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WORKSHOP REPORT

User Consultation Workshop on SukhaRakshak AI for Drought Management in India

Hyderabad, India | August 13, 2025

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December 2025

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Acknowledgement

This work was undertaken as part of the CGIAR Climate Action Program, the CGIAR Sustainable Farming Program and the CGIAR Accelerator for Digital Transformation. We would like to thank all funders who supported this research through their contributions to the CGIAR Trust Fund (www.cgiar.org/funders).
The authors gratefully acknowledge the research and funding support of the Indian Council of Agricultural Research (ICAR).

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Citation

Bhaduri, T.; Amarnath, G.; Bhatpuria, D.; Kapoor, S.; Sikka, A. 2025. *User Consultation Workshop on SukhaRakshak AI for Drought Management in India.* Report of the User Consultation Workshop on SukhaRakshak AI for Drought Management in India, Hyderabad, India, 13 August 2025. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Climate Action Program. 13p.

Front cover photo: Participants engaged in group discussions during the User Consultation Workshop on SukhaRakshak AI (*photo:* Tanmoy Bhaduri/IWMI)
Back cover photo: A woman farmer uses SukhaRakshak AI on a tablet during a field consultation in Manchal village, Ranga Reddy district, Telangana, India (*photo:* Tanmoy Bhaduri/IWMI)

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Contents

Background

India's agricultural economy remains acutely vulnerable to drought, a recurring climate hazard that affects nearly 68% of the country's cultivated area. Smallholder farmers—who constitute over 80% of the farming community—depend heavily on monsoon rainfall for their livelihoods. Variability in rainfall patterns, delayed onset of monsoons, and prolonged dry spells regularly disrupt agricultural productivity, water availability, and rural incomes. The effects of these droughts are further compounded by fragmented landholdings, limited irrigation infrastructure, and inadequate access to timely advisories or financial safety nets.

Over the decades, India has developed a robust institutional framework for drought monitoring and management. The South Asia Drought Management System (SADMS), developed jointly by International Water Management Institute (IWMI), Indian Council for Agricultural Research (ICAR), and Central Research Institute for Dryland Agriculture (CRIDA), has played a pivotal role in providing regional-level drought diagnostics using satellite data and meteorological indicators. SADMS helps government in decision-making, though quantifiable indicators utilised for drought declarations, relief planning, and monitoring of seasonal/ intra seasonal anomalies.

However, while SADMS and related systems offer crucial macro-level insights, they are often limited in their ability to deliver hyper-local, actionable information to those most affected—farmers and frontline extension workers. A persistent challenge remains in translating early warning signals into early and targeted field-level action. The time lag between drought onset, risk detection, advisory dissemination, and farmer response reduces the effectiveness of interventions and leaves communities exposed to escalating losses.

In addition, India's current drought management approaches mostly tend to emphasize reactive relief—such as compensation, emergency water and food supply, or fodder distribution—with far lesson anticipatory preparedness. Critical bottlenecks such as delayed alerts, fragmented communication, poor digital literacy, and lack of contextualized advisories prevent smallholders from making proactive decisions.

The **User Consultation Workshop on SukhaRakshak AI for Drought Management in India** was held on 13 August 2025 at the ICAR-CRIDA campus in Hyderabad, jointly organized by the International Water Management Institute (IWMI) and the ICAR-Central Research Institute for Dryland Agriculture (CRIDA).

About SukhaRakshak AI ("Drought Protector")

India's first anticipatory, AI-powered drought advisory system is developed by IWMI in collaboration with ICAR and CRIDA. Developed on the foundational work of SADMS, it is India's first AI-powered drought advisory system that bridges early warning with early action. SukhaRakshak AI leverages artificial intelligence, satellite-based earth observation, probabilistic weather forecasts, and localized agriculture contingency plans to deliver personalized, predictive drought advisories in over 20 Indian languages. It empowers farmers to take timely decisions—such as shifting to short-duration crops, adopting water-saving practices, or preparing livestock feed alternatives—before the drought's impacts escalate.

At the core of SukhaRakshak AI is a powerful hybrid AI architecture that leverages Google's Gemini large language model (LLM) integrated with a retrieval-augmented generation (RAG) engine and vector database (Qdrant) for real-time advisory generation. It uses seasonal and short-term forecasts, satellite data derived indices (SPI, NDVI, VCI, IDSI), and localized agricultural contingency plans to provide context-specific guidance. The platform ensures last-mile delivery through mobile apps, SMS, WhatsApp, IVR, and community radio, with multilingual and feedback-enabled interfaces to support inclusive and adaptive drought risk management.

