INITIATIVE ON Digital Innovation

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WORKING PAPER

Use Case - Delivering Contextualized Climate Information in Two Districts of Odisha and Understanding Farmer Decision-Making: A case study in Odisha

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Abstract: Smallholder agriculture, especially in the global South, is highly vulnerable to climate variability and change; hence, the aim of the Digital Innovation initiative was to equip farmers with actionable weather-based agro advisories to improve farm management and mitigate climate risks. This working paper explores the delivery of contextualized climate information to farmers in Rayagada and Gajapati districts of Odisha. The region is characterized by predominantly rainfed agriculture and high vulnerability to climate variability. The objective was to enhance farmers' resilience by providing tailored climate advisories and understand the dynamics of their decision-making across various farming stages while using agro advisories. A mixed-methods approach was employed, involving surveys with 200 farmers across four blocks of two districts and focus group discussions to gather comprehensive insights into their decision-making processes. The study found that 79% of farmers were male, while 21% were female, highlighting the need for gender-sensitive advisories. Decision-making was influenced by a complex interplay of traditional knowledge, market dynamics, climate advisories, and social influences. Digital climate services, such as those offered by ISAT, have shown to be valuable, with 82% of farmers accessing these advisories. Adoption rates varied significantly across different farming activities, with 67% adoption for supporting crop sowing decisions and 69% for crop protection, compared to lower uptake in land preparation (29%) and irrigation (24%). For decisions on crop and cultivar choice, farmers didn't intend to use the weather-based agro-advisories yet. Probably, advisories based on the seasonal climate forecast needed for decisions on crop and cultivar choices in the past either were not available or less reliable, resulting in the reluctance of farmers to use such advisories. The findings suggest that climate advisory services should be more localized, culturally sensitive, and integrated with traditional practices to address farmers' diverse needs effectively. By bridging the gap between modern advisory systems and traditional wisdom, these integrated services have the potential to enhance farm-level resilience and contribute meaningfully to the livelihoods of smallholder farmers in Odisha.

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Keywords: Climate Advisory Services, Farmer Decision-Making, Integrated Resilience Strategies

ICRISAT Transforming Dryland Agriculture

CGIAR Science for a food secure future

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1. Introduction

Agro-advisory or weather-based agro-advisory services have often been supply-driven and pushed to farmers through various channels including mobile SMS, WhatsApp messages, radio, weekly bulletins, etc. The assumption is that farmers are likely to use the advisories while making agricultural/ farming decisions to improve the performance and resilience of the farming systems. However, the influence of agro advisories received by the farmers on their farming decisions may not be straightforward. The use of agro advisories by farmers may be influenced by other sources of information, and farmers might use it for selective purposes.

The farmers navigate a complex web of uncertainties such as weather variability, market fluctuations, and resource availability while making farming decisions[3]. There are different strategic decision-making theories for farmers and there might be different factors influencing the farmers decision making process. Understanding how farmers make decisions is crucial for designing effective tailor-made interventions and agro advisories[4], as well as in creating strategies to improve the farmer ability.

In the current agricultural landscape, farm enterprises face a variety of challenges and opportunities due to an increasingly risky environment and competitive business landscape, focus on sustainability and nutrition and emerging markets[5]. Simultaneously, they must manage the inherent uncertainty of agriculture, especially with respect to fluctuating weather conditions and market prices[6]. Gaining a deeper understanding of how farmers make decisions is critical for developing effective agro-advisory system as well as delivery channels and enhance their effectiveness. [8]. Such insights can be useful both for researchers and for the extension agents and technical advisors in designing interventions tailored to farmers' specific needs.

In regions like Rayagada and Gajapati districts of Odisha, where agriculture is predominantly rainfed and vulnerable to climatic extremes, farmers face compounded challenges. The decisions about crop selection, sowing dates, or pest management are influenced by a mix of traditional practices, market

signals, and increasingly, digital climate advisories[9].

Recognizing the importance of these decisions, this initiative was undertaken to deliver tailored climate information to farmers in these districts under CGIAR Initiative on Digital Innovation[10]. The goal was not only to equip them with accurate and actionable advisories but also to understand the dynamics of their decision-making processes across various farming stages. By identifying the factors that drive their choices, this study aimed to improve the relevance and adoption of climate services, ultimately helping farmers mitigate risks.

Rayagada and Gajapati, with their predominantly tribal population and reliance on subsistence agriculture, are among the most climate-sensitive regions in Odisha. The irregular monsoons and extreme weather events have made traditional farming practices increasingly inadequate.

This working paper analyses the weather based agro advisories based on primary survey and focus group discussions conducted with 200 farmers from different villages in Rayagada and Gajapati districts, exploring farmers decision making and the influence of advisories on their decisions related to crop selection, land preparation, sowing, pest management, irrigation, and harvest. By understanding these dynamics, the study provides valuable insights into how climate services can be better aligned with farmers' needs, ensuring a more resilient agricultural future.

2. Methodology

Target Locations and Survey Approach:

This study focused on **Rayagada** and **Gajapati** districts in southern Odisha (Figure.1) known for their predominantly tribal population and rainfed agricultural systems. These regions are highly vulnerable to climate variability, with farmers frequently facing challenges like erratic rainfall, droughts, and declining soil fertility, and moisture holding capacity. The predominantly tribal population in these regions faces unique socio-economic challenges, including limited access to resources and infrastructure. This combination of factors makes Rayagada and Gajapati ideal locations for studying

the impact of climate advisories, as any improvements in decision-making processes here could lead to significant advancements in resilience and productivity for similarly vulnerable regions.

