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Farmers' Attitude towards Adoption of Sustainable Agricultural Practices: A Study in Manipur

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HIGHLIGHTS

- A moderate to high degree of favourable attitude towards sustainable agricultural practices observed across all districts.
- Farmers with high attitude scores were found leading in adoption of improved technologies contributing toward sustainable farming.
- Experience is the key factors significantly influencing farmers' favourable attitude across the districts toward adoption of sustainable agricultural practices.

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ABSTRACT

The farmers' psychological well-being has an impact on the adoption of sustainable farming practices. The key component involves attitude, which transforms covert behaviour into overt action. This study determined the socio-economic variables that influence farmers' attitude towards adoption of sustainable agricultural practices. The present study was carried out during 2021-23 in four districts of Manipur state on 320 respondents. In order to gauge the respondents' attitude, an attitude scale was developed. Linear regression model was applied to investigate the variables that explained attitudes of farmers toward the adoption of sustainable agricultural practices. The findings of the study revealed that majority of respondents exhibited favourable attitude with an attitude index of 70.96. The variables age, family size, education, experience, landholding, extension contacts, social media, market orientation, product orientation, and risk orientation influenced the farmers' attitudes toward adoption of sustainable agricultural practices. Developing a feedback channel for farmers to discuss their experiences and difficulties on adoption of technology and formation of farmer's cooperatives are imperative for bringing improvement in the farmers' attitude.

INTRODUCTION

Food supply comes mostly from agriculture, which contributes to the growth of the global economy and infrastructure. However, excessive use of chemicals and pesticides in cultivation poses a threat to human survival that causes damage to land and ecosystems. Reshaping agricultural practices becomes an urgent concern to prevent further ill-treatment of nature. Many experts agree that sustainable agriculture could be a way to address the current crisis in agriculture (Bekele *et al.,* 2021; Setsoafa *et al.,* 2022). Sustainability has emerged as a necessity in future agricultural policy and practice. Sustainable agriculture has been presented as a promising concept that utilizes a wide range of technologies. It aims to increase yields while protecting the environment, land, and other natural resources, as well as promoting a good quality of life and maintaining global food security (Diogo, 2022). This holistic approach has emerged as a promising solution to the current crisis primarily through the integration of environment conservation, socio-economic well-being, and food production (Cakmakci, 2023). As the global focus on sustainable agriculture advances,

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understanding the factors that motivate farmers to adopt sustainable farming is crucial. Providing an insight into the variables that influence farmers' intentions in favour of sustainable agriculture may close the significant gap in sustainability (Bhujel & Joshi, 2023). Thus, it is an unquestionable fact that cognitive factors relate to the adoption of sustainable practices because the adoption of specific sustainable agricultural practices has been observed higher when farmers have sufficient knowledge. Implementation of sustainable practices in agriculture is somehow determined by the psychological status of the farmers. Attitude is one of the important psychological factors that has the potential to influence an individual's decision toward a specific object or idea. It acts as the determinant factor by converting covert behaviour into overt action. Research on attitude may have major impact on the educational purpose of sustainability. Attitude is a crucial determinant of farmers' intention to adopt sustainable agriculture. However, the positive attitude towards sustainable farming practices is associated with beliefs and social status. Since farmers are the main actors in technology adoption or rejection, their socio-economic status can provide meaningful insight on their adoption behaviour. Farmers' attitude significantly impact on their willingness to adopt new technologies and practices. Farmers with more positive attitude toward sustainable practices were more likely to adopt them (Liao et al., 2022; Bhujel & Josh, 2023). Identifying the socio-economic factors influencing attitude may help to design better technology for adoption leading to increased agricultural sustainability. Insight into farmers' attitudes can guide the efficient allocation of resources. Farmers face various socio-economic challenges that affect their attitudes towards farming, such as access to credit, education, and market information.

