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Constraints in backyard poultry rearing in Uttar Pradesh and Uttarakhand, India

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Abstract

The primary survey was conducted in the purposively selected 8 villages falling in the interventional area of Development Action Plan for Scheduled Caste/Tribes (DAPSC/ST) in Uttar Pradesh (Fatehganj West and Nawabganj blocks, Bareilly district) and Uttarakhand (Khatima block, Udham Singh Nagar district) to identify the constraints faced by poultry rearers in their backyard poultry production system. The data sample comprised of 120 backyard poultry rearers each of the beneficiaries and non-beneficiaries. The data were collected by personal interview using pre-tested interview schedule that had a list of constraints. Initially, the constraints were identified based on two sources: (1) a comprehensive review of previous studies in similar contexts, and (2) preliminary findings from schedule testing during the research design phase. Subsequently, during data collection, farmers were asked to validate these constraints and list out other constraints if any, based on their personal experiences. They were asked to provide rankings according to the severity, they perceived with respect to various constraints. The data so collected were tabulated and analysed using Garrett's ranking technique. Among the listed constraints, high feed cost emerged as the most significant constraint with the highest Garrett's score and first rank followed by low egg production, mortality, problem of predators and unhygienic premises. On the other hand, the marketing problems and lack of space and time were considered comparatively less critical. In order to assess the statistical significance of ranking differences, the Friedman test was employed as a supporting non-parametric method. The test results indicated significant differences among the constraints, suggesting that farmers were able to clearly identify the constraints based on perceived severity rather than ranking them arbitrarily. The findings were consistent with the Garrett's ranking results, thereby supporting the reliability and suitability of the technique for prioritizing constraints in backyard poultry production.

Keywords: Backyard poultry, Constraints, Garrett's ranking, DAPSC, DAPST

1. Introduction

Backyard poultry rearing is a low-input or no-input livelihood activity that primarily depends on scavenging on the natural feed base with little supplementary feeding, minimal health care practices, and simple night shelter arrangements (Sharma and Chatterjee, 2009; Sheikh *et al.*, 2018; Islam *et al.*, 2020) ^[12, 13, 8]. It involves the rearing of native, indigenous, or improved poultry birds in rural household backyards (Kumaresan *et al.*, 2008; Chaiban *et al.*, 2020) ^[10, 3]. The number of birds maintained in a backyard production system varies with the availability of natural feed resources, while supplementary feeding is provided occasionally depending on household resources (Thieme *et al.*, 2014; Wong *et al.*, 2017) ^[16, 17]. Generally, birds are allowed to scavenge freely during the daytime and are sheltered only at night in locally made poultry houses

(Alders *et al.*, 2018) ^[1]. Backyard poultry not only serves as a source of nutritious food for rural households but also contributes to additional income through the sale of surplus birds and eggs. Male birds are usually sold or consumed at 1.5-2 kg body weight, whereas females are retained for flock propagation. Indigenous (desi) hens generally lay about 30-80 eggs annually in three to four clutches (Singh *et al.*, 2018) ^[15]. Rural poultry varieties possess several desirable characteristics, including multicoloured plumage, superior meat quality, attractive appearance, higher disease resistance, adaptability to harsh environmental conditions, and better scavenging ability (Sharma and Chatterjee, 2009; Rajkumar *et al.*, 2010) ^[12, 15].

The two Government programmes, viz., Development Action Plan for Scheduled Castes (DAPSC) and Development Action Plan for Scheduled Tribes (DAPST)

have been operational in ICAR-CARI since 2019 and 2018, respectively. These programmes aim at the socio-economic upliftment of Scheduled Caste (SC) and Scheduled Tribe (ST) communities residing in rural areas of Uttar Pradesh and Uttarakhand through interventions such as the distribution of improved backyard poultry birds and related support services. The programmes are intended to enhance income generation, nutritional security, and livelihood opportunities among resource-poor rural households. However, despite the advantages and potential benefits of backyard poultry farming, the successful adoption and management of indigenous or improved poultry birds under backyard conditions are often hindered by several socio-economic, technical, managerial, and infrastructural constraints which may adversely affect the sustainability and productivity of the backyard poultry system. Therefore, it was imperative to assess the constraints faced by beneficiary and non-beneficiary households engaged in backyard poultry rearing, with the former receiving support under the DAPSC and DAPST programmes. Identification and analysis of these constraints would provide valuable insights into the challenges experienced by beneficiary households and help in designing appropriate interventions and support mechanisms. The findings would also assist researchers, extension personnel, and policymakers in formulating effective strategies and policies to strengthen backyard poultry development programmes and improve the livelihoods of SC and ST communities.

