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Socio-personal determinants of KAU rice technology adoption among smallholder farmers of South Kerala

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Abstract

The present study was undertaken during 2021-2022 across seven rice-growing districts of South Kerala, namely Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Ernakulam, and Idukki, to examine the socio-personal profile of rice farmers and to determine the relationship between their socio-personal characteristics and the extent of adoption of Kerala Agricultural University (KAU)-recommended rice cultivation practices. An ex-post facto research design was followed, and a sample of 105 rice farmers was selected through simple random sampling from seven purposively chosen panchayats, with 15 farmers drawn from each panchayat. Eleven independent variables were measured using standardized scales, and the extent of adoption of 15 KAU-recommended practices was assessed using the Adoption Quotient (AQ) formula. The majority of the farmers (53.33%) belonged to the middle age group (48-65 years), possessed medium farming experience (54.29%), and cultivated rice in the medium land holding category (53.33%). The mean adoption quotient was 61.77 per cent, with 50.48 per cent of farmers falling in the medium adoption category. Simple correlation analysis revealed that extension participation ($r = 0.409$) and achievement motivation ($r = 0.218$) were significantly and positively correlated with the extent of adoption at the 1% level, while innovativeness ($r = 0.269$) was significant at the 5% level. The remaining variables, including age, farming experience, annual income, and knowledge level, showed no significant relationship with adoption. These findings underscore the overriding role of behavioural and institutional factors over demographic and economic characteristics in driving technology adoption among rice farmers of South Kerala, and call for targeted extension interventions emphasizing participatory approaches, motivational reinforcement, and innovation facilitation.

Keywords: Technology adoption, rice farmers, socio-personal profile, extension participation, achievement motivation, South Kerala, KAU varieties

1. Introduction

Rice (*Oryza sativa* L.) is the most important staple food crop for over 70 per cent of the world's population and constituted a central pillar of food security and rural livelihoods across South and Southeast Asia (IRRI, 2013). In India, rice farming supported the livelihoods of over 25 per cent of the rural workforce, and the country ranked first in the world in area under rice cultivation, with production rising from 64.6 million tonnes in 1971 to 178 million tonnes in 2020 (WDA, 2021). Despite these achievements, persistent yield gaps between research station yields and actual farm yields remained a major challenge, primarily attributed to suboptimal adoption of improved technologies by smallholder farmers (Lobell *et al.*, 2009) ^[14].

Kerala presented a compelling case study in this context. The state, which historically covered 8.82 lakh hectares under paddy, recorded a drastic decline to 0.58 lakh hectares by 2021-22, with production falling from 13.76 lakh MT to 1.82 lakh MT (GoK, 2021). Despite the sustained efforts of Kerala Agricultural University (KAU) in developing location-specific rice varieties and comprehensive packages of practices, adoption of these technologies by smallholder farmers remained uneven and below potential (Shanila, 2024) ^[20]. The research-extension gap was particularly pronounced in the southern districts, where diverse agro-ecological and socio-economic conditions complicated the dissemination of improved practices.

Agricultural extension literature consistently demonstrated that socio-personal characteristics, including extension participation, achievement motivation, innovativeness, mass media exposure, and economic variables, significantly influenced technology adoption behaviour

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among farmers (Shalini, 2017; Veena, 2017; Kumar, 2015) ^[19, 27, 12]. However, empirical studies that specifically examined the socio-personal profile of rice farmers in South Kerala and its relationship with the adoption of KAU-recommended practices were limited. The present study was therefore undertaken with the following objectives: (i) to study the socio-personal profile of rice farmers in South Kerala; and (ii) to determine the relationship between socio-personal characteristics and the extent of adoption of KAU-recommended rice cultivation practices.

2. Materials and Methods

2.1 Locale and Study Period

The study was conducted during 2020-2021 in seven rice-growing districts of South Kerala: Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Ernakulam, and Idukki. From each district, one block was purposively selected based on the highest area under paddy cultivation, with technical support from scientists at Krishi Vigyan Kendras (KVKs), Regional Agricultural Research Stations (RARS), and officers from the respective Krishi Bhavans. Subsequently, one panchayat from each selected block was identified based on the maximum number of rice farmers, in consultation with the Principal Agricultural Office (PAO).

2.2 Research Design and Sampling

An ex-post facto research design was adopted for the study, as the independent variables were inherently non-manipulable (Kerlinger, 1983) ^[11]. From each of the seven selected panchayats – Ramankary, Karumalloor, Udumbanchola, Sooranad North, Thiruvappu, Peringara, and Nagaroor - fifteen rice farmers were selected through simple random sampling, yielding a total sample of 105 respondents. Each selected farmer was required to own a minimum of 50 cents of rice land as the inclusion criterion.