METHODOLOGY

The research was conducted from 2021 to 2023 in the state of Manipur, where agriculture serves as the primary source of occupation and livelihood for approximately 80 per cent of the population. Understanding farmers' attitudes towards sustainable agricultural practices is pivotal for developing strategies to manage resources more effectively and sustainably. In this study, four districts from the state of Manipur were selected based on their productivity and cultivated areas. Specifically, Thoubal and Imphal East districts from the valley region, known for their higher productivity and extensive cultivated areas, were selected for study. From the hill region, Senapati and Churachandpur districts were selected, which similarly exhibit high productivity and large cultivated areas. Within these districts, two blocks from each district were chosen, and from each block, two villages were randomly selected. Furthermore, 20 farmers with adequate agricultural experience were randomly selected from each village, culminating in a total sample size of 320 farmers. To measure the attitude of farmers towards the adoption of sustainable agricultural practices, a Likert-based summated rating scale was constructed similar to Shitu et al., (2018). This scale underwent a relevancy test with 30 judges and was pre-tested with 50 farmers from a non-sampled area. The "t" values of the statements exceeded 1.75, resulting in a final scale consisting of 13 statements (8 positive and 5 negative) with a reliability coefficient of 0.71, indicating high reliability. The constructed scale was employed to assess farmers' attitudes towards sustainable agricultural practices. Responses were collected using a five-point continuum scale: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), and Strongly Disagree (SDA), with scores assigned as 5, 4, 3, 2, and 1, respectively (negative statements were reverse-scored). Individual scores were calculated by summing the scores from each statement, and the percentage score of each statement was measured. Based on the total score, respondents were categorized as less favourable, favourable, or highly favourable using mean and standard deviation values. Additionally, an attitude index was developed. The socio-economic characteristics determinants influencing farmers' attitudes towards adoption of sustainable agricultural practices were investigated by using linear regression model. This model estimated the effects of various socio-economic factors on farmers' attitudes towards adoption of sustainable agricultural practices.

RESULTS

The results presented in Table 1 show the percentage scores for each attitudinal statement, indicating the farmers' attitudes towards the adoption of sustainable agricultural practices. In Thoubal district, the scores for the statements ranged from 58.00 per cent to a maximum of 78.50 per cent. The results indicate that only a few statements scored close to 60.00 per cent, indicating generally high score. This consistency in scores suggested that respondents had common opinion with an above-moderate favourable attitude towards the adoption of sustainable agricultural practices. In Imphal East district, the scores for the statements ranged from 64.00 per cent to a maximum of 82.25 per cent. This range indicates a higher favourable attitude among respondents than respondents from Thoubal district, suggesting that farmers in Imphal East exhibit very positive attitude towards. In Senapati district, the score range of the statements from 51.50 per cent to maximum 84 per cent; this result showed that respondents' attitudes varied from moderate to highly favourable attitude towards the adoption of sustainable agricultural practices. In Churachandpur district, the scores for the statements varied from 60.50 per cent to 74.50 per cent, indicating respondents had favourable positive attitude towards adoption of sustainable agricultural practices. Overall, the results indicate that statement scores differ among districts, with each exhibiting a unique range. Despite these variations, respondents consistently expressed common opinion to sustainable agriculture, reflecting a generally favourable attitude towards adoption of sustainable agriculture. This result highlights the widespread recognition of the importance of sustainable practices among the respondents across all the districts.