The survey was conducted twice, the first on pre-seasonal advisories and second on mid-season. The selected villages and the number of farmers chosen to represent diverse farming practices, ensuring the findings are both representative and actionable (Table 1).

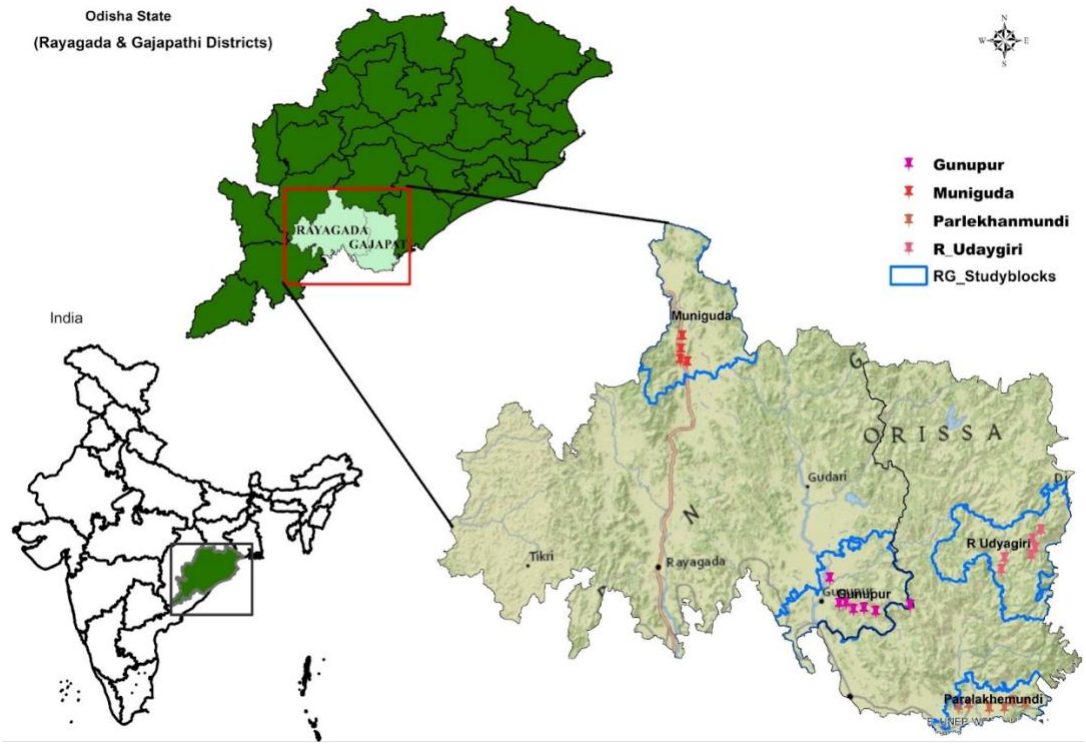

Figure 1: Study locations in Gajapati and Rayagada

Table 1: Farmers Surveyed by Location

District	Block	Number of Farmers
Rayagada	Muniguda	50
Rayagada	Gunupur	50
Gajapati	R.Udayagiri	50
Gajapati	Paralakhemundi	50

Two hundred farmers covered in the study represented diverse cropping systems and socio-economic backgrounds. The structured questionnaire was designed to capture insights across three key areas:

1. Perceptions of Climate Variability: Understanding farmers' observations and experiences with changing weather patterns.
2. Farm Decision-Making: Exploring the process of farmers decision making related to advisories and factors influencing decisions at different stages, from crop selection to harvest.
3. Importance of Digital Climate Services: Assessing the relevance, adoption, and challenges associated with digital advisories.

The survey included a total of **40 questions**, combining both open-ended and close-ended formats, designed to gather comprehensive insights into farmers' decisions on use and adoption of digital climate services, particularly for agricultural purposes. The survey was conducted using the **Kobo Collect tool**, with the assistance of local enumerators and field staff from **ICRISAT**, ensuring real-time data entry and accuracy during interviews (Figure 2). This approach facilitated the smooth collection of responses, reducing errors and enabling efficient data processing.

Figure 3: Interviewing farmers on field level insights

A total of **200 responses** were collected from farmers across four blocks in two districts, representing diverse cropping systems and socio-economic conditions. These questions were structured to ensure that responses captured a wide range of experiences, from the access to weather-based advisories to their application in critical farming operations like crop selection, irrigation, pest management, and harvest planning.

In addition to individual surveys, sixteen focused group discussions (FGDs) were conducted with small groups of farmers in both districts (Figure 4). These discussions provided valuable qualitative insights into the collective decision-making dynamics, the influence of community knowledge, and the shared challenges faced by farming communities (Table 2). Farmers shared their experiences of

how advisories and other factors have directly impacted their practices, offering a deeper understanding of their adoption behaviors and barriers.

Table 2: Key decisions and factors influencing the decisions

	Key decisions involved	**Factors influence the decisions**
1.	Land preparation	• Traditional knowledge • Family discussion • Input availability
2.	Crop selection	• Market demand and price • Peer influence • Access to irrigation
3.	Sowing of crops	• Weather based advisories • Peer influence • Input availability
4.	Pest and fertilizer management	• Weather based advisories • Traditional knowledge • Input availability
5.	Irrigation planning	• Water availability • Traditional knowledge • Peer influence
6.	Harvest	• Market demand • Peer influence • Traditional knowledge • Weather based advisories

Figure 4: Awareness on climate services and understanding decision-making and challenges

The detailed questionnaire used for the survey has been provided in the **annexure**, offering a complete breakdown of the topics covered and the specific questions asked. This approach ensured that the findings were representative and actionable, offering valuable insights into how digital technologies and advisories can be better targeted and integrated into farming practices.