2. Material and Methods

2.1 Study Area and Sampling Design

The study was conducted in the two states, namely, Uttar Pradesh and Uttarakhand where DAPSC/ST projects have been in operation since 2019 and 2018, respectively. Further, the districts, blocks and villages in each state were selected purposively based on area of intervention under DAPSC/ST projects. Respondents were selected randomly in each of the villages falling in the activity domains of the respective projects. In Uttar Pradesh, two villages each in Fatehganj West and Nawabganj blocks in the district of Bareilly were purposively selected where DAPSC project activities were concentrated. Similarly, in Uttarakhand, four villages in Khatima block in the district of Udham Singh Nagar were purposively selected where DAPST project activities were concentrated. Thus, a total of 8 villages were selected. From each of the villages, out of the total project beneficiaries, 15 beneficiaries were randomly selected. These beneficiaries were treated as the “Treatment group” who had availed the benefits under DAPSC/ST projects in the form of poultry interventions. Also from similar nearby villages, 120 additional non-beneficiaries (those who did not avail any benefits under the project in terms of poultry interventions but were engaged in rearing *desi* type birds in their backyards) were randomly selected which constituted the “Control group”.

2.2 Henry Garrett’s Ranking Technique

The constraints faced by individuals engaged in poultry farming—across both treatment and control groups—were assessed using Henry Garrett’s Ranking Technique. Data were collected through personal interviews using a pre-tested interview schedule containing a list of potential

constraints related to backyard poultry rearing. The identified constraints were initially derived from an extensive review of relevant literature and insights obtained during the schedule pre-testing stage of the study. During the field survey, respondents were requested to verify the relevance of these constraints and were also encouraged to report any additional constraints they had encountered based on their own experiences. Participants were instructed to rank the challenges based on their severity, assigning rank 1 to the most severe and subsequent ranks to less severe constraints. The assigned ranks were converted into scores using Garrett’s conversion procedure. The percent position of each rank was computed using the following formula proposed by Garrett and Woodworth (1969) [6]:

$$\text{Per cent position} = 100 (\text{Rij} - 0.50) / \text{Nj}$$

Where,

R = Rank given for the *i*th constraint by the *j*th respondent

N = Number of constraints ranked by the *j*th respondent

The calculated percent positions were then transformed into Garrett scores using the conversion table developed by Garrett and Woodworth (1969) [6]. Thereafter, for each constraint, the scores of the individual respondents were added together and divided by the total number of respondents for whom scores were added. Constraints were subsequently arranged in descending order of their mean scores, with the highest mean score indicating the most severe constraint. This technique enabled the conversion of ordinal rankings into quantitative measures, thereby facilitating meaningful comparison and prioritization of constraints across respondents.

2.3 Friedman Test of Differences in Constraint Rankings

Garrett ranking enables the ordering of constraints according to their perceived importance; however, it does not determine whether the differences in rankings assigned by respondents are statistically significant. Therefore, the Friedman test was employed as a complementary non-parametric method to assess whether farmers differed significantly in their perception of the identified constraints. The Friedman test serves as a non-parametric counterpart to repeated-measures ANOVA and is suitable when the same respondents rank a set of related items and the data are measured on an ordinal scale (Siegel *et al.*, 1988; Conover, 1999) [14, 4]. In the present study, all respondents ranked each of the identified constraints, resulting in a complete block design in which farmers constituted the blocks and the constraints represented the related treatments. The Friedman test examines whether the mean ranks assigned to the constraints vary significantly among respondents (Gibbons and Chakraborti, 2025) [7]. The null hypothesis (H_0) stated that there were no significant differences among the ranks assigned to the constraints, whereas the alternative hypothesis (H_1) proposed that at least one constraint differed significantly in its assigned rank. The Friedman test statistic follows a chi-square (χ^2) distribution with $(k - 1)$ degrees of freedom, where k denotes the number of constraints considered in the analysis (Conover, 1999) [4].

3. Results and Discussion

The constraints faced by the beneficiaries in backyard poultry rearing under the DAPSC and DAPST programmes were analysed using Garrett’s ranking technique, and the

results are presented in Table 1. The analysis revealed that high feed cost was perceived as the most serious constraint by the respondents, securing the first rank with the highest Garrett's score of 78 and a frequency of 66.73 percent. The increasing price of commercial poultry feed and limited availability of low-cost feed resources may have significantly affected the profitability of backyard poultry farming. Since most of the sampled households belonged to socio-economically marginalised communities, expenditure on supplementary feeding might have become a major burden, particularly during seasons when natural scavenging resources were inadequate. The second major constraint identified was low egg production, which obtained a Garrett's score of 66 and ranked second. The lower productivity of birds under backyard conditions may be attributed to poor nutrition, inadequate management practices, disease incidence etc. Backyard poultry systems generally rely on scavenging with minimal supplementation, which may not sufficiently meet the nutritional requirements for optimum egg production. Mortality was ranked as the third important constraint with a Garrett's score of 57 and a frequency of 58.48 percent. Higher mortality among birds may be associated with disease outbreaks, lack of timely veterinary services, poor vaccination coverage, and exposure to adverse climatic conditions and predators. In rural backyard systems, inadequate knowledge regarding disease prevention and scientific poultry management may further contribute to higher bird losses. The problem of predators emerged as another important constraint and secured the fourth rank with a Garrett's score of 50. Birds reared under free-range scavenging systems are more vulnerable to attacks from dogs, cats, foxes, snakes, and predatory birds. Lack of proper housing and protective measures during scavenging and night shelter may increase the risk of predation. Unhygienic premises were ranked fifth with a Garrett's score of 43. Poor sanitation and improper waste disposal practices create favourable conditions for the spread of diseases and parasites, thereby affecting bird health and productivity. Limited awareness regarding hygienic management practices among beneficiaries may also contribute to this problem. The respondents also reported marketing problems as a constraint, which received the sixth rank with a Garrett's score of 34. Since most beneficiaries sell birds and eggs in local markets, access to better marketing channels remains limited and may reduce the economic returns from backyard poultry farming. Finally, lack of space and time was ranked seventh with a Garrett's score of 21, indicating that it was perceived as a comparatively less severe constraint. Although backyard poultry requires relatively low investment and management, some respondents still faced difficulties in allocating adequate space and time for proper bird management due to involvement in other agricultural and household activities.

