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Farmers' information needs and sources for climate smart agriculture technologies (CSATs) in Chhattisgarh state

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Abstract

Climate change poses a critical threat to the stability and longevity of agriculture as a reliable food source. Sustainable agriculture aims to balance three dimensions: economic viability, social well-being, and ecological preservation. Farmers play a vital role in achieving these goals by implementing practices that protect natural resources, adapt to changing climates, and maintain economic stability. To make informed decisions, farmers need access to reliable, relevant information to support sound agricultural practices. This study was conducted in Chhattisgarh state which is having three agro-climatic zones: Bastar Plateau, Chhattisgarh Plains, and Northern Hills. Twenty percent of districts chosen from each agro-climatic zone. In total, six districts were included in the study, with a total sample of 360 farmers as respondents. The results of the study reaved that most respondents (60%) had a medium level of ICT utilization for Climate Smart Agriculture Technologies, followed by 21.39 percent with low and 18.61 percent with high utilization levels. Respondents' overall use of information sources for Climate Smart Agriculture Technologies showed that 55.83 percent were in the medium category, followed by 40.56 percent in the high category and 3.61 percent in the low category. Data on information needs for Climate Smart Agriculture Technologies indicated that most respondents (41.39%) had a medium level of need, followed by high (33.61%) and low (25 percent) levels.

Keywords: Agriculture, climate, information, practices

Introduction

Global food production faces serious challenges, including resource scarcity, climate change, and food waste. Climate change, in particular, impacts agriculture by increasing rainfall variability and the frequency of droughts and floods, which reduce crop yields. It also exacerbates ongoing environmental issues, such as groundwater depletion and soil degradation, further threatening food production systems and agricultural sustainability. Thus, climate change poses a critical threat to the stability and longevity of agriculture as a reliable food source. Sustainable agriculture seeks to balance three key dimensions: economic viability (profits), social well-being (people), and ecological preservation. Farmers play a vital role in achieving these goals. They are expected to implement practices that protect natural resources, adapt to changing climates, and maintain economic stability through income generation. To do so, farmers need access to reliable, relevant information to support sound decision-making in their agricultural practices.

Climate change, which includes both global warming and broader shifts in weather patterns, is largely driven by the greenhouse effect. Key sources of greenhouse gas emissions include fossil fuel combustion, agriculture, deforestation, and industrial processes. Climate change's main concerns are elevated temperatures, increased carbon dioxide levels, and rainfall variability. Rising temperatures are also expected to intensify the water cycle, increasing the likelihood of extreme rainfall and flooding events. These climate factors critically affect agriculture, and variations in these conditions are severe threats to food production.

The Climate-Smart Agriculture (CSA) concept was introduced by the Food and Agriculture Organization of the United Nations (FAO) at the 2010 Hague Conference on Agriculture, Food Security, and Climate Change. Designed within the framework of national food security and development goals, CSA addresses three core objectives. First, it aims to sustainably increase food security by enhancing agricultural productivity and income, ensuring more people have reliable access to an adequate food supply. Second, CSA focuses on building resilience to climate change, enabling agricultural systems and communities to better withstand extreme weather events and shifting climate patterns. Third, it seeks to reduce greenhouse gas emissions from agricultural practices whenever feasible, thereby contributing to climate change mitigation.

Key climate-smart practices include conservation agriculture, agroforestry, livestock and water management, integrated pest management, and ecosystem-based approaches in fisheries and aquaculture, all of which contribute to improving climate resilience in farming communities. The CSA approach is holistic, tackling agricultural challenges alongside global development issues

by incorporating environmental factors such as energy and water usage, social concerns like gender equality, and economic considerations. While modern agricultural practices have indeed increased food productivity, they have also intensified several environmental issues, including climate change, biodiversity loss, soil degradation, food insecurity, and overall environmental harm. Thus, CSA offers a pathway to address these interconnected challenges, combining sustainable agricultural productivity with climate adaptability and environmental stewardship to promote a more secure food future. Through CSA, agriculture can transition to methods that protect natural resources, support social development, and minimize environmental impact, aligning food production with sustainable and climate-conscious practices. To adapt to these conditions, farmers require specialized information to make effective agricultural decisions in the face of both climate change and volcanic activity. Studying the information needs and information-seeking behaviours of these farmers is especially important, as they face unique and frequent natural changes that affect their farming sustainability.

For farmers, access to information is essential not only for sustainable farming but also for effective agricultural knowledge-sharing programs. Farmers' information needs and behaviours, which includes all aspects of how people interact with information sources and channels. This behaviour encompasses active actions, like seeking advice in person, and passive actions, such as observing television ads without acting on them, as well as the actual application of information. Information, in this context, includes any materials, messages, documents, or resources that can aid farmers in making agricultural decisions. Farmers' agricultural information needs include knowledge about agricultural practices, climate, markets, and other relevant topics, which they access through various communication channels. This study, therefore, aims to identify the specific information needs of farmers, the sources they commonly use, and the methods they employ to obtain relevant information.