3. Key Findings:

The study focused on understanding the role of digital climate services and the factors influencing farmers' decisions in Rayagada and Gajapati districts. The findings highlighting their cropping patterns, experiences with climate shocks, adoption of climate services, and the key drivers of decision-making across various farming stages.

Gender Representation in Agriculture

Out of the surveyed farmers respondents, 79% were male, while 21% were female (Figure 5). This reflects the significant contribution of women to agriculture in these districts, despite traditional roles often limiting their decision-making. These 21% women farmers were mainly responsible for agriculture activity and related decision making. In addition, women were making significant contributions in the households of male respondents as well. Women participants emphasized that timely and easy-to-understand advisories are essential for improving farm productivity and resilience.

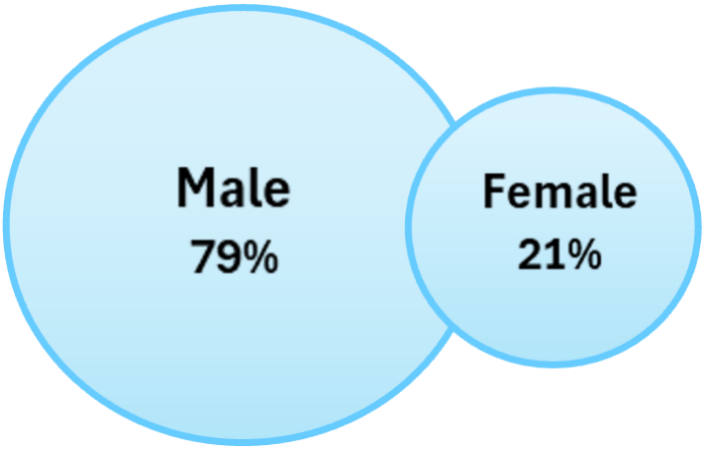

Figure 5: Gender representation

Cropping Patterns

Farmers predominantly grew rice, which accounts for 57% of the total cultivated area. Other significant crops include maize (19%), cotton (17%), and others (7%) (Figure 6). Rice remains the staple crop due to its adaptability to the rainfed systems prevalent in these regions. Maize and cotton, on the other hand, are cultivated for their market demand and profitability.

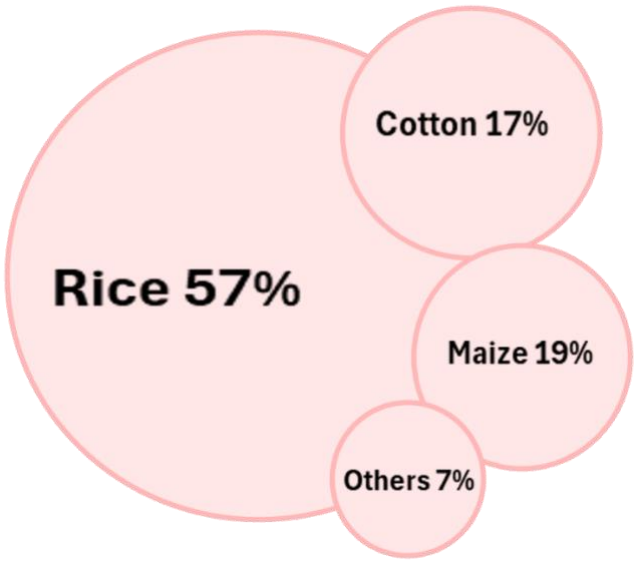

Figure 6 : Cropping Patterns in Rayagada and Gajapati Districts

Climate Shocks:

Farmers frequently experience climate shocks, which significantly affect their productivity. Pest and disease outbreaks (62%) were the most reported challenges, followed by irregular rains (37%), floods (18%), and droughts (5%) (Figure 7). While pest outbreaks directly impact crop health, leading to substantial losses in yield, irregular rains affect a broader range of farming activities, such as sowing, irrigation, and fertilizer application. Comparatively, irregular rains can disrupt multiple stages of crop growth, making their impact more pervasive but less immediate than pest outbreaks, which can cause severe damage if not managed promptly. This comparison highlights the complex nature of climate shocks and the varied approaches farmers need to mitigate these risks often struggling to manage unforeseen challenges.