This consultation workshop, convened by IWMI and ICAR-CRIDA, seeks to present SukhaRakshak AI to key stakeholders, gather feedback from users and decision-makers, and co-design strategies for field-level deployment and scaling. It offers a unique opportunity to transition India's drought management paradigm from reactive relief to anticipatory resilience, aligned with national priorities namely Mission Mausam, Pradhan Mantri Fasal Bima Yojana (PMFBY), Pradhan Mantri Krishi Sinchayee Yojana

(PMKSY), Digital Agriculture Mission (2021–2025), National Initiative on Climate Resilient Agriculture (NICRA), and National Mission for Sustainable Agriculture (NMSA) and several other initiatives.

Workshop Objectives

The user consultation workshop on SukhaRakshak AI aims to serve as a pivotal platform for dialogue, co-creation, and alignment among key stakeholders involved in drought risk management, agricultural extension, AI innovation, and climate resilience in India. As SukhaRakshak AI moves from the design and development phase toward operational deployment, this workshop provides a critical opportunity to validate system features, fine-tune its relevance to local needs, and explore avenues for institutional integration and scale-up.

Specifically, the workshop will:

1. **Demonstrate the functionality and architecture of SukhaRakshak AI**
   Present the system's core components—AI-based drought detection, seasonal forecast integration, satellite data analytics, and the embedding of district-level contingency plans to showcase how early warning can be converted into timely, personalized action on the ground.

2. **Validate user-centric design and delivery channels through stakeholder feedback**
   Gather insights from farmers, extension officers, state officials, and NGOs on usability, accessibility, language preferences, and interface design. This ensures that SukhaRakshak AI meets the diverse information needs and operational realities of last-mile users.

3. **Strengthen institutional partnerships for operationalization and scaling**
   Identify concrete roles for central and state government agencies (e.g., ICAR, CRIDA, NRAA, NDMA, Agriculture Departments, KVKs), development partners, and the private sector in deploying the system within ongoing programs such as PMFBY, contingency planning, and agri-insurance platforms.

4. **Co-create implementation pathways across different agro-ecological zones**
   Facilitate discussion on regional customizations—such as aligning advisories with cropping calendars, integrating local knowledge systems, and addressing gender and social inclusion gaps—to ensure context-specific relevance and ownership.

5. **Explore integration with national and state drought risk governance frameworks**
   Examine opportunities to embed SukhaRakshak AI into national drought monitoring protocols, state-level disaster management workflows, and digital agriculture initiatives—supporting the transition from reactive to anticipatory risk management.

6. **Build a roadmap for future collaboration, testing, and scale-up**
   Establish a shared vision for collaborative field testing, feedback loops, capacity building, and adaptive learning. The workshop will result in a set of co-agreed actions for piloting and mainstreaming the system across selected states and districts.

Welcome Remarks

Dr. K.V. Rao, Principal Scientist and Head, Division of Resource Management (DRM), ICAR-CRIDA, extended a warm welcome to all dignitaries and participants. In his address, he reflected on the current water scarcity challenges across the country and underscored the pressing need for effective drought management strategies. He highlighted the longstanding collaboration between IWMI and CRIDA in advancing drought monitoring and management tools and explained why timely monitoring is essential for enabling early action and building resilience among farming communities. Dr. Rao emphasized the transformative role of Artificial Intelligence in strengthening drought preparedness and outlined the objectives of the User Consultation Workshop. He noted that SukhaRakshak AI marks a first-of-its-kind initiative in India, providing an innovative AI-powered system to support proactive and adaptive drought risk management.

Setting the Scene

Dr. Giriraj Amarnath, Principal Researcher and Research Group Lead – Water Data for Climate Resilience, IWMI, set the stage by outlining the key challenges of drought in India and their implications for agriculture and livelihoods. He discussed the Agricultural Vulnerability Index and highlighted possible future drought scenarios, underscoring the urgent need for proactive measures. Dr. Amarnath emphasized the importance of integrating existing drought-related initiatives under a unified platform to enhance coordination and impact. Introducing SukhaRakshak AI as an AI-based "drought protector," he encouraged participants to share their perspectives and feedback to strengthen the system's relevance and usability. He further stressed that effective drought management demands a holistic approach, addressing not only technological innovations but also institutional and community-level integration. Highlighting data-related issues such as availability, quality, and interoperability, Dr. Amarnath noted that stronger collective action among stakeholders is essential to move from fragmented efforts toward coordinated resilience-building.

