

Scaling Up Climate Services for Farmers in Africa and South Asia

Workshop Report December 10-12, 2012
Saly, Senegal

Working Paper No. 40

CGIAR Research Program on Climate Change,
Agriculture and Food Security (CCAFS)

Arame Tall
Alexa Jay
Jim Hansen



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Working Paper

Scaling Up Climate Services for Farmers in Africa and South Asia

Workshop Report

December 10-12, 2012

Saly, Senegal

Working Paper No. 40

CGIAR Research Program on Climate Change,
Agriculture and Food Security (CCAFS)

Arame Tall, Alexa Jay, Jim Hansen

Correct citation:

Tall, A., A. Jay, J. Hansen, 2013. Scaling Up Climate Services for Farmers in Africa and South Asia Workshop Report. CCAFS Working Paper no. 40. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

This document is published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is a strategic partnership of the CGIAR and Future Earth. The views in this document cannot be taken to reflect the official opinions of CGIAR or Future Earth.

Contact:

CCAFS Coordinating Unit - Faculty of Science, Department of Plant and Environmental Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: ccaafs@cgiar.org

Creative Commons License



This Working Paper is licensed under a Creative Commons Attribution – NonCommercial–NoDerivs 3.0 Unported License.

Articles appearing in this publication may be freely quoted and reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

© 2013 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
CCAFS Working Paper no. 40

Photos:**DISCLAIMER:**

This Working Paper has been prepared as an output for Theme 2: Adaptation through managing climate risk under the CCAFS program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS, donor agencies, or partners. All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

Abstract

This report summarizes the proceedings of the workshop “Scaling Up Climate Services for Farmers in Africa and South Asia,” held in Saly, Senegal on December 10-12, 2012. The workshop brought together more than 100 experts from 30 countries and roughly 50 institutions to grapple with the challenge of supporting vulnerable farming communities through the production, communication, delivery and evaluation of effective agrometeorological information and advisory services; and to identify practical actions to address those challenges at scale.

Keywords

climate services; agrometeorological advisory services; Africa; South Asia.

About the authors

Arame Tall is a Scientist working for CCAFS Theme 2: Adaptation through managing climate risk, based at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). Dr. Tall's work focuses on strengthening the contribution of the CGIAR to climate services for agriculture. Contact: A.tall@cgiar.org, ICRISAT BP 320, Bamako, Mali.

Alexa Jay is a staff associate at the International Research Institute for Climate and Society (IRI), working on partnership development, communication and coordination for CCAFS Theme 2: Adaptation through managing climate risk. Contact: Ajay@iri.columbia.edu IRI, The Earth Institute, Columbia University, Lamont Campus, 61 Route 9W, Monell Building, Palisades, NY 10964-8000, USA.

James Hansen is a Research Scientist at the International Research Institute for Climate and Society (IRI), where he leads CCAFS Theme 2: Adaptation through managing climate risk. He has worked on managing climate-related risk for agriculture and food security since 1996. Contact: Jhansen@iri.columbia.edu, IRI, The Earth Institute, Columbia University, Lamont Campus, 61 Route 9W, Monell Building, Palisades, NY 10964-8000, USA.

Acknowledgements

The international workshop on “Scaling Up Climate Services for Farmers in Africa and South Asia,” held in Senegal on December 10-12, 2012, was made possible thanks to the generous support of the following organizations: the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the World Meteorological Organization (WMO), the US Agency for International Development (USAID), Engility Corporation, and the Climate Services Partnership (CSP). The authors also thank Carla Roncoli, Edward Carr, Surabhi Mittal, and Balaji Venkataraman for their edits and additions.



Participants at the Scaling Up Climate Services for Farmers in Africa and South Asia workshop.

Contents

Introduction.....	8
Workshop Agenda and Roadmap	10
Learning from national programs	12
Mali’s <i>Projet d’Assistance Agrometeorologique au Monde Rural</i>	12
India’s Agrometeorological Advisory Service	13
Addressing strategic challenges.....	15
Salience.....	15
Access	17
Legitimacy	19
Equity.....	21
Integration.....	22
Addressing the challenges at scale	25
Regional gaps and opportunities.....	25
Priority actions.....	28
Conclusions.....	31
Appendix 1: Workshop Agenda	33
Appendix 2: Participant List.....	35

Acronyms

AAS	India Integrated Agrometeorological Advisory Service
AWS	Automatic Weather Station
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CIMMYT	International Maize and Wheat Improvement Center
CREAM	Center for Research and Excellence in Agricultural Meteorology
CSP	Climate Services Partnership
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and communications technology
IMD	India Meteorological Department
IRI	International Research Institute for Climate and Society
NMS	National Meteorological Services
SMS	Short Message Service
USAID	United States Agency for International Development
WMO	World Meteorological Organization

Introduction

Smallholder farmers in the developing world are particularly vulnerable to the impacts of climate fluctuations and weather extremes. Although farming communities throughout the world have survived by mastering the ability to adapt to widely varying weather and climatic conditions, increasingly erratic climate variability and the rapid pace of other drivers of change are overwhelming indigenous knowledge and traditional coping practices. Effective climate information and advisory services offer great potential to inform farmer decision-making in the face of increasing uncertainty, improve management of climate-related agricultural risk, and help farmers adapt to change.

Jointly organized by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), the United States Agency for International Development (USAID), the World Meteorological Organization (WMO), and the Climate Services Partnership (CSP), the international workshop on “Scaling up Climate Services for Farmers in Africa and South Asia” (Saly, Senegal, 10-12 December 2012) brought together more than 100 experts from 30 countries and roughly 50 institutions (see Appendix 2) to grapple with the challenge of supporting vulnerable farming communities through the production, communication, delivery and evaluation of effective climate information and advisory services; and to identify practical actions to address those challenges at scale. Participants represented a cross-section of relevant stakeholders including researchers, practitioners, development organizations and farmers, spanning the climate and agricultural communities. Balanced representation among regions (West Africa, Eastern and Southern Africa, and South Asia) provided an opportunity for South-South learning and exchange.

The objectives of the workshop were:

- to capture and share lessons and evidence about how climate information and advisory services can be used to improve the lives of smallholder farmers, building on examples of good practice in sub-Saharan Africa and South Asia;
- to identify critical gaps in the design, delivery and effective use of climate-related information for risk management among smallholder farmers in sub-Saharan Africa and South Asia; and to identify and foster institutional linkages that could address those gaps;

- to foster collaboration between and within sub-Saharan Africa and South Asia on climate information and advisory services for smallholder farmers; and
- to initiate a collective process toward regional roadmaps for strengthening and scaling-up climate information and advisory services for agriculture and food security in sub-Saharan Africa and South Asia.

Relatively mature national agrometeorological advisory programs in Mali and India provided concrete examples for exploring what is possible even in difficult environments when a country makes a serious investment in climate services for its rural population, and the practical challenges encountered when scaling up. The workshop highlighted five challenges that confront efforts to use climate-related information to improve the lives of smallholder farmers:

- *Salience*: tailoring content, scale, format and lead-time to farm-level decision-making;
- *Access*: providing timely access to remote rural communities with marginal infrastructure;
- *Legitimacy*: ensuring that farmers own climate services, and shape their design and delivery;
- *Equity*: ensuring that women, poor and socially marginalized groups are served; and
- *Integration*: providing climate information as part of a larger package of agricultural support and development assistance, enabling farmers to act on received information.

Working groups considered a set of sixteen initiatives in sub-Saharan Africa and South Asia that have used innovative approaches to deal with these challenges, synthesizing good practices and addressing how they could be applied on a larger scale to overcome them.

The workshop culminated in a set of seven priority ideas that participants identified and rallied around, for enhancing the impact of climate services on smallholder farming communities in sub-Saharan Africa and South Asia.

