RESEARCH ARTICLE

Feeding and Natural Incubation Practices of Indigenous Chickens in Kannur and Kozhikode Districts of Kerala, India

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Abstract

A survey was conducted in native chicken farming households of Kannur (n=21) and Kozhikode (n=43) districts of Kerala (India), to document feeding and natural incubation practices. Many farmers in Kannur (47.62%) and Kozhikode (30.23%) did not provide supplementary feed, while others used paddy or rice, mainly for nutrition and behavioural conditioning of the birds. Feeding was typically done at noon or evening, with most farmers in Kannur providing less than 10 g per bird per day, whereas in Kozhikode, it was 10-20 g. Drinking water was not provided by 47.62% of farmers in Kannur and 39.53% in Kozhikode, while others used well water in coconut shells or steel utensils. Common nest boxes included plastic cans and rubber baskets, with sand as the preferred nesting material. Farmers incubated 9-12 eggs per broody hen, achieving over 60% hatchability. The study concludes that indigenous chickens require minimal care for feeding and watering, relying largely on scavenging, while natural incubation methods yield good hatchability across both districts.

Key words: Feeding, Management practices, Native chicken, Natural incubation.

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Introduction

Native chickens play a vital role in rural communities, serving as a valuable source of high-quality animal protein, apart from contributing to the economic, social, and cultural fabric of rural life (Franzoni *et al.,* 2021; Singh *et al*., 2022). These birds can forage for food, adapt to harsh environmental conditions, reproduce naturally, and exhibit resistance to certain diseases. Typically raised in backyard or extensive management systems, indigenous chickens are fed local grains and household scraps. Their adaptability to low-input farming conditions aligns with the Sustainable Development Goals (SDGs), particularly in reducing poverty and promoting balanced economic, social, and environmental development (Alders *et al*., 2018). Globally, countries such as Pakistan, Indonesia, South Africa, and India recognize the potential of native chickens in fostering community-level economic growth and providing a reliable source of animal protein in rural areas (Loengbudnark *et al*., 2024).

Indigenous chickens in India hold a significant place in integrated rural farming systems, coexisting with agriculture and other livestock like cattle, sheep, and goats. Until the 1970s, indigenous chickens dominated the entire backyard poultry population. However, the extensive introduction of exotic and hybrid varieties led to a considerable decline of the indigenous chicken in India, reducing to about 40% of total poultry population by 2020 (Churchil, 2022). The Tellicherry chicken breed, recognized as one of the 20 official breeds of India, is commonly found in Kannur and Kozhikode districts of Kerala state of India. Tellicherry is a dual-purpose breed, possessing good egg production and meat yield compared to most other indigenous ecotypes (Kumar *et al*., 2013a). Tellicherry chickens are also excellent mothers, capable of thriving in hilly terrains with dense vegetation with their ability to evade predators (Kumar *et al*., 2016). These birds primarily fulfill their nutritional needs through scavenging, while farmers supplement their diet with limited household grains (Kumar *et al*., 2013b). Indigenous chickens possess strong brooding instincts, making them ideal for natural incubation and chick rearing (Kumar *et al*., 2013c). Utilizing broody hens for incubation and brooding is a practical, cost-effective approach for rural farmers (Shimmura *et al*., 2015). Although farmers follow supplementary feeding and watering practices for indigenous chickens and have long relied on natural incubation methods to produce chicks, there is a lack of scientific documentation on these practices. The present study was aimed at addressing this paucity of information.

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Materials and Methods

A survey study was conducted among native chicken farmers in Kannur and Kozhikode districts of Kerala (India) to document the practices of feeding management and natural incubation of indigenous chickens. This high-altitude region experiences a humid tropical climate, with altitudinal variations reaching up to 500 meters above mean sea level. The landscape is characterized by moderate-gradient hills, narrow valleys, and distinct egg-shaped hilltops, with extensive forest cover of 55.86% in Kannur and 61.28% in Kozhikode districts. Preliminary studies were carried out to identify panchayats with significant backyard poultry activity involving pure indigenous chicken populations. Thrippangottur Panchayat in Kannur district and Chekkiad Panchayat in Kozhikode district were selected based on their remote locations, historical absence of exotic breed introduction, and the phenotypic characteristics of the birds, confirming the presence of pure native chicken populations.

