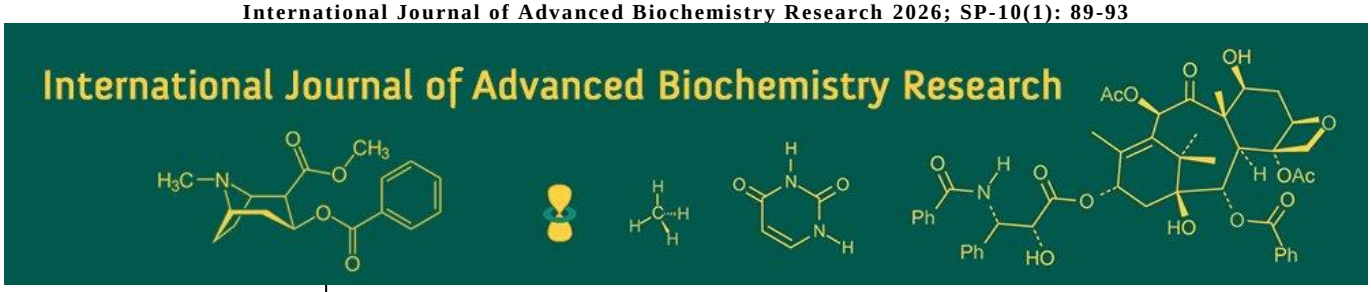

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A study on constraints faced by millet farmers in Andhra Pradesh: Garrett ranking analysis

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Abstract
Millets play a crucial role in ensuring nutritional security, climate resilience, and livelihood support, particularly in tribal and rainfed regions of India. Despite their importance, millet growers continue to face multiple constraints that limit productivity, value realization, and market integration. The present study aimed to identify and prioritize the constraints faced by millet growers associated with Farmer Producer Organizations (FPOs) using Garrett ranking analysis. The study was conducted during 2025-26 in the Alluri Sitharama Raju (ASR) district of Andhra Pradesh, covering 160 millet farmers selected from three FPOs. Primary data were collected through personal interviews using a structured schedule. A total of twelve major constraints related to input availability, technical support, marketing, finance, processing, mechanization, and extension were identified and ranked by the respondents. Garrett ranking technique was employed to convert ordinal ranks into numerical scores for objective prioritization. The results revealed that non-availability of quality seed, lack of technical advisory and irrigation support, and low market price or price fluctuation were the most severe constraints faced by millet growers. Constraints related to extension support, awareness, and credit access were perceived as relatively less severe. The study highlighted the dominance of input and market-related challenges in millet cultivation and provides a quantitative basis for prioritizing interventions aimed at strengthening millet-based farming systems.

Keywords: Millets, constraints, Garrett ranking, FPOs, tribal farmers

Introduction
Millets are recognized as nutritionally superior, climate-resilient cereal crops that play a significant role in ensuring food and nutritional security, particularly in rainfed, dryland, and tribal regions (Prabhakar *et al.*, 2023) [7]. Rich in dietary fibre, micronutrients, and bioactive compounds, millets contribute to improved human health while requiring relatively fewer inputs and lower water compared to major cereals (Saleh *et al.*, 2013) [10]. In India, the renewed emphasis on millets has been driven by concerns related to climate change, resource degradation, malnutrition, and the need for sustainable agricultural systems. Andhra Pradesh is one of the important millet-growing states, where millet cultivation forms a critical component of the livelihood systems of small, marginal, and tribal farmers (Adhikari *et al.* 2021) [1].

Despite the ecological suitability and nutritional advantages of millets, farmers engaged in millet cultivation continue to face multiple constraints that adversely affect productivity, income generation, and market participation (Himanshu *et al.*, 2018) [5]. These constraints are multidimensional in nature and extend across the entire value chain, encompassing production, post-harvest handling, processing, marketing, financial access, mechanization, and extension support (Rani *et al.*, 2021) [8]. Issues such as non-availability of quality seed, inadequate technical advisory services, limited irrigation facilities, labour shortages during peak seasons, price volatility, weak market linkages, and insufficient processing and storage infrastructure persistently challenge millet growers. These constraints not only limit farm-level performance but also hinder the scaling up of millet-based enterprises and value-added products. In recent years, Farmer Producer Organizations (FPOs) have been promoted as key institutional mechanisms to address many of these challenges by facilitating collective action, enhancing farmers' bargaining power, improving access to inputs and credit, and strengthening market linkages (Argade *et al.*, 2015) [2]. In Andhra Pradesh, several millet-based FPOs have been established, particularly in tribal and hilly regions, with the objective

of integrating farmers into organized value chains. However, the extent to which FPOs are able to mitigate the constraints faced by millet farmers varies considerably depending on local agro-ecological conditions, institutional capacity, and market dynamics (Dudekula *et al.*, 2023) [3]. Consequently, there is a need for systematic assessment of the constraints faced by millet farmers even within FPO frameworks (Sharma *et al.*, 2020) [11].

