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Psychological determinants influencing technology adoption among marginal farmers in Sagar district, Madhya Pradesh

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Abstract

This study aimed to understand the psychological factors that affect how smallholder farmers in Sagar district, Madhya Pradesh, adopt modern agricultural practices. We surveyed 120 marginal farmers from the Bina and Khurai blocks through direct, face-to-face interviews. Our findings show that most farmers (58.33%) had a moderate level of technology adoption. When we looked at their psychological traits, we found that the majority fell into the 'medium' category for innovativeness (55.83%), risk-taking (55.00%), economic motivation (53.33%), and scientific orientation (54.17%). Using the Chi-square test, we analyzed the link between these traits and how much technology farmers actually use. Interestingly, the results showed no significant relationship between these psychological factors and the adoption level. The biggest challenges farmers face are the high cost of inputs (85.00%) and a lack of proper irrigation (81.67%). This tells us that even though these farmers are mentally open to trying new things, it is the lack of money and infrastructure that keeps them from fully using modern farming methods.

Keywords: Technology adoption, marginal farmers, psychological attributes, Sagar, Madhya Pradesh

Introduction

Agriculture continues to play a vital role in the Indian economy by providing livelihood and food security to a large section of the population. Marginal farmers, who operate less than one hectare of land, constitute about 68% of the total operational holdings in India. These farmers mostly depend on agriculture for their daily survival. In recent decades, agricultural scientists have developed many improved technologies, such as high-yielding seed varieties, integrated pest management, farm mechanization, and precision farming. However, the actual use of these technologies by marginal farmers is still very low and uneven.

Researchers have found that technology adoption is not determined solely by economic or infrastructural factors. It is also strongly influenced by the psychological characteristics of the farmers. Attributes such as risk orientation, achievement motivation, scientific orientation, and innovativeness play a crucial role in shaping a farmer's decision-making behavior.

Sagar district is situated in the Bundelkhand region of Madhya Pradesh, where agriculture is mostly rainfed and marginal farmers face many ground-level challenges. Despite the presence of agricultural extension services like KVKs and ATMA, farmers in this district continue to face difficulties in

modernizing their farms. Therefore, this study was planned with the specific objective of assessing the psychological attributes of marginal farmers in Sagar district, measuring their extent of technology adoption, and identifying the constraints that restrict them from adopting new agricultural practices.

Research Methodology

The present study was conducted in the Sagar district of Madhya Pradesh. Out of the 8 development blocks in the district, two blocks, namely Bina and Khurai, were purposively selected. These blocks were chosen because they have a high population of marginal farmers and active agricultural extension activities.

From each of the selected blocks, two villages were randomly selected: Girol and Lahrabda from Bina block, and Gwari and Satnai from Khurai block. From each village, 30 marginal farmers were selected using a simple random sampling technique, making a total sample size of 120 respondents.

The primary data was collected through personal face-to-face interviews using a pre-tested structured interview schedule. The dependent variable of the study was the adoption of improved agricultural technologies, while various socio-economic and psychological characteristics were taken as

independent variables. The collected data were tabulated and analyzed using statistical methods such as frequency, percentage, and the Pearson Chi-square test to draw meaningful conclusions.

Results and Discussion

Socio-Economic and Communication Profile of Marginal Farmers

To understand the background of the respondents, their socio-

economic and communication characteristics were analyzed. The data shows that the majority of the farmers (51.67%) belonged to the middle-age group of 36 to 55 years. This indicates that middle-aged farmers are actively involved in agricultural decision-making. Regarding education, 26.67% had attained middle school education, followed by 23.33% with a high school education, while 15.00% were illiterate. The majority of the respondent.

Table 1: Distribution of Respondents According to Selected Independent and Dependent Variables (N = 120)