Workshop Agenda and Roadmap

A highly interactive workshop program (see Appendix 1) was designed to engage all participants in identifying elements of good practice, and mobilize a community around a set of priority actions that will overcome existing constraints and enable climate services to have a greater impact on rural communities in sub-Saharan Africa and South Asia – at the scale of the development challenge.

The workshop was opened by representatives of Senegal’s ministries of Environment and Sustainable Development, and Agriculture and Rural Equipment. The CCAFS-commissioned video, *“Voices from the Field: Benefits and Potential of Climate Information for Smallholder Farmers in Mali and India,”* provided a ground-level look at how farmers access and benefit from agrometeorological advisory services run by their national meteorological agencies, complementing village level evaluations of the services featured later in the workshop.

A keynote presentation by Dr. M.V. Sivakumar made the case that agriculture is becoming increasingly knowledge-intensive, and provided an overview of what we know about opportunities and challenges to meet the information needs of smallholder farmers in Africa and South Asia. These regions currently face the highest risk of food and water insecurity, and the highest rates of child malnutrition. Without effective intervention, their populations are projected to suffer disproportionately from the impacts of an increasingly variable and changing climate. In the face of these stressors, Dr. Sivakumar discussed the increasing importance of “frontier technologies” such as agricultural meteorology, information and communication technologies (ICT), simulation modelling and remote sensing applications to support farmers. He presented several examples of information that meets the needs of farmers, and discussed a number of constraints limit the ability of these technologies to benefit smallholder farmers at scale.

Session 2 introduced five key issues (salience, access, legitimacy, equity and integration) that often constrain the benefits of climate services to farmers where they are not addressed.

The rest of the first day (Sessions 3 and 4) focused on lessons from the relatively mature national programs in Mali and India, which show the potential to reach and benefit a significant portion of rural populations on a sustained basis, even under difficult physical and economic conditions.

On the second day, working groups discussed (Session 5) and presented on (Session 6) the five key challenges introduced in Session 2. Sixteen case studies from Africa and South Asia served to stimulate discussion about good practice for addressing these challenges.

The issues, challenges and potential solutions were put into a geographic context, as participants re-grouped by region of interest (West Africa, Eastern and Southern Africa, and South Asia) to identify key strengths, gaps, and priority opportunities to address the gaps (Session 7-8).

On the final day, Session 9 led participants to brainstorm about promising opportunities for exchange and collaboration across regions, with emphasis on strengths in particular regions that might help address gaps in others.

Between thematic working groups, regional working groups and plenary discussion, fifteen ideas were put on the table for upscaling and strengthening the impact of climate services for smallholder farmers in the target regions. Following a competitive “marketplace” process, participants rallied around seven of those ideas, and formed ad-hoc working groups to further develop them, and presented them to the full set of participants (Session 10-11).

In the closing session (Session 12), the workshop sponsors discussed actions and timelines for following up on the priority ideas for action that came out of the workshop.

Learning from national programs

A few national agro-meteorological advisory services already reach a significant proportion of their farming populations on a sustained basis with information and guidance. CCAFS and partners conducted in-depth studies of national services in India and Mali, in order to provide evidence of use and benefit at the village level; and insights about factors that have contributed to their uptake, impact and sustainability at scale. These lessons were brought forth during the first day of the workshop to begin a dialogue to identify meaningful good practices that deserve to be scaled up world-over, to enable farmers to access relevant climate information and advisory services, and improve their ability to face a changing climate while increasing productivity and incomes.

In a separate session for each country (Sessions 3 and 4), agrometeorological services leaders from Mali and India gave an overview of program history and function, followed by presentations of preliminary findings from the assessment studies given by participating researchers. Panel discussions composed of information providers and users within each advisory system then helped put the assessment findings in context and solicited feedback from other workshop participants. The following section summarizes program descriptions, assessment findings and panel discussions for each country.

Mali's Projet d'Assistance Agrometeorologique au Monde Rural

Daouda Zan Diarra provided an overview of Mali's thirty-year-old advisory program, *Projet d'Assistance Agrometeorologique au Monde Rural*. In the wake of a serious drought in the early seventies in the Sahel region that drastically impacted agriculture, Mali's meteorological service, in conjunction with several other government offices and entities, developed a capacity to provide agrometeorological information to rural communities with the goal of increasing crop yields. The program disseminates agrometeorological advice to farmers through radio broadcasts, which are interpreted into village level action by expert farmers, and through extension workers.

Responding to demand for similar programs in other parts of the Sahel, USAID commissioned an assessment of the scientific and institutional aspects of the program, and its impacts on the ground to capture and transfer knowledge on sources of

success. Draft findings from the science assessment emphasized, for example, the difficulty of providing reliable forecasts at a spatial scale fine enough to inform decisions in particular villages and the need for more verification information, which requires high quality historical data. Opportunities to enhance services include prospects for improved forecast downscaling via merging station and satellite data, and using model outputs to strengthen forecasts. The institutional assessment found that the highly inter-disciplinary nature of the program's coordinating group, which provided an informal channel for information and feedback to flow between providers and users, was a major source of its success.

Dr. Edward Carr presented preliminary results from the field assessment. In early 2012, teams of enumerators visited 36 villages: 18 participating in the program and 18 controls. These teams conducted focus groups and over 700 interviews with farmers, gathering information on livelihood practices, agricultural activities, user engagement with NGOs, and engagement with the program. Initial findings identified some evidence that the provision of agrometeorological information might be fostering crop diversification. Opportunities to build on end user delivery, better target end user needs, and to expand the user base of the service beyond predominantly young men were also identified. The difficulty of determining causality for yield impacts is one limitation of the current assessment data, but further assessment work will undertake qualitative research to address issues of causality. In addition, Dr. Carr noted that as a good practice, monitoring and evaluation must be planned for at the inception of climate services projects, to enable robust conclusions about program impacts.

During the panel discussion, Dr. Sibiry Traore noted that the process of engaging with farmers, working to build their knowledge and capacity to integrate climate information with other inputs, is more important than the information product itself. This process is also important in creating a salient and credible information product; as Dr. Traore noted, farmers are almost always more knowledgeable than scientists about their agricultural practices and information needs. Panel member Aminata Bagayoko, a farmer from Cinzana, Mali, emphasized that climate services should not focus exclusively on field operations—for example, women in her village have used information provided by the service extensively in support of other daily activities.

India's Agrometeorological Advisory Service

Nabansu Chattopadhyay provided an overview of India's Integrated Agrometeorological Advisory Service (AAS). Smallholder agriculture in India is highly sensitive to fluctuations in monsoon rainfall, which have become more

frequent and more intense in recent years. To support management of extreme weather and climate variability, AAS provides a variety of services to farmers at the district level, including weather observation and forecasting, agricultural advisories, extension services offering two-way communication with users, and information dissemination through media and other local agencies.

In the summer of 2012, CCAFS, in partnership with the India Meteorological Department (IMD) and ICRISAT, commissioned a village-level assessment of AAS's impact from the farmer perspective. Preliminary results from this evaluation were presented for the first time during the workshop, by participating researcher Kalpana Venkatasubramanian. The evaluation found that communication and usability of agrometeorological information was improved by multiple targeted efforts at the village level (e.g., posting advisories in strategic public places, announcements over loudspeakers, enlisting NGOs to help communicate, translation of advisories into local languages). Greater engagement of local farmers in every aspect of the program, through a bottom-up process that starts with farmers' needs, increases trust and ownership of the program. When women farmers are fully engaged, such as by targeting women groups with outreach, the uptake and use of AAS information is maximized. "Progressive" farmers can be utilized as change agents; they are able to use their own resources to engage other farmers. Downscaling and value-addition to advisories is critical to ensure salience to local farmer needs and usability by farmers, supported in this case by IMD's recognition of the need to enhance its observations network as a way to provide more locally relevant information. Finally, the credibility and uptake of information is enhanced by demonstration of its economic benefit. Key constraints to climate services use identified by the evaluation included equity issues (e.g., women may not have time to listen to radio advisories, farmers groups may be based on gender or political groupings), communication (e.g., illiteracy, SMS advisories not being provided in local languages), and the lack of enabling factors (e.g., needed inputs such as electricity and fertilizer not being available).