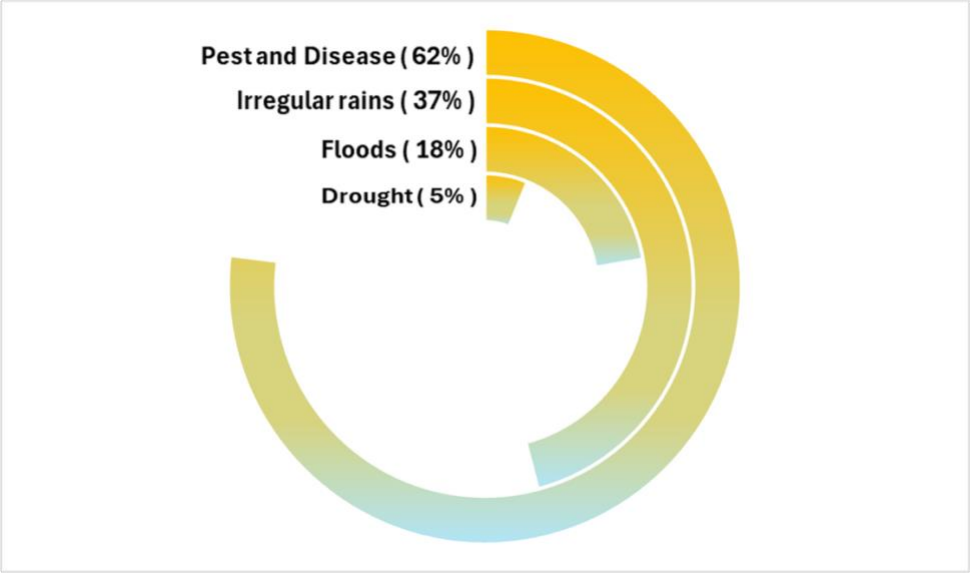

Figure 7: Climate Shocks Experienced by Farmers

Sources of Weather Information

Access to accurate and timely weather information is critical for farm management. As shown in Figure 8, the most used source of weather information was ISAT (39%), followed by KVK (31%), local news channels (13%), and NGOs/private companies (9%). The predominance of ISAT as the primary source of information highlights the increasing reliance on formal and digital sources over traditional ones like neighbors and input dealers, which accounted for only a small fraction. The ISAT has established its credibility among farmers within one year of its implementation. This shift indicates a growing trust in specialized digital advisories, which provide more targeted and actionable insights compared to traditional, less precise methods.

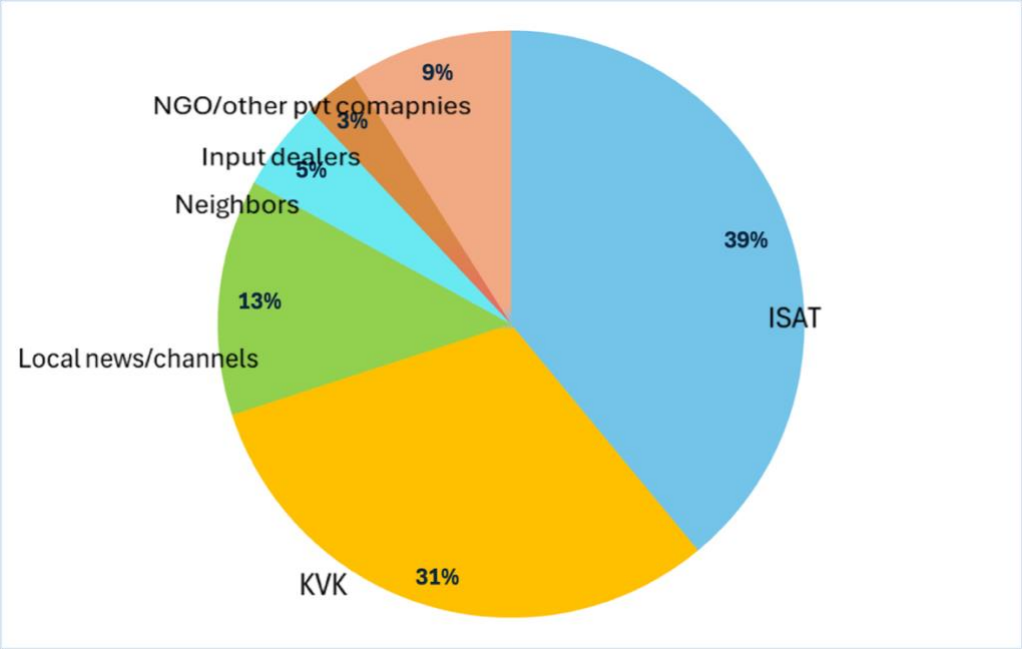

Figure 8: Sources of Weather Information Used by Farmers

Adoption of Climate Services:

Farmers in these districts have utilised climate services for various agricultural activities. The survey showed that: 82% of farmers accessed climate advisories for general information. Among them, 84% reported following these advisories for making informed decisions on specific farm activities. Sowing decisions were significantly influenced by climate advisories (67% adoption), followed by crop protection (69%) and fertilizer application (57%). Other operations like irrigation and harvest showed lower adoption levels (24% and 52%, respectively).

The lower adoption of climate advisories for land preparation can be attributed to the farmers' reliance on traditional knowledge passed down through generations, which they continue to trust for land tillage and preparation practices. Moreover, land preparation is often determined by fixed community schedules and the availability of labor and tools, limiting the perceived need for advisory services. Low adoption rates for irrigation are linked to the scarcity of reliable water sources and the high

dependency on monsoon rains. Many farmers lack irrigation infrastructure, making it challenging to implement advisories even if they are received. Additionally, irrigation practices are influenced by the timing of rainfall, which is difficult to predict precisely, leading farmers to depend more on observational cues and traditional knowledge rather than advisories.

Understanding these barriers is crucial to enhancing the relevance of climate services, particularly for less-adopted activities. Improving irrigation infrastructure and increasing awareness about the benefits of climate advisories for land preparation could potentially boost adoption in these areas.

