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Knowledge gaps in poultry farming: A comparative study of tribal and non-tribal farmers in Himachal Pradesh

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Abstract

Background: Poultry production in India has seen substantial growth, primarily concentrated in large-scale commercial units. However, backyard poultry farming has been largely neglected. In Himachal Pradesh, there has been a sharp 50% decline in households engaging in backyard poultry farming, and per capita egg consumption remains alarmingly low at 12 eggs per annum, compared to the national average of 101 eggs. This study hypothesized that knowledge gaps in key poultry farming practices, particularly in remote hilly areas, contribute to the low productivity of backyard poultry.

Methods: The study assessed the knowledge levels of farmers from Kangra (non-tribal district) and Lahaul & Spiti (tribal district) in Himachal Pradesh. Structured interviews were conducted with 80 farmers (40 from each district), evaluating their knowledge across five critical domains: breeding, housing, health, feeding, and management. Farmers' knowledge was categorized into three levels: low, medium, and high. Data were analysed using descriptive statistics, including frequency distributions, means, and standard deviations.

Results: The results revealed significant knowledge deficits in all domains, with 95-100% of farmers in both tribal and non-tribal regions falling into the low knowledge category, especially in feeding and management. Tribal farmers consistently demonstrated lower scores than their non-tribal counterparts. The findings support the hypothesis that knowledge gaps are a key factor contributing to the low productivity of backyard poultry farming in these regions.

These results emphasize the need for targeted extension programs and community outreach to address knowledge deficits and improve poultry farming practices and productivity.

Keywords: Backyard poultry, breeding, feeding, Himachal Pradesh, knowledge assessment, management

Introduction

Poultry production in India has grown significantly over the years, with an increase of 32.68% from 2003-2007, 12.39% from 2007-2012, and 16.81% from 2012-2019 Dinesh *et al.* (2023) [3]. In Himachal Pradesh, the sector grew even faster, with a 36.42% rise between 2007-2012 and a notable 21.36% growth from 2012-2019. However, this growth has been concentrated in large-scale commercial units, leaving backyard poultry farming neglected. Only 3.7% of households in Himachal Pradesh engage in backyard poultry farming, compared to regions like the north-eastern hill states, where participation is as high as 50% (Kornel 2008) [6] and Thakur *et al*. (2012) [13]. Per capita egg availability in Himachal Pradesh remains extremely low, with just 12 eggs per person annually, far below the national average of 101 eggs (GOI, 2023) [4].

The Government of India recognizes backyard poultry farming as a valuable tool for addressing protein malnutrition in rural and tribal communities and has promoted it through various schemes Rajkumar *et al.* (2021) [9]. Backyard poultry production has shown a tremendous increase of 45.38% in backyard poultry in 2012-17 in the country (Toor, and Goel 2022) [14].

Despite state government initiatives, such as the Him Kukut Palan Yojana aimed at promoting poultry farming, the sector in Himachal Pradesh remains underdeveloped. One major reason for this underdevelopment is the limited access to advanced farming technologies and practices, especially in remote and hilly areas. Effective poultry farming relies on key areas such as breeding, housing, feeding, health care, and management, yet knowledge gaps persist among backyard poultry farmers in these critical areas.

The hypothesis of this study is that a lack of adequate knowledge and access to resources in these regions is contributing to low productivity in backyard poultry farming. It further hypothesizes that this knowledge gap

may be more pronounced in the tribal regions of the state. This study aimed to address that gap by assessing the current knowledge levels of farmers in the non-tribal hilly district of Kangra and the tribal district of Lahaul & Spiti.
By understanding the existing knowledge gaps, the study aimed to provide practical insights to improve extension programs, enhance backyard poultry production, and boost the livelihoods of small-scale farmers in Himachal Pradesh.

Materials and Methods

Study design and location

This study was conducted among 80 poultry farmers, equally represented by 40 participants from tribal and 40 from non-tribal regions of Himachal Pradesh. The non-tribal participants were selected from three-day poultry training programs held in August 2024 at the Department of Veterinary and Animal Husbandry Extension Education, DGCN COVAS, CSKHPKV, Palampur, Kangra, and at Krishi Vigyan Kendra (KVK) Kukumseri, Lahaul & Spiti district, Himachal Pradesh. The tribal participants were chosen from a similar training program conducted in September 2024 at Krishi Vigyan Kendra, Kukumseri, Lahaul & Spiti. Kangra district, where the non-tribal farmers reside, is a hilly region situated between latitudes 31˚21′ to 32˚59′ N and longitudes 75˚47′55″ to 77˚45′ E, traversed by the Shivalik, Dhauladhar, and Himalayan ranges. In contrast, Lahaul & Spiti district, home to the tribal participants, is in the outer Himalayas at an average altitude of 10,000 feet, characterized by a rugged terrain, extreme climatic conditions, and improved accessibility due to the Atal Tunnel (Shashni and Sharma 2023) [10].