During the discussion, panel member Sudhakar Narahari emphasized the important role of NGOs in disseminating climate information, and the multiple channels of information sharing including cable TV, drum beating, group meetings, announcements over a public address system, and blackboards at the centre of villages.

Addressing strategic challenges

The workshop highlighted five key challenges that confront efforts to use climate-related information to improve the lives of smallholder farmers. These challenges can either constrain or enhance the benefits of climate services to farmers:

- *Salience*: tailoring content, scale, format and lead-time to farm-level decision-making;
- *Access*: providing timely access to remote rural communities with marginal infrastructure;
- *Legitimacy*: ensuring that farmers own climate services, and shape their design and delivery;
- *Equity*: ensuring that women, poor and socially marginalized groups are served; and
- *Integration*: providing climate information as part of a larger package of agricultural support and development assistance, enabling farmers to act on received information.

A set of plenary presentations summarized the main challenges, and some promising approaches to addressing them. Participants broke into working groups to discuss each challenge; and to identify and report to plenary on examples of good practices that show promise for overcoming the challenge, and priority actions that will address the challenge in the target regions. Sixteen initiatives in sub-Saharan Africa and South Asia that have used innovative approaches to deal with these constraints were mapped onto the five key challenges. The relevant case studies were presented to stimulate discussion about promising approaches to address the challenges.

Salience

How do we ensure that climate information (e.g., content, scale, format, timing) and advisory services are relevant to the decisions of smallholder farmers, in a manner that can be scaled up?

The presentation by Dr. James Hansen cited salience as one of several prerequisites to benefiting from any information service, along with credibility, legitimacy, access, understanding and capacity to respond. Farmers typically need a combination of historic observations, monitored information through the growing season, and predictions at a range of time scales that depend on the time horizons of their particular decision. Relevant time scales for farm decision-making range from daily weather forecasts, to seasonal prediction, to climate change; but seldom exceed about two decades. As lead-time increases from weather to climate time scales, decisions

tend to become more context- and farmer-specific, information more uncertain and hence more complex to communicate and interpret; and therefore the scope of services needed to use that information tends to expand. Translating meteorological quantities into predicted impacts on agricultural systems (crops, rangelands, pests, diseases), management advisories or decision-support tools increases the relevance of complex climate information to agricultural decisions. Dr. Hansen briefly discussed an approach used to train smallholder farmers in Kenya and Senegal to understand probabilistic seasonal climate forecast information and incorporate it into their decision-making. Smallholder farming is quite extensive, but farmer decisions are very local and depend on information at a very local scale. Research has shown that seasonal forecasts can be downscaled to individual locations with only modest loss of skill. Gaps in historic observations – needed to downscale and interpret seasonal forecasts and climate change projections – are an obstacle to locally relevant climate services in much of Africa and parts of South Asia. Blending sparse station observations with satellite rainfall data provides a feasible avenue for overcoming data gaps. Unfortunately inadequate funding of National Meteorological Services (NMS) often perpetuates policies that treat meteorological observations as a source of revenue rather than as a public good that can fully benefit agriculture. Dr. Hansen cited significant gaps between farmer needs, and the seasonal forecast products from the Regional Climate Outlook Forums, to illustrate the importance of giving agricultural stakeholders ownership and an effective voice in the design, implementation and evaluation of climate services. While institutional arrangements may vary, climate services that are relevant to farmers require partnership and a degree of co-ownership between meteorological services, agricultural research and extension services, and farmers.

The working group examined two case studies. The third study listed was included in the white paper but not presented:

- Wote (Kenya): Communicating downscaled probabilistic seasonal forecast information to farmer groups- Communication and Downscaling methods. Case presenter: Dr. KPC Rao
- Kaffrine (Senegal): Communicating downscaled probabilistic seasonal forecast information to farmer groups- Communication and Downscaling Best practices. Case presenter: Dr. Ousmane Ndiaye
- GFCS Frameworks for Climate Services at the National Level: Bringing Forecasters and users together around the priority needs of community end-users- Lessons from pilot West Africa experiences.

Working group participants highlighted several opportunities to ensure that climate information and advisory services are relevant to smallholder farmers. An overarching message is that partnership between agricultural and climate stakeholders, and interaction and co-learning, are need at multiple levels if information providers are to understand and respond to the needs of vulnerable farmers. Climate information is most useful when it is downscaled, combined with management advisories and farmer training, and integrated with support (e.g., production inputs, credit, insurance) for management responses. Starting with farmers' local climate knowledge and traditional indicators can be an effective way to ensure that new information is relevant, and to build trust. Participants discussed the particular needs of rural women and youth, and the need to target them. Given the scale of the development challenge, climate information and advisories should be designed with upscaling in mind. Capacity constraints, particularly within NMS, are a major challenge to scaling up relevant climate services. Meeting this challenge will require support for NMS with observational infrastructure, forecast capacity, and the process of tailoring information to the needs of agriculture. Tailoring is likely to include: (a) downscaling information at all time scales; (b) providing broadly-relevant advisories at the weather time scale for time-sensitive decisions (sowing, irrigation, pest and disease control); and (c) combining sources of expertise for co-production of climate services.

The working group proposed two immediate priorities for enhancing the salience of climate services for smallholder farmers. The first is to develop a community of donors and advocates to support investment in climate services for agriculture, including infrastructure and capacity for NMS. The second is to form a community of practice to develop methodology and good practice guidelines around climate-based advisories; and training curricula to equip agricultural extension and other communication intermediaries.

Access

How can we provide timely climate services access to remote rural communities with marginal infrastructure?

Dr. Balaji Venkataraman delivered a preliminary discussion of constraints to reaching remote farmers at the “last mile” at scale. Institutionalized agricultural extension services have weakened, and an adverse ratio of farmers to extension personnel is the norm. Several different models for reaching smallholder farmers have been tried by various agencies, but a scalable solution has yet to be found. Given the human resources challenges of reaching large numbers of farmers, mobile telephony—voice

and text messaging—may be the business model of the future for delivering climate services in rural areas. Community radio and cell phone integration is another opportunity. However, Information and Communication Technology (ICT) and community radio experts and agricultural researchers are not well integrated, and much of what is needed in ICT for reaching the last mile has not yet been invented. Long-term research and investment is needed to address this challenge, and mutual capacity building and partnership will be a key component.

The working group examined three case studies:

- Grameen Uganda SMS-based farmer advisory delivery. Case Presenters: Gilbert Agaba (Grameen Uganda AppLab) / Deus Bamanya (Uganda NHMS)
- Farm Radio International: Building the Capacity of rural radios to package and communicate climate information to farmers. Case Presenters: Margaret Kingamkono (Farm Radio International)
- Dissemination of Weather and Climate Information in Local Languages. Case Presenters: Patrick Luganda (Farmers Media Link, Uganda)

The working group identified a critical need for reaching farmers at scale: building the capacity of stakeholders to serve as rural climate intermediaries, trained in weather data gathering with integrity; conveying farmer inquiries to experts via mobile or web; and interpreting advisories for farmers. Community-identified “champions” can also be used to engage other community members in the process of information collection, interpretation, and utilization. This approach can maintain focus on reaching individuals while scaling up, ensuring face-to-face interaction at the end user level. Involving end users in the engagement process, for instance through distribution of rain gauges and training in how to use them to collect data, promotes sustainability of the service. Involving multiple stakeholders, including faith-based groups, women groups, schools, and farmer groups, in grassroots operationalization and development of a communication strategy was identified as a priority.

