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Constraints Perceived by South Kerala Rice Farmers in Adoption of KAU-Recommended Technologies

S. Shanila[1]

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ABSTRACT

Background: The primary food crop grown in Kerala is rice, which feeds the state's expanding population. Kerala's rice fields have lost land area steadily since the 1970s and are constantly being converted to other purposes. The rice fields of South Kerala are well known for their distinctive challenges that prevent rice varieties from reaching their maximum yield potential. The current study aimed to identify the constraints experienced and suggestions for refinement as perceived by the farmers.

Methods: This study was carried out in Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Ernakulam and Idukki districts representing the rice growing tracts of South Kerala during the year 2020-2021. About 15 respondents from one panchayat of each of these seven districts were selected totalling 105 farmer respondents and investigates the constraints encountered by rice farmers in this region. In the investigation, ex-post facto research design is being employed. The interview schedule was developed based on the objective of the study and review of literature. The information was collected by personal interview method. Constraints were analysed using Garrett's ranking technique and suggestions were analysed according to their frequency and percentage.

Result: The study focused on crop management and economic constraints and it was observed that high labour charges ranked first among constraints with garret score 402 followed by non availability of timely inputs and labours (357), flooding due to heavy rainfall (351), pest and disease incidence (337) and high loading charges (264). The important suggestions stated by the farmers for improving adoption of recommended rice cultivation practices and to reduce the yield gap includes making provisions for constructing check dams and strengthening bunds (93.33%) followed by making available combines and harvesters at less rent (85.71%), prioritization of agricultural activities in MGNREGA programme by providing labours (83.81%) *etc.*

Key words: Constraints, Food security, Paddy farmers, Rice cultivation.

INTRODUCTION

Rice (*Oryza sativa* L.) is a staple crop belonging to the Poaceae family. It thrives in tropical and subtropical climates, requiring a temperature range of 20°C to 40°C and over 100 cm of annual rainfall or adequate irrigation where rainfall is insufficient (Siddiq, 2000). In India, rice cultivation supports the livelihood of over 25 per cent of the global population and remains integral to food security and rural economies. Despite favourable agro-climatic conditions, India often reports suboptpimal productivity in rice, mainly due to limited adoption of modern technologies, inadequate input use and inefficient farm management practices.

India is the world's leading rice producer and exporter. As per data from the Ministry of Agriculture, India produced an estimated 146.1 million tonnes of rice in 2024-25, with domestic consumption around 120.7 million tonnes (Indiastat, 2025). This surplus has allowed the government to allocate about 5.2 million tonnes of rice for ethanol production as part of its biofuel strategy (Bhardwaj and Jadhav, 2024). The Food Corporation of India reported record rice stocks of 59.5 million tonnes by mid-2025, significantly above the buffer target of 13.5 million tonnes (Jadhav, 2025). This surplus, while economically beneficial, has also driven India to lift export restrictions, pushing rice exports to a projected 22.5 million tonnes in 2025 and causing a global drop in rice prices (Schipani *et al.* 2025).

[1]Department of Agricultural Extension, College of Agriculture, Vellayani, Kerala Agricultural University, Thiruvananthapuram-695 522, Kerala, India.

Corresponding Author: S. Shanila, Department of Agricultural Extension, College of Agriculture, Vellayani, Kerala Agricultural University, Thiruvananthapuram-695 522, Kerala, India.
Email: shanila1544@gmail.com

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Despite this national abundance, yield disparities persist across states. Nayak *et al.* (2024) revealed that actual rice yields in states like Jharkhand (~3.3 t/ha) fall far below potential yields (~6.7 t/ha), while Andhra Pradesh, with higher adoption of improved technologies, achieves yields of up to 5.5 t/ha. These yield gaps highlight missed opportunities for productivity enhancement, primarily driven by limitations in knowledge dissemination, mechanization and resource optimization.

Kerala presents a contrasting narrative within the Indian rice economy. Historically, paddy cultivation was widespread in the state, covering 8.82 lakh hectares in the 1970s. However, over the past four decades, paddy area has drastically declined to just 0.58 lakh hectares by 2020-21,

with production falling from 13.76 lakh tonnes to 1.82 lakh tonnes (GoK, 2021). Contributing factors include high input costs, unavailability of quality seeds, disease incidence, fragmented landholdings and poor marketing infrastructure (Abraham, 2019). These constraints have prompted many farmers to shift toward cash crops such as spices, fruits and vegetables, which are perceived to offer better returns. Although Kerala's rice acreage has diminished, its productivity offers cautious optimism. During 2018-19, Kerala achieved a productivity level of 2,920 kg/ha, which, while lower than that of states like Punjab (5,728 kg/ha) or Tamil Nadu (3,191 kg/ha), surpassed the national average of 2,659 kg/ha during the same period (Research Gate, 2023). In certain pockets like the Kuttanad region, recent interventions and policy support have boosted yields further-from 1,188 kg/ha in earlier years to over 3,100 kg/ha-demonstrating the state's untapped potential when appropriate technologies and strategies are implemented (Thomas, 2020).