2.3 Measurement of Variables

Eleven independent variables were operationalised and measured using standardized scales: age (Census 2011 classification), farming experience (years in paddy farming), area under rice cultivation (acres), annual income (Rs. per year), mass media exposure (self-developed schedule), extension participation (Dhaliwal, 1963) ^[6], achievement motivation (Gopala, 2010) ^[8], risk orientation (Supe, 1969) ^[25], credit orientation (Beal and Sibley, 1967, as adapted by Esakkimuthu, 2012) ^[2, 7], innovativeness (Syam Kumar, 1999, with modifications) ^[26], and knowledge level (teacher-made test). The dependent variable, the extent of adoption of 15 KAU-recommended rice cultivation practices - was measured using the Adoption Quotient (AQ) formula (Chattopadhyay, 1963; modified by Singh and Singh, 1967) ^[4, 21]. Respondents were

categorized into low, medium, and high adoption groups using quartile deviation. Simple correlation analysis was employed to determine the significance of the relationship between independent variables and the extent of adoption at both 1% and 5% significance levels.

3. Results and Discussion

3.1 Socio-Personal Profile of Rice Farmers

The distribution of respondents based on their socio-personal characteristics is presented in Table 1. The majority of the farmers (53.33%) belonged to the middle age group (48-65 years), followed by the young age group (27.61%) and the old age group (19.05%). The preponderance of middle-aged farmers was consistent with the findings of Sunil (2007) ^[24], Lairenlakpam (2012) ^[13], and Kumar (2015) ^[12], who also reported a dominant presence of middle-aged farmers in paddy cultivation. This distribution reflected the balanced combination of physical capability and accumulated farming knowledge characteristic of this age cohort.

With respect to farming experience, the majority (54.29%) had between 20 and 40 years of paddy farming experience, while 32.38 per cent had less than 20 years and only 13.33 per cent had more than 40 years. Area under rice cultivation was medium (1-5 acres) for 53.33 per cent of respondents, while 25.71 per cent cultivated less than one acre and 20.95 per cent cultivated more than five acres. In terms of annual income, 41.90 per cent of respondents belonged to the medium income category (Rs. 75,000 to 2,25,000 per year), while 33.33 per cent and 24.76 per cent fell in the low- and high-income categories, respectively. The limited income profile of paddy farmers corroborated the financial vulnerabilities documented in the context of Kerala's paddy sector (Abraham, 2019) ^[1].

The majority of respondents (60.95%) had medium mass media exposure, while only 2.86 per cent reported high exposure, indicating restricted access to agricultural media content. Extension participation was predominantly low (57.14%), followed by medium (24.76%) and high (18.09%), reflecting a critical gap in the reach and effectiveness of formal extension services across these districts. Achievement motivation was at a medium level for 49.52 per cent and low for 36.19 per cent of respondents, suggesting a predominantly risk-neutral farming community with limited proactive drive towards technological improvement. Risk orientation was predominantly medium (46.67%) and low (45.71%), credit orientation was largely low (46.67%) indicating limited formal credit utilisation, and both innovativeness and knowledge level were medium for 60.95 per cent and 60.00 per cent of respondents, respectively. Only 6.67 per cent of farmers had a high level of knowledge about KAU rice technologies, indicating substantial scope for knowledge enhancement through targeted extension programmes.

Table 1: Distribution of Respondents Based on Socio-Personal Characteristics (N = 105)

Variable	Category	Frequency (n)	Percentage (%)
Age	Young (< 48 yrs)	29	27.61
	Middle aged (48-65 yrs)	56	53.33
	Old aged (> 65 yrs)	20	19.05
Farming Experience	Low (< 20 yrs)	34	32.38
	Medium (20–40 yrs)	57	54.29
	High (> 40 yrs)	14	13.33
Area Under Rice cultivation	Small (< 1 acre)	27	25.71
	Medium (1–5 acres)	56	53.33
	Large (> 5 acres)	22	20.95
	Low (< Rs. 75,000)	35	33.33

Annual Income	Medium (Rs. 75,000–2,25,000)	44	41.90
	High (> Rs. 2,25,000)	26	24.76
Mass Media Exposure	Low	38	36.19
	Medium	64	60.95
	High	3	2.86
Extension Participation	Low	60	57.14
	Medium	26	24.76
	High	19	18.09
Achievement Motivation	Low	38	36.19
	Medium	52	49.52
	High	15	14.28
Risk Orientation	Low	48	45.71
	Medium	49	46.67
	High	8	7.62
Credit Orientation	Low	49	46.67
	Medium	45	42.85
	High	11	10.48
Innovativeness	Low	30	28.57
	Medium	64	60.95
	High	11	10.48
Knowledge Level	Low	35	33.33
	Medium	63	60.00
	High	7	6.67

3.2 Extent of Adoption of KAU-Recommended Practices

The distribution of respondents based on the extent of adoption of KAU-recommended rice cultivation practices revealed that the majority (50.48%) fell in the medium adoption category, corresponding to an adoption quotient range of 54.66–69.33 per cent, followed by the low category (25.71%) and the high category (23.81%). The mean adoption quotient was 61.77 per cent, with values ranging from a minimum of 28 per cent to a maximum of 93.77 per cent. No respondent completely adopted all 15 KAU-recommended practices, underscoring a persistent research-extension gap consistent with the observations of Raghuwanshi (2005) ^[16], Singh and Jay (2010) ^[22], and Sasane *et al.* (2012) ^[18].

