



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(6): 347-350
Received: 11-03-2026
Accepted: 15-04-2026

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An empirical analysis of farmers' preferences for selected rice varieties in Godavari districts of Andhra Pradesh

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i6Se.5844>

Abstract

The present study was conducted to analyse farmers' preferences for selected rice on important varietal traits in the East and West Godavari districts of Andhra Pradesh using conjoint analysis. A multistage sampling design was adopted and primary data were collected from 270 rice farmers during Kharif 2024–25 through a pre-tested interview schedule. Six important varietal attributes, namely plant height, crop duration, pest tolerance, disease resistance, non-lodging ability and grain type, each with two levels, were considered for the analysis. An orthogonal design technique was employed to generate varietal profiles and utility estimates along with relative importance values were computed using the additive conjoint model. The validity of the conjoint model was confirmed through significant correlation coefficients, with Pearson's R (0.88) and Kendall's tau (0.61) significant at the 5 per cent level, indicating strong agreement between estimated and actual farmers preferences. The utility estimates, revealed that farmers preferred short plant height, lengthy crop duration, yellow stem borer tolerance, sheath blight resistance, non-lodging nature and slender grain type. Among all the attributes, non-lodging emerged as the most influential trait with a relative importance of 33.10 per cent, followed by crop duration (21.10%), plant height (16.73%), grain type (12.70%), disease resistance (10.90%) and pest tolerance (5.40%). The study concluded that farmers largely preferred rice varieties capable of ensuring yield stability, minimizing production risks and improving market acceptability. The preferred combination of traits included short plant height (dwarf), lengthy crop duration, non-lodging ability, slender grains, tolerance to yellow stem borer and resistance to sheath blight. The findings provide useful implications for rice breeders, researchers and policymakers in developing and promoting farmer-preferred rice varieties for sustainable rice production in Andhra Pradesh.

Keywords: Conjoint analysis, rice varietal traits, utility estimates, Godavari districts and Andhra Pradesh

Introduction

Rice is the world's second most important cereal crop after corn and plays a crucial role in global food security. Global rice production in 2024–25 is projected to reach a record 540.93 million tonnes, over 3 per cent higher than 2023–24. In this global scenario, India occupies a significant position as it has the largest rice cultivation area in the world, covering about 47 million hectares and is the second largest producer after China, with a production of about 134 million tonnes and an average productivity of 35 q ha⁻¹. Rice continues to play a central role in Indian agriculture, with 47.82 million hectares under cultivation and an annual production of 206.72 million metric tonnes, recording an average productivity of 4322.3 kg ha⁻¹ (FAO, 2023). Among the rice-growing regions of the country, the major rice-producing states are West Bengal, Uttar Pradesh, Andhra Pradesh, Punjab, Tamil Nadu, Odisha, Bihar and Chhattisgarh, together accounting for about 75 per cent of the country's rice production and 72 per cent of the rice-growing area. In 2025, West Bengal ranked first in rice production with 15.75 million tonnes from 5.86 million hectares, followed by Uttar Pradesh, while Andhra Pradesh stood fifth with 7.49 million tonnes produced from 2.16 million hectares. In Andhra Pradesh, rice research and varietal development have been significantly strengthened by the Andhra Pradesh Rice Research Institute (APRRI), Maruteru, which is one of India's

premier rice research institutes. The varieties developed by the institute cover nearly 75 per cent of the Kharif area and 90 per cent of the Rabi area in the state. The institute has developed 70 rice varieties, including popular mega varieties such as MTU 7029 (Swarna), MTU 1001 (Vijetha) and MTU 1010 (Cotton Dora Sannalu), each occupying more than 5 lakh hectares in India. Other widely adopted varieties include MTU 1061, MTU 1064, MTU 1121, MTU 1153, MTU 1156, MTU 1224 and MTU 1262, while MTU 1318, MTU 1121, MTU 7029, MTU 1064, MTU 1061, BPT 5204 and RGL 2537 are extensively cultivated in the Godavari zone (Krishnaji *et al.*, 2025) [6].