Participants emphasized that technology will play a major role in scaling up climate services to reach large numbers of farmers. Using a combination of cell phones, radio (including community radio) and interaction voice response as well as GPS can move scaling up forward. Multiple information channels should be employed to complement Short Message Service (SMS) and voice messaging, such as public address systems at the village level. The use of local language and appropriate formatting of information to suit farmers’ literacy levels is key.

The group recommended that policy-level participation in developing information delivery pathways at various levels be built into the scaling up process along with products to appeal to policymakers (e.g., disaster warnings). Multiple participants agreed that monitoring and evaluation is critical for program sustainability, and should be built into projects from the beginning. Feedback mechanisms and evaluations for accuracy and outcomes should be multi-dimensional. Finally, the group recommended that expertise be mobilized to develop business plans and scenarios for national-level upscaling of information delivery strategies.

Legitimacy

How do we ensure that farmers own climate services, and shape their design and delivery?

As highlighted in the Salience section and elaborated upon through working group discussion, farmer input is absent on a systematic level in the development of climate information services. Several pilot projects have sought to incorporate farmers in climate services development and delivery, but a number of institutional and structural barriers to full farmer participation remain. For example, climate scientists and meteorological services have limited organizational capacity and experience in working directly with farmers. They may be equally challenged in communicating with intermediaries and the media, as the language and terminologies they use may be unfamiliar, confusing, or alienating to lay users. In addition, the administrative and programmatic mandates of meteorological services do not typically include provisions for systematic farmer involvement, and their ability to communicate directly with extension services may be complicated by issues of territory and chains of command across ministries. At the same time, low levels of capacity among farmers, extension services and other communicators to interpret and apply the information and technologies currently available is another limitation to engaging in and scaling up two-way communication processes involving new approaches.

Four case studies were selected under the Legitimacy theme and featured in the white paper distributed prior to the workshop, but only the first case was presented at the workshop:

- Climate Forecasting for Agricultural Resources (CFAR) project- Burkina Faso: lessons learnt and challenges to replicability? Case Presenters: Carla Roncoli (Emory U.)

- Integrating Indigenous Knowledge in Climate Risk Management in support of Community Based Adaptation project in Nyangi Community (Kenya). Case Presenters: Laban Ogallo (ICPAC) / Kenya Meteorological Department (KMD)
- Integrating Indigenous Knowledge with Seasonal Climate Forecasts in Lushoto (Tanzania). End user-specific needs in climate service provision in Kaffrine (Senegal). Case Presenters: Prof. Mahoo (Sokoine University) / Tanzania Meteorological Agency (TMA)
- Indigenous Knowledge Bank. Case Presenters: Aby Drame (ENDA-TM)

Legitimacy and salience are closely related in that climate services have legitimacy when they not only involve farmers but also do so in ways that address their concerns and result in relevant and actionable information. To achieve this broad vision, the working group recommended the development of learning networks and communication platforms that directly link climate information systems with supports for sustainable livelihoods in the context of broader environmental changes. These multi-disciplinary networks should include farmers organizations, NGOs that work with farmers, extension services, meteorological services, researchers in relevant disciplines, and governance institutions at local to national scales.

The farmers in the working group stressed the need to ensure that such efforts recognize, empower, and respect their farming experience, cultural values, and social networks. Existing social networks and communication systems should be leveraged in establishing new information pathways, creating new channels as needed to ensure that hard-to-reach farmers are met at the “last mile.” Intermediaries should be trained in proactive and inclusive communication and facilitation approaches that ensure the meaningful involvement of disadvantaged groups, ethnic minorities, remote communities, and mobile populations (e.g., pastoralists).

Development of climate services should be complemented by advocacy and efforts to create an enabling environment that supports farmers’ preferred management responses. Among potential interventions, farmers in attendance mentioned community-based natural resource management (e.g., assisted natural regeneration, biodiversity conservation, wetland protection), local common property regime conventions (e.g., social forestry), women’s income-generation initiatives (e.g., basketry), and energy efficient technologies (e.g., solar dryers, clay ovens).

Good practices identified by the group include the systematic involvement of farmers in policy development and planning, scaling up from community consultations to district, provincial, regional, and national levels. To ensure that community voices are not filtered out at successively higher levels, participants recommended ensuring effective farmer representation at meetings beyond the community level.

Priority scalable ideas for participatory production and communication of agro-meteorological knowledge and information identified by the group include roving seminars, participatory scenario planning, creation of champions/translators, and engaging farmers in producing data (e.g., training community weather station monitors).

Farmers in attendance also stressed that farmers' involvement in data generation calls for initiatives to build farmers' competencies in data collection and equipment maintenance as well as their abilities to understand how climate impacts interact with land use change and landscape interactions.

Equity

How do we ensure that women, poor and socially marginalized groups are served?

Dr. Sarah McKune provided an overview of the role of gender in agricultural livelihood systems and the associated barriers to equitable access to climate services. Women make significant contributions to smallholder agricultural production, but have less access to land capital, credit, technology, and other resources than men do, limited by formal laws and/or informal practices. Gender inequalities intersect with other social and economic variables including religion, age, ethnicity, race, class and income level, that impact climate services access and use. Gender and equity considerations in climate services include the types of information needed by different groups, different information channels used, and socio-cultural and/or institutional constraints to accessing information. However, limited access to this type of social data at the community level and the high cost of collecting it is a barrier to scaling up approaches to designing climate services projects that attempt to ensure equitable access. The difficulty of prioritizing this issue within a limited range of problems is another constraint. Capacity for the integration of gender and social differentiation is needed at all levels, from extension agents in the field to the institutional and policy levels.

The working group examined two case studies:

- Demonstrating the Value of Climate Services in Senegal and Kenya: Results of ANACIM- Red Cross collaboration to communicate short-range weather advisories to women in three rural communities: Identification of Gender-specific needs in climate service provision in Kaffrine (Senegal). Case Presenters: Mara Laye (Senegal Red Cross) / Soxna Diouf (model farmer, Dioly village, Kaffrine)
- Rockefeller Regional Project on Agro-met advisory to farmers- Ethiopia results. Case Presenters: Atos Derecha and Hailemariam (Ethiopia National Meteorological Agency, Agrometeorology department).

Gender analysis offers a systematic approach to understanding the differential impacts of climate variability and change on women and men. Implementing gender analysis at scale requires collecting sex-disaggregated data under the assumption that the social construction of gender is context specific, and asking the fundamental questions of who does what and when, who has access to what, and who decides. Participants emphasized that a gendered analysis of any farming community is essential to gain maximum project effectiveness. Understanding social differentiation broadly is important, but in particular, crops and tasks should be considered by gender in order to understand the relevance of climate information services to different groups. Researchers and extension workers should also be attentive to information channels, languages, and the particularities of participatory group processes, which may impact whether dialogues with farmers should be conducted in separate groups.

Demonstrating the value of the gendered approach in successful climate risk management in agriculture, via controlled experiments developed to provide solid evidence of impact, was a major priority identified by the group. Participants recommended that gender and social differentiation be explicitly emphasized at the inception of climate services projects and programs. A community of practice nucleated by workshop participants and other researchers and practitioners can facilitate the sharing of lessons learned and challenges, with the goal of moving from the research foundation to action.

Integration

How do we connect climate services with other interventions to enable management of climate-related risk at the farm level?

Surabhi Mittal gave an overview of the key challenges in integrating climate services with larger agricultural and development support, to strengthen farmers' capacity to

make use of received information. Mittal noted that climate information services are mostly supply driven and there is limited understanding of their usability in action by farmers. Climate information from meteorological departments as transmitted to farmers must have an actionable point of entry into their decision systems, within a larger package of agricultural and development support. Farmers need additional information on plant protection, crop choices, market sources, weather-probability of rainfall, and cultivation best practices to enable management of production and market risk. In addition, climate services should be coupled with field demonstrations, and cannot rely on mobile transfer of information alone. The group noted that upscaling good practices and taking into account the needs of different target groups is a challenge that needs to be overcome.