Welcome Remarks

Dr. V. K. Singh, Director, ICAR-CRIDA, extended his gratitude and a warm welcome to all dignitaries and participants. In his address, he highlighted the achievements of the South Asia Drought Monitoring System (SADMS), which has laid a strong foundation for advancing drought monitoring in the region. He presented the key features of *SukhaRakshak AI*, explaining how the system integrates Artificial Intelligence with district- and block-level contingency plans to deliver timely, actionable advisories. Dr. Singh noted the need for further upgrades, particularly the integration of commodity-specific data to enhance the tool's precision and usability. He emphasized the inclusive nature of the platform, which supports 22 major Indian languages and can serve a wide range of users, including individual farmers, civil society organizations, agriculture departments, Krishi Vigyan Kendras (KVKs), and policymakers.

Dr. Singh further stressed that once validated, *SukhaRakshak AI* should be showcased on larger platforms in collaboration with ATARIs and KVKs to drive large-scale adoption. He suggested informing ICAR Deputy Director Generals (DDGs) to enable them to present the tool at national forums and policy platforms. Concluding his remarks, he thanked IWMI for its continuous support to ICAR and CRIDA in strengthening drought risk management in India.

Participants gather for the User Consultation Workshop on SukhaRakshak AI at ICAR-CRIDA, Hyderabad, on August 13, 2025 (*photo:* Tanmoy Bhaduri/IWMI)

Dr. Alok Sikka, IWMI Representative – India & Bangladesh / Senior Fellow, reflected on his long-standing experience of working with ICAR-CRIDA and the National Rainfed Area Authority (NRAA), and extended a warm welcome to delegates from across different states. He noted that nearly two-thirds of India's

geographical area is drought-prone, stressing that drought, once viewed primarily as an agricultural challenge, is now posing severe threats to the drinking water sector as well. Tracing the journey of drought monitoring in India, he recalled the development of the South Asia Drought Monitoring System (SADMS) and the subsequent creation of the INTEGRATE platform, following feedback from the ICAR Director General.

Dr. Sikka emphasized the need to make drought advisories more dynamic, localized, and actionable, highlighting that *SukhaRakshak AI* represents India's first AI-powered drought advisory system. He noted that while the Krishi DSS platform largely focuses on drought declaration, *SukhaRakshak AI* is designed to prioritize proactive drought management, offering advisories in 22 Indian languages to overcome a major barrier in last-mile communication. Stressing the importance of collaboration, he expressed IWMI's strong interest in working with NRAA to integrate and complement both Krishi DSS and *SukhaRakshak AI*, and eventually align with the Ministry of Agriculture and Farmers Welfare for broader adoption.

Susama Sudhisri from National Rainfed Area Authority, Ministry of Agriculture and Farmers Welfare, Government of India, delivers remarks during the workshop (*photo*: Tanmoy Bhaduri/IWMI)

He called on participants to provide candid feedback and practical suggestions for improving the tool before its national-level launch. Dr. Sikka underlined that *SukhaRakshak AI* must be validated and demonstrated in partnership with drought-prone states, ensuring it is refined through field-level learning before scaling up. Concluding his remarks, he urged collective action to enable widespread adoption of this first-of-its-kind AI-based drought management system for India.

Special Remarks

Dr. Susama Sudhisri, Technical Expert, National Rainfed Area Authority (NRAA), Ministry of Agriculture and Farmers Welfare, Government of India, shared her perspective on the potential of SukhaRakshak AI. She noted that upon learning about the system, she saw it as a highly promising opportunity to strengthen drought risk management. Highlighting NRAA's close collaboration with ICAR-CRIDA, she pointed out that multiple indices have already been developed under SukhaRakshak AI, including those tailored for rainfed regions particularly for rainfed cultivated areas, which account for 45% of the country's net sown area.