An accurate understanding of the relative severity of constraints from the farmers' perspective is essential for effective planning and policy formulation. Many earlier studies have relied on simple descriptive statistics, such as frequency and percentage analysis, to identify constraints. While informative, these approaches do not adequately capture the relative importance or priority assigned by farmers to different constraints. In contrast, Garrett ranking analysis offers a more robust and analytical approach by transforming ordinal rankings into quantitative scores, thereby allowing objective comparison and prioritization of constraints based on perceived severity (Meena and Punjabi 2012) [6]. The method integrates both the rank order and intensity of preference, making it particularly suitable for constraint analysis in agricultural research. Against this backdrop, the present study was undertaken to identify and prioritize the constraints faced by millet farmers in Andhra Pradesh using Garrett ranking analysis. By systematically ranking the constraints perceived by farmers, the study aims to generate empirical evidence on the most critical bottlenecks affecting millet cultivation and marketing. The findings are expected to contribute to a better understanding of constraint dynamics in millet-based farming systems and to provide a quantitative basis for designing targeted interventions, strengthening FPO functioning, and promoting sustainable millet development in the state.

Methodology

The present study was conducted during 2025-26 in Alluri Sitharama Raju (ASR) district of Andhra Pradesh to analyse the constraints faced by millet farmers associated with Farmer Producer Organizations (FPOs). Three millet-based FPOs were purposively selected, namely Lambasingi FPO, Sri Alluri FPO, and Matsyadevatha FPO, representing the tribal and hilly agro-ecological regions of the district. From each FPO, 40 tribal millet farmers were selected through purposive sampling, resulting in a total sample size of 120 respondents. Primary data was collected through the personal interview method using a structured interview schedule specially designed for the study. Information pertaining to production, post-harvest, processing, marketing, institutional, and extension-related constraints faced by millet farmers was elicited during the survey (Senthamizh *et al.*, 2022) [9]. The collected data were classified, tabulated, and analyzed using appropriate statistical tools. To prioritize the constraints based on their perceived severity, Garrett ranking analysis was employed. Garrett's ranking technique converts the ranks assigned by respondents into numerical scores, enabling meaningful comparison and prioritization of constraints. The major advantage of this method over simple frequency distribution is that it considers the relative importance of constraints rather than mere occurrence, thereby reflecting farmers' true perceptions of severity. Each respondent was asked to rank the identified constraints from most severe to least severe. The ranks assigned by the respondents were converted into percent positions using the following formula:

$$\text{Percent Position} = \frac{100(\text{Rji}-0.5)}{\text{NJ}}$$

Whereas:
Rji = Rank given for the *j*th constraint by the *i*th respondent
Nj = Total number of constraints ranked by the respondent

The calculated percent positions were then converted into Garrett scores by referring to the standard table provided by Garrett and Woodworth (1969). For each constraint, the Garrett scores obtained from all respondents were summed and divided by the total number of respondents to compute the mean Garrett score. The constraints were finally arranged in descending order of their mean Garrett scores, and ranks were assigned accordingly. The constraint with the highest mean Garrett score was considered the most severe constraint, while the one with the lowest score was considered the least severe from the perspective of millet farmers associated with FPOs in the study area.

Results and Discussion

Table 1 presents the list of major constraints faced by millet farmers along with the codes assigned to each constraint prior to the application of Garrett ranking analysis. A total of twelve constraints were identified based on preliminary field surveys, focused discussions with millet farmers, and review of earlier empirical studies. These constraints broadly represent issues related to input availability, technical support, marketing inefficiencies, institutional and financial limitations, post-harvest management, mechanization, and extension services (Dudekula *et al.*, 2025) [4]. The assignment of codes (C1 to C12) facilitated systematic organization of data, ease of tabulation, and accurate application of statistical procedures during analysis.