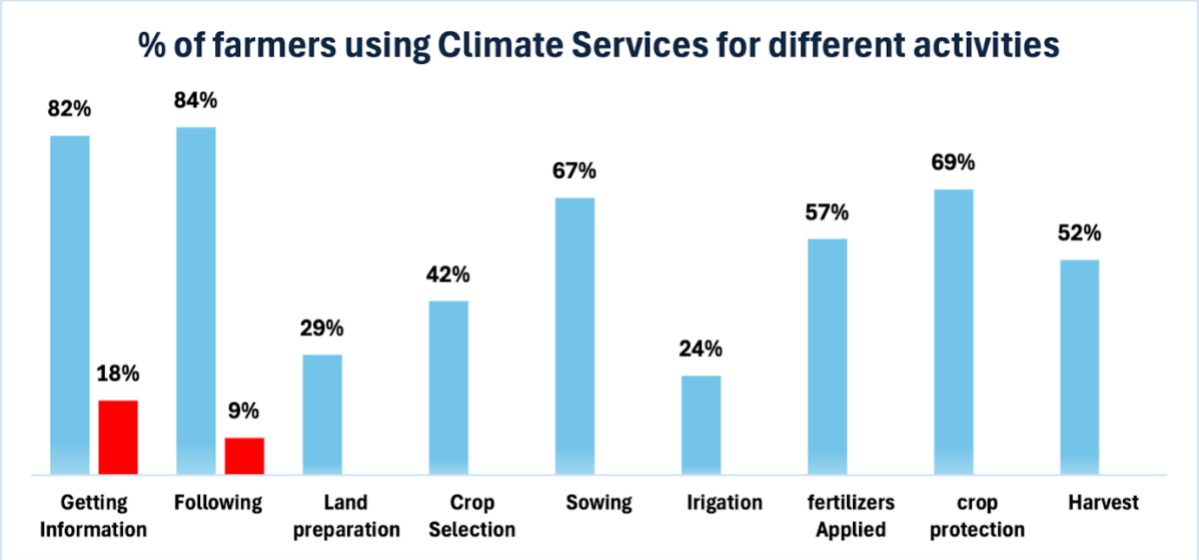

Figure 9: Adoption of Climate Services for Farming Operations

Factors Influencing Farmer Decision-Making Across Farming Stages:

Farmers make decisions across various stages—from land preparation to harvest—based on a combination of traditional practices, market dynamics, and climate advisories. Each stage is shaped by specific influences, as summarized in Figure 10: Factors Influencing Decision-Making Across Stages.

- Land Preparation: Traditional knowledge plays a significant role, with 51% of farmers relying on practices passed down through generations, focusing on soil tillage and field preparation.

- Crop Selection: Market demand is key, influencing 38% of farmers. Farmers often choose crops based on expected profitability, market prices, and past success, supported by family discussions. In future, seasonal climate forecasts based agro advisories could benefit farmers in making right decisions to enhance resilience.

- Sowing: Weather advisories significantly impact sowing decisions for 27% of farmers, helping align planting with favorable weather conditions, such as optimal rainfall.

- Irrigation: Weather advisories guide 32% of farmers on irrigation schedules, though traditional methods remain prevalent due to limited water infrastructure.

- Fertilizer Application & Crop Protection: Decisions here are largely influenced by input availability (26% for fertilizer, 31% for crop protection) along with traditional practices.

- Harvest: Market demand drives harvest decisions for 38% of farmers, with timing based on prevailing market prices to ensure better profitability.

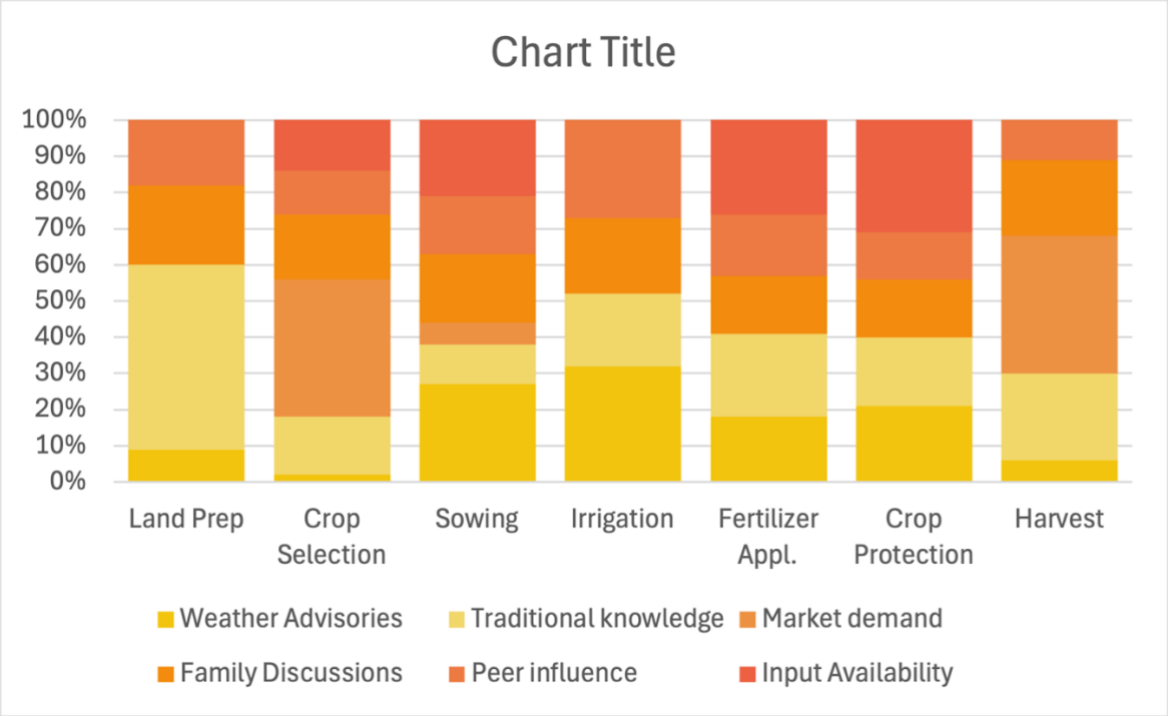

Figure 10: Factors influencing decision-making across stages

4. Understanding Farmer Decision-Making Dynamics:

The "Decision Dynamics Loop Diagram" below illustrates the complex interplay of various factors that influence the decision-making process of farmers at different farming stages. These factors include traditional knowledge, weather advisories, market demand, input availability, family discussions, and peer influence, among other key elements. The diagram captures both direct and indirect influences on each stage, demonstrating how farmers manage decisions regarding activities like land preparation, crop selection, sowing, irrigation, fertilizer application, crop protection, and harvest.