Dr. Sudhisri informed participants that the Government of India has allocated dedicated funds for rainfed area development across 12 states under catalytic assistance to 12 most drought prone states in India, including Andhra Pradesh and Telangana, and stressed that SukhaRakshak AI could be integrated into these programs as part of an implementation and scale-up strategy. She suggested involving the National Disaster Management Authority (NDMA) to ensure broader institutional alignment and resilience planning. Further, she proposed merging *SukhaRakshak AI* with the Ministry's Krishi DSS platform, noting that integration with existing decision support systems is vital for achieving efficiency, sustainability, and nationwide impact.

A policy brief launched by dignitaries during the workshop (*photo*: Tanmoy Bhaduri/IWMI)

After the opening session, Dr. Alok Sikka, Dr. Giriraj Amarnath, Dr. Vinod Kumar Singh, Dr. K.V. Rao, and Dr. Susama Sudhishri launched a Policy Brief titled “SukhaRakshak AI – Transforming Drought Preparedness in India” outlining strategies to integrate anticipatory AI systems like SukhaRakshak AI into India’s drought risk governance frameworks.

Presentation: SukhaRakshak AI – Overview, Rationale, and Innovations

The session was led by Dr. Giriraj Amarnath, who introduced participants to the evolution of drought monitoring systems in South Asia. The presentation began with an overview of the South Asia Drought Monitoring System (SADMS) and the India Drought Management System, outlining their capabilities and the institutional partnerships that enabled their development.

A hands-on demonstration of *SukhaRakshak AI* followed, showcasing the system’s user interface, features, and operational workflows. The team highlighted how the tool integrates Artificial Intelligence with multi-source datasets—including satellite-based indices, weather forecasts, and contingency plans—and supports advisories in 22 Indian languages to ensure inclusivity.

Through live examples, the presenters illustrated the wide-ranging applications of the platform for farmers, policymakers, civil society organizations, and Krishi Vigyan Kendras (KVKs). They emphasized the system’s transformative potential in moving from reactive relief measures to proactive drought monitoring and management, thereby empowering users at multiple levels to take timely and informed decisions.

Technical Session: Architecture, Forecast Integration, Advisory Logic & Co-designing User Interfaces and Delivery Channels

The session, led by Mr. Dhyey Bhatpuria and Ms. Sanya Kapoor, provided participants with a deeper understanding of the technical backbone of SukhaRakshak AI. The presenters outlined the system’s

architecture, explaining how the hybrid AI framework integrates large language models with retrieval-augmented generation (RAG) and vector databases for real-time advisory generation. They highlighted how seasonal and short-term forecasts, combined with satellite-derived indices such as SPI, NDVI, VCI, and IDSI, feed into the system to generate predictive and context-specific drought advisories.

The session also detailed the advisory logic, showing how district- and block-level contingency plans are embedded within the platform to deliver actionable recommendations. Participants were introduced to the co-design process for user interfaces and delivery channels, emphasizing inclusivity and accessibility. Demonstrations covered multilingual support in 22 Indian languages and the use of multiple dissemination channels such as mobile apps, SMS, WhatsApp, IVR, and community radio.

Mr. Bhatpuria and Ms. Kapoor underscored the importance of tailoring advisory formats based on user feedback from farmers, extension workers, policymakers, and civil society organizations. They emphasized that effective last-mile delivery, grounded in user-centric design, is central to making *SukhaRakshak AI* a transformative tool for anticipatory drought management across India.

Group Discussions

Participants were divided into five thematic groups to deliberate on critical aspects of SukhaRakshak AI and provide feedback for its refinement and future deployment. Each group engaged in in-depth discussions, followed by presentations and a synthesis dialogue in plenary.

1. **Local Relevance and Advisory Design**

   Discussions focused on aligning advisories with local cropping calendars, agro-ecological conditions, and community knowledge systems. Participants emphasized the need for region-specific customization and inclusion of gender-sensitive perspectives to ensure advisories are practical and equitable.

2. **Delivery Channels and Last-Mile Connectivity**

   The group highlighted the importance of multi-modal dissemination—including SMS, WhatsApp, IVR, mobile apps, and community radio—given varying levels of digital access and literacy. They stressed that advisory formats must remain simple, multilingual, and culturally contextualized for effective adoption.

