



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



Improving resilience to climate impacts
in West Africa through improved
availability, access and use of climate
information: dialog with users

Niamey, Niger, 21-23 January 2014

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and Barbara Platzer**



AGRHYMET REGIONAL CENTRE

COMITE PERMANENT INTER-ETATS DE LUTTE CONTRE LA SECHERESSE DANS LE

SAHEL



Bénin Burkina Faso Cap Vert Côte d'Ivoire Gambie Guinée Guinée Bissau Mali Mauritanie Niger Sénégal

Improving resilience to climate impacts in West Africa through improved availability, access and use of climate information: dialog with users

A stakeholder workshop on AGRHYMET ENACTS information products

Workshop Report

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

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Correct citation:

Ali A., Djibo H., Minoungou B., Dinku B., Platzer B. 2014. Improving resilience to climate impacts in West Africa through improved availability, access and use of climate information: dialog with users. CCAFS Workshop Report. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.

CCAFS Workshop Reports aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

Published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

CCAFS is a strategic partnership of the CGIAR and the Earth System Science Partnership (ESSP). CGIAR is a global research partnership for a food secure future. The program is supported by the Canadian International Development Agency (CIDA), the Danish International Development Agency (DANIDA), the European Union (EU), and the CGIAR Fund, with technical support from the International Fund for Agricultural Development (IFAD).

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Abstract

The stakeholder workshop on *“Improving Resilience to Climate Impacts in West Africa Through Improved Availability, Access and Use of Climate Information: Dialogue With Users”* was convened by the Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle (AGRHYMET) in collaboration with the International Research Institute for Climate and Society (IRI) with funding and technical support from the United States Agency for International Development (USAID), the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the United Nations Development Program (UNDP). Stakeholders from six Permanent Inter-state Committee for Drought Control in the Sahel (CILSS) countries were invited, in addition to representatives of five river basin organizations and the African Center of Meteorological Application for Development (ACMAD). The three-day meeting in Niamey, Niger (January 21-23, 2014) was attended by 40 participants and facilitators. It consisted of five components:

- Introduction to AGRHYMET’s latest climate data, tools, and information products;
- Training on the use of the tools for data analysis and visualization;
- Engagement on the concept of climate risk management in the different sectors;
- Soliciting feedback and needs from participants, to assess the value of the available tools and products to users, and inform improvements that are most relevant to stakeholders; and
- Exploration of an Advisory Group for improving Climate Services provided by the AGRHYMET Center.

The workshop introduced and solicited feedback on data, products and decision-support tools launched to support improved resilience to climate impacts, across sectors, initially targeting the agriculture, water and disaster risk management communities.

Keywords

Climate services; remote sensing; precipitation; risk management

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Acknowledgements

We gratefully acknowledge the organizing host, Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle (AGRHYMET). The workshop was co-organized by the International Research Institute for Climate and Society (IRI, Columbia University), Engility Corporation, and ICF International. Financial support was provided by the United States Agency for International Development (USAID)/Climate Change Resilient Development (CCRD); the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS); and the United Nations Development Program (UNDP). The following meeting rapporteurs contributed material that was incorporated into this report: Hamidou Coulibaly (Direction Nationale de Météorologie/Nouakchott-Mauritanie), Halidou Tinni (AGRHYMET), Rémi Cousin (IRI), and Henri Songoti (AGRHYMET).

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Acronyms

AGRHYMET	Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle
ANACIM	Agence Nationale de l'Aviation Civile et de la Météorologie
APSD	Action Plan for Sustainable Development
CCAFS	Climate Change, Agriculture and Food Security
CGIAR	Formerly: Consultative Group on International Agricultural Research
CCD	Cold Cloud Duration
CILSS	Comité Permanent Inter-états de Lutte contre la Sécheresse dans le Sahel
CNEDD	Conseil National pour l'Environnement et le Développement Durable
CPE	Commission Permanente des Eaux
CPT	Climate Predictability Tool
CRA	AGRHYMET Regional Center
DHI	Danish Hydrology Institute
DSS	Decision Support System
ENACTS	Enhancing National Climate Services
ENSO	El Niño/Southern Oscillation
FEWS NET	Famine Early Warning System Network
FIT	Forecast Interpretation Tool
GCM	General Circulation Model
GST	Global Telecommunications System
GTP	Groupe de Travail Pluridisciplinaire
ICF	ICF International (Formerly: Inner City Fund)
ICT	Information and Communications Technology
IFRC	International Federation of Red Cross and Red Crescent Societies
IRG	International Resources Group
IRI	International Research Institute for Climate and Society
MoU	Memorandum of Understanding
NBA	Niger Basin Authority
NDVI	Normalized Difference Vegetation Index
OMVG	Organisation pour la Mise en Valeur du fleuve Gambie
OMVS	Organisation pour la Mise en Valeur du fleuve Sénégal

ONM	Organisation Nationale de la Météorologie
PADD	Programme d'Action pour le Développement Durable du Bassin
PET	Potential EvapoTranspiration
PNUD	Programme des Nations Unies pour le Développement
PRESAO	Prévisions Saisonnières en Afrique de l'Ouest
RFE	Rain Fall Estimate
RS	Remote Sensing
TAMSAT	Tropical Applications of Meteorology using SATellite data and ground-based observations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USGS	United States Geological Survey
VBA	Volta Basin Authority
VCI	Vegetation Condition Index
WEAP	Water Evaluation and Planning
WFP	World Food Program
WRIS	Water Resources Information System
WRM	Water Resources Management

Introduction

Building resilience against the negative impacts of climate and maximizing the benefits from favorable climate conditions requires mainstreaming climate issues into development policy, planning, and practice at different decision making levels. Thus, the availability of decision-relevant climate information at different levels is very critical. The number and quality of weather stations in many parts of Africa, however, has been declining and has contributed to challenges in accessing relevant climate data. The available stations are often unevenly distributed with most of the stations located along major roads. This imposes severe limitations to the availability of climate information and services to rural communities where these services are often needed most. Where observations are taken, they suffer from gaps and poor quality and are often unavailable beyond the respective national meteorological services.