The working group examined three case studies:

- Results of the MetAgri Project: WMO Roving seminars. Case Presenter: Jose Camachos (WMO)
- Results of the Climate Learning for African Agriculture project. Case Presenter: John Morton (NRI)
- Developing approaches to support smallholder planning and decision making. Case Presenter: Peter Dorward (Reading University)
- Identifying farmer's information needs to manage production risk in the Indo Gangetic Plains of India. Case Presenter: Surabhi Mittal (CIMMYT)

The group established that information from national and decentralized climate and meteorological services should be integrated with agricultural information and customized to local decision making processes. Key types of information for integration include: concepts of conservation agriculture (e.g., crop rotation, minimum soil disturbance, crop residue management); socio-economic understanding (of local contexts, scalability, impacts and constraints); and the impact of collective information, better farm management advisories and market inputs. Integration must occur across information, infrastructure, technologies and institutions.

Discussions noted that progressive farmers can be used as champions in promoting the use and integration of climate information into agricultural management. There is great potential for transferring good practices from countries that successfully bridge the gap between meteorological services and service users, promoting not only the data but also the value added product. Development of institutional platforms at

national, regional and local levels to integrate all aspects related to agricultural practices with weather and climate information is needed.

Priority actions identified by the group include developing a consortium or working group to explore ways to encourage meteorological services to provide analyzed historical climate information to users. Within and across countries, participants recommended that national programs and policy be developed to link climate information with ongoing agricultural extension programs and national rural development programs—keeping in mind the fundamental needs of small farmers. Developing weather-based agricultural insurance policy (e.g., following the example of national drought policy as supported by WMO, the Food and Agricultural Organization, and the United Nations Convention to Combat Desertification) is also a priority identified by the group.

Addressing the challenges at scale

Regional gaps and opportunities

After identifying good practices to overcome the major thematic constraints to scaling up climate services for farmers, participants were tasked with exploring their application for addressing climate services gaps in their respective regions. In Session 7, regional working groups for West Africa, Eastern and Southern Africa, and South Asia were convened to discuss strengths and gaps in climate services and opportunities to fill those gaps within their geographic areas. Following this discussion, working groups each reported on two priority actions for scaling up climate services in their regions (Session 8), detailed in the second half of this section. Session 9 led participants to brainstorm about promising opportunities for exchange and collaboration across regions, with emphasis on strengths in particular regions that might help address gaps in others. The following section synthesizes gaps and opportunities in each region, and cross-regional insights in addressing them.

Eastern and Southern Africa

The Eastern and Southern Africa regional working group described existing regional and national meteorological agencies and agricultural research organizations across the region as a solid foundation for upscaling climate services. Skilled forecasts are available for the region. Strong networks of NGOs and extension services and available human resources are poised to put this information to use to enhance farmer capacities. However, the group noted that the timely provision of salient forecasts to farmers is limited by the lack of climate and agricultural information at appropriate scales, low-density observational networks, and the lack of analysed historical data. Institutional collaboration between met services and agricultural extension services is poor, as is capacity for translating climate information into agricultural impacts through extension services.

A number of potential opportunities to overcome these challenges were identified. To address the challenge of tailoring forecasts to appropriate scales, the co-production of knowledge achieved through enabling farmers to collect climate data and express needs was recommended to improve planting guides for specific locations. Utilizing intermediaries to support data collection and provision at the farmer level and providing government subsidies for scouts to collect field data is another potential component of this strategy. The co-production of knowledge could also be a

foundation for donor supported micro-projects addressing risk management at the farm level. On the technical side, research partnerships with national met agencies were recommended (e.g., Ethiopia's Meteorological Agency-International Research Institute for Climate and Society partnership) for enhancing downscaling capacity.

To address the challenge of poor institutional collaboration between meteorological services and extension agencies, multi-disciplinary working groups allowing meteorological services to collaborate with rural development services were proposed, following Mali's model. Involving agricultural extension in meteorological services trainings is another opportunity to leverage existing resources towards better integrating the agriculture and meteorology/climate communities.

Finally, the sharing of good practices for integrating different types of weather data (traditional, Automatic Weather Station (AWS), satellite) was recommended to help overcome the lack of analysed historical data and low density of observation networks in the region. Seeking donor support for the promotion of AWS and model climate data management systems was also suggested.

West Africa

The West Africa regional working group noted that existing communications technologies and networks in West Africa, including rural radio, NGOs and other intermediaries, and farmers organizations, offer a strong foundation to build on in upscaling climate services. As in Eastern and Southern Africa, national services and regional organizations are in place that could facilitate cooperation on multiple levels.

Limitations to communication with farmers include the present costs and low coverage of ICT, and the need to translate advisories into local languages.

Opportunities to meet this challenge include establishing governmental contracts with cell phone companies for information services provision and enhanced utilization of local radio and ICT. Public-private partnerships in ICT, an approach that has found success in South Asia, were also suggested to help create demand and reduce the costs of ICT for usage in extension systems. Utilization of multiple channels of communication, and innovative uses of communications intermediaries, can also help overcome ICT cost constraints. In Eastern and Southern Africa, voice-based services have been used to overcome the challenge presented by multiple local languages.

Working group members also cited a sparse data collection network as a challenge to upscaling the provision of location specific information. To help overcome this challenge, participants from other regions recommended leveraging partnerships with

civil society organizations that have invested in monitoring and evaluation to foster knowledge exchange, and enabling farmers to collect data.

West Africa working group members cited the need to enhance capacity at all levels of climate services development, delivery and usage, from improving observing networks to conducting roving seminars with farmers and training them in data collection. Participants from other regions recommended exchange programs with research centers (e.g., the Center for Research and Excellence in Agricultural Meteorology (CREAM) in Pune), on-site farmer trainings, and the identification of institutional points of entry for gender training as capacity-building strategies. Disseminating lessons learned and training materials from organizations that have successfully built capacity over the past five years was also proposed as a useful strategy for building capacity and preventing its erosion. To address regional disparities in capacity, the strategy of service providers assessing demand, reducing overlaps in similar areas, and identifying unique needs has found success in India.

South Asia

South Asia working group members reflected on the feature case study on India's proven model for forecasting and advisory, the Integrated Agrometeorological Advisory Service (AAS), as a source of guidance for developing similar programs in the region. Lessons from AAS's experiences in India are transferable across South Asia, as countries share similar ecological regions. CREAM in Pune is also a significant source of expertise relevant in other parts of the region.

However, the group noted that agrometeorological infrastructure, services and human capacity are still inadequate and unevenly distributed across the region. Further improving observation networks (meteorological stations, AWS, data management and dissemination), and enhancing human capacities at various levels were both recommended. There is potential for capacity building at all levels, and particularly for training new professionals in farmers groups. Participatory approaches to climate services that have been tested with farmers groups and through scenario planning exercises were suggested for scale up. Proven frameworks from advisory services in India and seasonal forecasting experiences from Kenya were also recommended as models for scaling up.

The working group also emphasized the need to bundle agro-advisory services with other inputs. Tools identified that can help management in extreme weather conditions and are candidates for scaling up include assistance for market gardening

and reclamation of degraded land; and for intensification of other income-generating activities, particularly for women, to help offset rainfall gaps.

Priority actions

Between thematic working groups, regional working groups and plenary discussion, fifteen priority actions were identified for strengthening and scaling up the impact of climate services for smallholder farmers in the target regions. In Session 10, the suite of candidate actions were opened up to all participants to "vote with their feet" by choosing an idea to develop further. This allowed the group as a whole to prioritize those ideas with the most support, and in Session 11 ad-hoc working groups were convened around the top seven priority ideas to flesh out preliminary concept notes sufficiently to achieve consensus and collective commitment to put them into action.¹ The concepts draw from a broad range of expertise across the full scope of agrometeorological advisory systems: information producers, enabling institutions and communicators to end-users. With further development, they represent promising opportunities to put the lessons of the workshop into action towards filling critical gaps in delivering salient climate services for farmers.