By visualizing these influences, the diagram provides a comprehensive understanding of the dynamic nature of decision-making in farming, especially under the conditions of climate variability. It highlights how farmers integrate multiple information sources, traditional practices, and economic

considerations into their management practices.

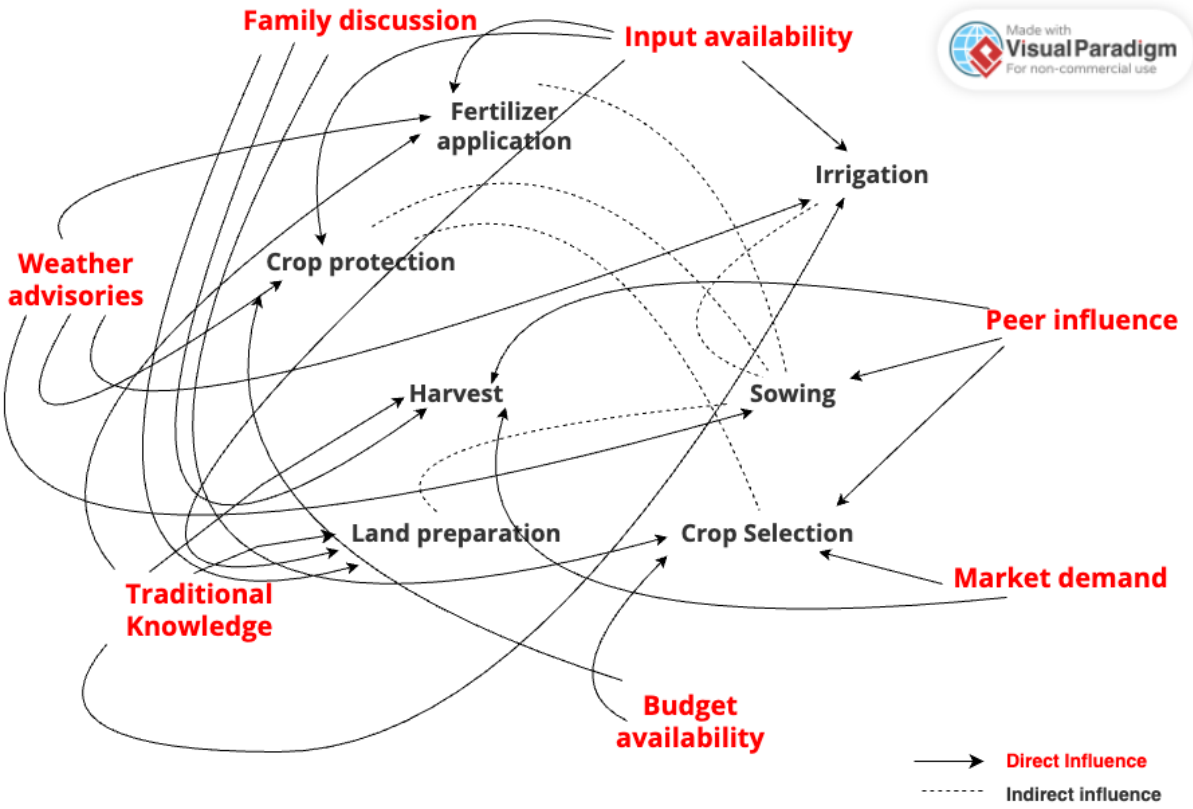

Figure 11: Decision Dynamics Loop Diagram: Influences on Farmer Decision-Making Across Farming Stages

As shown in the Figure 11, decision-making by the farmer is not a linear process but rather a dynamic cycle influenced by multiple feedback loops.

- **Traditional Knowledge**: Traditional knowledge, often passed down through generations, has a direct impact on activities such as **land preparation** and **crop protection**. Farmers draw upon past experiences to decide the best time and method to prepare land or to use natural repellents for pest control.
- **Weather Advisories**: Weather advisories, represented as a crucial influencing factor, play a significant role in determining **sowing times, irrigation schedules,** and **crop protection** measures. Timely weather information helps farmers align their sowing with rainfall and avoid

potential losses due to adverse weather conditions.

- **Market Demand**: The market demand primarily drives decisions around **crop selection** and **harvest timing**. When market prices for a particular crop are high, farmers may choose to allocate more land to that crop or adjust their harvest timing to maximize profit.
- **Input Availability and Budget**: Factors like **input availability** and **budget constraints** are critical in deciding stages like **fertilizer application** and **crop protection**. Farmers' access to fertilizers, pesticides, and funds directly influences their ability to manage crops effectively.
- **Peer Influence and Family Discussions**: Family discussions and peer influence also play key roles in shaping decisions. Farmers often consult with family members on **irrigation and crop selection**, and peer practices heavily influence whether to try new crops or farming methods.

The interplay between these factors highlights the importance of providing well-timed, relevant climate advisories and supporting farmers in balancing **economic, environmental, and social considerations**. By understanding this complex decision-making process, interventions can be better tailored to fit farmers' needs, enhancing their resilience to climate challenges and improving overall productivity.

5. Discussion

The findings from this study provide in-depth understanding of the decision-making dynamics of farmers in Rayagada and Gajapati, Odisha. Farmers' decisions, covering stages from land preparation to harvest, are shaped by a confluence of traditional knowledge, market dynamics, weather advisories, and social influences.

Traditional knowledge played a foundational role, particularly in land preparation and pest management. However, with increasing climate unpredictability, relying solely on these methods has proven insufficient. Many farmers have started integrating modern weather advisories from platforms like ISAT, allowing them to make more informed decisions regarding sowing dates, irrigation

schedules, and fertilizer applications. Data from the study also highlight the significance of market dynamics, particularly for crop selection and harvest timing, as farmers prioritize crops with better market returns.