A total of 21 native chicken farming households in Thrippangottur and 43 households in Chekkiad were randomly selected for this study, ensuring that only those maintaining pure indigenous birds were included. Structured questionnaires were used to interview the member of each family who was directly responsible for the care of chickens. The survey was aimed to collect information on the feeding and watering practices of native chicken, including reason for supplemental feeding to the native chicken, time of feeding, type and quantity of feed source of drinking water and type of waterer. Further, the natural incubation practices like the common nest box and nesting material, number of eggs incubated per setting and hatchability percentage on total egg set were also recorded. The collected data were categorized into different classes, and district-wise frequencies were analyzed using z-statistics to identify cross-district variations in these practices.

$$Z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

Where, $\hat{p}_1$: The proportion of sample 1, with sample size n_1, $\hat{p}_2$; The proportion of sample 2, with sample size n_2; $\hat{p}$: The pooled proportion calculated as $(x_1+x_2)/(n_1+n_2)$, where x_1 and x_2 are the number of successes in each sample.

Results and Discussion

Feeding and Watering Practices

The data on feeding and watering practices in native chicken rearing in Kannur and Kozhikode districts are presented in Table 1.

The study revealed that a considerable proportion of farmers in Kannur (47.62%) and Kozhikode (30.23%) did not provide any supplementary feeding, which is consistent with the earlier finding of 41.5% reported by Kumar *et al.* (2013b) in the same study area. This is notably higher compared to other regions worldwide, such as 13.33% in the Amhara region (Kefale and Mitiku, 2023) and 5% in the Sidama region (Chebo *et al*., 2024) of Ethiopia, 8.67% in Bangladesh (Zalal *et al*., 2023), and just 0.9% in the Philippines (Rodriguez *et al*., 2023). This suggests that the birds in this densely vegetated hilly region have access to abundant natural scavenging resources. In Kannur district, most farmers considered supplementary feeding essential either for behavioural reasons alone (28.57%) or for both nutritional and behavioural reasons (23.81%). In contrast, in Kozhikode district, the primary purpose of supplementary feeding was for both nutrition and behaviour (32.56%) or nutrition alone (23.26%). Kumar *et al.* (2013b) reported that the purpose of supplementary feeding in the combined area of Kannur and Kozhikode was for nutrition (29.7%) or to encourage certain behavioural activities (18.8%) or for both reasons (15.6%). Farmers train their hens to return to the doorstep immediately after laying eggs by giving them grains. This allows prompt collection of eggs and minimizing losses to crows, snakes, and other predators. Some farmers provide feed in the evening to encourage the birds to return from grazing before dusk. Additionally, farmers condition the birds from a young age to respond for a distinctive call before feeding. Upon hearing the call, birds gather from distant locations, as this signal is typically associated with feeding of supplementary feed or kitchen scraps.

Although most farmers in the study area did not follow a specific feeding schedule, the pattern between Kannur (81.82%) and Kozhikode (26.67%) revealed a significant ($p<0.01$) difference. Similarly, Kumar *et al.* (2013b) reported that 41.5% of farmers in the combined area of Kannur and Kozhikode did not follow strict feeding schedules. Among the remaining farmers, 18.88% in Kannur and 23.33% in Kozhikode fed their birds at noon. A considerable proportion of farmers in Kozhikode (23.33%) provided feed in the evening, while a smaller percentage of farmers fed their birds in the morning (6.67%), at all three times (13.33%), or after egg-laying (6.67%). Unlike intensive poultry farming, native chicken rearing does not require strict feeding schedules, allowing households to care for their birds at their convenience. A study on rural families in Bangladesh by Das *et al.* (2008) reported a practice of feeding twice a day; once in the morning when birds leave their night shelter and again in the evening when they return. The results of the study contrast with feeding practices in Ethiopia, where 36.67% of backyard farmers provided feed twice daily, and 56.67% fed their chickens three times a day (Kefale and Mitiku, 2023).