Rice competitiveness in India, including in states like Kerala, is shaped by multiple variables. According to a study by Yadav and Chattopadhyay (2025), factors such as yield, input costs, global market access, currency exchange rates and export incentives determine the economic viability of rice production. Thus, addressing the barriers to technology adoption becomes critical for maintaining competitiveness both domestically and globally.

Recognizing these challenges, the Government of India's Annual Agriculture Report (2024-25) emphasized the role of improved varietal adoption, integrated nutrient and pest management, mechanized operations and enhanced irrigation systems to close the yield gap and improve profitability (GOI, 2025). However, translating these recommendations to the farm level remains inconsistent, particularly in states like Kerala where socio-economic and environmental conditions differ substantially from the Indo-Gangetic plains.

The Kerala agricultural university (KAU) has introduced a suite of region-specific technologies and best practices aimed at reviving paddy cultivation in the state. These include high-yielding rice varieties, integrated pest and nutrient management packages, mechanized transplanting and harvesting solutions and advisory services through Krishi Bhavans and digital platforms (Shanila, 2024). Yet, the adoption of these technologies by smallholder rice farmers remains uneven and frequently constrained by financial, institutional and informational barriers.

Therefore, the present study titled "Constraints Perceived by South Kerala Rice Farmers in Adoption of KAU Recommended Technologies" was conceptualized to bridge this knowledge-implementation gap. It aims:

To identify the constraints and suggestions perceived by rice farmers in the adoption of KAU recommended technologies.

By understanding the on-ground realities and farmer suggestions, this study seeks to offer actionable insights for policy reform, extension planning and institutional interventions to reinvigorate Kerala's rice sector and restore its contribution to the state's food security and rural livelihoods.

MATERIALS AND METHODS

Research design

The research utilized an ex-post facto approach to evaluate the challenges perceived by rice farmers in implementing technologies recommended by Kerala Agricultural University (KAU) in the southern districts of Kerala. This design was suitable for exploring existing perceptions and correlations without altering any variables, thus capturing the natural intricacies of farmers' experiences across diverse ecological and socio-economic backgrounds.

Study area

The study took place during the 2020-2021 academic year under the auspices of Kerala Agricultural University (KAU), encompassing seven primary rice-producing districts in South Kerala: Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Ernakulam and Idukki. These districts were intentionally chosen due to their diverse agro-ecological characteristics, varied topographic features and significant presence of rice-based farming systems.

Selection of blocks and panchayats

After consulting with experts from Krishi Vigyan Kendras (KVKs), Regional Agricultural Research Stations (RARS) and Agricultural Officers from the corresponding Krishi Bhavans, one block was purposefully selected from each district based on the highest acreage of paddy cultivation. The blocks chosen included: Veliyanad (Alappuzha), Alangad (Ernakulam), Nedumkandam (Idukki), Sasthamcotta (Kollam), Ettumanoor (Kottayam), Pulikeezhu (Pathanamthitta) and Kilimanoor (Thiruvananthapuram).

From each selected block, one panchayat with the largest number of rice farmers was identified in coordination with the respective Principal Agricultural Offices (PAOs). The final selected panchayats consisted of Ramankary, Karumalloor, Udumbanchola, Sooranad North, Thiruvarppu, Peringara and Nagaroor.

Sampling procedure

A listing of rice farmers from each chosen panchayat was acquired through the respective Agricultural Officers. In each panchayat, 15 farmers were randomly chosen utilizing a simple random sampling technique, resulting in a total sample size of 105 participants. The inclusion criterion stipulated that each farmer must own at least 50 cents of rice land. If a selected panchayat lacked enough qualified farmers, the next panchayat with the highest number of rice farmers was selected as a replacement.

Data collection

Primary data were gathered through face-to-face interviews using a pre-tested structured interview schedule. This

schedule was formulated following an extensive literature review and discussions with agricultural scientists, concentrating on identifying both crop management and economic challenges faced by farmers in utilizing KAU-recommended rice production technologies. Farmers were also invited to propose potential solutions to address these issues. Secondary data were collected from agricultural department reports, published research papers and official documents from KAU to provide context and substantiate the analysis.