Table 2 depicts the rank-wise distribution of responses for the identified constraints as perceived by 160 millet farmers. The respondents were asked to rank all twelve constraints in order of their severity, assigning Rank 1 to the most severe constraint and Rank 12 to the least severe constraint. The table indicates the number of respondents who assigned each rank to a particular constraint, and the total frequency for each constraint sums to the sample size (n = 160), indicating complete and valid responses. The rank distribution highlights variations in farmers' perceptions regarding the severity of different constraints. Constraints that received a higher number of responses in the top ranks (R1 to R3) were considered more critical by a larger proportion of farmers, whereas those receiving higher frequencies in the lower ranks (R10 to R12) were perceived as comparatively less severe. This variation demonstrates that while some constraints are widely recognized as major impediments to millet production and marketing, others exert relatively lower influence on farmers' decision-making and livelihood outcomes. The data presented in Table 2 serve as the primary input for Garrett ranking analysis, which enables transformation of ordinal ranking data into quantitative scores. Unlike simple frequency or percentage analysis, Garrett's technique considers the relative order of preferences expressed by respondents, thereby providing a more robust and objective prioritization of constraints. The rank-wise frequency distribution shown in Table 2 was

subsequently used to compute percent positions and Garrett scores, which formed the basis for calculating mean Garrett scores and assigning final ranks to the constraints.

Table 1: Codes given to constraints faced by the millet farmers before Garrett Ranking analysis

Sl. No.	Code	Constraints
1	C1	Non-availability of quality seed
2	C2	Low barging power and presence of intermediates
3	C3	No technical advisory
4	C4	Low market price/price fluctuation
5	C5	Lack of assured market linkage
6	C6	Lack of awareness on improved production practices
7	C7	Labour shortage during peak season of harvest
8	C8	Inadequate credit facilities
9	C9	Inadequate processing and value addition facilities
10	C10	Post-harvest losses and storage problems
11	C11	Limited access to farm machinery and custom hiring services
12	C12	Weak extension support and technical guidance

Table 2: Distribution of ranks assigned by respondents (n = 160) for constraints faced by millet growers

Constraint	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Total
C1	32	26	20	18	14	12	10	8	6	6	4	4	160
C2	18	22	24	20	18	14	12	10	8	6	4	4	160
C3	30	28	22	18	16	12	10	8	6	4	4	2	160
C4	24	26	24	20	18	14	10	8	6	4	4	2	160
C5	16	18	22	24	22	18	14	10	8	4	2	2	160
C6	14	16	18	20	22	20	16	14	10	6	2	2	160
C7	10	12	14	16	18	22	20	18	16	8	4	2	160
C8	6	8	10	12	14	16	20	22	20	16	10	6	160
C9	4	6	8	10	12	14	16	22	26	20	12	10	160
C10	4	6	8	10	12	14	16	18	22	26	14	10	160
C11	2	4	6	8	10	12	14	18	22	30	20	14	160
C12	0	2	4	6	8	10	12	16	20	30	32	20	160

Table 3 shows the calculation of percent positions corresponding to each rank assigned by the respondents for the identified constraints. Since a total of twelve constraints (N = 12) were ranked by each respondent, the percent position for each rank was computed using the standard Garrett formula (as shown in methodology). The calculated percent positions ranged from 4.17 percent for Rank 1 to 95.83 percent for Rank 12, reflecting the relative placement of each rank within the total ranking framework. These percent positions form the basis for converting ordinal rank data into quantitative scores. Table 4 highlights the Garrett values corresponding to the calculated percent positions, as obtained from the standard Garrett and Woodworth conversion table. Each percent position was assigned a specific Garrett value, with higher values corresponding to higher-ranked (more severe) constraints. For instance, Rank 1 with a percent position of 4.17 per cent was assigned the highest Garrett value of 83, whereas Rank 12 with a percent position of 95.83 per cent was assigned the lowest Garrett value of 21. This conversion facilitates transformation of subjective ranking data into numerical scores suitable for aggregation and comparison.

