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Assessment of Information Transfer and Farming Practices Constraints in Gajapati and Rayagada, Odisha

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HIGHLIGHT

- Insufficient knowledge of modern cultivation techniques was the most severe information transfer constraint (RBQ 85.62%).
- Non-availability of credit facilities ranked foremost among farming practices constraints (RBQ 85.26%).
- Limited literacy and high labour cost were perceived as least severe constraints.
- Cognitive and financial along, not educational or infrastructural deficits, principally restrict agricultural advancement.

ARTICLE INFO

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ABSTRACT

Timely transfer of agricultural information and alleviation of farm-level bottlenecks are vital for enhancing productivity in tribal rainfed regions; however, the comparative severity of these constraints remained inadequately quantified. The present study was undertaken in 2026 to assess and prioritise the constraints of information transfer and farming practices as perceived by farmers of Gajapati and Rayagada districts of Odisha. A total of 240 farmers were selected through multi-stage sampling covering eight blocks, and data were collected with a pre-tested structured interview schedule comprising eight statements under each constraint category. The responses were analysed using the Rank-Based Quotient technique. Insufficient knowledge about modern cultivation techniques (85.62%) and lack of conviction in new technology (78.49%) emerged as the most severe information transfer constraints, while non-availability of credit facilities (85.26%) and dependence on monsoon (80.31%) ranked foremost among farming practices constraints; limited literacy (28.28%) and high cost of labour (26.35%) were perceived as least severe. The study established that cognitive and financial bottlenecks principally restricted agricultural advancement and suggested skill-oriented extension approaches together with strengthened institutional credit and irrigation support as priority interventions for tribal farming communities.

INTRODUCTION

Agricultural extension has been identified as a key role player in closing the gap between research institutions and farming communities however, the mechanisms used to transfer knowledge have been found to be face with several constraints (Mishra et al., 2025). In India, where agriculture is the main occupation of more than half the population, the efficient dissemination of agricultural information is of great importance to increase productivity and food security. The tribal farmers, however, have many difficulties in accessing information and are faced with challenges such as limited literacy rate, lack of trained extension officers, poor infrastructure

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and technological gap (Raji et al., 2024; Sharma et al., 2025). To enhance the capabilities of extension support and technology adoption, it is crucial to understand these constraints as perceived by farmers. In rainfed areas, production is inherently challenged by climatic variability, resource limitations as well as socio-economic constraints (Yadav et al., 2026).

This concern is especially acute in tribal-dominated tracts, where geographical remoteness, low literacy and fragmented holdings restrict farmers contact with formal information sources (Saha et al., 2026). Odisha, which ranks second among Indian states in tribal population, illustrates this challenge sharply. Its interior districts of Gajapati and Rayagada are characterised by hilly terrain, rain-fed cultivation and predominantly Scheduled Tribe communities that depend on informal and interpersonal channels rather than institutional extension (Ghosh et al., 2024). Socio-economic status, ownership of communication tools and the reach of extension agencies all influence which information sources farmers actually use (Meena et al., 2022; Chandra et al., 2023; Singh et al., 2023; Niranjan et al., 2023). Recent Odisha-based investigations of occupational diversification and developmental programmes report that infrastructural, economic and socio-psychological barriers dominate, yet their relative intensity varies across settings (Jayasingh et al., 2024; Prajapati et al., 2025). Against this background, the present study assesses the pattern of information transfer and the constraints associated with farming practices among farmers of Gajapati and Rayagada districts of Odisha.