Sampling and respondent selection

The study employed purposive sampling to select 80 farmers (40 from each district). All respondents were trainees from the poultry training programs, ensuring their active involvement in poultry farming. Structured interviews were conducted to evaluate their knowledge across five critical domains of poultry farming: breeding, housing, health, feeding, and management.

Data collection

A semi-structured interview schedule was designed to assess the knowledge levels of the farmers. The questionnaire was divided into five domains, with scoring ranges assigned to categorize knowledge as low, medium, or high. The scoring system was as follows:
Low Knowledge: Score range from 0-5 or 0-6, depending on the domain.
Medium Knowledge: Score range from 6-11 or 6-13.
High Knowledge: Score range from 12-17 or 14-19.

These scores were designed to capture the breadth of knowledge across the critical domains of poultry farming, allowing for a comprehensive evaluation of each respondent's understanding and practices.

Data analysis

Descriptive statistics, including frequency distributions, means, and standard deviations, were used to analyze the data. The farmers' knowledge was categorized into low, medium, and high levels, with comparisons made between the tribal and non-tribal groups to highlight any significant differences.
The study aimed to identify key knowledge gaps that might be contributing to low productivity in backyard poultry farming. This detailed methodology ensures that the study can be replicated by future researchers in similar contexts.

Results and Discussion

Socio-Personal Profile of Poultry Farmers

As evident in table 1 among non-tribal farmers, the majority (47.5%) fall in the middle-aged category (35-50 years), while only 22.5% were young (up to 35 years). In contrast, tribal farmers exhibited a predominant middle-aged population (70%) involved/interested in poultry farming, with a minimal representation from the young group (7.5%). This suggests that poultry farming in tribal communities may be more reliant on older generations, while non-tribal communities exhibit a more balanced age distribution. Age showed a meaningful relationship with the level of adoption, suggesting that the younger generation is more likely to embrace and implement modern technologies on their farms Singh *et al*. (2021) [12]. Encouraging young tribal farmers to engage in poultry farming could be a major step toward sustainability and innovation within these communities.
Among non-tribal farmers, a higher level of education was observed, with 45% having completed high school and 17.5% having attained intermediate education or higher. Conversely, 17.5% of tribal farmers are illiterate, and only 5% have completed middle school. However, a considerable portion of tribal farmers (40%) had a high school education. There was a near-equal gender representation among non-tribal farmers (52.5% male and 47.5% female), reflecting a balanced participation of men and women in poultry farming. However, in tribal district, men dominate poultry farming activities (65% male and 35% female). The vast majority of both non-tribal (92.5%) and tribal (97.5%) farmers are marginal farmers with landholdings below 1 hectare. A ridiculously small proportion of small farmers (7.5% non-tribal and 2.5% tribal) were observed. These findings reflect that poultry farming is practiced by marginal farmers who use it as a supplementary source of income. Small-scale landholdings are common in hilly regions, limiting the ability to expand poultry farming into a larger commercial venture. Therefore, the introduction of efficient management practices for small flocks could help optimize output and improve income for these marginal farmers.
In terms of income, most non-tribal farmers (72.5%) earned up to ₹1 lakh annually from, while a similar trend was observed among tribal farmers, where 50% fall in the same income bracket. However, tribal farmers showed more diversity in income levels, with 20% earning between ₹2-5 lakhs and another 20% earning between ₹5-10 lakhs annually, indicating a potential for income from farming in these areas. For non-tribal farmers, higher income levels remain concentrated in a smaller group (5% earning over ₹2 lakhs). The average experience in poultry farming was higher among non-tribal farmers (0.97 years) compared to tribal farmers (0.58 years), indicating that non-tribal farmers have more familiarity with poultry farming practices. Additionally, non-tribal farmers tend to manage larger flocks, with an average flock size of 13.77 birds, while tribal farmers had smaller flocks, averaging 6.25 birds.