3. **Data, Forecast Integration, and Trust**

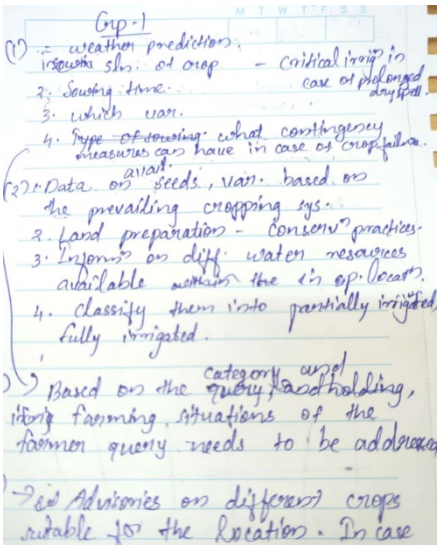
   Participants pointed to challenges around data availability, quality, and interoperability. Building user trust through transparent methodologies, validation of advisories, and regular feedback loops was considered essential for ensuring credibility and sustained use of the platform.

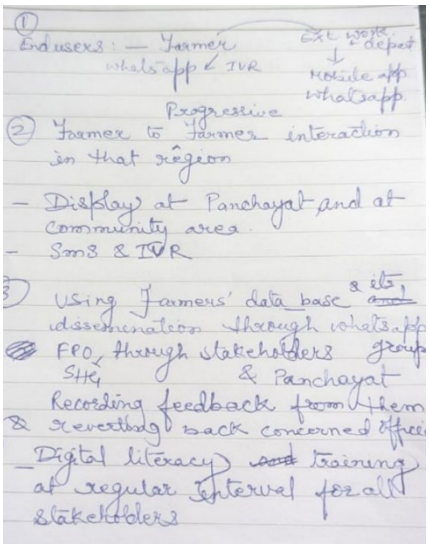
4. **Institutional Integration and Operationalization**

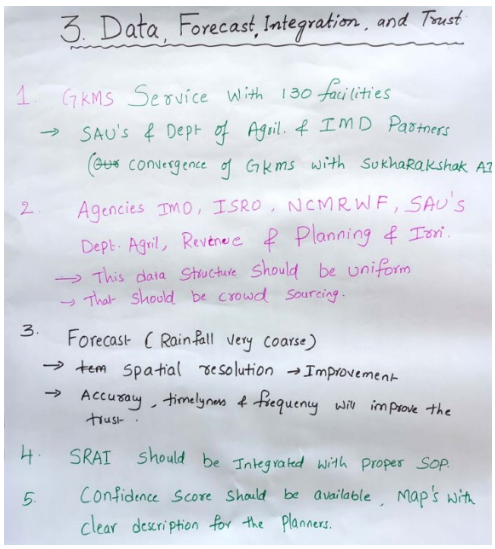
   This group underscored the need to embed SukhaRakshak AI within existing national and state-level drought management frameworks, including linkages with ICAR, NRAA, NDMA, agriculture departments, and Krishi Vigyan Kendras (KVKs). Clear roles, protocols, and partnerships were identified as key for smooth operationalization.

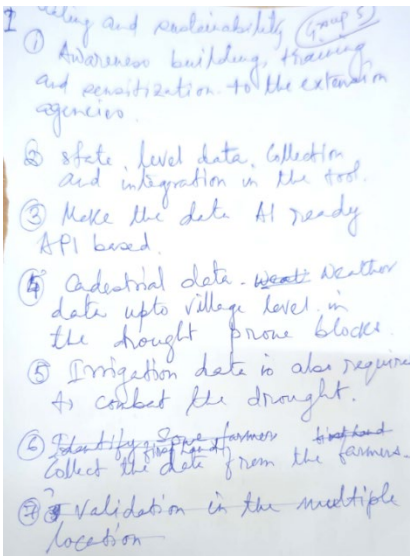
5. **Scaling and Sustainability**

   Participants emphasized phased rollouts, starting with pilot testing in drought-prone districts before moving toward national adoption. Suggestions included securing institutional champions, ensuring long-term financing, and aligning with programs such as PMFBY, PMKSY, and NICRA to ensure sustainability and policy integration.









Suggestions received from each group during the workshop (*photo:* Tanmoy Bhaduri/IWMI)

Feedback Synthesis

1. Overall Value of the AI Chatbot

- Recognized as the *need of the hour* – comprehensive, timely, and worthy.
- Strong potential for proactive drought risk management.