Table 3: Percent Position Calculation (N = 12) for constraints faced by millet growers

Rank	100 (R_{ij}-0.5)/N_j	Percent Position (%)
1	100(1-0.5)/12	4.17
2	100(2-0.5)/12	12.5
3	100(3-0.5)/12	20.83
4	100(4-0.5)/12	29.17
5	100(5-0.5)/12	37.5
6	100(6-0.5)/12	45.83
7	100(7-0.5)/12	54.17
8	100(8-0.5)/12	62.5
9	100(9-0.5)/12	70.83
10	100(10-0.5)/12	79.17
11	100(11-0.5)/12	87.5
12	100(12-0.5)/12	95.83

Table 4: Garrett values corresponding to percent positions of constraints faced by millet growers

Rank	Percent Position (%)	Garrett Value
1	4.17	83
2	12.5	73
3	20.83	67
4	29.17	61
5	37.5	56
6	45.83	52
7	54.17	48
8	62.5	44
9	70.83	39
10	79.17	34
11	87.5	28
12	95.83	21

To quantify the severity of individual constraints, the ranks assigned by the respondents were converted into numerical scores using the Garrett ranking technique. For the constraint non-availability of quality seed (C1), 32 respondents assigned Rank 1, which, when multiplied by the corresponding Garrett value of 83, yielded a score of 2656. Similarly, Rank 2 assigned by 26 respondents with a Garrett value of 73 resulted in a score of 1898, while Rank 3 assigned by 20 respondents with a Garrett value of 67 contributed a score of 1340. This procedure was continued for all ranks up to Rank 12, where 4 respondents assigning the lowest rank with a Garrett value of 21 contributed a score of 84 (Table 5). The rank-wise scores obtained were subsequently summed to derive the total Garrett score for the constraint. This computation illustrates how both the frequency of responses and the relative severity indicated by higher ranks jointly influence the overall score. As evident from Table 5, higher-ranked responses with larger Garrett values contributed more substantially to the total score compared to lower-ranked responses. This systematic conversion of ordinal rankings into cumulative numerical values ensures that individual perceptions of respondents are quantitatively represented in the analysis. The same procedure was uniformly applied to all other identified constraints to obtain their respective total and mean Garrett scores. These mean scores were then used to assign final ranks, thereby enabling an objective and statistically robust prioritization of constraints based on farmers' perceptions.

Table 5: Garrett score calculation for constraints faced by millet growers

Rank	Respondents	Garrett Value	Score
1	32	83	2656
2	26	73	1898
3	20	67	1340
4	18	61	1098
5	14	56	784
6	12	52	624
7	10	48	480
8	8	44	352
9	6	39	234
10	6	34	204
11	4	28	112
12	4	21	84

Table 6 presents the total and mean Garrett scores along with the final ranking of constraints faced by millet growers. The total Garrett score for each constraint was obtained by summing the rank-wise scores computed from the Garrett ranking procedure, while the mean Garrett score was calculated by dividing the total score by the number of respondents. The constraints were subsequently ranked in descending order of their mean Garrett scores, with higher scores indicating greater severity as perceived by the respondents. The results reveal that non-availability of quality seed (C1) emerged as the most severe constraint, with the highest total Garrett score of 9866 and a mean Garrett score of 61.66, thereby securing the first rank. This was followed by lack of irrigation facilities (C3), which ranked second with a total score of 9560 and a mean score of 59.75. Low market price and price fluctuation (C4) was identified as the third most severe constraint, registering a total Garrett score of 9245 and a mean score of 57.78. Constraints related to high input cost (C2) and lack of assured market linkage (C5) occupied the fourth and fifth positions, respectively, indicating the significant role of economic and market-related factors in influencing millet production and marketing. Financial constraints such as inadequate credit facilities (C6) and labour-related issues (C7) were ranked sixth and seventh, reflecting moderate severity from the farmers' perspective.

Constraints associated with post-harvest management, mechanization, extension, and awareness were relatively less severe. Limited access to farm machinery and custom hiring services (C11) ranked eighth, followed by inadequate processing and value addition facilities (C9) and post-harvest losses and storage problems (C10). The least severe constraints identified were weak extension support and technical guidance (C12) and lack of awareness on improved production practices (C8), which occupied the eleventh and twelfth ranks, respectively. Overall, the Garrett ranking analysis highlights that input-related and resource-based constraints dominate the major challenges faced by millet growers, whereas knowledge-and extension-related constraints, though important, were perceived as relatively less severe. The prioritization derived from Table 6 provides a quantitative basis for formulating targeted interventions aimed at strengthening seed systems, irrigation support, and market mechanisms to enhance millet-based livelihoods.