Two concepts proposed during the workshop cross regions. *“Inter-regional capacity building for design and delivery of climate information and advisory services to farmers”* aims to transform large-scale meteorological information into locally-relevant agro-advisories for farmers. The strategy includes (a) creating networks with regional institutions focused on strengthening human capacity, (b) networks that link farmers’ knowledge and practises across regions, and (c) demand-driven and need-based content development that is sensitive to the special needs of women and marginalized groups. *“Co-production of climate smart services”* aims to design and deploy an interactive framework in which farmers, investors, donors, and agricultural institutions come together in a locally-appropriate structure to co-produce agricultural services that are climate-smart, and to learn and disseminate good practices surrounding this deployment. This project will create a community of practice around the co-production of such services, which will facilitate the translation and scale-up of tools, processes, and lessons learned through this process to new sites and institutions. Following the workshop, participants submitted a third cross-regional concept. *“Meeting farmers’ climate and weather information needs through integrated, effective, and sustainable approaches”* aims to develop effective, efficient and

¹ Three additional ideas were developed and submitted after the workshop.

sustainable means of providing smallholder farmers in developing countries with climate and weather information and related agricultural advice that meet farmers' needs, include analysed historical climate data, and can be implemented on a large scale. Review of the status of NMS and pilot projects in providing climate services will feed into the design of a multi-country project that will include capacity development and mechanisms for evaluation and learning.

Two ideas were proposed for Eastern and Southern Africa. First, *“Enhancing climate service delivery to meet the needs of smallholder farmers”* aims to increase relevance and use of climate information by enhancing the skills and capacities of farmers, meteorological services, extension services and agricultural researchers in generating, disseminating, and using climate information and effectively responding to the effects of climate variability and change. The plan involves work at multiple levels, including creating training modules to enhance understanding and interpretation of probabilistic climate information and use by farmers and their support agents, training met services in generating location specific forecasts and analysing historical data, and developing effective institutional relationships between NMS and agricultural research and extension departments to enhance their ability to understand climate impacts on agriculture and provide corresponding guidance to smallholder farmers. Second, *“Timely provision of location-specific forecasts and services”* aims to enhance timely provision of location-specific weather forecast information for farm level decision making to improve risk management, community resilience and sustainable livelihoods among smallholder farmers in the Eastern and Southern Africa. The project will work toward upscaling good practices to each country or to specific farming communities.

From West Africa, one group proposed a *“Group communication”* activity that aims to address the communications gap between agro-climatic information producers and users, which includes inappropriately technical language and insufficient communication pathways, with the goal of enabling better crop management, improved yields, increase in incomes, and increased awareness of the importance of climate in agriculture. The proposed activity would employ participatory approaches to involve farmers and address gender challenges in communications. A second activity around *“Capacity-building”* aims to create sustainable conditions for enabling actors in West Africa to supply and effectively use climate services. Through a focus on participatory development of solutions and mobilization of trained local intermediaries, the project will help to introduce technologies built upon farmers' indigenous knowledge systems and existing social groups and networks to enhance

ownership and sustainability. Potential methods to be employed include sensitization seminars and collaboration with known institutes on agrometeorological services and knowledge in capacity building for the purposes of knowledge transfer. A third concept was submitted after the workshop: “*Mali: Support to farmer adaptation to climate variability and change.*” This activity targets gaps in Mali’s existing agrometeorological advisory program, including the need for additional farmer-requested information (and the need for additional research to produce it and support for dissemination once available), and the need for the inclusion of farmers’ know-how and local knowledge for the production of more locally salient forecasts.

South Asia participants proposed a single concept on “*Transition from climate risk to climate smart agriculture*” that aims to employ knowledge on climatic risk to enable farmers to fine tune agronomic strategies, make better decisions for livelihoods, and improve their adaptive capacity. Potential good practices to be employed include partnership between agricultural and climate stakeholders at multiple levels; involving female and young farmers considering their particular needs; and participatory production and communication of agro-meteorological information, knowledge and policy development and planning.

In the final session of the workshop (Session 12), the workshop steering committee outlined plans to support the further development of the roadmaps into viable proposals, and to help mobilize funding to support their implementation.

Conclusions

The workshop on Scaling Up Climate Services for Farmers and Africa and South Asia provided an important platform to explore – across geographic contexts and through diverse disciplinary lenses – the issues and challenges that must be addressed if climate services are to effectively support farmers’ adaptation to a changing and increasingly variable climate, and potential solutions.

A diverse set of researchers and practitioners reached a consensus that *salience*, *access*, *legitimacy*, *equity*, and *integration* are the key challenges that must be targeted in order to substantially improve the benefits of climate services for farmers’ livelihoods. Commonalities emerged across regional contexts, in both constraints and solutions, underscoring the potential for South-South learning and collaboration in meeting these challenges. In scaling up solutions, building upon farmers’ traditional risk management practices was identified as a key building block. Building on that foundation, workshop participants across all regions represented (West Africa, Eastern and Southern Africa, and South Asia) emphasized that one potent pathway to overcoming the challenge of providing locally relevant climate services is through enabling co-production of knowledge with farming communities. Participants also championed the importance of employing multiple communication mechanisms to reach rural populations at scale, including the exciting possibilities presented by ICTs, while maintaining person-to-person channels through the use of intermediaries. Finally, attendees from all regions stressed the critical need for capacity development at all levels, from farmers and extension services to agricultural researchers, meteorological services and climate forecasters, and other boundary institutions.

A number of regionally differentiated challenges in the delivery of effective climate services for farmers emerged during the workshop. West Africa participants focused on strengthening and scaling up communication mechanisms (building on successful practices such as roving seminars and the use of rural radio and mobile phone technology), whereas participants from Eastern and Southern Africa prioritized capacity development at all levels for the sustained provision of forecasts, early warnings and advisories that are more locally relevant through national agricultural extension services. South Asia participants viewed India’s long-standing AAS program as a demonstration of the potential to exploit innovations in combining ICTs (e.g., SMS and voice messages) and human interaction platforms (rural extension

centres, national extension services as well as NGOs), with lessons that can benefit other countries in the region. The key strengths and gaps that each region reported on informed a discussion about opportunities for exchange and collaboration among regions, and allowed participants to prioritize actions for scale-up, learning from good practice in other countries and regions.

The consensus-based, cross-thematic and cross-regional process adopted during the workshop culminated in a set of seven ideas (plus two submitted after the workshop) for promising actions for addressing the challenges to scaling up climate services within and across regions, and a collective commitment to implement them. In the final session of the workshop, the steering committee outlined plans to support the further development of these roadmaps into full project proposals, pledging to help participants move these ideas forward. This included support for planning and proposal writing workshops, competitive start-up grants, and assistance in identifying potential sources of further funding.

Additional outputs from the workshop will include further analysis and publication of lessons from the set of case studies examined by participants, a CCAFS report and accompanying brief targeted at policymakers that will more fully capture the lessons learned from the case studies, and a journal special issue structured around the intellectual basis for the workshop. Full reports from the Mali and India case studies are also forthcoming.

Most of all, the workshop made evident the need for partnership across regions, and highlighted exciting opportunities for collaboration among communities of practice, institutions, and individuals, urgently needed if we are to be successful in our collective endeavour to overcome the tenacious challenges to scaling up climate services for farmers. Presentations and discussion brought forth rich reservoirs of knowledge in Eastern and Southern Africa, West Africa and South Asia that are ripe for cross-regional sharing and exchange.

The time is now right to learn from and build upon examples of good practice in farmer-focused climate information and advisory services, and further support sharing of good practice between Africa and South Asia. The innovative and encouraging approaches to overcoming the challenges of farmers' access to and utilization of climate information and risk management options in agriculture, shared during the international workshop on Scaling up Climate Services for Farmers, pave the way for further investments in farmer-focused climate services at scale.