METHODOLOGY

Gajapati and Rayagada districts of southern Odisha were purposively selected in 2026 as predominantly tribal, rainfed tracts with low irrigation coverage. Gajapati lies between 18°50′–19°40′ N and 83°50′–84°30′E and Rayagada between 19°00′–19°58′N and 82°54′–84°02′E (Das et al., 2020; Pattanaik et al., 2006). Four blocks were selected per district (Gajapati: Rayagada, Gumma, Nuagada and Kashinagar; Rayagada: Kolnara, Rayagada, Gunupur and Ramanaguda) for their cropping diversity, tribal farm-household concentration and monsoon accessibility. Two villages per block (eight per district) were identified in consultation with block officials. To establish the sampling frame, total households in the selected blocks were divided by the total number of villages to obtain the average households per village; the eight villages accounted for 725 households in Gajapati and 791 in Rayagada. From each district, 120 households (15 per village) were selected, giving a total sample of 240 (Government of Odisha, Official portal; Ministry of Rural Development, Government of India). Each farmer was surveyed using a pre-tested structured schedule covering constraints in information transfer (8 statements) and farming practices (8 statements). As selection was purposive, the sample is not statistically representative; remote habitations facing the severest constraints may be under-represented, possibly understating constraint severity.

$$\overline{H}_d = \frac{H_d}{v_d} \quad \text{... (1)}$$

$$n = \sum_{d=1}^{D}(v_d \times h) = D \times v \times h \quad \text{... (2)}$$

Where, $\overline{H}d$ = average households per village in district d; Hd = total households in the selected villages; vd = villages per district (= 8); n = total sample size; D = districts (= 2); v = villages per district (= 8) and h = households per village (= 15).

The Rank Based Quotient (RBQ) approach was used by Sabarathnam (1988), which is widely used in agricultural research (Gowdhaman et al., 2024; Das et al., 2025) to analyse the ranked data. RBQ transforms the responses into weighted scores, giving higher-ranked constraints more weight, allowing systematic prioritization with less ranking bias. RBQ was calculated using the following formula:

$$RBQ_i = \frac{\sum_{j=1}^{N} f_{ij}(N - R_j + 1) \times 100}{nN} \quad \text{... (3)}$$

Where, RBQ_i = Rank Based Quotient for constraint i; f_{ij} = respondents assigning rank j to constraint i; N = total constraints (8); R_j = rank position (1–8); n = respondents (240); and Σ = summation over ranks. Data were analysed in Microsoft Excel and Google Colab.

RESULTS

The information transfer constraints, "insufficient knowledge about various aspects of modern techniques in cultivation" emerged as the most severe, securing the first rank with the highest Rank-Based Quotient of 85.62%, followed by "lack of conviction in the new technology" (78.49%) and "non-availability of desired technology" (68.80%). "Limited access to reliable and timely information" (61.09%) and "lack of awareness or knowledge about certain technologies" (50.73%) reflected moderate difficulty, whereas "not aware about an extension person" (40.47%), "lack of proper knowledge" (36.51%), and "limited literacy" (28.28%) were perceived as least serious.

Among the farming practices constraints, "non-availability of credit facilities" ranked first (85.26%), establishing access to finance as the predominant obstacle, followed by "dependence on monsoon"

Table 1. Statement-wise RBQ (%) and Ranking of Constraints

Statement	RBQ (%)	Rank
Information Transfer Constraints		
Insufficient knowledge about various aspects of modern techniques in cultivation	85.62	1
Lack of conviction in the new technology	78.49	2
Non-availability of desired technology	68.8	3
Limited access to reliable and timely information	61.09	4
Lack of awareness or knowledge of about certain technologies	50.73	5
Not aware about an extension person	40.47	6
Lack of proper knowledge	36.51	7
Limited Literacy	28.28	8
Farming Practices Constraints		
Non-availability of credit facilities	85.26	1
Dependence on monsoon	80.31	2
Small land	68.18	3
High cost of inputs	60.78	4
Land soil problem	52.08	5
Heavy pest and disease incidence	43.91	6
Lack of subsidy for inputs	33.12	7
High cost of labour	26.35	8

(80.31%) and "small land" holdings (68.18%), which highlight the vulnerability of rain-fed, fragmented cultivation. "High cost of inputs" (60.78%), "land soil problem" (52.08%), and "heavy pest and disease incidence" (43.91%) occupied intermediate positions, while "lack of subsidy for inputs" (33.12%) and "high cost of labour" (26.35%) were rated least severe. Overall, financial and natural-resource limitations constitute the principal barriers, pointing to the need for improved institutional credit, irrigation facilities, and resource-augmenting interventions.