Knowledge on poultry breeding practices

The knowledge on poultry breeding practices was assessed across several key areas, including the understanding of suitable poultry breeds and breed or varieties for backyard poultry farming, particularly in Himachal Pradesh. This evaluation focused on the farmers' awareness of high-yielding layers and broilers and their egg and meat production capacities. Additionally, knowledge of bird selection parameters for breeding in backyard poultry systems was considered, along with familiarity with varieties developed or distributed by the State Animal Husbandry Department, State Agricultural University, or private players. Farmers were also assessed on their awareness of the laying capacities of various poultry breeds under both backyard and commercial systems.

The results (Table 2) highlight significant knowledge gaps among the surveyed farmers, with 95% of non-tribal and 100% of tribal farmers categorized as having low knowledge. A mere 5% of non-tribal farmers displayed medium knowledge, while no farmers from either group demonstrated high knowledge. The average knowledge score was slightly higher among non-tribal farmers (2.27) compared to tribal farmers (1.5). Additionally, the greater variability in scores among non-tribal farmers (SD = 1.57) suggests a broader range of awareness levels within this group.

These findings indicate that most farmers lack awareness of essential poultry breeds and basic breeding practices critical for successful backyard poultry farming. The absence of technical knowledge continues to be a major obstacle to advancing backyard poultry farming in India, as noted by Kumar *et al.* (2021) [8]. Addressing this gap through targeted education and training programs is crucial for improving productivity and sustainability in rural poultry farming. Empowering farmers with the necessary technical knowledge will enable them to make informed decisions and enhance their farming outcomes.

Knowledge on Poultry housing Practices

The knowledge of poultry housing practices was assessed based on several essential aspects, including an understanding of the housing requirements for layers, chicks, and growers, particularly about space needs. The evaluation also focused on farmers' knowledge of housing modifications to manage winter and summer stress, as well as their awareness of brooder and predator management. Additionally, the assessment covered the use of appropriate bedding materials, the proper orientation and direction of poultry houses, and the implementation of seasonal adjustments to reduce stress on the birds. This comprehensive approach aimed to identify gaps in farmers' understanding of effective poultry housing practices, which are crucial for maintaining bird health and optimizing productivity.

Table 2 reveals that considerable proportion of farmers demonstrated low knowledge of poultry housing, with 85% of non-tribal and 100% of tribal farmers falling into the lowest knowledge category. Interestingly, tribal farmers had a slightly higher average knowledge score (3.82) compared to non-tribal farmers (3.45), though the larger standard deviation among non-tribal farmers indicated greater variability in their knowledge levels.

These findings underscore the pressing need for enhanced training on poultry housing practices, which are essential for minimizing environmental stress and maximizing poultry productivity. Proper housing plays a pivotal role in maintaining bird health, optimizing growth, and reducing mortality. For all poultry systems, the basic requirements for poultry housing are space, ventilation, light, and protection. Singh *et al.* (2024) [11] similarly observed that awareness of innovative housing practices was alarmingly low, with only 10% of trainees in Muzaffarpur, Darbhanga, and Nalanda districts of Bihar showing knowledge in this area. This calls for more widespread dissemination of modern housing techniques to improve overall poultry farming outcomes.

Knowledge on poultry health practices

Health practices, including basic biosecurity measures, deworming, infection control, litter management, and ammonia management in sheds, were assessed to understand the level of health-related knowledge.

As shown in Table 2, most farmers had low knowledge of poultry health practices, with 90% of non-tribal and 100% of tribal farmers falling into the low knowledge category. Only 10% of non-tribal farmers showed medium-level knowledge. Tribal farmers had a slightly higher average score (4.1) than non-tribal farmers (3.2). Kumar *et al.* (2024) [7] reported that the knowledge of respondents on crucial areas of poultry health (chick vaccination, common diseases of backyard poultry and precautionary measures to be followed in cases of disease outbreaks) was exceptionally low among farmers of Thrissur district of Kerala. Given the critical role of health management in preventing diseases and improving productivity, this lack of awareness poses a significant challenge.