Table 2 illustrates the attitudes of farmers among four districts of Manipur towards adoption of sustainable agricultural practices. In Thoubal district, majority (73.75%) of respondents exhibited a favourable attitude towards sustainable agricultural practices. The attitude index for this district was found to be 70.15. In Imphal East district, a majority (67.50%) of the respondents had a favourable attitude with attitude index of 73.88, reflecting a high positive attitude towards sustainable practices among most farmers. In Senapati district majority (75.00%) of the respondents had a favourable attitude and attitude index of 71.90, demonstrating a high

Table 1. Score of the attitudinal statements among the farmers of different districts towards adoption of sustainable agricultural practices

Statements	Percentage of total score				
	THB	IME	SNP	CCP	Overall
In my village most of the farmers are more interested in chemical utilisation for farming (-)	75.00	82.25	83.50	71.75	78.13
I am not aware about the importance of natural resource conservation in agricultural practices (-)	70.75	82.00	84.00	72.50	77.31
Agricultural practices of my village are not concern about health and natural resources (-)	73.50	80.00	78.50	70.25	75.56
Government should make strict rules to act on the farmer who waste the natural resources (+)	78.50	72.75	69.75	74.50	73.88
I look forward to participate in training and demonstration on sustainable farm technologies for adoption and farm profitability (+)	72.75	74.00	78.25	68.75	73.44
Agriculture will be sustainable by attracting young farmers to take up a career in farming (+)	74.50	73.75	77.25	67.5	73.25
Farmers should always protect natural resources at the earliest as it belongs to all generations (+)	70.25	80.50	77.25	63.75	72.94
There is a lack of social support regarding environmental issues & natural resource management (-)	73.00	76.75	69.75	67.25	71.69
In my village the farmers who practice sustainable farming system have a quality life (+)	72.75	73.25	69.25	70.00	71.31
Sustainable agricultural practices are costly and can be only adopted by rich farmers (-)	61.75	66.00	78.50	63.5	67.44
Cultivation without chemicals gives nutrients rich food and good health in the society (+)	71.00	68.50	51.50	66.5	64.38
I follow Integrated farming practices to maintain cash flow throughout the year and increase sustainability (+)	58.00	66.50	64.25	60.50	62.31
Farmers should not use excessive chemicals fertilizers to avoid harmful effect on environment (+)	60.25	64.25	53.00	65.75	60.81

THB: Thoubal district; IME: Imphal East; SNP: Senapati district; CCP: Churachandpur district

Table 2. Level of farmers' attitude towards adoption of sustainable agriculture practices

Districts	Level of attitude	Percentage	Mean	SD	Attitude Index
THB (n_1=80)	Less favourable (<39.24)	7.50	45.00	5.76	70.15
	Favourable (39.24-50.76)	73.75			
	Highly favourable (>50.76)	18.75			
IME (n_2=80)	Less favourable (<40.89)	6.25	47.89	7.00	73.88
	Favourable (40.89-54.98)	67.50			
	Highly favourable (>54.89)	26.25			
SNP (n_3=80)	Less favourable (<40.02)	5.00	46.20	6.18	71.90
	Favourable (40.02-52.38)	75.00			
	Highly favourable (>52.38)	20.00			
CCP (n_4=80)	Less favourable (<38.63)	12.50	44.04	5.41	67.88
	Favourable (38.63-49.45)	73.75			
	Highly favourable (> 49.45)	13.75			
Overall (n=320)	Less favourable (<39.28)	7.81	45.37	6.09	70.96
	Favourable (39.28-51.46)	72.50			
	Highly favourable (> 51.46)	19.69			

THB: Thoubal district; IME: Imphal East; SNP: Senapati district; CCP: Churachandpur district; f: Frequency and %: Percentage

positive attitude. In Churachandpur district majority (73.75%) of respondents displayed a favourable attitude. The attitude index for this district was found to be 67.88, slightly lower as compared to the other districts. Overall findings revealed that 72.50 per cent of the respondents had a favourable attitude towards sustainable agricultural practices and overall attitude index across all districts was found to be 70.96, indicating a strong positive and favourable attitude towards adoption of sustainable agricultural practices among the farmers in Manipur. These findings align with previous research findings of Nataraju et al., (2019); Pawar & Channaveer (2021); Liao et al., (2022) & Kumar et al., (2023), who also found that the majority of respondents exhibited a higher attitude index towards sustainable agricultural practices. Similar result was also drawn by Boora et al., (2022), reinforcing the consistency of these results. The above findings suggest that while there are variations in the degree of favourability across different districts, the general trend indicates a positive attitude towards adoption of sustainable agricultural practices among the farmers in Manipur.