Figure 1 depicts the rank-frequency distribution of the two constraint categories as paired heatmaps, with information transfer constraints presented in blue and farming practices constraints in green. In each matrix, the rows correspond to the eight constraint statements, arranged from top to bottom in descending order of severity based on their Rank-Based Quotient values, while the columns represent the rank positions from Rank 1 (most severe) to Rank 8 (least severe).

A pronounced diagonal gradient extending from the upper-left to the lower-right of both panels reveals a strong consensus among respondents on the relative severity of the constraints. In the information transfer category, the leading constraint, "insufficient knowledge about various aspects of modern techniques in cultivation," received Rank 1 from 107 respondents, whereas "limited literacy" was ranked at Rank 8 by 102 respondents. A corresponding pattern characterises the farming practices category, where "non-availability of credit facilities" attracted 99 first-rank responses and "high cost of labour" was assigned Rank 8 by 108 respondents. The intermediate constraints displayed comparatively dispersed shading around the middle positions, indicating mixed perceptions of their severity.

Figure 2 shows the Rank-Based Quotient (RBQ) values of the two categories of constraints using paired spider-net (radar) charts: info of info transfer constraints in blue, and farming of farming practices constraints in green. In each chart, the constraint statements of the chart are arranged around the circumference of the chart, the concentric rings indicating the RBQ scale from the centre (0) outwards to the periphery (100), with the greater the extension of a plotted point towards the periphery, the more severe the constraint perceived to be.

The polygon is the widest for the information transfer constraints item "insufficient knowledge about various aspects of modern techniques in cultivation" (RBQ 85.6) and the next widest for "non-availability of desired technology" (68.8) and "lack of conviction in the new technology" (78.5), while it is the most contracted for the two most severe constraints, "limited literacy" (28.3) and "lack of proper knowledge" (36.5). Similar patterns of constraint distribution are found for the farming practices constraints, with the distribution being concentrated at "non-availability of credit facilities" (85.3) and "dependence on monsoon" (80.3) and then shrinking to the "high cost of labour" (26.4) and "lack of subsidy for inputs" (33.1).

DISCUSSION

The constraints identified in this study follow a clear hierarchy rather than a flat distribution, a pattern effectively captured by the Rank-Based Quotient (RBQ) technique, which assigns differential weights to successive rank positions (Sabarathnam, 1988). This graded structure corroborates recent RBQ-based studies in Indian agriculture, where a few dominant constraints sharply contrast with the remainder (Kaleeswaran et al., 2024; Gowdhaman et al., 2024), reinforcing the need to prioritise constraints rather than merely enumerate them.

In the information transfer domain, insufficient knowledge of modern cultivation techniques (RBQ 85.62%) and lack of conviction in new technology (78.49%) emerged as the foremost constraints. The likely reason is that tribal farmers in Gajapati and Rayagada operate in geographically remote, hilly terrain with limited access