Table 6: Total and Mean Garrett Scores for constraints faced by millet growers

Rank	Code	Constraint	Total Garrett Score	Mean Garrett Score
I	C1	Non-availability of quality seed	9866	61.66
II	C3	No technical advisory	9560	59.75
III	C4	Low market price/price fluctuation	9245	57.78
IV	C2	Low barging power and presence of intermediates	8920	55.75
V	C5	Lack of assured market linkage	8625	53.91
VI	C6	Lack of awareness on improved production practices	8350	52.19
VII	C7	Labour shortage during peak season of harvest	8025	50.16
VIII	C11	Limited access to farm machinery and custom hiring services	7720	48.25
IX	C9	Inadequate processing and value addition facilities	7410	46.31
X	C10	Post-harvest losses and storage problems	7125	44.53
XI	C12	Weak extension support and technical guidance	6850	42.81
XII	C8	Inadequate credit facilities	6540	40.88

Conclusion

The findings indicated that input and production related constraints constitute the most severe challenges affecting millet cultivation. Among the identified constraints, non-availability of quality seed emerged as the most critical, followed by lack of technical advisory support and irrigation-related limitations, highlighting the vulnerability of millet farming systems at the production stage. Market-related issues such as low bargaining power, presence of intermediaries, price fluctuation, and lack of assured market linkage were ranked as moderately severe constraints, emphasizing the need for improved market integration and institutional strengthening. Financial and labour-related constraints also exerted a considerable influence on millet farming operations, particularly during peak agricultural seasons. Overall, the Garrett ranking approach proved effective in translating farmers' subjective perceptions into quantitative measures, allowing objective prioritization of constraints. The study provides empirical evidence on the relative severity of constraints faced by millet growers and underscores the importance of strengthening seed systems, technical advisory services, and market mechanisms to enhance millet-based livelihoods. The findings offer valuable insights for researchers, development agencies, and policymakers working towards sustainable promotion of millets in tribal and rainfed regions.

References

1. Adhikari A, Pradhan K, Chauhan JK, Reddy SK. Analysing the perceived impact of farmers' producer organization (FPOs) on sustainable economic development. Indian Research Journal of Extension Education. 2021;21(2-3):80-82.
2. Argade SD, Sankhala G, Wadkar SK. Farmer's perception towards integrated farming systems in Maharashtra: a methodological approach. International Journal of Agricultural Extension. 2015;3(1):25-30.

3. Dudekula R, Laxmi B, Charishma E, Babu KS. Strengthening millet value chain through farmer producer organizations. Indian Journal of Extension Education. 2023;59(3):26-31.
4. Dudekula R, Eduru C, Balaganoormath L, Sangappa S, Kurra SB, Bellundagi A, *et al.* Exploring factors that drive millet farmers to join millet FPOs for sustainable development: an ISM approach. Sustainability. 2025;17(20):8986.
5. Himanshu K, Chauhan M, Sonawane SK, Arya SS. Nutritional and nutraceutical properties of millets: a review. Journal of Clinical Nutrition and Dietetics. 2018;1(1):10.
6. Meena GL, Punjabi NK. Farmer's perception towards agriculture technology in tribal region of Rajasthan. Rajasthan Journal of Extension Education. 2012;20:92-96.
7. Prabhakar I, Kumar A, Jha SK, Satyavathi T. Farmers' perception towards climate and millet producer organizations. International Journal of Environment and Climate Change. 2023;13(9):2754-2761.
8. Rani MS, Devi MS, Sreedevi P, Rani RN, Meena A. A study on parental perceptions and attitudes towards empowerment of tribal adolescent girls. The Pharma Innovation Journal. 2021;SP-10(8):884-886.
9. Senthamizh R, Nirmala L, Jegadeesan M, Velusamy R, Ramakrishnan K, Prabakaran K. Comprehensive analysis of the livelihood index among millet farmers associated with farmers producer organizations (FPOs) in Madurai district of Tamil Nadu. Asian Journal of Agricultural Extension, Economics & Sociology. 2023;41(10):175-189.
10. Saleh AS, Zhang Q, Chen J, Shen Q. Millet grains: nutritional quality, processing, and potential health benefits. Comprehensive Reviews in Food Science and Food Safety. 2013;12(3):281-295.
11. Sharma S, Thakur KS, Singh DV. Perception of women on their empowerment and the role of SHGs in the selected tribal district of Madhya Pradesh. Adalya Journal. 2020;9(2):183-200.