Among the recently popularized rice varieties, MTU 1318 has emerged as an important Kharif variety with a crop duration of about 150 days. It was developed from a cross between MTU 1064 and MTU 7029 and was released in 2022. The variety gained rapid acceptance among farmers due to its high yield potential, adaptability to diverse soil and climatic conditions, early vigour and tolerance to major diseases. It is also characterized by healthy green foliage, quick growth and suitability for shorter crop rotations.

Similarly, MTU 1121 (Sri Druthi) is a short-duration Rabi rice variety with a crop duration of 125 days, developed from the cross between BPT 5204 and MTU BB 8-24-1 through pedigree breeding at APRRI, Maruteru. Released in 2015, the variety is resistant to blast and brown plant hopper (BPH), possesses low grain shattering and is suitable for direct seeding and machine harvesting. It produces high-quality translucent grains with better head rice recovery and recorded superior yield performance over national and regional checks. Due to its high yield, stress tolerance and grain quality, the variety was rapidly adopted by farmers in coastal Andhra Pradesh.

Materials and Methods

The present study was conducted to examine the preferential traits influencing farmers in the selection of rice varieties in the Godavari districts of Andhra Pradesh during Kharif 2024–25. The study employed a multistage sampling design in which the districts were selected deliberately based on the objectives of the study, whereas the mandals and villages within the selected districts were selected through random sampling technique. From East Godavari district, Nidadavole, Undrajavaram and Peravali mandals were selected, while from West Godavari district, Kalla, Ganapavaram and Undi mandals were chosen based on the larger area under rice cultivation. From each selected mandal, three villages were further selected based on the maximum area under rice cultivation. Thus, a total of 18 villages and 270 respondents, comprising 15 farmers (10 Adopters and 5 Non -adopters) from each village, were selected for the study. The respondents were categorized into adopters and non-adopters based on the cultivation of selected rice varieties. Farmers who cultivated both MTU 1318 and MTU 1121 were considered as adopters, whereas farmers cultivating varieties other than these were categorized as non-adopters. Primary data was collected through a well-structured and pre-tested interview schedule and the collected data were analyzed using the conjoint analysis technique.

Conjoint analysis

It is a multivariate technique used to understand farmers' relative preferences for different traits or attributes of rice varieties based on their perceptions. The technique assumes that respondents derive utility not from the product itself, but from the attributes or characteristics possessed by the product (Dharanipriya *et al.*, 2019) [3]. In the present study, conjoint

analysis was employed to assess the rice varietal traits preferred by farmers in the Godavari districts of Andhra Pradesh.

The strength of conjoint analysis lies in its ability to simulate real-life decision-making, where respondents evaluate and trade off one trait against another while selecting a variety. Among the different approaches of conjoint analysis, the full-concept method was adopted in the present study, as it is more realistic and considers all attributes simultaneously. Under this method, respondents were asked to rank different varietal profiles from most preferred to least preferred.

To identify the important rice varietal traits and their feasible levels, discussions were conducted with rice farmers in the study area and consultations were held with subject matter specialists. Based on this process, six important attributes with two levels each were identified for the analysis. Since the total possible combinations of six attributes resulted in 64 profiles (2⁶), an orthogonal design procedure using R software was employed to reduce the number of profiles to 10 for practical evaluation. Each profile was presented on a separate plan card and respondents were asked to rank the randomly arranged cards according to their preference. Based on these rankings, utility values known as part-worths were estimated for each attribute level. These values helped in determining the relative importance of different rice traits and identifying the most preferred and least preferred varietal characteristics among farmers.

In the present study, the additive conjoint model was used. The model has been formulated as:

$$Y = \sum_{i=1}^n \sum_{j=1}^m V_{ij} X_{ij}$$

Where, Y = Farmers' overall evaluation of the rice.

V_{ij} = Part worth associated with 'j' (1,2,3, ...m) of attributes, 'i' (1,2, ...n)

X_{ij} = Dummy variable representing the preference of the jth level of ith attribute.