The decision dynamics loop diagram included in this report captures the interconnected nature of the various influencing factors, illustrating that decision-making is not linear but instead involves a series of continuous feedback loops. For example, weather advisories not only inform immediate decisions such as sowing but also indirectly shape irrigation and pest control strategies throughout the farming season. This complexity underlines the need for a comprehensive understanding of how different factors interplay at each stage of the agricultural cycle.

Nevertheless, challenges remain, particularly regarding the adoption of digital advisories. Farmers frequently face issues with poor connectivity, a lack of locally relevant information, and limited access for female farmers. Gender-based disparities were notably evident, with women often having less access to advisory information, despite their significant involvement in farm operations. Addressing these challenges is crucial for ensuring equitable access to information and resources.

Integrating traditional practices with digital innovations is essential to overcome these barriers. The development of culturally sensitive, localized climate advisories that are accessible to all community members could help bridge existing gaps. Such an integrated approach would empower farmers to navigate climate variability and market uncertainties more effectively, leading to a more resilient agricultural system that meets the specific needs of Rayagada and Gajapati's farming communities.

6. Conclusions:

This study highlights the complex decision-making processes of farmers in Rayagada and Gajapati, Odisha, where decisions are influenced by traditional knowledge, market demand, weather based advisories, and social influences. Tools like ISAT have played a crucial role in mitigating climate risks, though the uneven adoption of these services across different farming stages suggests a need for targeted support and improved accessibility.

To better support these farmers, integrated advisory services that combine traditional wisdom with digital tools are essential. These services must be culturally relevant, localized, and adaptable to address the unique socio-economic challenges faced by the farming communities in these regions. By enhancing advisory integration and ensuring equitable access, farmers can build greater resilience against climate variability, ultimately leading to improved agricultural productivity and outcomes for vulnerable populations.

Acknowledgments

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Annexure:

Survey to assess farmers' decision dynamics through Agro advisories and perceptions about potential uses of advisories

Interview information

Name of Interviewer	
Date of Interview	
Starting Time	
Ending Time	
State	
District	
Block	
Village	
Latitude	
Longitude	

1. DEMOGRAPHIC PROFILE

a. Respondent: No: (allot a serial number 001,002,003)

Name	
Gender	Male/Female
Age	18-25/25-35/35-45/45-60/Above 60
Marital status	Single/Married/Divorced/Widowed
Level of education	Not Educated/Primary/Secondary/Diploma/Degree
Literacy level	Cannot read and write/Can sign (write) only/Can read only/Can read and write
Employment status	Employed/ Self Employed/Farmer/Other….....
Is household head?	Yes/No
If not relationship with head	

b. Household Composition (including respondent):

Household members	Male	Female
Aged <16 years		
Aged 16-40 years		
Aged 40-60 years		
Aged >60 years		

c. Dependence on agriculture. (Sources of income and their share in total income)

Source	Share in total income (%)

Agriculture (crops)	
Livestock (cattle, poultry, sheep, goat etc.)	
Regular employment	
Casual employment	
Business	
Remittances from family members	
Others (specify)	

d. Land holding

Ownership	Total land (ac)	Rental value/ac	Cultivated (ac)	Crops grown	Irrigation source
Owned (self)					
Owned (Joint)					
Rented in					
Rented out					

e. Livestock ownership:

Livestock	Owned (Nos)	Sold during the season	Amount received	Purchased during the season	Amount invested
Cattle					
Sheep/goat					
Poultry					
Others (Specify)					

f. **Which crops are you cultivating present?**

	Crop	Variety	Area (acre)	Irrigated	Sowing date	Fertilizer N: P: K
First crop						
Second crop						
Third crop						
Intercrop (Specify) ex: GN60+PP40						

g. Which crop you cultivated in 2023?

	Crop	Variety	Area (acre)	Irrigated /Rainfed	If irrigated, source?	Sowing date	Fertilizer N:P: K	Yield (Q/ac)
First crop								

Second crop								
Third crop								
Intercrop (Specify) ex: GN60+PP40								

Stage-1 pre-season

2. Access, timeliness and appropriateness of the messages

Item	Response	If not
Have you received the pre-season messages in the may month?	Yes/No	If yes, for what? [ ] No Use [ ] Helps in complete seasons 'planning [ ] Helps in land allocation [ ] Helps in choosing the crop [ ] Helps in choosing managing investment [ ] Others_____
Are the messages clear and easy to understand?	Yes/No	[ ] Messages are very brief [ ] Messages are very long [ ] Language is difficult to understand
Will the pre-season messages inform you on the coming season's condition?	Yes/No	would like to get any additional information? If yes mention [_____] [_____] [_____]
Are there any other sources through which you get similar information?	Yes/No	If yes what are the sources [ ] University/Agri. Department [ ] NGOs [ ] Pvt companies/Input dealers [ ] Radio/TV/News paper [ ] Neighbour/friend
How do you rate the information from ISAT?	Good/Not good	If not good [ ] Irregular access and not dependable [ ] Difficult to understand and use [ ] Less accurate and erratic
How do you rate the information from other sources?	Good/Not good	[ ] Irregular access and not dependable [ ] Difficult to understand and use [ ] Less accurate and erratic