Although paddy or rice was the most common supplementary feed provided to native chickens by farmers in Kannur (33.33%) and Kozhikode (53.49%), very few farmers in these districts also use wheat, broken rice, ragi, or commercial feed. Rice, being the staple food of Kerala, is widely used as supplementary poultry feed due to its easy household availability (Kumar *et al.,* 2013b).The earlier report

Table 1: Feeding and watering practices in native chickenrearing (n=64)

S.No.	Parameters	Classes	Kannur	Kozhikode	z-statistics
1	Reason for Supplemental feeding	No supplemental feeding	47.62 (10)	30.23 (13)	1.30
		Nutrition alone	0.00 (0)	23.26 (10)	2.44*
		Nutritional and behavioral reasons	23.81 (5)	32.56 (14)	0.78
		Behavioural reasons alone	28.57 (6)	13.95 (6)	1.36
		Total	**100.00 (21)**	**100.00 (43)**	
2	Time of feeding	Morning	0.00 (0)	6.67 (2)	0.88
		Noon	18.18 (2)	23.33 (7)	0.35
		Evening	0.00 (0)	23.33 (7)	1.76
		Morning, noon and evening	0.00 (0)	13.33 (4)	1.25
		After laying	0.00 (0)	6.67 (2)	0.88
		No specific timing	81.82 (9)	26.67 (8)	3.18**
		Total	**100.00 (11)**	**100.00 (30)**	
3	Type of feed[#]	No supplemental feed	47.62 (10)	30.23 (13)	1.30
		Wheat	9.52 (2)	9.30 (4)	0.00
		Paddy/ Rice	33.33 (7)	53.49 (23)	1.61
		Ragi	0.00 (0)	4.65 (2)	1.02
		Broken rice	4.76 (1)	2.33 (1)	0.51
		Company feed	4.76 (1)	0.00 (0)	1.43
		Total	**100.00 (21)**	**100.00 (43)**	
4	Quantity of feed per bird (g)	No feed	47.62 (10)	30.23 (13)	1.3
		up to 10	33.33 (7)	13.95 (6)	1.76
		10.1 to 20.0	0.00 (0)	23.26 (10)	2.44*
		20.1 to 30.0	19.05 (4)	20.93 (9)	0.22
		Above 30.0	0.00 (0)	11.63 (5)	1.65
		Total	**100.00 (21)**	**100.00 (43)**	
5	Water source	No water provided	47.62 (10)	37.21 (16)	0.72
		Well water	52.38 (11)	60.47 (26)	0.72
		River water	0.00 (0)	2.33 (1)	0.71
		Total	**100.00 (21)**	**100.00 (43)**	
6	Type of waterer	No waterer	47.62 (10)	39.53 (17)	0.54
		Coconut shell	19.05 (4)	25.58 (11)	0.63
		Broken earthen pots	0.00 (0)	11.63 (5)	1.65
		Steel plates	23.81 (5)	13.95 (6)	0.94
		Plastic utensils	4.76 (1)	6.98 (3)	0.36
		Rubber containers	4.76 (1)	2.33 (1)	0.51
		Total	**100.00 (21)**	**100.00 (43)**	

* Significant ($p<0.05$); ** Significant ($p<0.01$); [#]Among farmers who provide supplemental feeding to their birds. Fig in parentheses is percent

also confirmed that feeding commercial feed is not common in the same population of Tellichery chicken (Vij *et al.*, 2007). Perusal of literature revealed that the farmers feed their chicken with the grains they cultivate, available in plenty locally or they commonly use as food (Tantia *et al.,* 2006; Kefale and Mitiku, 2023; Rodriguez *et al.*, 2023).

Most farmers in Kannur (33.33%) provide less than 10 g of supplementary feed per bird, whereas the majority farmers in Kozhikode (44.19%) offer a moderate quantity of 10-30 g. Similar to the present findings, Kumar *et al.* (2013b) reported an average supplementary feed of 19.5 g per bird per day in the combined areas of Kannur and Kozhikode. The quantity observed in the study was lower than those reported earlier by Tantia *et al.* (2006) in Ankleshwar birds and Kumar and Kumar (2007) in local hill fowl of Uttarakhand. The extensive chicken production system of Zimbabwe was described as a low input – low output system by McAinsh *et al.* (2004), where the birds were given limited amounts of feed to supplement what they find to eat in scavenging.