Table 1: Rice Attributes and their Levels, Considered for Conjoint Analysis

S. No.	Attribute	Attribute Levels
1	Plant Height	Short
		Tall
2	Crop Duration	Short
		Long
3	Grain Type	Bold
		Slender
4	Non-Lodging	Non-lodging
		Lodging
5	Pest Tolerance	Yellow Stem Borer
		Brown Plant Hopper
6	Disease Resistance	Sheath Blight
		Bacterial Leaf Blight

Results and Discussion

In the present study, conjoint analysis was employed to quantify the importance of different rice varietal traits influencing farmers' preferences in the East and West Godavari districts of Andhra Pradesh. The major attributes considered in the analysis were plant height, crop duration, pest tolerance, disease resistance, non-lodging nature and grain type. The conjoint model was used to estimate the utility values (part-worths) associated with each attribute level, thereby identifying the combinations of traits preferred by farmers.

Correlation analysis was carried out to evaluate the aggregate validity of the conjoint results in predicting respondents' preferences. The correlation values presented in Table 2 indicated that both Pearson's R (0.88) and Kendall's tau (0.61) were statistically significant at the 5 per cent level. This implied a strong association between the estimated preferences and the actual preferences of the respondents, thereby confirming the reliability and predictive accuracy of the conjoint model in explaining farmers' varietal choices.

Table 2: Correlation Values

Correlations	Value	Sig.
Pearson's R	0.88	0.0007
Kendall's tau	0.61	0.034

The individual utility estimates of the selected rice attributes are presented in Table 3. With respect to plant height, farmers showed a clear preference for short plant varieties, which recorded a positive utility estimate (0.08), whereas tall plant types exhibited a negative utility value (-0.08). This preference for short plants may be attributed to their greater resistance to lodging, particularly during the kharif season when heavy rainfall and winds frequently affect rice fields in the study area. From the table it was further revealed that farmers preferred long duration rice varieties, as indicated by the positive utility estimate (0.10), while short-duration varieties showed a negative utility value (-0.10). The preference for long-duration varieties may be associated with farmers' perception that such varieties ensure higher productivity and better crop stability under local conditions. Regarding pest tolerance, farmers exhibited preference for varieties tolerant to yellow stem borer, which recorded a positive utility estimate (0.02), whereas tolerance to brown planthopper showed a negative utility estimate (-0.02). Similarly, under disease resistance, resistance to sheath blight recorded a positive utility value (0.05), while bacterial leaf blight resistance showed a negative utility estimate (-0.05). From the Table 3, among all the attributes non-lodging emerged as one of the most preferred traits. Farmers strongly preferred non-lodging varieties, which recorded a positive utility estimate of 0.16, whereas lodging susceptibility showed a negative utility value (-0.16). Lodging is considered a major constraint in rice cultivation as it leads to considerable grain yield losses during harvesting. Hence, farmers placed high importance on lodging resistance while selecting rice varieties. With regard to grain type, farmers preferred slender grains, which recorded a positive utility estimate (0.06), compared to bold grains that showed a negative utility estimate (-0.06). This preference could be attributed to better consumer demand and higher market price associated with slender grain rice varieties.

Table 3: Utility Estimates of Rice Attribute Levels

S. No.	Attribute	Attributes Level	Utility Estimate
1	Plant Height	Short	0.08
		Tall	-0.08
2	Crop Duration	Short	-0.10
		Long	0.10
3	Pest Tolerance	Yellow Stem Borer	0.02
		Brown Plant Hopper	-0.02
4	Disease Resistance	Sheath Blight	0.05
		Bacterial Leaf Blight	-0.05
5	Non-Lodging	Non-lodging	0.16
		Lodging	-0.16
6	Grain Type	Bold	-0.06
		Slender	0.06

Based on the utility estimates, the most preferred combination of rice varietal traits among farmers included short plant height, long crop duration, non-lodging nature and slender grain type, along with tolerance to yellow stem borer and resistance to sheath blight. These findings indicate that farmers largely preferred varieties capable of ensuring yield stability, minimizing production risks and enhancing market acceptability. The relative importance values of the selected attributes are presented in Table 4 and illustrated in Figure 1. Relative importance values indicate the contribution of each attribute toward the overall preference structure of farmers. Higher percentage values denote greater influence of the attribute on varietal selection decisions.

The analysis revealed that non-lodging was the most influential trait, accounting for 33.10 per cent of the total relative importance. This clearly indicates that farmers considered lodging resistance as the most critical factor while selecting rice varieties. Crop duration emerged as the second most important attribute with a relative importance of 21.10 per cent, followed by plant height (16.73%). Grain type contributed 12.70 per cent, while disease resistance accounted for 10.90 per cent of the total importance. Pest tolerance was found to be the least influential trait, contributing only 5.40 per cent to the overall preference structure.