Knowledge on poultry feeding practices

In this domain, the knowledge of poultry feeding practices was assessed based on key areas such as understanding the feeding requirements for different bird categories, including chicks, growers, and layers. The evaluation also focused on farmers' knowledge of appropriate feeding resources for backyard poultry farming, daily feed requirements, and the specific vitamin and mineral needs of the birds. Additionally, it included assessing awareness of ingredients suitable for backyard poultry, sources of essential vitamins and minerals, and familiarity with several types of poultry feed, including feed for chicks and growers. This assessment aimed to identify gaps in feeding practices, which are crucial for ensuring proper nutrition and enhancing poultry productivity.

The results, as indicated in Table 1, reveal that all farmers (tribal and non-tribal) scored in the lowest knowledge category, with an average score of 0.69 for non-tribal and 0.54 for tribal farmers. This reflects an alarming gap in knowledge regarding essential feeding regimes, which directly impacts poultry health and productivity.

Knowledge on poultry management practices

The knowledge of poultry management practices was assessed in areas such as understanding the lighting requirements for different bird categories, as well as the importance of proper litter management. The evaluation also covered farmers' awareness of scavenging practices, and the

common vices and problems associated with poultry feeding. Additionally, knowledge of chick management and methods for controlling behavioural issues, such as vices, was assessed.

The results presented in Table 1 reveal a concerning low level of knowledge among farmers, with none scoring in the medium or high categories. Non-tribal farmers demonstrated a marginally better average score (1.8) compared to tribal farmers (1.4), indicating minimal variation in knowledge levels.

In contrast, Jagalur *et al.* (2022) [5], in their study of backyard poultry farmers in Dharwad and Belgaum districts of Northern Karnataka, found that over half (55.00%) of the farmers possessed medium-level knowledge of poultry management practices. This moderate level of understanding was influenced by factors such as education, experience in poultry farming, economic motivation, achievement motivation, mass media utilization, social participation, and flock size.

The stark difference in knowledge levels highlights the critical need for targeted training and capacity-building initiatives to enhance poultry management skills, particularly among under informed groups. Empowering farmers through education and practical guidance can lead to better management practices, backyard improving poultry productivity and welfare (Banerjee and Ghosh 2021) [2]

Comparative difference in poultry farming practices between non-tribal and tribal farmers

A comparative analysis of the knowledge levels in various poultry farming practices between non-tribal and tribal farmers reveals notable differences, with both groups demonstrating low scores across all domains (breeding, housing, health, feeding, and management). However, tribal farmers from Lahaul and Spiti consistently scored lower in most areas. In poultry breeding, non-tribal farmers exhibited significantly higher knowledge (P = 0.010), due to better access to breeding technologies and extension services. While tribal farmers scored lower in poultry housing (3.45) compared to non-tribal farmers (4.00), the difference was not statistically significant (P = 0.209), suggesting moderate understanding in both groups, though housing infrastructure improvements in tribal areas could enhance production. A highly significant difference was noted in poultry health (P = 0.000), with non-tribal farmers (4.82) far surpassing tribal farmers (3.20), potentially due to limited access to veterinary care and training in remote regions. Interestingly, tribal farmers had slightly higher scores in poultry feeding (0.77) compared to non-tribal farmers (0.45), although this difference was not statistically significant (P = 0.163), reflecting their understanding of locally available feed resources. The largest gap was seen in poultry management practices, where non-tribal farmers scored significantly higher (1.41 vs. 0.20, P = 0.000), indicating a substantial gap in adopting scientific backyard poultry management practices. The results from Yadav *et al.* 2015 [15] highlight the effectiveness of extension interventions in improving the knowledge and attitude levels of tribal poultry owners in Mandla District of Madhya Pradesh. Their study demonstrated that targeted extension efforts could significantly enhance the adoption of scientific poultry farming practices, which are essential for boosting productivity.