Appendix 1: Workshop Agenda

Workshop Agenda

DAY 1	
Session 1: Workshop opening	
Welcome remarks	Arame Tall, CCAFS/ICRISAT
Video: Voices from the Field: Benefits and Potential of Climate Information for Smallholder Farmers in Mali and India	
Keynote address: What do we know about the information needs of farmers, and the challenges to meeting those needs?	M.V. Sivakumar, WMO
Workshop opening	H.E. Republic of Senegal's Minister of Environment and Sustainable Development, Mr. Ali Haydar H.E. Republic of Senegal's Minister of Minister of Agriculture and Rural Equipment, Mr. Abdoulaye Balde
Session 2: Workshop themes <i>Chair: John Furlow, USAID</i>	
Cross-community introduction icebreaker	Arame Tall, CCAFS/ICRISAT
Workshop objectives and roadmap	Jim Hansen, CCAFS/IRI
Climate information services reaching the unreached: options for the Great Unconnected	Balaji Venkataraman, Commonwealth of Learning
Making climate information more relevant to smallholder farmers	Jim Hansen, CCAFS/IRI
Gender literacy: Why gender matters in climate information and advisory services	Sarah McKune, U. Florida
Farmers, information and information networks: What else is needed?	Surabhi Mittal, CIMMYT
Discussion	
Session 3: Lessons from Mali's Agrometeorological Advisory Service <i>Chair: Kaliba Konare, WMO</i>	
Overview of Mali's agrometeorological advisory program	Daouda Diarra, Agence Meteo-Mali
Lessons from Mali evaluation	Ed Carr, USAID/U. South Carolina
Panel discussion	Pierre Sibiry Traore, ICRISAT; Abdoulaye S. Moussa, CCAFS W. Africa; Youssouf Coulibaly, Extension officer Cinzana; Aminata Bagayoko/Souibou Toure, model farmers, Cinzana
Session 4: Lessons from India's Agromet-Advisory Service <i>Chair: M.V. Sivakumar, WMO</i>	
Overview of India's Integrated Agromet-Advisory Service (AAS)	N. Chattopadhyay, India Meteorological Department
Lessons from India village study	Kalpana Venkatasubramanian, CCAFS/Rutgers U.
Panel discussion	Pramod Aggarwal, CCAFS S. Asia, R.S. Rana, Palampur Agr. U., Himachal Pradesh, M.S. Gandla, ANGRAU, Hyderabad; S.R. Narahari, Shanti Service Society, Andhra Pradesh Chekkala Venkataiah, Model farmer, Gorita
DAY 2	
Session 5: Parallel thematic working groups	
Charge to thematic working groups (<i>plenary</i>)	Alhassan Diallo, ACMAD
<u>WG 1</u> : How to produce climate information and	Chair: Jim Hansen, CCAFS/IRI

advisory services that are more salient for smallholder farmers?	
<u>WG 2</u> : Reaching the "last mile" – at scale: What are the most promising pathways for reaching millions of farmers?	Chair: Balaji Venkataraman, Commonwealth of Learning
<u>WG 3</u> : How to give farmers an effective voice into the design, delivery and evaluation of climate services?	Chair: Carla Roncoli
<u>WG 4</u> : Equitable rural climate services: How to reach women, other socially- and economically-disadvantaged groups?	Chair: Sarah McKune, University of Florida
<u>WG 5</u> : Is Information Enough? How to connect climate services with other interventions to enable management of climate-related risk at the farm level?	Chair: Surabhi Mittal, CIMMYT
Session 6: Thematic working groups report to plenary <i>Chair: Alhassan Diallo, ACMAD</i>	
Session 7: Parallel regional working groups	
Session 8: Regional Working Group report to plenary <i>Chair: Seleshi Bekele, ACPC</i>	
DAY 3	
Session 9: Opportunities for South-South learning and partnership <i>Chair: Bob Stefanski, WMO</i>	
Session 10: Toward priority actions <i>Chair: Haresh Bhojwani, IRI</i>	
Session 11: Development panel discussion on priority actions <i>Chair: Steve Zebiak, CSP/IRI</i>	
Reflections from development panelists	USAID, CCAFS, WMO, ADB, GIZ, CDKN
Panel discussion on each proposed priority action	
Session 12: Workshop closing <i>Jim Hansen, Arame Tall, John Furlow, Bob Stefanski, Steve Zebiak</i>	

Appendix 2: Participant List

Chiranjibi Adhikari CARE Nepal Nepal chiranjibiA@np.care.org	Samuel Adiku University of Ghana Ghana s_adiku@ug.edu.gh	Gilbert Agaba Grameen Uganda Foundation Uganda gagaba@grameenfoundation.org
Pramod Aggarwal CCAFS India P.K.Aggarwal@cgiar.org	Youcef Ait-Chellouche UNISDR Regional Office for Africa Kenya Youcef.Ait-Chellouche@unep.org	MD Shadukul Alam Bangladesh Meteorological Department Bangladesh shadukul@gmail.com
Aminata Bagayoko Model Farmer (Cinzana) Mali contact through Ousmane Ndiaye: ousmanen@yahoo.com	Deus Bamanya Uganda Department of Meteorology Uganda bamanya@yahoo.com	Wendylin Bartels University of Florida USA wendylin@ufl.edu
Seleshi Bekele ACPC Ethiopia sbekele@uneca.org	Gopal Bhatta CCAFS South Asia India G.Bhatta@cgiar.org	Haresh Bhojwani IRI USA haresh@iri.columbia.edu
Jose Camachos WMO jcamacho@wmo.int	Edward Carr University of North Carolina USA carr@see-group.net	Lalith Chandrapala Department of Meteorology Sri Lanka lalithch@hotmail.com
N. Chattopadhyay India Meteorological Department India kksingh2022@gmail.com	Venkataiah Chekkala Farmer's representative, Mahabubnagar, Andhra Pradesh India chekkalavenkataiah@gmail.com	Hamidou Coulibaly National Meteorological Service Mauritania coulibaly_hamidou@yahoo.fr
Youssef Coulibaly Agricultural Extension (Cinzana) Mali contact through Ousmane Ndiaye: ousmanen@yahoo.com	Laxmi Prasad Devkota NDRI Nepal lpdevkota@ndri.org.np	Alhassan Diallo ACMAD Niger a2diyalo04@yahoo.fr
Daouda Zan Diarra National Meteorological Service Mali ddiarra165@gmail.com	Mpie Kader Diarra National Meteorological Service Mali diarrampi@yahoo.fr	Bounama Dieye Ministry of Agriculture Senegal bounama1968@gmail.com
Moctar Dieye CSE Senegal dieye@cse.sn	Cherif Diop National Meteorological Service Senegal cherifdiop@yahoo.fr	Aliou Gory Diouf Environmental Development Action in the Third World Senegal aliou.diouf@gmail.com

Anne Dix
USAID Regional Office
Ghana
adix@usaid.org

Peter Dorward
Reading University
UK
p.t.dorward@reading.ac.uk

Aby Drame
Environmental Development
Action in the Third World
Senegal
Byba27@hotmail.com

Diande Elie
Agricultural Extension
(Ouahigouya)
Burkina Faso
contact through Ousmane Ndiaye:
ousmanen@yahoo.com

John Furlow
USAID
USA
jfurlow@usaid.gov

Mahadevappa Sajjana Gandla
ANGR Agricultural University,
Hyderabad
India
sgmahadevappa@gmail.com, mah
adevb4u@yahoo.co.in