Objective

To study the farmer's Information Needs and Sources for Climate-Smart Agriculture Technologies (CSATs).

Methodology

The present study was conducted in the Chhattisgarh state during the year 2022-23 and 2023-24. The state of Chhattisgarh is divided into three agro-climatic zones, namely Bastar Plateau, Chhattisgarh Plains, and Northern Hills. To represent whole state, districts from three Agro-climatic zones were selected through proportional random sampling and twenty percent districts were selected from each Agro- climatic region. Out of seven districts in Northern hills, one district, Sarguja was selected, out of twenty districts in Chhattisgarh plains, four districts, Raipur, Rajnandgaon, Bemetara, Dhamtari were selected. Out of six districts in Bastar plateau one district, Kanker was selected. Thus, total six districts were selected for the study. From each selected district 2 blocks were selected, where two villages from each block were considered to obtain a sample of 360 farmers as respondents. The data collected from respondents through personal interview and group discussions were coded, tabulated and subjected to statistical analysis in accordance with the objectives of the study. This study was carried out to measure the Farmers' Information Needs and Sources for Climate-Smart Agriculture Technologies (CSATs).

Results and Discussion

Information needs for Climate Smart Agriculture Technologies (CSATs)

In development of agricultural information is critical because it allows farmers to make informed decisions about their practices in order to avoid or mitigate climate change risks and promote sustainable development. Climate information and prediction services helps to better manage climate variability and adoption by incorporating science-based approaches into global and national planning, policy, programmes and practices.

It can be observed from table 1 that farmers need more information on adaptation strategies, with the highest information need index 81.94 percent ranked 1st followed by water management (77.91%), suitable varieties (76.38%), appropriate inter-cultural practice (76.11%) and agro diversification (70.00%) which ranked 2nd, 3rd, 4th and 5th, respectively.

Whereas soil conservation had information index 68.75 percent, followed by alternative /complement livelihood activities (65.13%) and alternate wet and drying (48.67%) ranked 6th, 7th and 8th. It was also revealed that farmers need less information about agro forestry practices with information index 39.58 percent ranked 9th and flood/erosion control practices had the lowest information need index 39.16 percent ranked 10th. More knowledge on adoption techniques is needed by respondents so that they can easily adopt climate smart agricultural technologies and mitigate the effects of climate change.

To be able to adopt to climate change and implement sustainable farming, information related to adaptation strategies, water management and alternate wetting and drying method in rice cultivation for water saving is very important for farmers. These sources of information are most important for farmers to obtain the information related to climate smart agricultural technologies. In the process of finding information, farmers tend to rely more on rural agriculture extension officer and input dealer in building their knowledge to adopt to climate smart agricultural technologies and ensure the sustainability of their farming practices. The study's findings are in line with the findings of Panda and Shivamurthy (2017) [13] and Baidya (2022) [2].

Table 1: Distribution of respondents according to their Information needs for Climate Smart Agriculture Technologies (CSATs)

Sl. No	Items	Regularly		Occasionally		Never		Information needs index	Rank
		F	%	F	%	F	%		
1.	Adaptation strategies	247	68.61	96	26.67	17	4.72	81.94	I
2.	Flood/erosion control practices	75	20.83	132	36.67	153	42.5	39.16	X
3.	Alternative /complementary livelihood activities	156	43.33	157	43.61	47	13.05	65.13	VII
4.	Soil conservation	180	50	135	37.5	45	12.5	68.75	VI
5.	Agro forestry practices	76	21.11	133	36.94	151	41.94	39.58	IX
6.	Alternate Wet and Drying	108	30	134	37.23	118	32.77	48.61	VIII
7	Water management	225	62.5	111	30.83	24	6.66	77.91	II
8	Agro diversification	161	44.72	182	50.55	17	4.72	70.00	V
9	Suitable Varieties	226	62.77	98	27.23	36	10	76.38	III
10	Appropriate inter- cultural practice	216	60	116	32.23	28	7.77	76.11	IV

Table 2: Distribution of respondents according to their overall information needs for Climate Smart agriculture technologies (CSATs)

Sl. No	Information needs	Frequency	Percentage
1.	Low (Score Up to 4)	90	25.00
2.	Medium (Score 5 to 9)	149	41.39
3.	High (Score more than 10)	121	33.61

n=360

The data regarding the overall information needs compiled in table 2 revealed that the majority (41.39%) of the respondents had medium level of information need followed by high and low that were 33.61 percent and 25.00 percent. It can be concluded that the majority of the respondents had medium (41.39%) to high (33.61%) level of information needs. It may be due to they are much aware with the benefits of climate smart agricultural technologies.