Table 1: Socio-Personal profile of poultry farmers

Socio-Personal Parameters	Non-tribal farmers frequency (Percentage)	Tribal farmers frequency (Percentage)
Age		
Young (Up to 35 years)	9 (22.5%)	3 (7.5%)
Middle (35-50 years)	19 (47.5%)	28 (70%)
Old (Beyond 50 years)	12 (30%)	9 (22.5%)
Education		
Illiterate	0 (0%)	7 (17.5%)
Primary	0 (0%)	8 (20%)
Middle	15 (37.5%)	2 (5%)
High School	18 (45%)	16 (40%)
Intermediate & above	7 (17.5%)	7 (17.5%)
Gender		
Male	21 (52.5%)	26 (65%)
Female	19 (47.5%)	14 (35%)
Landholding Size		
Landless Farmers	0 (0%)	0 (0%)
Marginal Farmers (<1 hectare)	37 (92.5%)	39 (97.5%)
Small Farmers (1-2 hectares)	3 (7.5%)	1 (2.5%)
Average Income		
Up to ₹1 Lakh	29 (72.5%)	20 (50%)
₹1-2 Lakhs	7 (17.5%)	4 (10%)
₹2-5 Lakhs	2 (5%)	8 (20%)
₹5-10 Lakhs	2 (5%)	8 (20%)
Above ₹10 Lakhs	0 (0%)	0 (0%)
Average Experience in Poultry Farming	0.97 years (about 11 and a half months)	0.58 years (about 7 months)
Average Flock Size	13.77 birds	6.25 birds

Table 2: Knowledge level on poultry production practices among non-tribal and tribal farmers

Knowledge on Poultry Breeding Practices				
Knowledge Category	**Non-Tribal Farmers**		**Tribal Farmers**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Low (0-5)	38	95	40	40
Medium (6-11)	2	5	0	0
High (12-17)	0	0	0	0
Mean ± SD	2.27 ±1.56		1.57 ± 0.98	
Knowledge on Poultry Housing Practices				
Knowledge Category	**Non-Tribal Farmers**		**Tribal Farmers**	
	F	**Percentage**	**F**	**Percentage**
Low (0-6)	34	85%	40	100%
Medium (7-13)	6	15%	0	0%
High (14-19)	0	0%	0	0%
Mean ± SD	4.01 ± 0.23		3.45 ± 2.74	
Knowledge on Poultry Health Practices				
Knowledge Category	**Non-Tribal Farmers**		**Tribal Farmers**	
	F	**Percentage**	**F**	**Percentage**
Low (0-6)	36	90%	40	100%
Medium (7-12)	4	10%	0	0%
High (13-18)	0	(0%)	0	0%
Mean score ± SD	4.82 ±0.96		3.2 ± 2.1	
Knowledge on Poultry Feeding Practices				
Knowledge Category	**Non-Tribal Farmers**		**Tribal Farmers**	
	F	**Percentage**	**F**	**Percentage**
Low (0-6)	40	100%	40	100%
Medium (7-13)	0	0%	0	0%
High (14-19)	0	0%	0	0%
Mean ± SD	0.45 ±1.06		0.77 ± 0.99	
Knowledge on Poultry Management Practices				
Knowledge Category	**Non-Tribal Farmers**		**Tribal Farmers**	
	F	**Percentage**	**F**	**Percentage**
Low (0-6)	40	100	40	100
Medium (7-13)	0	0	0	0
High (14-19)	0	0	0	0
Mean ± SD	1.41 ± 0.55		0.2 ± 0.16	

Table 3: Mean Scores in various poultry rearing practices of non-tribal and tribal farmers

Poultry rearing practices	**Non -Tribal Farmers Mean ± SD**	**Tribal Farmers Mean ± SD**	**P value**
Poultry breeding	2.27 ± 1.56	1.5 ± 0.98	*.010
Poultry housing	4.00 ± 0.01	3.45 ± 2.74	.209
Poultry health	4.82 ± 0.96	3.2 ± 2.1	*.00
Poultry feeding	0.45 ± 1.06	0.77 ± .99	.163
Poultry management	1.41 ± .55	0.2 ±.16	*.00

Conclusion

This study reveals significant gaps in the knowledge of poultry farming practices among tribal and non-tribal farmers in Himachal Pradesh, especially in critical areas like breeding, housing, health, feeding, and management. Tribal farmers consistently displayed lower scores across all domains, reflecting a more pronounced lack of knowledge compared to their non-tribal counterparts. The findings emphasize the need for targeted extension services and capacity-building initiatives to enhance poultry farming practices. Focused training programs, mass media campaigns, and community outreach can help bridge these knowledge gaps and contribute to better productivity, animal health, and income generation in backyard and commercial poultry farming.

Competing Interests

Authors have declared that no competing interests exist.

Authors' Contributions

"Devesh Thakur designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Rakesh Ahuja, and Manoj Sharma, managed the analyses of the study. Krishanender Dinesh and Madhu Suman Sambyal managed the literature searches. Sanjay Khurana edited the final manuscript. "All authors read and approved the final manuscript."

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