Analytical tool

Garrett's Ranking Technique was used to rank the constraints faced by the farmers. Respondents were requested to rank the constraints based on the level of difficulty they encountered. The ranks assigned by each farmer were subsequently converted into scores using Garrett's formula:

$$\text{Per cent position} = 100 \times \frac{Rij - 0.5}{Nj}$$

Where,

Rij = Rank given for the ith factor by j^{th} respondent

Nj = Number of factors ranked by the j^{th} respondent

The percentage positions were then turned into scores using Garrett and Woodworth's (1969) table. These scores were averaged across all participants for each constraint and the constraints were ranked based on the mean score. This approach enabled the identification of the most significant barriers to adoption.

Research period

The research was carried out over a two-year timeframe during the 2020-2021 academic session, which included the phases of planning, instrument development, data collection, analysis and interpretation.

RESULTS AND DISCUSSION

Constraints experienced by the rice farmers

Paddy growers in South Kerala experience a multitude of challenges, both in crop management and economic aspects of rice cultivation. The identified constraints were analyzed using Garrett's ranking technique. The constraint with the highest average score was assigned the top rank. The summarized results are presented in Table 1.

Crop management constraints

Among the crop management challenges, non-availability of timely inputs and labour emerged as the most pressing issue (Rank 1), followed by flooding due to heavy rainfall, which is a common issue in Kerala's low-lying paddy fields. Similar challenges were also observed by Sabu and Roy (2024), who reported that limited mechanization and input delays significantly impacted farmers' operational efficiency. Pest and disease incidence ranked third among crop-related constraints. This aligns with the findings of Seevagasinthamani *et al.* (2025), who noted that unanticipated pest outbreaks severely reduced productivity in rice-growing regions. Farmers also expressed concern over the lack of timely information and guidance from extension staff, a finding that corroborates with the study by Sri Chandana *et al.* (2022), where ineffective information dissemination *via* digital platforms limited adoption of modern technologies. Drought and lack of storage facilities were ranked fifth and sixth, respectively, showing the infrastructural and climatic vulnerabilities that affect paddy cultivation in Kerala. These are consistent with the results of Usha *et al.* (2021), who found that environmental unpredictability and post-harvest handling remain major barriers among rice farmers.

Economic constraints

Among economic factors, high labour charges emerged as the most critical constraint (Rank 1 overall), which is particularly significant in Kerala where wage rates are higher than the national average. Similar economic pressures were observed by Ramya *et al.* (2021) in their study on Integrated Farming Systems in Karnataka where, high labour and transportation costs significantly reduced profitability for small and marginal farmers. High loading charges followed by lack of credit facilities and low profitability were also significant. These findings agree with Karangami *et al.* (2019), Pandey *et al.* (2019) and Singh *et al.* (2022) who observed similar economic barriers among mushroom and rice farmers, particularly the limited access to institutional credit and exploitative pricing mechanisms. Price fluctuations, although ranked last, still represent a significant constraint, especially in the absence of a structured procurement and price support mechanism. This issue has been echoed by Paul and Somanath (2022), who highlighted how market instability and lack of assured returns discouraged cultivation and digital marketing initiatives, particularly among small and marginal farmers. In general, economic constraints were identified as more critical than issues related to crop management, as indicated by the greater emphasis on labour and operational expenses. These findings highlight the immediate necessity for policy measures aimed at labour mechanization, access to credit, price stabilization and enhancing the extension system. The results of this research align with several previous studies, reinforcing the idea that comprehensive interventions-addressing technical, infrastructural and economic dimensions-are essential for increasing the adoption of recommended practices among paddy farmers in Kerala.

Suggestions for refinement as perceived by the farmers

The major ways for refining the available recommendations as perceived by farmers and filtered after discussions with subject matter experts were presented in Table 2.

A significant majority (93.33%) of farmers emphasized the need for provisions to construct check dams and strengthen bunds. This aligns with the findings of Sangeetha *et al.* (2018), who reported that

the non-availability of water storage facilities was a major constraint to climate adaptation. Soil and water conservation measures like bunding and check dams reduce runoff, increase percolation and help manage floods more effectively. Around 85.71% of farmers sought access to combines and harvesters at subsidized or low rent rates. Labour shortages, as noted in the findings of Matto *et al.* (2017), exacerbate harvesting difficulties and mechanization is seen as a cost-effective solution. Farmers (83.81%) advocated for prioritizing agricultural work within the MGNREGA scheme (*Thozhilurappu Padhathi*). Dineshkumar *et al.* (2024) similarly emphasized the need for government intervention in labour allocation, especially during peak agricultural seasons, to offset labour shortages. The introduction of farmer-friendly implements was suggested by 80.95% of farmers to ease labour dependency. This is supported by Maheriya *et al.* (2014) and Agarwal and Kumar (2017), who found labour shortage and drudgery in equipment usage to be key issues that hinder technology adoption. About 78.09% demanded timely and region-specific information regarding inputs, implements and prices.