S. No.	Variable Name	Variable Type	Categories	Frequency (f)	Percentage (%)
1	Age	Independent	Young age (Up to 35 years)	28	23.33
			Middle age (36 to 55 years)	62	51.67
			Old age (Above 55 years)	30	25.00
2	Education	Independent	Illiterate	18	15.00
			Primary	26	21.67
			Middle	32	26.67
			High school	28	23.33
			Graduate / Post graduate	16	13.33
3	Caste	Independent	Scheduled Caste (SC)	24	20.00
			Scheduled Tribe (ST)	12	10.00
			Other Backward Classes (OBC)	68	56.67
			General (Unreserved)	16	13.33
4	Family Size	Independent	Small	26	21.67
			Medium	68	56.67
			Large	26	21.66
5	Land Holding	Independent	Marginal land holding	58	48.33
			Small land holding	34	28.33
			Semi medium land holding	18	15.00
			Medium land holding	8	6.67
			Large land holding	2	1.67
6	Level of Livestock Holding	Independent	Low	64	53.33
			Medium	38	31.67
			High	18	15.00
7	Social Participation	Independent	No membership	34	28.33
			Member in one organization	46	38.33
			Member in more than one organization	22	18.33
			Office bearer in one organization	12	10.00
			Office bearer in more than one organization	6	5.00
8	Farming Experience	Independent	Low (Up to 5 years)	18	15.00
			Medium (5 to 10 years)	42	35.00
			High (11 years and above)	60	50.00
9	Occupation	Independent	Agriculture	52	43.33
			Allied activities	18	15.00
			Agricultural labour	26	21.67
			Non-agricultural	8	6.67
			Mixed	16	13.33
10	Annual Income	Independent	Low (Up to Rs.100000)	66	55.00
			Medium (Rs.100000 to 250000)	40	33.33
			High (Above Rs. 250000)	14	11.67
11	Mass Media Exposure	Independent	Radio	14	11.67
			Television	38	31.67
			Newspapers	16	13.33
			Magazines	10	8.33
			Internet and mobile-based platforms	42	35.00
12	Extension Contact	Independent	Low	27	22.50
			Medium	67	55.83
			High	26	21.67
13	Information Seeking Behaviour	Independent	Low	24	20.00
			Medium	68	56.67
			High	28	23.33
14	Innovativeness	Independent	Low	18	15.00
			Medium	67	55.83
			High	35	29.17

15	Risk Orientation	Independent	Low	18	15.00
			Medium	66	55.00
			High	36	30.00
16	Economic Motivation	Independent	Low	15	12.50
			Medium	64	53.33
			High	41	34.17
17	Scientific Orientation	Independent	Low	14	11.67
			Medium	65	54.17
			High	41	34.16
18	Overall Psychological Attributes	Independent	Low	18	15.00
			Medium	72	60.00
			High	30	25.00
19	Extent of Adoption Level	Dependent	Low adoption level	22	18.33
			Medium adoption level	70	58.33
			High adoption level	28	23.34

Economically, the farmers were resource-poor. Most of the respondents (48.33%) possessed marginal land holdings (up to 1 ha), and a significant majority (55.00%) reported a low annual income of up to Rs. 1,00,000. Agriculture remained their primary occupation (43.33%), followed by agricultural labor (21.67%).

In terms of communication and mass media exposure, digital platforms are rising in villages. A majority of respondents (35.00%) used internet and mobile-based platforms as their main source of information, followed closely by television (31.67%). When it comes to personal extension contact, input dealers and private extension agencies were the most frequently contacted sources (51.67%), followed by field extension workers (37.50%). Institutional sources like KVK scientists were contacted less frequently.

Assessment of Psychological Attributes

Technology adoption is a mental process before it becomes a physical action. The study assessed four major psychological determinants:

- **Innovativeness:** The data reveals that 55.83% of the marginal farmers possessed a medium level of innovativeness, while 29.17% showed a high level. Most farmers preferred improved practices over traditional methods, but they hesitated to be the "first" to try them due to financial risks.
- **Risk Orientation:** About 55.00% of the respondents had a medium level of risk orientation. They were willing to take calculated risks for higher returns, but economic limitations prevented them from making blind investments in uncertain conditions.
- **Economic Motivation:** A large section of farmers (53.33%) fell into the medium economic motivation category. Their primary goal was to increase farm income and reduce production costs.
- **Scientific Orientation:** The majority of respondents (54.17%) exhibited a medium level of scientific orientation, meaning they believed that scientific methods increase crop productivity and preferred following expert recommendations.

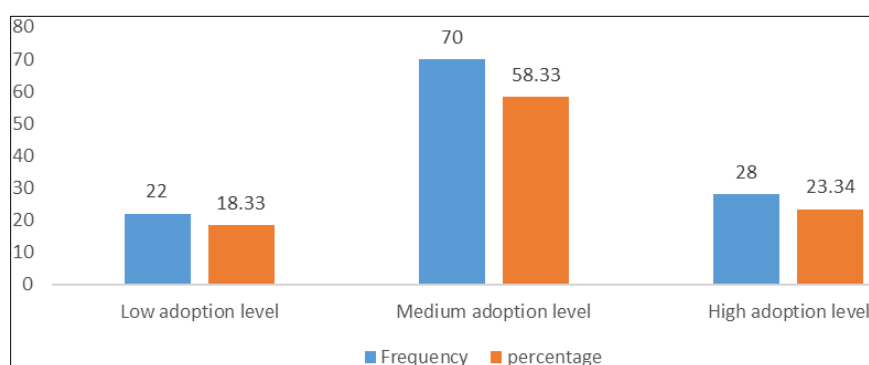


Fig 1: Distribution of respondents according to level of adoption of improved agricultural technologies (N = 120)

Extent of Adoption of Improved Agricultural Technologies

The core objective of the study was to measure how much technology farmers are actually using in their fields. The overall adoption distribution showed that 58.33% of the respondents belonged to the medium adoption category. Only 23.34% achieved a high level of adoption, while 18.33% remained in the low category.

