35.45)	48 (43.64)	85	XVI
3	Reduce protein slightly and increase fat content in feed during summer	14 (12.73)	35 (31.82)	61 (55.45)	63	XVII
4	Provide wet mash or soaked grains in extreme heat to improve palatability and reduce heat increment	11 (10)	36 (32.73)	63 (57.27)	58	XIX
5	Ensure continuous access to clean, cool drinking water, especially during summer	45 (40.91)	31 (28.18)	34 (30.91)	121	XII
6	Supplement feed with immune boosters such as herbal preparations or probiotics	10 (9.09)	26 (23.64)	74 (67.27)	46	XX
7	Use locally available feed resources during feed shortages (e.g., millets, azolla, kitchen waste)	67 (60.91)	27 (24.55)	16 (14.55)	161	V
8	Select hardy and dual-purpose breeds suitable to local agro-climatic conditions (e.g., Kadaknath, Vanaraja)	74 (67.27)	25 (22.73)	11 (10)	173	II
9	Promote backyard poultry breeds with better adaptability to climate variability	86 (78.18)	24 (21.82)	00 (0)	196	I
10	Practice rotational breeding to maintain flock health and reduce genetic disorders	16 (14.55)	28 (25.45)	66 (60)	60	XVIII
11	Provide well-ventilated housing with proper insulation (thatched roof or reflective paint in summer)	46 (41.82)	43 (39.09)	21 (19.09)	135	XI
12	Use foggers, fans, or water sprinkling during peak heat hours	36 (32.73)	43 (39.09)	31 (28.18)	115	XIV
13	Use deep litter system with dry bedding to maintain warmth during winter	44 (40)	32 (29.09)	34 (30.91)	120	XIII
14	Ensure raised housing/flooring during monsoon to avoid dampness and waterlogging	56 (50.91)	43 (39.09)	11 (10)	155	VII
15	Maintain optimum bird density to reduce overcrowding and heat build-up	67 (60.91)	36 (32.73)	07 (6.36)	170	III
16	Regular vaccination and deworming as per schedule	64 (58.18)	25 (22.73)	21 (19.09)	153	VIII
17	Isolate sick birds to prevent disease spread	61 (55.45)	34 (30.91)	15 (13.64)	156	VI
18	Practice proper waste disposal and shed sanitation (lime, disinfectants, fumigation)	54 (49.09)	44 (40)	12 (10.91)	152	IX
19	Schedule feeding during cooler parts of the day during heat stress	67 (60.91)	36 (32.73)	7 (6.36)	170	III
20	Use gunny bags, tarpaulin, or other insulators to cover cages in winter	54 (49.09)	43 (39.09)	13 (11.82)	151	X
21	Monitor weather forecasts and adopt preventive measures (e.g., early chick brooding in winter)	31 (28.18)	30 (27.27)	49 (44.55)	92	XV
22	Provide grit/sand to improve digestion when green feed is limited	11 (10)	21 (19.09)	78 (70.91)	43	XXI

*Figures in parentheses indicate percentage

3.2 The adoption index of climate-resilient practices among poultry production system

The adoption of climate-resilient practices among poultry production system varies across three categories i.e. low, medium and high adoption levels. Data from table 03 reveled that maximum 68 respondents were partially adopted the climate resilient practices with adoption index ranging between 0.17-0.58 (Figure 1). However, minimum of 20 respondents was fully adopted the climate resilient practices with adoption index ranging from 0.59-0.73. The overall adoption index of climate-resilient practices among poultry production system was 42.48.

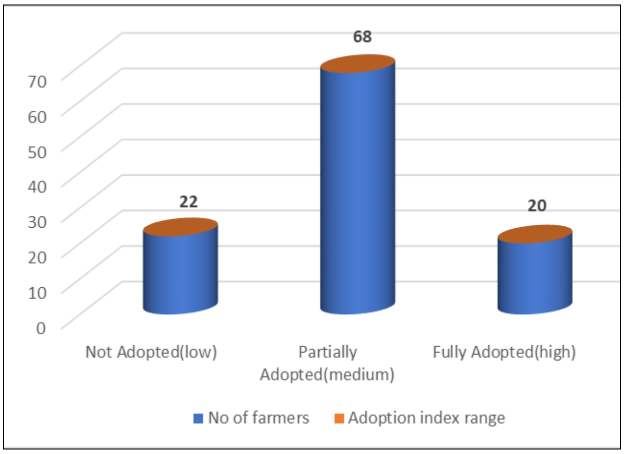

Fig 1: The distribution of respondents according to adoption index of climate-resilient practices in poultry production system, (N=110)

Table 3: The distribution of respondents according to adoption index of climate-resilient practices in poultry production system, (N=110)

Adoption level	No of farmers	Adoption index range	Overall adoption index
Not Adopted (low)	22	0.04-0.16	42.48 0.37±0.21
Partially Adopted (medium)	68	0.17-0.58	
Fully Adopted (high)	20	0.59-0.73	

The study reveals that climate-resilient poultry farming is increasingly being adopted by smallholder farmers in Madhya Pradesh as a strategic response to climate variability, particularly heat stress. High adoption rates were observed for practices such as promoting backyard breeds adaptable to local climates and managing heat through optimal bird density and feeding schedules (Grados *et al*., 2023) [9]. This suggests that farmers prioritize strategies that offer immediate relief from temperature-related stress, with breed selection emerging as a key long-term adaptive measure (Hasan and Kumar, 2021) [10]. Conversely, cold-weather feeding practices saw the lowest uptake, possibly due to limited awareness, geographical relevance, or lack of access to appropriate resources (Yussif *et al*., 2023) [11].

The adoption pattern reflects a broader interplay between environmental needs, socio-economic conditions, and institutional support. While farmers show innovation in using locally available feed resources during shortages (Samal *et al*., 2023) [12], broader adoption is hindered by barriers such as lack of credit, infrastructure, and technical guidance. Integrating indigenous knowledge with scientific advances (Oloyo and Ojerinde, 2019) [13] and reorienting breeding programs toward resilience rather than just productivity (Xie *et al*., 2018) [14] are essential to strengthen climate adaptation. Hence, enhancing farmer capacity through targeted training, policy support, and resource access is critical for scaling up climate-resilient poultry systems.

4. Conclusion

The study highlights the current state of climate-resilient poultry farming in Madhya Pradesh, revealing moderate adoption levels across diverse agro-climatic zones. The calculated Climate Resilient Adoption Index (CRAI) of 42.48% reflects growing awareness among smallholder poultry farmers, particularly in adopting heat stress mitigation strategies and resilient breeds. However, the adoption of other crucial practices such as cold-weather feeding, disease prevention, and housing improvements remains limited due to socio-economic barriers, technical gaps, and inadequate institutional support. These findings underscore the need for region-specific extension strategies, capacity-building programs, and targeted policy interventions that promote inclusive access to climate-smart technologies. Strengthening the adaptive capacity of poultry farmers will be vital to ensure sustainable livelihoods, enhance food and nutritional security, and build long-term resilience in the face of climate variability. Future research should focus on longitudinal assessments of adoption trends and the impact of integrated interventions on productivity and climate adaptability.

5. Conflict of Interest

The author declares no conflict of interest in the conduct and publication of this research.

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Not available

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