Table 1: Constraint analysis using Garrett's ranking technique

Sl.	Constraint	Frequency	Score	Rank
1	High feed cost	66.73	78	1
2	Low egg production	30.27	66	2
3	Mortality	58.48	57	3
4	Problem of predators	56.22	50	4
5	Unhygienic premises	59.35	43	5
6	Marketing problem	34.19	34	6
7	No space and time	30.27	21	7

The findings of the present study are in agreement with earlier studies on backyard poultry farming. High feed cost, which emerged as the most severe constraint in the present study, was also reported by Mandal *et al.*, (2006) ^[11] as a major challenge faced by backyard poultry farmers. Similarly, low egg production, ranked second in the present study, was also identified as an important constraint by Deka *et al.*, (2013) ^[5] Mortality among birds was another significant constraint observed in the present study, which corroborates the findings of Deka *et al.*, (2013) ^[5] who reported early chick mortality as a major problem in backyard poultry production systems. Predator attack, ranked fourth in the present study, has also been reported as a major constraint by Mandal *et al.*, (2006) ^[11], Khandait *et al.*, (2011) ^[9], Deka *et al.*, (2013) ^[5], and Bharti *et al.*, (2019) ^[2] Unhygienic premises identified in the present study are in line with the findings of Mandal *et al.*, (2006) ^[11] and Khandait *et al.*, (2011) ^[9] who reported poor hygienic conditions as an important constraint. Further, shortage of space was also reported by Mandal *et al.*, (2006) ^[11], while lack of time for poultry management was highlighted by Khandait *et al.*, (2011) ^[9], Bharti *et al.*, (2019) ^[2] also reported low productivity as a major challenge in backyard poultry farming. These similarities indicate that the constraints identified in the present study are common across different geographical regions and continue to affect the productivity and sustainability of backyard poultry enterprises.

The Friedman test was conducted to determine whether there were significant differences in the rankings assigned by the 240 respondents to the seven identified constraints. The test yielded a chi-square (χ^2) value of 792.11 with 6 degrees of freedom and a p-value less than 0.001. Since the p-value is far below the 5 per cent level of significance, the null hypothesis that all constraints were ranked equally is rejected. This indicates that the respondents perceived significant differences among the constraints and assigned distinct ranks to them. The results suggest that the constraints did not have equal importance and that there was a statistically significant variation in their perceived severity. This clearly indicates that the farmers did not assign ranks randomly rather, they were able to meaningfully distinguish between more serious and less serious constraints. Therefore, the ranking pattern obtained can be considered reliable and reflective of the farmers' actual perceptions regarding the constraints under study.

Table 2: Friedman Test for Constraints

Category	Value
Test Statistics (χ^2)	792.11
Degrees of freedom (df)	6
P value	< 0.001

The mean rank analysis revealed that high feed cost recorded the lowest mean rank (2.05) and was therefore perceived as the most serious constraint faced by the farmers. This was followed by low egg production (2.90), mortality (3.01), problem of predators (3.24), unhygienic premises (4.70) and marketing problem (5.84), considered relatively less severe constraints in that order, while no space and time (6.22) emerged as the least serious constraint. The ordering of constraints based on the mean

ranks was found to be consistent with the results obtained from the Garrett's ranking analysis. This agreement between the two methods further validates the reliability and suitability of the Garrett's ranking technique in identifying and prioritizing the constraints perceived by the farmers. The consistency of findings across both approaches strengthens confidence in the robustness of the ranking results.

Table 3: Mean Ranks of Constraints

Sl.	Constraints	Mean Ranks
1	High feed cost	2.05
2	Low egg production	2.90
3	Mortality	3.01
4	Problem of predators	3.24
5	Unhygienic premises	4.70
6	Marketing problem	5.84
7	No space and time	6.22

4. Conclusion

From the present study, it can be concluded that the economic and managerial constraints were the major challenges affecting the successful adoption and sustainability of backyard poultry farming among DAPSC and DAPST beneficiaries and non-beneficiaries. Addressing issues related to feed cost, productivity enhancement, disease management, predator control, and market access through suitable policy interventions, training programmes, and extension support could significantly improve the effectiveness of backyard poultry development programmes and enhance the livelihood security of rural SC and ST households.

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Competing Interests

Authors have declared that no competing interests exist

Abbreviations: DAPSC - Development Action Plan for Scheduled Caste, DAPST -Development Action Plan for Scheduled Tribes

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