The study revealed that the majority of farmers in Kannur (52.38%) and Kozhikode (60.47%) used well water for drinking purpose of their poultry, while the rest did not provide any water, except for one farmer in Kozhikode who used river water for his birds. The results agree with the earlier finding of 57.8% in the combined areas of Kannur and Kozhikode as reported by Kumar *et al.* (2013b). In such cases, birds rely on moisture from scavenged feed, which contains over three-fourths water. Chickens typically need twice as much

Table 2: Natural incubation practices in native chicken rearing (n=64)

S.No	Parameters	Classes	Kannur	Kozhikode	Z-statistics
1	Nest box commonly used	No nest box provided	14.29 (3)	27.91 (12)	1.21
		Plastic can	23.81 (5)	20.93 (9)	0.26
		Base of broken earthen pot	9.52 (2)	13.95 (6)	0.50
		Steel pan	19.05 (4)	11.63 (5)	0.80
		Wooden crates	0.00 (0)	13.95 (6)	1.80
		Rubber basket	28.57 (6)	11.63 (5)	1.69
		Spathe	4.76 (1)	0.00 (0)	1.44
		Total	**100.00 (21)**	**100.00 (43)**	
2	Nesting material commonly used	No nesting material	4.76 (1)	18.60 (8)	1.50
		Sand	57.14 (12)	48.84 (21)	0.62
		Straw	9.52 (2)	13.95 (6)	0.50
		Paddy husk	19.05 (4)	13.95 (6)	0.53
		Clothes	0.00 (0)	4.65 (2)	1.00
		Ash	4.76 (1)	0.00 (0)	1.44
		Coir fibre	4.76 (1)	0.00 (0)	1.44
		Total	**100.00 (21)**	**100.00 (43)**	
3	Number of eggs per setting[#]	5 to 8	5.00 (1)	20.83 (5)	1.52
		9 to 12	75.00 (15)	66.67 (16)	0.60
		13 to 16	15.00 (3)	12.50 (3)	0.24
		16 to 20	5.00 (1)	0.00 (0)	1.11
		Total	**100.00 (20)**	**100.00 (24)**	
4	Hatchability percentage on TES[#]	Up to 40	15.00 (3)	29.17 (7)	1.12
		41 - 60	10.00 (2)	12.50 (3)	0.26
		61 - 80	10.00 (2)	20.83 (5)	0.98
		Above 80	65.00 (13)	37.50 (9)	1.82
		Total	**100.00 (20)**	**100.00 (24)**	

* Significant ($p<0.05$); ** Significant ($p<0.01$). [#]One farmer in Kannur and 19 farmers in Kozhikode were unable to recall this information. Fig in parentheses is percent

water as feed but adapt to low availability by excreting waste as uric acid. Earlier, Kumar and Kumar (2007) reported that water springs, and government water pipelines were common water sources for local hill fowl in Uttarakhand, India. Similarly, Chebo *et al.* (2024) found that 88.2% of rural chicken farmers in Ethiopia relied on river water, while 6.8% used piped water.

Coconut shells (19.05% in Kannur and 25.58% in Kozhikode) and steel plates (23.81% in Kannur and 13.95% in Kozhikode) were the most commonly used materials as troughs for watering native poultry. Additionally, broken earthen pots, plastic utensils, and rubber containers were used to a lesser extent for this purpose. Similarly, Kumar *et al.* (2013b) reported coconut shells (23.4%) and stainless-steel containers (17.2%) as common water troughs in the combined area of Kannur and Kozhikode. According to Kumar and Kumar (2007), the waterers used for the local hill fowls of Uttarakhand were metallic pots. But in Zimbabwe the farmers use old tyres, plastic containers, cups and plates (McAinsh *et al.*, 2004). This showed that the poultry farmers of native chicken do not use any specialized drinkers similar to those used in commercial farms but only use locally available container that can hold water.

Natural Incubation Practices

The data on natural incubation practices in native chicken rearing in Kannur and Kozhikode districts are presented in Table 2.