These findings suggest that structural and agronomic traits such as non-lodging ability, crop duration and plant height exerted greater influence on farmers' varietal preferences than pest and disease resistance traits in the study area. Similar findings were also reported by Chinni *et al.* (2023) [2], Ravindera and Singh (2022) [7], Sharma *et al.* (2017) [8], Hossain (2021) [4] and Asante *et al.* (2013) [1], who emphasized the importance of key varietal attributes in determining farmers' varietal selection behaviour.

Figure 1 further illustrates the relative importance of different rice varietal traits preferred by farmers in the Godavari districts of Andhra Pradesh.

Table 4: Relative Importance Values of Rice Traits

S. No.	Attribute	Relative importance (%)
1	Plant Height	16.73
2	Crop Duration	21.10
3	Pest Tolerance	5.40
4	Disease Resistance	10.90
5	Non-Lodging	33.10
6	Grain Type	12.70
Total		100.00

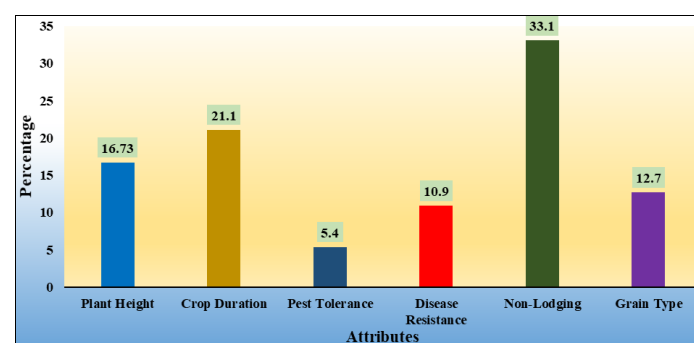


Fig 1: Relative Importance Values of Rice Preference in Godavari Districts

Conclusion

The findings of the conjoint analysis revealed that farmers' preferences for rice varieties in the East and West Godavari districts of Andhra Pradesh were significantly influenced by

several varietal characteristics, namely plant height, crop duration, pest tolerance, disease resistance, non-lodging ability and grain type. The validity of the conjoint model was confirmed through the significant values of Pearson's correlation coefficient (0.88) and Kendall's tau (0.61) at the 5 per cent level, indicating a strong relationship between predicted preferences and the actual choices of farmers. The results further indicated that non-lodging ability emerged as the most influential trait, contributing 33.10 per cent to the overall preference structure. This demonstrates that farmers strongly preferred rice varieties capable of withstanding lodging, thereby reducing yield losses and harvesting difficulties. Crop duration ranked as the second most important attribute with a relative importance of 21.10 per cent, reflecting farmers' preference for long-duration varieties that are perceived to provide better yield stability. Plant height accounted for 16.73 per cent of the total importance, indicating farmers' inclination toward shorter plants due to their better resistance to lodging and ease of crop management. Grain type contributed 12.70 per cent to varietal preference, suggesting that farmers largely preferred slender grains because of their higher market demand and consumer acceptability. Disease resistance accounted for 10.90 per cent of the relative importance, with farmers showing preference for varieties resistant to sheath blight. Pest tolerance was found to be the least influential trait, contributing only 5.40 per cent, although farmers preferred varieties tolerant to yellow stem borer. Overall, the study revealed that the most preferred combination of rice varietal traits among farmers included short plant height, long crop duration, non-lodging nature and slender grain type, along with tolerance to yellow stem borer and resistance to sheath blight. These findings indicate that farmers primarily favour rice varieties capable of ensuring production stability, minimizing cultivation risks and improving market returns. Therefore, the study suggests that plant breeders, agricultural scientists and research institutions should focus on incorporating these farmer-preferred traits while developing improved rice varieties. Greater emphasis on non-lodging ability, suitable crop duration, desirable grain quality and stress resistance, along with high yield potential, would enhance varietal adoption, improve farm profitability and contribute to sustainable rice production in the study region.

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