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Constraints faced by farmers in crop and dairy enterprises under integrated farming systems: A Garrett ranking approach in Chhattisgarh plains

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Abstract

Integrated Farming Systems (IFS) integrate crop production with allied enterprises and provide opportunities for diversification of farm activities and utilization of available farm resources. However, farmers face several productions, climatic, labour, market and institutional constraints while managing individual enterprises. The present study was undertaken to identify and prioritize the major constraints faced by farmers in crop and dairy enterprises under Integrated Farming Systems in the Chhattisgarh Plains Zone. The study was conducted in Bemetara and Rajnandgaon districts of Chhattisgarh. A total of 210 farmers were selected through a multistage sampling procedure, and primary data were collected through personal interviews using a pre-structured interview schedule. The sample farmers were classified into six farming system categories, viz., FS-0 (Crop Only), IFS-I (Crop + Dairy + Horticulture), IFS-II (Crop + Poultry + Horticulture), IFS-III (Crop + Fisheries + Horticulture), IFS-IV (Crop + Dairy + Goatery + Horticulture) and IFS-V (Crop + Agroforestry + Horticulture). Garrett's Ranking Technique was employed to prioritize the constraints perceived by farmers. In the crop enterprise, high cost of agricultural inputs emerged as the most important constraint, followed by erratic rainfall and inadequate irrigation, high labour wages and labour shortage, and fluctuation in market prices of agricultural produce. In the dairy enterprise, high cost of concentrate feed for lactating animals ranked first, followed by inadequate veterinary and artificial insemination services, high incidence of animal diseases and treatment cost, shortage of skilled labour for dairy management, and low milk procurement/sale price. The findings indicate the need for timely availability of agricultural inputs, improved irrigation facilities, appropriate farm mechanization, affordable feed resources, accessible veterinary and breeding services, and improved market linkages for farmers practicing Integrated Farming Systems.

Keywords: Integrated farming system, crop enterprise, dairy enterprise, constraints, Garrett ranking technique, Chhattisgarh plains

1. Introduction

Agriculture is an important source of livelihood for rural households in Chhattisgarh. However, increasing production costs, climatic variability, labour shortages, fluctuating market prices and inadequate access to institutional and technical services pose several challenges to farm households. Dependence on seasonal rainfall further increases uncertainty in agricultural production and farm income.

Integrated Farming System (IFS) is an approach that combines crop production with one or more allied enterprises such as dairy, poultry, fisheries, goatery, horticulture and agroforestry. The integration of complementary enterprises provides opportunities for diversification of farm activities and utilization of available land, labour and other farm resources. Crop residues can be utilized by allied enterprises, while organic wastes generated from livestock and other activities can be recycled within the farm.

In the Chhattisgarh Plains Zone, crop production forms the major component of farming, while farmers also undertake

allied enterprises according to their landholding, irrigation facilities, family labour availability, capital resources and access to markets. Different combinations of crop and allied enterprises were observed in the study area, including crop-only farming and integrated systems involving dairy, poultry, fisheries, goatery, horticulture and agroforestry.

Evidence from Chhattisgarh also demonstrates the potential of integrated farming systems to improve farm profitability and livelihood outcomes. Chandrakar *et al.* (2020) ^[1] reported improved profitability and livelihood prospects among marginal farmers through integrated farming system models in Kawardha district of Chhattisgarh. Similarly, Netam *et al.* (2023) ^[7] reported that animal husbandry made the largest contribution to net returns in a livestock-based IFS model, while effective recycling of crop residues and livestock wastes as feed and organic manure contributed to resource conservation and sustainable production.

Despite the potential benefits of enterprise integration, farmers face several constraints while managing individual enterprises. Crop production is affected by input costs,

rainfall variability, labour availability and market conditions, whereas dairy farming is influenced by feed costs, animal health, breeding services, labour availability and milk prices. Identification and prioritization of these constraints are important for designing interventions suited to the requirements of individual enterprises.