3. Reliability and usefulness of the messages in decision making

Item	Response	Why
What was your expectation about the season at the start of the season in May/June?	Good/Average/Poor	[ ] My own experience [ ] Since last season was poor [ ] Based on village elders/friends etc. [ ] Based on TV/Newspaper report
Was there any change in your expectation after receiving the message?	Yes	[ ] More scientific [ ] Trust in the message
	No	[ ] Matched with my expectation [ ] Belief on my expectation [ ] Unreliability of forecast
How do you rate the 2023 kharif season?	Good/Average/Poor (multiple selections)	[ ] Erratic start [ ] Long dry spells [ ] Less rain during critical stages [ ] Others (specify)_____
How do you rate the reliability of the information in the message?	Reliable/Average/Unreliable	[ ] Mostly correct [ ] Correct more than 75% times [ ] Correct more than 50% times [ ] Mostly incorrect

4. Contribution to change in decision and the value of changed decision

a. Changed decisions

	Decision taken based on message	*Possible decision if there is no message*
What are the three key decisions that you took based on the messages?		

b. Influence of advisory in making various decisions

Decision	Role of advisory
Selection of crops grown during the season *(Others include advice from tv, radio, Agri dept, friends etc., availability of seed, market price, land suitability, crops grown last year)*	[ ] 100% by advisory [ ] 75% advisory and 25% others [ ] 50% advisory and 50% others [ ] 25% advisory and 75% others [ ] 100% others
Allocation of land to various crops *(Others include land availability, family requirements, market price, land suitability)*	[ ] 100% by advisory [ ] 75% advisory and 25% others [ ] 50% advisory and 50% others [ ] 25% advisory and 75% others [ ] 100% others
Time of planting of crops *(Others include completion of land preparation, seed availability,*	[ ] 100% by advisory [ ] 75% advisory and 25% others [ ] 50% advisory and 50% others

labour availability, amount of rainfall or moisture in the soil)	[ ] 25% advisory and 75% others [ ] 100% others
Would you like to continue to receive the in-season messages?	[ ] Yes, Certainly [ ] Yes, If possible [ ] Yes, but do not mind missing [ ] No, do not want to receive
If yes, With the current levels of reliability, is this information useful in planning farm operations?	[ ] Land preparation [ ] Sowing [ ] Intercultural operations [ ] Spraying/fertilizer application [ ] Harvesting
In your own assessment, what will be the value of this information?	In Rs_____

c. What are the key indicators that drive your decision-making in seasonal planning? Multiple Ans

1. Seasonal forecast
2. Soil condition
3. Market prices
4. Experience from past season
5. Govt agencies recommendations
6. Based on seed/fertilizer availability
7. Based on your budget
8. Other _____

d. Preferred medium and format to receive advisory

Q) Which medium do you prefer to receive agro advisory?

1. Mobile SMS

2. WhatsApp
3. Telegram
4. Meghdooth
5. Other_____

Q) In which format do you like to receive?

1. Voice
2. SMS text
3. Infographic
4. Video

5. Other_____

5. Overall assessment: (all are multiple answers)

I found messages are extremely useful because	[ ] They provide highly reliable information [ ] They advise me about various operations [ ] They improve my confidence in making decisions [ ] They make me think and act in making decisions
Message based decision making helps me in	[ ] Selecting right crops [ ] Making timely decisions [ ] Doing better management [ ] Achieving better yield [ ] Reduced cost of cultivation
I would like the messages to be	[ ] More frequent [ ] With more information [ ] More specific to my conditions

6. Farmer's perception on various climate related changes

Major impact area	Indicators	Farmer's responses (Yes/No/Don't Know)
Climatic Conditions	Changes in rainfall	
	Changes in temperature	
	No of rainy days are decreasing	
	Warming days are increasing	
	Long dry spell	
	Rainfall pattern unpredictable	
	Late onset of monsoon	
Environmental	Water source and availability is decreasing	
	Changes in land use and land cover pattern	

interactions	Changes in cropping pattern and season	
	Frequency of drought is increasing	

7. Adaptation measures by farmers due to climate change

Phenomenon	Yes/No	If yes, Adaptation measures	Yes/No
Have you experienced delay in monsoon onset?		Have you adjusted or changed sowing dates?	
Have you faced less available water, water shortage?		Did you opt for different Crop variety?	
Have you experienced Drought spells		Did you go for short duration?	
Did you see less production?		Did you change farming activity to non-farming activities?	
Have you faced Soil fertility issues?		Any intercropping or rotation of crop?	

Questions for FGD - Decision-Making Influences

1. How do you decide the timing for land preparation? What are the main steps involved?
2. What specific factors do you consider when deciding on land preparation methods (e.g., traditional practices, weather advisories)?

3. How do you decide which crop to cultivate each season?
4. Who else is involved in helping you decide which crops to grow?
5. How do you select the seeds for sowing?
6. What factors influence your sowing date decisions?
7. How do weather advisories influence your sowing decisions?
8. How do you decide on your irrigation schedule? Do you follow a fixed schedule or adjust based on weather conditions?
9. Do you discuss irrigation-related decisions with family members or neighbors?
10. Does the availability of water resources or budget constraints impact how you plan irrigation?
11. How do you determine the quantity and timing of fertilizer application?
12. How do you plan pest control measures for your crops?
13. Do weather forecasts influence your decisions regarding pest control?
14. How do you decide when to harvest your crops?
15. Who else is involved in helping you make harvest-related decisions?
16. Do market prices play a significant role in determining your harvest timing?
17. How does your family or community influence the decisions you make at each farming stage?
18. How important is traditional knowledge in making decisions about farm management?
19. Do you also get influenced by what other farmers in your area are doing?
20. Do you use any climate advisory services to help you make farming decisions? If yes, which ones?
21. Which stages of farming (e.g., sowing, irrigation, fertilizer application) do you find climate advisories most useful for?
22. What challenges do you face in using digital or climate advisory services?
23. Do you think digital advisories should provide more localized information to make them more effective for your specific needs?
24. What improvements do you think are needed in current advisory services to help you make better decisions?