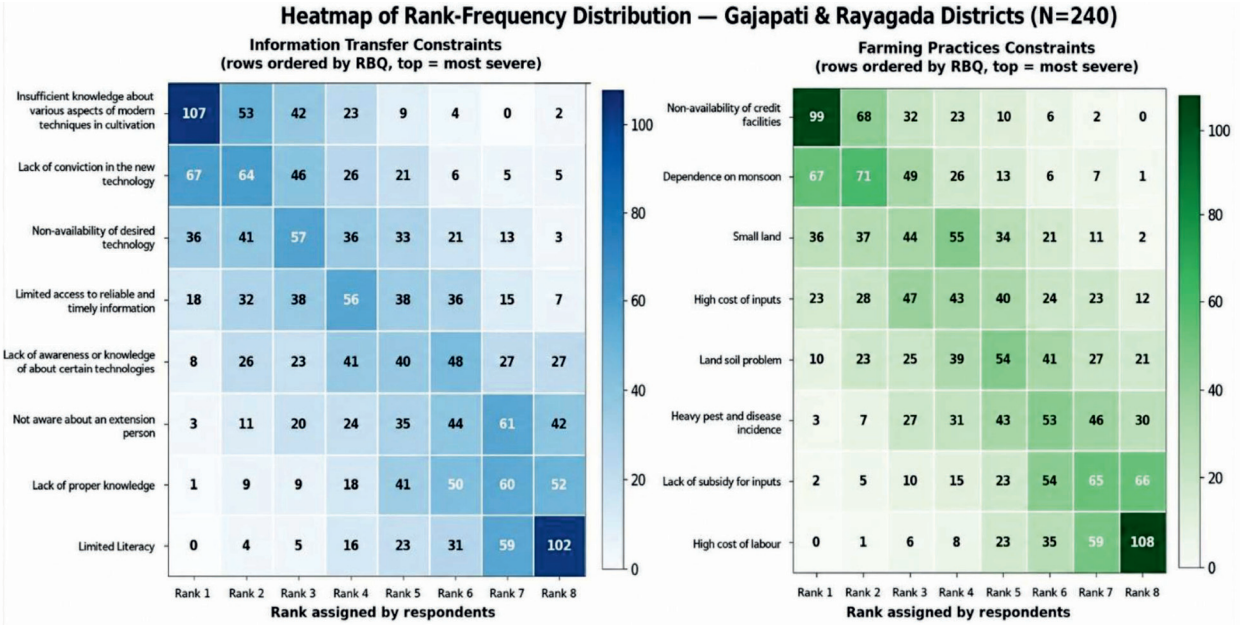

Figure 1. Rank Frequency Distribution Heatmap

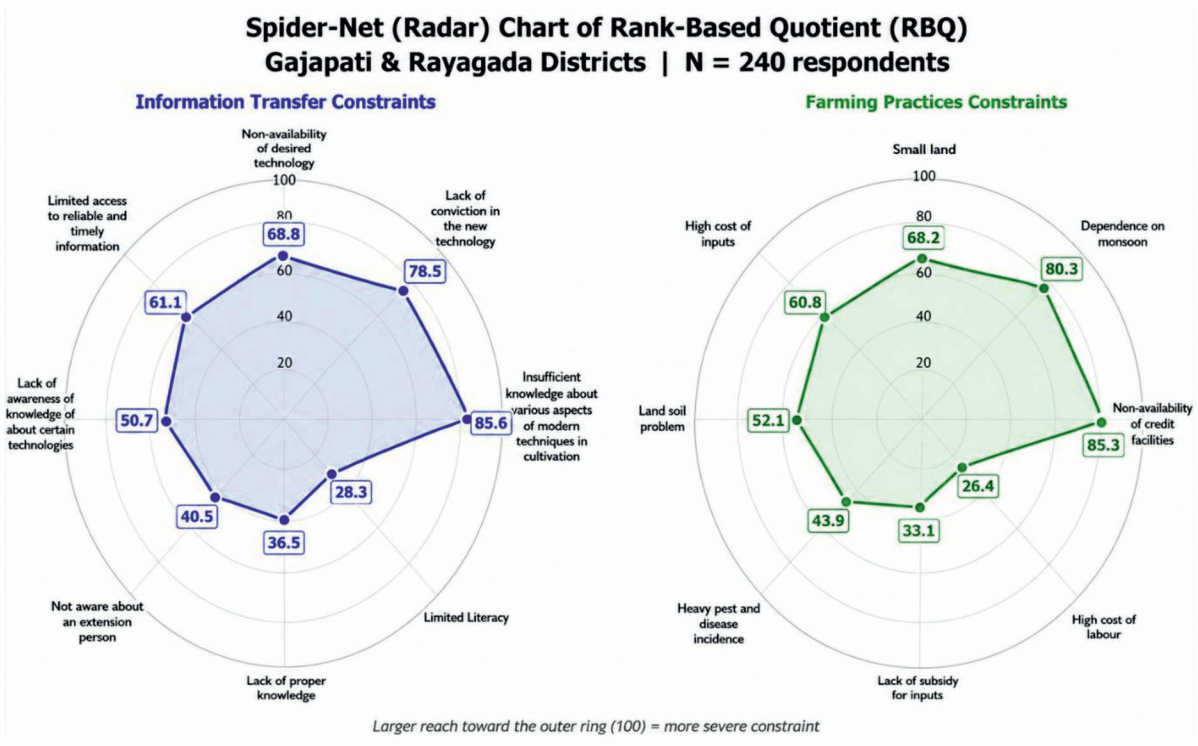

Figure 2. RBQ constraints analysis: Radar chart visualization

to formal extension infrastructure, leaving them exposed to new technologies only through fragmented, informal channels. Without adequate demonstration or repeated contact with extension agents, cognitive gaps persist and trust in unfamiliar practices remains low. For written material the content, format and illustrations were perceived as highly effective on journalistic parameters (Nain et al., 2019). The cognitive-attitudinal origin of constraints is consistent with Mittal and Mehar (2016), who established that information content, communication channel quality and farmers' personal attributes collectively determine what farmers trust and act upon. Notably, limited literacy ranked last among information transfer constraints (RBQ 28.28%), which appears counterintuitive in a tribal setting but is plausibly explained by the community's deep reliance on oral communication, peer learning and demonstration-based knowledge exchange. When information circulates through interpersonal channels rather than written material, literacy ceases to be a binding bottleneck, as Mittal and Mehar (2016) similarly observed.

Among farming practices constraints, non-availability of credit facilities (85.26%) and dependence on monsoon (80.31%) dominated. The predominance of credit constraint is attributable to structural exclusion: insecure podu land titles restrict collateral eligibility, thin banking networks limit outreach, and Business Correspondent presence is insufficient in scattered hill habitations. Without institutional credit, farmers cannot invest in inputs, equipment or risk-mitigation measures, making financial access the foundational bottleneck. This finding aligns with (Raina et al., 2011; Kaleeswaran et al., 2024; Gowdhaman et al., 2024), who similarly identified credit access as the primary constraint among Indian farm beneficiaries, and with (Jayasingh et al., 2024), who reported economic and infrastructural barriers as dominant in the Odisha farming context. Monsoon dependence ranking second (80.31%) reflects the near-total absence of irrigation infrastructure in these rainfed tracts, where undulating terrain precludes