Studies by Ramu and Karthikeyan (2022) noted that a poor ratio of extension staff to farmers and limited communication infrastructure were major constraints in effective information dissemination. The need for increased subsidies (71.42%) reflects the high cost of inputs and financial constraints reported in various studies. Mishra *et al.* (2024) and Pusparani *et al.* (2025) reported similar economic barriers that hindered the adoption of climate-smart or improved practices. Approximately 68.57% of respondents emphasized the need for regular follow-up and support from extension personnel. The constraint of low extension-farmer interaction was also highlighted by Matto *et al.* (2017) and Ramu and Karthikeyan (2022) as a key deterrent to technology adoption. A majority (56.19%) suggested the adoption of group farming to reduce input costs and enhance operational efficiency. Collective action helps improve bargaining power, manage shared resources better and facilitate technology diffusion. More than half (52.38%) recommended the development of pest- and disease-resistant rice varieties, a view echoed by Patel *et al.* (2019), who highlighted that approximately 70% of paddy farmers in Chhattisgarh perceived insect-pests and diseases as major production constraints, thereby underscoring the urgent need for resistant varieties to mitigate these challenges and improve productivity. Lastly, 40.95% of farmers stressed the importance of training on rice processing and value addition, like suggestions by Maheriya

Table 1: Constraints experienced by the rice farmers.

Constraints	Score	Rank over class	Rank over total
Crop management constraints			
Non availability of timely inputs and labours	357	1	2
Flooding due to heavy rainfall	351	2	3
Pest and disease incidence	337	3	4
Lack of timely information and proper guidance from extension staff	193	4	6
Drought	188	5	7
Lack of storage facilities	110	6	11
Economic constraints			
High labour charges	402	1	1
High loading charges	264	2	5
Lack of credit facilities	185	3	8
Less profit	164	4	9
Price fluctuations	151	5	10

Table 2: Suggestions for refinement.

Suggestions	No.	%
Making provisions for constructing check dams and strengthening bunds	98	93.33
Making available of combines and harvesters at less rent	90	85.71
Prioritization of agricultural activities in MGNREGA programme (*Thozhilurappu Padhathi*) by providing labours	88	83.81
Introducing farmer friendly implements to reduce the labour problem	85	80.95
Making available timely and adequate information about availability of inputs, implements and prices	82	78.09
Increasing subsidies for rice farming	75	71.42
Ensuring extension agents' follow-up and support in the adoption of recommended practices	72	68.57
Adopting group farming approach in rice farming	59	56.19
Developing pest and disease resistant varieties	55	52.38
Conducting farmer training programmes regarding processing and value-addition	43	40.95

et al. (2014) and Pusparani *et al.* (2025) to enhance income diversification and post-harvest value creation.

CONCLUSION

The study titled "Constraints Perceived by South Kerala Rice Farmers in Adoption of KAU-Recommended Technologies" highlights a complex array of challenges that hinder effective adoption of modern rice production technologies. Chief among these is the non-availability of timely inputs and labour, which critically disrupts the farming calendar and adversely affects productivity. Additional constraints-such as pest and disease outbreaks, inadequate access to information, drought, poor storage infrastructure, high labour and loading charges, lack of credit support, fluctuating prices and low profitability-further compound the difficulties faced by rice growers.

These findings call for strategic, multi-dimensional interventions tailored to the regional realities of South Kerala. Priority should be given to improving irrigation and water conservation through the construction of check dams and bunds, enhancing mechanization support by making harvesters and combines more accessible and integrating agricultural activities into labour schemes like MGNREGA. Equally important are measures to increase technical support through strengthened extension services, promote group farming models, develop resistant varieties and offer structured training in value addition and processing. Future research should focus on evaluating the impact of these suggested interventions, particularly in terms of their influence on the rate and quality of technology adoption. Additionally, a deeper exploration into the roles played by local market dynamics, weather variability and institutional support systems could provide more nuanced insights, enabling the formulation of holistic and context-specific strategies to support Kerala's rice farmers in transitioning to more sustainable and productive agricultural practices.

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Conflict of interest

All authors declared that there is no conflict of interest.

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