The study found that farmers use various locally available materials as nest box for incubating eggs, including rubber baskets and steel pans commonly used in civil construction, plastic cans of 10 litre capacity with one side cut out, the bases of earthen pots, wooden crates (tomato boxes), and spathes of areca nut palm. Among these, plastic cans (23.81% in Kannur and 20.93% in Kozhikode), rubber baskets (28.57% in Kannur and 11.63% in Kozhikode), and steel pans (19.05% in Kannur and 11.63% in Kozhikode) were the most commonly used materials for nest boxes in natural egg incubation. Earlier, Kumar *et al.* (2013b) reported similar nest box materials for incubating eggs in the same study area, including plastic cans (21.9%), rubber baskets (17.2%), and steel mortar pans (14.1%) commonly used in construction, broken earthen pots (12.5%), vegetable wooden crates (9.4%), and baskets made from the spathe of areca palm (1.6%). Kumar and Kumar (2007) reported that people in Uttarakhand in India use basket from locally available material as nest box for incubating the eggs. The use of bamboo baskets for this purpose has also been reported earlier in India (Vij *et al.,* 2005; Tantia *et al.,* 2005) and in other countries (Das *et al.*, 2008). It is interesting to note that a considerable number of farmers (14.29% in Kannur and 27.91% in Kozhikode) did not use a nest box but instead set the eggs directly on the floor in a corner of their house. This finding is consistent with an earlier report, which documented a similar practice among 23.44% of farmers in the same study area (Kumar *et al.,* 2013b).

Sand was the most commonly used nesting material in Kannur and Kozhikode districts (57.14% and 48.84%, respectively), followed by paddy husk (19.05% and 13.95%) and straw (9.52% and 13.95%); while other materials such as cloth, ash, and coir fiber were less common. Earlier, Kumar *et al.* (2013b) also reported that sand (51.6%), paddy husk (15.6%), and straw (12.5%) as the most commonly used nesting materials for incubating eggs in the same study area. In a similar study from Bangladesh, Zalal *et al.* (2023) reported that 13.3% of farmers used ash as nesting material, while 20, 10, 9, and 50.7% used straw, cloth, leaves, and mixed materials, respectively. A small proportion of farmers (4.76% in Kannur and 18.60% in Kozhikode) did not use any nesting material, instead allowing hens to incubate eggs directly on the floor. As reported by Vijh *et al.* (2005), in indigenous Miri birds, paddy straw bedding was provided; whereas, in Zimbabwe it was grass (McAinsh *et al.*, 2004) and in Bangladesh it was wood shavings or paddy straw (Das *et al.*, 2008).

Although the number of eggs incubated under a hen varied widely, the majority of farmers in Kannur (75.00%) and Kozhikode (66.67%) set between 9 and 12 eggs per hen. A very closer values 10.60 eggs were recorded in local chickens of Zimbabwe by McAinsh *et al.* (2004) and 12 and 12.3 eggs by Das *et al.* (2008) and Zalal *et al.* (2023), respectively, in Bangladesh.

Most farmers in Kannur (65%) reported hatchability above 80% compared to 37.5% in Kozhikode. Kumar *et al.* (2013c) recorded a mean hatchability of 63.12% in the same area. Similar hatchability rates have been reported in Tellichery chickens of Kerala (70-80%) by Vij *et al.* (2007), local chickens of Zimbabwe (73%) by McAinsh *et al.* (2004), and native chickens of Bangladesh (87.9%) by Zalal *et al.* (2023). However, higher hatchability values of 92% in Bangladesh (Roy *et al.*, 2004) and 90% in Uganda (Kugonza *et al.*, 2008) have also been reported from the natural incubation. Notably, 57.81% of farmers in this study area kept no cocks despite knowing their role in fertility. Interestingly, those without cocks still incubated eggs, assuming hens mated with neighboring cocks (Kumar *et al.*, 2013b).

Conclusion

The study provides valuable insights into native chicken farming in Kannur and Kozhikode districts of Kerala. Indigenous chickens in this region thrive on scavenged feed with minimal supplementation, making them well-suited for low-cost, small-scale farming. Farmers rely on traditional, cost-effective natural incubation methods that have been refined over generations, yielding good hatchability rates. The findings highlight the significance of traditional knowledge in sustaining productivity while also indicating the need for scientific interventions to enhance hatchability and growth through strategic nutritional supplementation and improved water management.

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