canal systems and community-managed water harvesting remains underdeveloped. Small landholdings (68.18%) compound this vulnerability, as fragmented plots reduce the viability of collective investment and mechanisation. The low severity assigned to high labour cost (RBQ 26.35%) is explained by the prevalence of family and community labour arrangements in tribal agriculture, which reduces dependence on hired labour and shifts cost concerns towards credit and inputs rather than wages. Similarly, the low ranking of input subsidy absence (33.12%) likely reflects limited awareness of subsidy schemes rather than their actual adequacy.

CONCLUSION

Constraints in Gajapati and Rayagada are hierarchical rather than uniform: insufficient knowledge of modern cultivation techniques and low conviction in new technology dominate information transfer, while credit non-availability and monsoon dependence dominate farming practices; limited literacy and labour cost are least restrictive. Advancement is thus constrained cognitively and financially, not educationally. A pilot extension package is proposed for two blocks per district: season long Farmer Field Schools on ragi and pulse agronomy, demonstration plots managed by trained lead farmers (one per 50 households) and vernacular audio-visual advisories routed through SHG and PRI networks. This should be paired with Joint Liability Group–based Kisan Credit Card saturation drives and MGNREGA-converged water harvesting. Feasibility is limited by scattered hill habitations

raising delivery costs, thin banking and Business Correspondent networks, insecure podu land titles restricting collateral, and undulating terrain precluding canal irrigation; FPO-mediated credit and community-managed lift irrigation are the realistic entry points.

DECLARATIONS

Ethics approval and informed consent: Ethical norms were strictly followed while conducting this research according to the principles of social science research. Ethical issues were considered and waived by Departmental Research Advisory Committee, Department of Agricultural Extension Education, M. S. Swaminathan School of Agriculture, Centurion University of Technology & Management, Odisha-761211, India. All participants provided their informed consent for collection of response.

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