Source of information on Climate Smart Agriculture Technologies (CSATs)

The respondents' source of information covers both the information sources from which they obtain information and the respondents' perceptions of the credibility of these sources. Table 3 shows the information sources used to find information about Climate Smart Agriculture Technologies (CSATs). According to the findings, cent percent of the respondents obtained information about climate smart agricultural practices through rural agriculture extension officer/ rural horticulture extension officer which ranked 1st with the highest source of information index score 81.38 percent followed by Input dealer and Friends/Relatives/ Neighbours which ranked 2nd and 3rd with source of information index score 79.02 percent and 75.00 percent. While, television ranked 4th with source of information index score 69.72 percent, newspaper ranked 5th with source of information index score 41.66 percent, Smart phone ranked 6th with source of information index score 38.33 percent, scientist/SMS ranked 7th with source of information index score 16.67 percent and magazine ranked 8th with source of information index score 18.61 percent. Whereas, radio and non-governmental organization ranked 9th and 10th with source of information index score 12.36 percent and 6.25 percent respectively. The study's findings are in line with the findings of Panda and Shivamurthy (2017) [13], Baidya (2022) [2] and Kumar *et al.* (2022) [11].

Table 3: Distribution of respondents according to their Source of information on Climate Smart Agriculture Technologies (CSATs)

Sl. No	Items	Regularly		Occasionally		Never		Source of information Index	Rank
		F	%	F	%	F	%		
1.	Friends'/Relatives/Neighbours	222	61.66	96	26.67	42	11.66	75	III
2.	Smart phone	81	22.5	114	31.67	165	45.83	38.33	VI
3.	RAEOs/RHEOs	255	70.83	76	21.11	29	8.05	81.38	I
4.	Radio	3	0.83	83	23.05	274	76.11	12.36	IX
5.	Television	188	52.22	126	35	46	12.77	69.72	IV
6.	Magazine	16	4.45	102	28.33	242	67.22	18.61	VIII
7	News paper	93	25.83	114	31.66	153	42.5	41.66	V
8	Input dealer	235	65.27	99	27.5	26	7.22	79.02	II
9	NGOs	5	1.38	35	9.72	320	88.89	6.25	X
10	Scientist/ SMS	5	1.38	110	30.55	245	68.05	16.66	VII

Table 4 explains the distribution of respondents according to their overall utility of information source for Climate Smart Agriculture Technologies. The majority of the respondents (55.83%) belonged to medium category, followed by 40.56 percent and 3.61 percent of the respondents were from high and low level of category, respectively.

Table 4: Distribution of respondents according to their Source of information on Climate Smart Agriculture Technologies

Sl. No	Source of information	Frequency	Percentage
1.	Low (Score Up to 10)	146	40.56
2.	Medium (Score 11 to 18)	201	55.83
3.	High (Score more than 19)	13	3.61

n=360

Conclusion

The findings emphasize the critical role of Information and Communication Technologies (ICTs) in enhancing farmers' access to climate-smart agricultural technologies. Television, mobile phones, internet, and social media are widely used, helping farmers stay informed on important agricultural information. However, computer ownership remains low, highlighting a potential gap in access to more advanced ICT resources. Most farmers shown medium to high level of engagement with information sources for climate-smart agriculture, which supports their ability to make informed decisions essential for managing climate-related risks. This knowledge is crucial for sustainable agricultural practices. Key areas of information needs include adaptation strategies, water management, and suitable crop varieties, which are vital for helping farmers tackle climate challenges. Other topics, such as soil conservation and flood control, were of lower priority but still significant. Overall, farmers rely primarily on agriculture extension officers and input dealers for information, suggesting a need to strengthen these support channels to aid farmers in adopting climate-smart technologies. By meeting these information needs, farmers can more effectively adapt to climate impacts, ensure sustainable productivity, and contribute to broader environmental resilience. Addressing these areas will be key to fostering sustainable agricultural development in the face of climate change.

Policy implication

1. Focus on increasing access to ICT tools like televisions, mobile phones, and social media in rural areas. Provide subsidies or incentives for affordable internet services and low-cost digital devices such as smartphones. Enable farmers to access timely and relevant information on climate and agricultural innovations.
2. Expand and reinforce agricultural extension services to meet farmers' information needs. Train and deploy more extension officers with expertise in Climate-Smart Agricultural Technologies (CSATs). Ensure extension officers effectively guide farmers on adaptation techniques and resource management.
3. Emphasize providing farmers with information on adaptation strategies, water management and suitable crop varieties. Develop localized, science-based climate prediction services to inform farmers about weather patterns. Promote water-saving techniques, particularly for water-intensive crops like rice.
4. Raise awareness and promote the adoption of a broader range of climate-smart practices. Include soil conservation, flood control, agroforestry, alternate livelihoods, and other resilience-building methods. Diversify the practices taught to help farmers cope with varied climate impacts.

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Conflict of interest

The authors of the paper declare no conflict of interest

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