JA Garane
Burkina Meteorological Authority
Burkina Faso
ajgarane@yahoo.fr

Natasha Grist
CDKN
UK
n.grist@odi.org.uk

Dil Bahadur Gurung
NARC
Nepal
gurung_dilbahadur@yahoo.com

Dilipkumar Gutunku
ICRISAT
India
G.Dileepkumar@cgiar.org

Arjumaand Habib
SAARC
Bangladesh
director@saarc-smrc.org,
smrc@citech.net

Kinfe Hailemariam
National Meteorological Agency
Ethiopia
kinfe_hm@yahoo.com

James Hansen
IRI/CCAFS
USA
jhansen@iri.columbia.edu

Sheila Huggins-Rao
Farm Radio International
Canada
sheilanhrao@farmradio.org

Abdulai Jallow
CORAF
Senegal
abdulai.jalloh@coraf.org

Alexa Jay
IRI/CCAFS
USA
ajay@iri.columbia.edu

Britta Jell
GIZ
Mauritania
britta.jell@giz.de

Ken Johm
AfDB/ClimDevAfrica
Tunisia
k.johm@afdb.org

Fatimata Kane
Workshop Rapporteur
Senegal
fatey05@gmail.com

Nnamani Kate
UN University Institution for
Natural Resources in Africa/
University of Ghana
Ghana
drnnamanikate@gmail.com

Mariama Keita
Model Farmer (Kaffrine)
Senegal
contact through Ousmane Ndiaye:
ousmanen@yahoo.com

James Kinyangi
CCAFS
Kenya
j.kinyangi@cgiar.org

Souleye Kitane
AfDB
Senegal
s.kitane@afdb.org

Kituyu
Kenya Model Farmer- Machakos
Kenya

Kaliba Konaré
WMO
Switzerland
kkonare@wmo.int

Diriba Korecha
National Meteorological Agency
Ethiopia
dkorecha@yahoo.com

Filipe Lucio
WMO/GFCF
Switzerland
flucio@wmo.int

Patrick Luganda
NECJOGHA
Uganda
patrick_luganda@yahoo.com

Cromwell Lukorito
University of Nairobi/ICPAC
Kenya
cblukorito@gmail.com;
cbusolo@uonbi.ac.ke;
dept_meteo@uonbi.ac.ke

Mamadou Ly
ARED
Senegal
lymadou2001@gmail.com

Oumou Kalsoum Ly
USAID Senegal
Senegal
oly@usaid.org

Cindy Malvicini
Asia Development Bank
Thailand
cmalvicini@adb.org

Durga Prakash Manandhar
Department of Hydrology and
Meteorology
Nepal
dg@dhm.gov.np ;
rishisharm@yahoo.com

Sarah McKune
University of Florida
USA
smckune@ufl.edu

Ruth Mitei
CARE International
Kenya
rmitei@careclimatechange.org

Surabhi Mittal
CIMMYT
India
s.mittal@cgiar.org

John Morton
NRI
UK
J.F.Morton@greenwich.ac.uk

Abdoulaye S. Moussa
CCAFS West Africa
Mali
a.s.moussa@cgiar.org

Emmanuel Mpeta
National Meteorological Service
Tanzania
empeta@meteo.go.tz, empeta@
yahoo.co.uk

Drake Mubiru
NARO
Uganda
dnmubiru@kari.go.ug

Valery Mueller
IFPRI
USA
v.mueller@cgiar.org

Mainza Mugoya
East Africa Farmers' Federation
Kenya
Mmainza2001@yahoo.com

Manyewu Mutamba
Southern African Confederation of
Agricultural Unions
South Africa
mmutamba@sacau.org

Jasper Batureine Mwesigwa
ICPAC
Kenya
jbmwesigwa@icpac.net

Durton Nanja
Zambia Meteorological
Department
Zambia
dnanja@yahoo.com

Sudhakar Reddy Narahari
Shanti Service Society
India
nsreddy69@yahoo.com

Soxna Ndao
Model farmer (Kaffrine)
Senegal
contact through Ousmane Ndiaye:
ousmanen@yahoo.com

Arouna Ndiaye
Model farmer (Kaffrine)
Senegal
contact through Ousmane Ndiaye:
ousmanen@yahoo.com

Ousmane Ndiaye
National Meteorological Service
Senegal
ousmane@iri.columbia.edu

Mrs. Yacine Ndour
ISRA
Senegal
yacine.ndour@ird.fr

Lily Njinga
Engility Corp.
USA
Joyce-
Lynn.Njinga@engilitycorp.com

David Obongo
FAO Food Security Network
Kenya
David.Obongo@fao.org

Happiness Oselebe
Ebonyi State University
Nigeria
happinessoselebe@yahoo.com

Dominic Soami Pokperlaar
Ghana Meteorological Services
Department
Ghana
soamipokperlaar@yahoo.com

Maren Radeny
CCAFS
Kenya
M.RADENY@CGIAR.ORG

Ranbir S. Rana
Government of Himachal Pradesh
India
ranars66@rediffmail.com

K.P.C. Rao
ICRISAT-Nairobi
Kenya
K.P.Rao@CGIAR.ORG

Carla Roncoli
Emory University
USA
mcronco@emory.edu

Judith Sanfo
Burkina Meteorological Authority
Burkina Faso
sanfo_b@yahoo.com

Moussa Seck
Agricultural Extension (Kaffrine)
Senegal
seckelha@yahoo.fr

Ramasamy Selvaraju
Tamil Nadu Agricultural University
India
selvaraju_r@hotmail.com

Ayub Shaka
Kenya Meteorological Department
Kenya
ayubshaka@ymail.com

G. Shrotriya
IFFKO Kisan Sanchar Ltd.
India
shrotriyagc@yahoo.com,
shrotriya.iksl@iffco.in

Aissa Sita
National Meteorological Service
Niger
aissasita_s@yahoo.fr

Mannava Sivakumar
WMO/Consultant
Switzerland
msivakumar@wmo.int

Robert Stefanski
WMO
Switzerland
rstefanski@wmo.int

Leopold Some
Burkina Faso
bsomel@yahoo.fr

Minielle Tall
Communication expert
Senegal

Vieiri Tarchiani
IBIMET-CNR
Italy
v.tarchiani@ibimet.cnr.it

Arame Tall
ICRISAT/CCAFS
Mali
a.tall@cgiar.org

Minielle Tall
Communication expert
Senegal

Vieiri Tarchiani
IBIMET-CNR
Italy
v.tarchiani@ibimet.cnr.it

Paul Thiao
FONGS
Senegal
fassarpate@yahoo.fr

Maralaye Thiom
Red Cross
Senegal
maralaye@hotmail.com

Yoro Thioye
CNCR
Senegal
thioyey@yahoo.fr

Souibou Toure
Model Farmer (Cinzana)
Mali
contact through Ousmane Ndiaye:
ousmanen@yahoo.com

Pierre Sibiry Traore
ICRISAT
Mali
p.s.traore@CGIAR.ORG

Seydou Traore
AGRHYMET
Niger
seydou_traore@yahoo.com

Andrea Di Vecchia
IBIMET-CNR
Italy
a.divecchia@ibimet.cnr.it

Balaji Venkataraman
Commonwealth of Learning
Canada
vbalaji@col.org

Kalpana Venkatasubramanian
Rutgers University
USA
kalpanasa@gmail.com

B. Venkateswarlu
CRIDA
India
Contact through Dr. Ayyapann:
dg.icar@nic.in;
vbandi_1953@yahoo.com

Pascal Yaka
Burkina Meteorological Authority
Burkina Faso
pascal_yaka@yahoo.fr

Steve Zebiak
IRI/CSP
USA
steve@iri.columbia.edu

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic initiative of the Consultative Group on International Agricultural Research (CGIAR) and the Earth System Science Partnership (ESSP), led by the International Center for Tropical Agriculture (CIAT). CCAFS is the world's most comprehensive global research program to examine and address the critical interactions between climate change, agriculture and food security.

For more information, visit www.ccafs.cgiar.org

Titles in this Working Paper series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**