Garrett's Ranking Technique provides a systematic approach for prioritizing farmer-perceived constraints by converting ordinal rankings into numerical scores. The method facilitates comparison of the relative importance of different constraints and identification of the most serious constraints perceived by farmers.

Therefore, the present study was undertaken to identify and prioritize the major constraints faced by farmers in crop and dairy enterprises under Integrated Farming Systems in the Chhattisgarh Plains Zone.

2. Materials and Methods

2.1 Study Area

The study was conducted in the Chhattisgarh Plains Zone. Bemetara and Rajnandgaon districts were selected for the study. The selected area represents an important crop-producing region of Chhattisgarh where farmers practice crop production along with different allied enterprises.

The study area was selected considering the prevalence of crop-based farming and the practice of diversified farming systems involving dairy, poultry, fisheries, goatery, horticulture and agroforestry.

2.2 Sampling Procedure and Sample Size Determination

A multistage sampling procedure was followed for the selection of sample farmers. Bemetara and Rajnandgaon districts were purposively selected from the Chhattisgarh Plains Zone. Subsequently, blocks and villages were selected from the selected districts, followed by identification and selection of farmers practicing different combinations of crop and allied enterprises. The study classified the selected farmers into six farming system categories based on the enterprise combinations practiced at the farm level. The six categories were FS-0 (Crop Only), IFS-I (Crop + Dairy +

Horticulture), IFS-II (Crop + Poultry + Horticulture), IFS-III (Crop + Fisheries + Horticulture), IFS-IV (Crop + Dairy + Goatery + Horticulture) and IFS-V (Crop + Agroforestry + Horticulture).

The sample size for the present study was determined using the formula suggested by Cochran (1977) ^[2]. The initial sample size for a large population was calculated as:

$$n_0 = (Z^2pq) / e^2$$

where n_0 is the initial required sample size, Z is the standard normal deviate corresponding to the desired confidence level, p is the estimated proportion of the population possessing the attribute of interest, $q = 1 - p$, and e is the desired level of precision.

For the present study, $Z = 1.96$, $p = 0.50$, $q = 0.50$, and $e = 0.05$. Thus,

$$n_0 = [(1.96)^2 \times (0.50) \times (0.50)] / (0.05)^2$$

$$n_0 = 384.16$$

Since the population of eligible farmers was finite, the Finite Population Correction (FPC) was applied. The total population of eligible farmers identified in the selected study villages was 460, which was considered as the finite population (N) for determining the required sample size. The adjusted sample size was calculated as:

$$n = n_0 / [1 + (n_0 - 1) / N]$$

where n is the adjusted sample size and N is the total population of eligible farmers.

$$n = 384.16 / [1 + (384.16 - 1) / 460]$$

$$n = 209.58 \approx 210$$

Thus, the final sample size for the study was fixed at 210 farmers.

The final distribution of sample farmers across the identified farming systems is presented in Table 1.

Table 1: Distribution of Sample Farmers under Different Farming Systems

Farming System	No. of Farmers	Percentage
FS-0 – Crop Only	37	17.62
IFS-I – Crop + Dairy + Horticulture	63	30.00
IFS-II – Crop + Poultry + Horticulture	32	15.24
IFS-III – Crop + Fisheries + Horticulture	26	12.38
IFS-IV – Crop + Dairy + Goatery + Horticulture	31	14.76
IFS-V – Crop + Agroforestry + Horticulture	21	10.00
Total	210	100.00

Source: Primary Survey Data, 2025–26.

IFS-I constituted the largest group, accounting for 30.00 per cent of the sample, followed by FS-0 (17.62%), IFS-II (15.24%), IFS-IV (14.76%), IFS-III (12.38%) and IFS-V (10.00%). The final farming-system distribution is consistent with the 210-farmer classification used in the current study.

2.3 Selection of Respondents

Based on the estimated sample size of 210 respondents, a multistage sampling design was adopted for the selection of sample farmers. The Chhattisgarh Plains Zone was

purposively selected for the study, followed by purposive selection of Bemetara and Rajnandgaon districts. Subsequently, two blocks from each selected district and two villages from each selected block were selected, resulting in a total of four blocks and eight villages.