2. Data, Forecasts, and Integration

- Convergence of datasets from NRSC, IMD, Department of Agriculture, Irrigation, and Planning through SukhaRakshak AI.
- Integration of all state-level data and improvement in spatial resolution.
- Data should be AI-ready, with API-based structures for interoperability.
- Emphasis on village-level data collection and use of farmer databases.

3. Advisory Design and Customization

- Advisories should be tailored to different farmer categories and situations.

- Crop-specific advisories, including intercropping options, should be location-sensitive.
- Integration of seed variety data based on prevailing cropping systems.
- Development and regular updating of contingency plans at sub-district and village levels.

4. Delivery Channels and Outreach

- Proposed WhatsApp bot, IVR system, and mobile web app for wide accessibility.
- Use of short YouTube videos in local languages for farmer awareness.
- Display information at Panchayat and community levels for wider dissemination.
- Inclusion of FPOs (Farmer Producer Organizations) and SHGs (Self-Help Groups) in outreach efforts.

5. Capacity Building and Trust

- Regular feedback and validation mechanisms to build credibility.
- Digital literacy training for farmers and stakeholders at regular intervals.
- Queries from farmers should be addressed promptly within the system.

6. Infrastructure and Water Management

- Water storage options (small ponds, check dams, and other local structures) should be factored into advisories.
- Integration of localized water management practices into the tool.

During the synthesis, participants collectively recognized SukhaRakshak AI as a transformative step toward anticipatory drought management in India. They agreed on the importance of user-centered refinement, institutional collaboration, and iterative piloting to build confidence in the system. The session concluded with consensus on developing a shared roadmap for validation, integration, and scale-up, ensuring that the tool delivers practical, trusted, and inclusive solutions for farmers and decision-makers alike.

Vote of Thanks

Dr. M. A. Sarath Chandran, Scientist (Agricultural Meteorology), ICAR-CRIDA, delivered the Vote of Thanks. He expressed gratitude to all dignitaries, speakers, and participants for their valuable contributions to the workshop. He acknowledged the collaborative efforts of IWMI and ICAR-CRIDA in conceptualizing and organizing the consultation, and thanked representatives from government agencies, research institutions, civil society organizations, and farming communities for their active engagement. Dr. Chandran emphasized that the insightful discussions and feedback shared during the workshop will play a vital role in refining and scaling SukhaRakshak AI.

Annex A.

Table A.1. Agenda of the workshop

Time	Session	Lead/Speaker
09:30 – 09:45	Registration	
09:45 - 10:00	Welcome Remarks	Dr. K.V. Rao, ICAR-CRIDA
	Setting the Scene	Dr. Giriraj Amarnath, Principal Researcher & Research Group Lead – Water Data for Climate Resilience, IWMI
10:00 – 10:15	Opening Remarks	Dr. Vinod Kumar Singh, Director, ICAR-CRIDA Dr. Alok Sikka, Country Representative India & Bangladesh / Senior Fellow, IWMI
10:15 – 10:30	Special Remarks	Dr. Susama Sudhisri, Technical Expert, National Rainfed Area Authority (NRAA), Ministry of Agriculture and Farmers Welfare, Government of India
10:30 – 11:00	Presentation: SukhaRakshak AI – Overview, Rationale, and Innovations	Dr. Giriraj Amarnath
11:00 – 11:30	Open Discussion: Opportunities and Gaps in Drought Management	All Participants
11:30 – 11:45	Tea Break & Group Photo	
11:45 – 13:00	Technical Session 1: Architecture, Forecast Integration, Advisory Logic	Mr. Dhyey Bhatpuria, Researcher, IWMI Ms. Sanya Kapoor, Intern, IWMI
13:00 – 14:00	Lunch	
14:00 – 14:30	Technical Session 2: Co-designing User Interfaces and Delivery Channels	Mr. Dhyey Bhatpuria, Researcher, IWMI Ms. Sanya Kapoor, Intern, IWMI
14:30 – 15:00	Group Discussion: (1) Local Relevance and Advisory Design (2) Delivery Channels and Last-Mile Connectivity (3) Data, Forecast Integration, and Trust (4) Institutional Integration and Operationalization (5) Scaling and Sustainability	Facilitated by CRIDA & IWMI Team
15:00 – 15:30	Group Presentations & Synthesis Discussion	
15:30 – 16:00	Closing Remarks & Next Steps	ICAR-CRIDA & IWMI

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