Farmers showed a high preference for technologies that give immediate results. For example, the use of farm machinery (62.50%), recommended crop spacing (58.33%), and high-

yielding varieties (56.67%) were widely adopted. However, knowledge-intensive and long-term practices like improved storage techniques (25.00% not adopted) and soil testing (40.00% partially adopted) showed lower field execution.

Relationship Between Psychological Determinants and Technology Adoption

To find out if factors like age, education, innovativeness, or risk orientation directly influence the adoption level, the Pearson Chi-square test was applied.

Table 2: Chi-Square Analysis of Independent Variables with Adoption Level (N=120)

S. No.	Independent Variables	Chi-Square Value (χ^2)	Degrees of Freedom (df)	Significance Result
1.	Age	6.04	4	Non-Significant
2.	Education	10.14	8	Non-Significant
3.	Land Holding	3.31	8	Non-Significant
4.	Annual Income	0.28	4	Non-Significant
5.	Extension Contact	0.05	4	Non-Significant
6.	Innovativeness	0.46	4	Non-Significant
7.	Risk Orientation	0.39	4	Non-Significant
8.	Economic Motivation	0.30	4	Non-Significant
9.	Scientific Orientation	0.48	4	Non-Significant

(Tested at 5% level of significance)

Discussion on Chi-Square Results

The statistical analysis yielded a very important finding. The calculated Chi-square values for all socio-economic, communication, and psychological variables were found to be statistically non-significant at the 5% level. This means that the variation in adoption levels among farmers cannot be directly blamed on their age, lack of education, or poor psychological motivation. The farmers are psychologically ready and motivated, but their transition to actual adoption is completely overpowered by external problems.

Constraints in Technology Adoption and Suggested Interventions

To understand why adoption is not increasing despite psychological readiness, farmers were asked about the problems they face.

Major Constraints

The biggest barrier reported by the respondents was the high cost of improved agricultural inputs (85.00%). This was closely followed by a lack of irrigation facilities (81.67%) and small, fragmented landholdings (80.00%). Furthermore, a lack of timely availability of quality seeds (78.33%) and poor access to credit facilities (75.00%) restricted the farmers from modernizing their farms.

Suggested Interventions

When asked for solutions, the farmers highly recommended that the government should strengthen market linkages and Minimum Support Price (MSP) awareness (95.83%). They also strongly suggested the promotion of efficient irrigation systems like drip and sprinkler (93.33%), providing subsidized inputs (91.67%), and ensuring easy access to institutional credit (90.00%).

Conclusion

The chi-square analysis revealed that none of the selected socio-economic, communication and psychological variables had a significant association with technology adoption behaviour among the respondents. Age ($\chi^2 = 6.04$), education ($\chi^2 = 10.14$), caste ($\chi^2 = 4.72$), family size ($\chi^2 = 2.30$), landholding ($\chi^2 = 3.31$), livestock holding ($\chi^2 = 0.78$), farming experience ($\chi^2 = 0.38$), occupation ($\chi^2 = 0.57$) and annual income ($\chi^2 = 0.28$) were all non-significant. Similarly, mass media exposure ($\chi^2 = 0.45$), extension contact ($\chi^2 = 0.05$), information-seeking behaviour ($\chi^2 = 0.56$), innovativeness ($\chi^2 = 0.46$), risk orientation ($\chi^2 = 0.39$), economic motivation ($\chi^2 = 0.30$) and scientific orientation ($\chi^2 = 0.48$) showed no significant relationship at the 5 per cent level. Overall, 53.33

per cent of respondents had low adoption, 31.67 per cent had medium adoption and 15.00 per cent had high adoption, indicating that the selected characteristics did not significantly differentiate respondents according to their technology adoption level.

The present study concludes that the marginal farmers of the Sagar district possess a highly favorable and progressive psychological disposition towards modern agriculture. They exhibit a medium-to-high level of economic motivation, scientific orientation, and a willingness to take calculated risks. However, their actual field-level adoption of improved agricultural technologies remains restricted to a medium level (58.33%). The empirical evidence from the Chi-square analysis clearly establishes that the slow diffusion of technology in this region is not caused by the traditional or backward mindset of the farmers. Instead, it is a direct result of severe structural bottlenecks. Because they operate on marginal landholdings with very low annual incomes, the high initial cost of farm inputs and the lack of basic irrigation facilities completely crush their motivation to adopt new technologies. Therefore, extension agencies and policymakers must shift their focus from merely creating 'awareness' to providing tangible support, such as heavily subsidized inputs, local custom hiring centers for machinery, and assured market linkages, to truly uplift the marginal farming community.

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