The results of the linear regression analysis depicted in Table 3 highlights the socio-economic factors influencing farmers' attitudes towards adoption of sustainable agricultural practices across different districts of Manipur. In Thoubal district, the analysis revealed that education (t=2.928, p=.005**), family size (t=-1.913, p=.050*), experience (t=7.014, p=.001**), and market orientation (t=4.569, p=.003**) significantly contributed to fostering a favourable attitude towards sustainable agriculture. These factors play a crucial role in encouraging farmers to adopt sustainable practices. The model's effectiveness, measured by the R-square value of 0.754, explained approximately 75.40 per cent of the variability in farmers' attitudes towards sustainable agricultural practices. In Imphal East district, family size (t=-2.076, p=.042*), experience (t=-6.592, p=.000**), landholding (t=2.470, p=.016*),

Table 3. Regression of socio-economic variables with attitude towards adoption of sustainable agricultural practices

Variables	Districts							
	THB		IME		SNP		CCP	
	t	P value	t	P value	t	P value	t	P value
Constant	1.424	.159	4.594	.001	3.219	.002	4.775	.000
Age	-1.380	.172	-1.905	.061	.869	.388	4.661	.001**
Education	2.928	.005**	.219	.827	1.431	.157	1.412	.163
Family size	-1.913	.050*	-2.076	.042*	-2.844	.006**	-1.133	.261
Experience	7.014	.001**	6.592	.000**	.252	.802	3.738	.003**
Landholding	.664	.509	2.470	.016*	-1.825	.073	1.037	.304
Income	-.187	.852	-.690	.493	1.086	.282	.950	.346
Extension contacts	0.049	.961	2.424	.018*	3.018	.004**	.445	.658
Mass media	-.157	.876	-1.471	.146	.412	.682	-.244	.808
Social media	0.273	.786	2.769	.007**	1.398	.167	2.162	.034*
Market orientation	4.569	.003**	-1.510	.136	1.961	.050*	-.644	.522
Production orientation	-0.29	.977	1.916	.050*	.012	.991	2.955	.004**
Risk orientation	-1.104	.274	.571	.570	2.217	.030*	-1.265	.210
R square	0.754		0.704		0.396		0.499	
F value	15.560**		12.062**		3.041**		5.062**	

**Significant at 1% level of significance, *Significant at 5% level of significance

extension contact (t=2.424, p=.018*), social media (t=2.769, p=.007**), and product orientation (t=1.916, p=.050*) significantly influenced the farmers' attitudes towards adopting sustainable agricultural practices. The model explained approximately 70.40 per cent of the variability in farmers' attitudes in this district. For Senapati district, family size (t=-2.844, p=.006**), extension contact (t=3.018, p=.004**), market orientation (t=1.961, p=.050*), and risk orientation (t=2.217, p=.030*) are identified as significant factors influencing farmers' attitudes towards sustainable agriculture adoption. The model accounted for approximately 39.60 per cent of the variability in farmers' attitudes in Senapati district. Further, in Churachandpur district, age (t=4.661, p=.001*), experience (t=3.738, p=.003**), social media (t=2.162, p=.034*), and product orientation (t=2.955, p=.004**) significantly influenced farmers' attitudes towards adopting sustainable agricultural practices. The model explained approximately 49.90 per cent of the variability in farmers' attitudes in this district.