Within the selected villages, farmers practicing different Integrated Farming Systems (IFS) were identified and classified according to their operational landholding size. The respondents were stratified into four farm-size categories, namely marginal (below 1.00 ha), small (1.00–2.00 ha),

medium (2.01–4.00 ha) and large (above 4.00 ha). Farmers were then selected through random sampling within each farm-size stratum.

Thus, the final sample comprised 210 farmers selected from eight villages of Bemetara and Rajnandgaon districts, representing different farm-size categories and farming systems.

2.4 Data Collection

Primary data were collected during 2025–26 through personal interviews using a pre-structured interview schedule. Information relating to farming-system characteristics and constraints faced in crop and dairy enterprises was collected from the selected farmers.

2.5 Analytical Framework: Garrett's Ranking Technique

Garrett's Ranking Technique was used to prioritize the constraints perceived by farmers. Respondents were asked to rank the constraints according to their perceived importance. The percentage position for each rank was calculated using:

$$\text{Percentage position} = 100(\text{Rij} - 0.5) / \text{Nj}$$

where:

Rij = rank given by the ith respondent for the jth constraint
Nj = number of constraints ranked by the ith respondent.

The percentage positions were converted into Garrett scores using the standard Garrett conversion table. The mean Garrett score for each constraint was then calculated by averaging the scores across respondents. The constraints were ranked in descending order of their mean Garrett scores, with the highest score representing the most important constraint. This procedure follows the standard application of Garrett's Ranking Technique (Garrett and Woodworth, 1969) [4].

3. Results and Discussion

3.1 Constraints Faced by Farmers in Crop Enterprise

The major constraints faced by farmers in the crop enterprise were prioritized using Garrett's Ranking Technique. The results are presented in Table 2.

Table 2: Garrett Mean Scores of Constraints Faced by Farmers in Crop Enterprise

S. No.	Constraints	Garrett Mean Score	Rank
1	High cost of agricultural inputs (seed, fertilizer and pesticides)	64.02	I
2	Erratic rainfall and inadequate irrigation	60.38	II
3	High labour wages and labour shortage	57.43	III
4	Fluctuation in market prices of agricultural produce	53.80	IV
5	Non-availability of agricultural inputs on time	50.27	V

Source: Primary Survey Data, 2025–26.

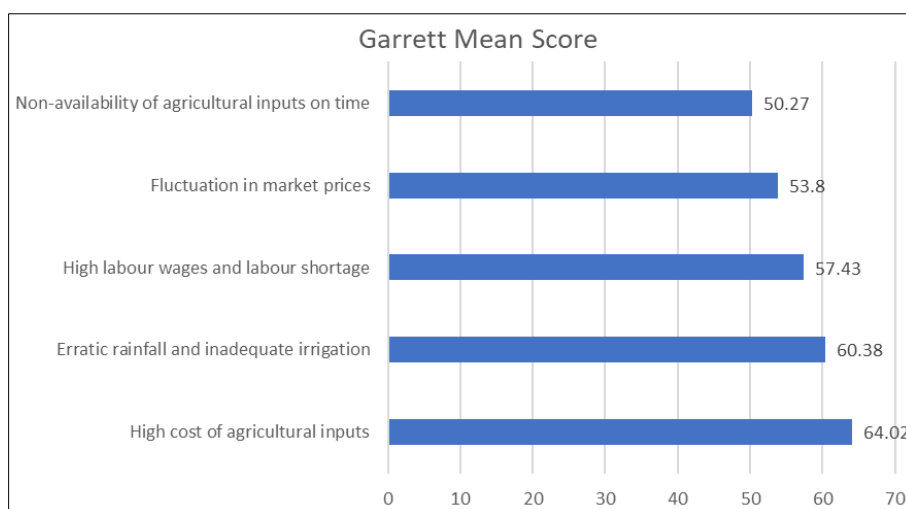


Fig 1: Garrett Mean Scores of Constraints Faced by Farmers in Crop Enterprise

High cost of agricultural inputs emerged as the most important constraint in crop production, with a Garrett mean score of 64.02, followed by erratic rainfall and inadequate irrigation (60.38). High labour wages and labour shortage ranked third with a score of 57.43, while fluctuation in market prices of agricultural produce ranked fourth with a score of 53.80. Non-availability of agricultural inputs on time ranked fifth, with a Garrett mean score of 50.27. The ranking indicates that, although timely availability of agricultural inputs was a relatively lower constraint compared with the other factors, it remained an important concern among the sample farmers.