Practice-wise analysis indicated that the most widely adopted practice was following suitable months for sowing across all three crop seasons (Virippu, Mundakan, and Puncha), adopted by 94.28 per cent of respondents, followed by adoption of recommended KAU varieties including Uma, Jyothi, Kanchana, and Manurathna (90.47%). The least adopted practices were the recommended spacing (21.90%), management of aged or over-raised seedlings (20.00%), and seed rate (25.71%), primarily because several districts such as Alappuzha, Kottayam, and Pathanamthitta practiced direct-seeded rice (DSR), rendering transplanting-specific recommendations less applicable. According to Rogers' (1982) ^[17] adopter categorization, late majority farmers (42.86%) constituted the largest share, followed by early majority (28.57%), indicating that the majority of farmers were still in a transitional phase of technology adoption.

3.3 Relationship between Socio-Personal Characteristics and Extent of Adoption

The results of simple correlation analysis between the 11 independent variables and the extent of adoption of KAU-recommended practices are presented in Table 2. Out of the 11 variables examined, three showed statistically significant positive relationships with the extent of adoption. Extension participation recorded the highest positive significant correlation

($r = 0.409$) at the 1 per cent level of significance. This finding underscored the critical role of extension contact in enabling farmers' access to agricultural information, facilitating experiential learning through demonstrations and training programmes, and reinforcing knowledge about improved technologies. Farmers who actively engaged with extension services were better positioned to evaluate new technologies and make informed adoption decisions, corroborating the findings of Deepa (1999) ^[5], Pottappa (2008) ^[15], and Channamallikarjuna (2013) ^[3].

Achievement motivation was also significantly and positively correlated with extent of adoption ($r = 0.218$) at the 1 per cent level. Farmers with higher achievement motivation demonstrated a stronger internal drive to improve their farming outcomes and strive for excellence, which naturally predisposed them towards greater uptake of improved technologies. Innovativeness exhibited a significant positive correlation ($r = 0.269$) at the 5 per cent level, consistent with the notion that innovative farmers tend to be early information seekers and technology experimenters, thereby facilitating faster and broader adoption. These findings were in agreement with Sudhakar (2002) ^[23], Channamallikarjuna (2013) ^[3], and Shalini (2017) ^[19].

In contrast, the remaining seven variables – age, farming experience, area under rice cultivation, annual income, mass media exposure, risk orientation, and knowledge level – did not exhibit statistically significant relationships with the extent of adoption. These results suggested that demographic and economic characteristics alone were insufficient determinants of adoption behaviour among rice farmers in South Kerala. The non-significant relationship of knowledge level with adoption, despite its theoretical role as a precondition for practice, pointed to a potential disconnect between knowledge possession and actual implementation, highlighting the need for more demonstration-based and experiential learning approaches in extension programming. These findings collectively implied that behavioural and institutional factors constituted the primary drivers of rice technology adoption in this context.

Table 2: Correlation between Socio-Personal Characteristics and Extent of Adoption (N = 105)

Variable	Independent Variable	Correlation Coefficient (r)	Significance
X1	Age	0.129	NS
X2	Farming Experience	0.126	NS
X3	Area under Rice Cultivation	0.170	NS
X4	Annual Income	0.129	NS
X5	Mass Media Exposure	0.179	NS
X6	Extension Participation	0.409	**
X7	Achievement Motivation	0.218	**
X8	Risk Orientation	0.076	NS
X9	Credit Orientation	0.145	NS
X10	Innovativeness	0.269	*
X11	Knowledge Level	0.173	NS

** Significant at 1% level; * Significant at 5% level; NS = non-significant

4. Conclusion

The study revealed that rice farmers in South Kerala were predominantly middle-aged, possessed medium farming experience and land holdings, and operated under constrained income levels. The overall extent of technology adoption was at a medium level (mean AQ = 61.77%), with a substantial proportion of farmers in the late majority adopter category, signaling the need for intensified extension effort. Among the 11 socio-personal variables examined, extension participation and achievement motivation (at 1% significance) and innovativeness (at 5% significance) emerged as the key determinants of adoption behaviour, while demographic and economic variables showed no significant relationship. These findings call for a paradigm shift in extension strategy towards participatory approaches, farmer field schools, and motivational reinforcement programmes. Future research should explore the role of digital extension platforms and group farming approaches in enhancing adoption rates and bridging the research-extension gap in South Kerala's rice sector.

5. Future Scope of Research

Future research could extend this study by employing multivariate models or structural equation modelling to disentangle the direct and indirect effects of socio-personal, institutional and contextual factors on rice technology adoption among smallholder farmers of South Kerala. Longitudinal studies that track changes in farmers' extension participation, motivational levels and adoption behaviour across multiple seasons would provide deeper insight into pathways of sustained technology use. Further work may also examine the role of digital extension platforms, group farming initiatives and farmer producer organizations in strengthening farmers' participation and innovation orientation. Comparative studies across different agro-ecological zones or states would help validate the present findings and generate location-specific extension strategies that enhance adoption of KAU-recommended rice technologies.

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