DISCUSSION

The findings of the study indicated a strong positive favourable opinion on the statements of farmer's attitude towards the adoption of sustainable agriculture practices. Farmers with high attitude scores towards sustainable agriculture are likely to be leading in adoption that contributes to the sustainability of agriculture. Majority of the respondents had a favourable attitude towards adoption of sustainable practices. Bhujel & Josh (2023) opined that positive attitude towards sustainable agriculture positively influenced farmers intention to adopt the recommended practices. Further, respondents of Imphal East district had more favourable attitude towards adoption of sustainable agricultural practices as compared to Thoubal district, Senapati and Churachandpur district. Investigation of the key factors influencing farmers' attitude towards adoption of sustainable agricultural practices indicated that significant variables can potentially alter farmers' attitudes towards sustainable agricultural practices. Age played a crucial role in shaping farmers' attitudes, willingness, and capacity to adopt sustainable agricultural practices, as highlighted by Thangjam & Jha (2024). Li et al., (2021) indicated that younger farmers tend to exhibit higher favourable attitude. Education emerged as another important predictor, influencing farmers' knowledge, skills, attitude, and behaviour towards sustainable practices. Educated farmers are more likely to stay informed about new techniques, technologies, and market opportunities. Yadav et al., (2017); Arhin et al., (2023); Pawar & Channaveer (2021) supported these findings, demonstrating a significant relationship between farmers' age, education levels, and their engagement in sustainable agricultural practices. On the other hand, family size negatively impacted on attitude towards adopting sustainable agricultural technologies. Large families, as noted by Yang & Sang (2020), may have more opportunities for non-farm activities, potentially diverting attention and resources away from adopting sustainable technologies. This could lead to decline the willingness to adopt the technology. Experience impacted farmers knowledge, skills, and decision-making abilities, that significantly influencing their favourable attitude towards sustainable practices. This insight is supported by research highlighting that experienced farmers were more likely to adopt new technologies and practices effectively (Deng et al., 2020). Moreover, higher landholding among farmers correlated with a favourable attitude towards sustainable agriculture. Farmers with larger landholdings typically have greater financial resources and better access to markets, making the adoption of technology more feasible (Deng et al., 2020). Additionally, higher levels of engagement with extension services contribute to a positive attitude of farmers. Therefore, increased contacts with extension services tend to enhance farmers' favourable attitude towards sustainable agricultural practices. Social media plays a significant role in influencing farmers' attitudes that exposure to information through social media sources increases the adoption of sustainable agricultural practices, as noted by Ashrit and Joshi (2024). Market-oriented farmers were typically more inclined to adopt technological innovations, driven by their

focus on responding to market demands and maximizing efficiency. While production-oriented farmers, aiming to meet market demands, tend to show a positive attitude towards adopting sustainable practices that align with market expectations. On the other hand, farmers with a higher risk orientation were more inclined to experiment with innovative and sustainable agricultural practices. Therefore, market orientation, production orientation and risk orientation emerged as a crucial factor significantly influencing farmers' attitudes towards the adoption of sustainable agricultural practices. The above findings aligns with Hamee & Sawicka (2017); Ashrit & Joshi (2024), which highlighted that variables like age, landholding, farming experience, family size, annual income, extension contact, risk orientation, and market orientation significantly contribute towards shaping farmers' attitudes. Further, these factors have a substantial influence on farmers' attitudes, thereby influencing the attitude of farmers to adopt sustainable agricultural practices.

CONCLUSION

The study suggested that a majority of respondents exhibited a favourable attitude, as evidenced by their responses and a high attitude index of 70.96. The key variables influencing farmers' attitudes include age, family size, education level, farming experience, landholding size, engagement with extension services, use of social media, market orientation, product orientation, and risk orientation. These factors collectively shape farmers' attitude and behaviour to adopt sustainable agricultural practices, and affecting their decision-making process for a profitable venture. Thus, farmers' attitude towards adopting innovation is influenced by multiple socio-economic factors that impact their attitude throughout the adoption process. The study recommends encouraging the formation of farmer's cooperatives to develop a consistent favourable attitude by facilitating resource-sharing and the dissemination of sustainable practices.

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