The findings indicate that input costs, water availability,

labour and market conditions were the major areas of concern in crop production. The prominence of input costs suggests that expenditure on seed, fertilizers and plant protection chemicals represents an important concern for the sample farmers. Similarly, erratic rainfall and inadequate irrigation indicate the importance of water availability for crop production.

The predominance of input cost, labour-related and irrigation constraints observed in the present study is broadly consistent with earlier studies reporting input availability, labour shortages and production-related constraints among farmers practicing integrated or diversified farming systems (Devi *et al.*, 2022; Kumar *et al.*, 2022; Sharma *et al.*, 2023) [3, 5, 8].

3.2 Constraints Faced by Farmers in Dairy Enterprise

Garrett ranking for dairy constraints was based on the

responses of 94 farmers who practiced dairy as a component of their farming system.

Table 3: Garrett Mean Scores of Constraints Faced by Farmers in Dairy Enterprise

S. No.	Constraints	Garrett Mean Score	Rank
1	High cost of concentrate feed for lactating animals	62.38	I
2	Inadequate veterinary and artificial insemination services	59.93	II
3	High incidence of animal diseases and treatment cost	57.65	III
4	Shortage of skilled labour for dairy management	53.93	IV
5	Low milk procurement/sale price	50.40	V

Source: Primary Survey Data, 2025–26.

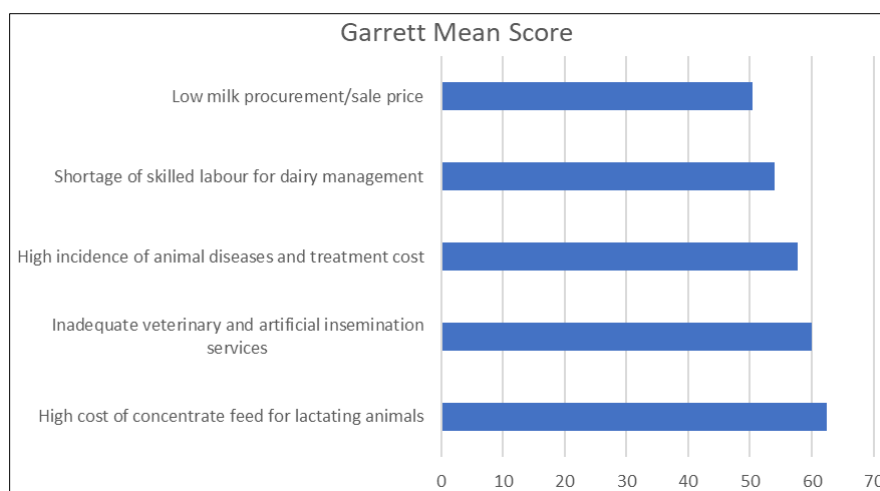


Fig 2: Garrett Mean Scores of Constraints Faced by Farmers in Dairy Enterprise

High cost of concentrate feed for lactating animals emerged as the most important dairy constraint, with a Garrett mean score of 62.38. It was followed by inadequate veterinary and artificial insemination services (59.93) and high incidence of animal diseases and treatment cost (57.65). Shortage of skilled labour for dairy management ranked fourth (53.93), while low milk procurement/sale price ranked fifth (50.40). The results indicate that feed costs, animal health, breeding services, labour and milk marketing were the major constraints faced by farmers in dairy enterprise.

The prominence of concentrate feed cost, veterinary and artificial insemination services, and animal health-related constraints in the present study is consistent with earlier findings that identified feed costs, veterinary services and animal health as important constraints faced by dairy farmers (Nagrle *et al.*, 2015) ^[6].

4. Suggestions to Overcome Production Constraints in Crop and Dairy Enterprises

4.1 Crop Enterprise

4.1.1 High Cost of Agricultural Inputs

The timely availability of quality seeds, fertilizers and plant protection chemicals at reasonable prices should be ensured. Collective procurement through farmer groups, cooperatives and Farmer Producer Organizations (FPOs) may help farmers reduce input procurement costs and improve their access to quality agricultural inputs.

4.1.2 Erratic Rainfall and Inadequate Irrigation

Expansion of assured irrigation facilities, development of water-harvesting structures and adoption of efficient irrigation practices should be encouraged to reduce farmers'

dependence on rainfall. Weather-based advisories may also be strengthened to support farm-level planning and timely decision-making.

4.1.3 High Labour Wages and Labour Shortage

Farm mechanization and Custom Hiring Centres (CHCs) should be strengthened to improve farmers' access to labour-saving machinery, particularly during peak agricultural operations. Affordable and timely access to farm machinery can help reduce dependence on manual labour and minimize the adverse effects of labour shortages.

4.1.4 Fluctuation in Market Prices

Access to reliable market information, collective marketing and organized market channels should be strengthened to reduce the adverse effects of price fluctuations. Farmer Producer Organizations (FPOs) and cooperative marketing arrangements may improve farmers' bargaining power and facilitate better market access.

4.1.5 Non-availability of Agricultural Inputs on Time

Quality agricultural inputs should be made available to farmers well before the commencement of the cropping season through improved distribution networks and local-level input supply mechanisms. Strengthening timely delivery systems can help farmers undertake farm operations according to the recommended production schedule.

4.2 Dairy Enterprise

4.2.1 High Cost of Concentrate Feed

Farmers should be encouraged to cultivate green fodder and utilize locally available crop residues and other feed

resources. Balanced feeding practices and improved fodder management may help reduce dependence on costly concentrate feed.

4.2.2 Inadequate Veterinary and Artificial Insemination Services

Veterinary and artificial insemination services should be strengthened at the village level. Regular veterinary camps and mobile veterinary services can improve accessibility for farmers.

4.2.3 Animal Diseases and Treatment Cost

Regular vaccination, preventive health care and animal-health camps should be promoted. Farmers should also be trained in early identification and prevention of common livestock diseases.

4.2.4 Shortage of Skilled Labour

Training programmes should be organized on scientific dairy management, feeding, breeding, animal health and hygienic milk production to improve the technical capacity of farm households.

4.2.5 Low Milk Procurement/Sale Price

Organized milk collection systems, cooperative marketing and improved market linkages should be strengthened to provide farmers with reliable outlets for milk and improve access to remunerative markets.

5. Conclusion

The present study identified and prioritized the major constraints faced by farmers in crop and dairy enterprises under Integrated Farming Systems in the Chhattisgarh Plains Zone using Garrett's Ranking Technique. In the crop enterprise, the high cost of agricultural inputs emerged as the most important constraint, followed by erratic rainfall and inadequate irrigation, high labour wages and labour shortage, and fluctuations in market prices of agricultural produce. In the dairy enterprise, the high cost of concentrate feed for lactating animals ranked first, followed by inadequate veterinary and artificial insemination services, high incidence of animal diseases and treatment costs, shortage of skilled labour, and low milk procurement/sale prices.

The findings indicate that farmers face both enterprise-specific and common constraints in managing crop and dairy enterprises. Addressing these constraints requires timely access to quality agricultural inputs, assured irrigation facilities, improved farm mechanization, affordable feed resources, accessible veterinary and breeding services, technical training and better market linkages. Strengthening these support services can reduce production and management constraints and facilitate more effective and sustainable management of crop and dairy enterprises within Integrated Farming Systems in the Chhattisgarh Plains Zone.

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