Combining available local observation with cutting-edge satellite proxies, making data and products openly and readily available and working with stakeholders to understand and use climate information will help to alleviate these challenges and pioneer a new approach to improved climate resilience in Africa. Activities led by AGRHYMET and IRI in West Africa have already included: (a) an unprecedented thirty-year time series of ten-daily rainfall data for every 4 km grid across eight CILSS countries; (b) an online mapping service installed at AGRHYMET providing user-friendly tools for the analysis, visualization, and download of climate information products; and (c) increased technical capacity at AGRHYMET to make the project sustainable and also help member countries acquire similar capabilities.

The online platform developed currently includes three Map Rooms for: Climate Analysis, Climate Monitoring, and Climate Forecast. Two other Map Rooms, Climate Information for Agriculture and Climate information for Water, are expected to be added following consultation with stakeholders during the workshop. The Climate Analysis Map Room provides information on the mean climate (in terms of rainfall and temperatures) - at any point for national and sub-national levels. It can also show the performance of the rainfall seasons over the years as compared to the mean. The Climate Monitoring Map Room enables monitoring of the current season. Different maps and graphs compare the current season with

the mean of recent years. This information could be extracted at any point or for any administrative boundary. Data is updated every ten days, thus enabling close monitoring of the season. Extracting and presenting information at any administrative level enables focusing on specific areas of interest. The Climate Forecast Map Room translates the PRESAO seasonal forecasts to different values that can easily be understood by users. It presents the forecasts in the context of historical rainfall data and ENSO events. This information can be analyzed and extracted at national or sub-national levels.

The project work accomplished so far will significantly improve the availability of and access to climate information in West Africa. However, there was one big piece missing: ensuring the use of the new data, tools and climate information products. Generating climate information products and making them available online may not necessarily lead to their uptake.

The workshop was therefore convened to critically engage stakeholders on the value and application of such information products. Recognizing the need for constant dialogue and interactions with different user groups, this workshop sought to identify practitioners in the agriculture, water and disaster risk management communities to work towards improved climate resilience in West Africa. Its objectives were to:

1. Enable participants to understand and use AGRHYMET's new data, tools and information products.
2. Enable participants to understand the basic concepts of climate change and variability.
3. Enable participants to understand the basic concepts of climate risk management in their respective sectors.
4. Solicit critical feedback from stakeholders in order to improve the existing information products and/or develop new ones based on identified needs.
5. Explore the possibility and value of forming communities of practice.

Program summary

Opening session

The workshop was officially opened by Mr Malang Diatta of the “Organisation pour la Mise en Valeur du Fleuve Sénégal” (OMVS), who welcomed the guests of honor and participants. Ms. Seon-Mi Choi of UNDP provided a brief overview of activities under the Africa Adaptation Program (AAP) and initiatives of the UNDP Africa Bureau and Niger country office, reiterating strong support for AGRHYMET and its partners on improved climate information and products to assure resilience to climate impacts in the Sahel. Dr Molly Hellmuth of ICF International, an implementing partner of the USAID Climate Change Resilient Development (CCRD) Program, also welcomed stakeholders to the meeting and provided a summary of the USAID Climate Change Office’s Task Order and CCRD’s collaborations with AGRHYMET to support regional level investments in availability, access and use of climate data and decision tools.

Full opening remarks of IRI’s Tufa Dinku and AGRHYMET’s Oumarou Moulaye are included below.

Tufa Dinku, IRI

Dear colleagues, it is my great pleasure to welcome here all distinguished guests and participants on behalf of the International Research Institute for Climate and Society (IRI) and Columbia University and its partners.

I would also like to start by thanking AGRHYMET for organizing and hosting this important workshop and their collaborations on preparations to launch new climate information products here in West Africa. I am very grateful also to USAID, particularly to the Climate Change Resilient Development (CCDRD) initiative for their funding and support to the workshop. I would also like to thank UNDP and CCAFS for providing additional resources.

Ladies and Gentlemen, the availability, access, and use of climate information are critical to achieving climate resilient development and sustained development gains in general. The AGRHYMET Center has been providing climate information to CILSS countries for decades. It has been making efforts to improve these services. This recent investment has resulted in over 30-years of rich rainfall data for every 10km grid across all the CILSS countries and new climate information products that are now available online. You will explore these new information products over the next three

days and help AGRHYMET to further tailor them to your needs. This project, named Enhancing National Climate Services (ENACTS), has been implemented in other countries in Africa at the national level. However, AGRHYMET is the first to implement ENACTS at the regional level- this is an incredibly important milestone. The AGRHYMET Center is the only regional center entrusted with climate data from national meteorological services. This, plus AGRHYMET's excellent scientists and experts, has made implementing ENACTS in West Africa possible. The IRI has provided major technical support to this project, and will continue working with AGRHYMET in improving climate information products, as well as in ensuring their relevance to users and decision-makers. This is not the first collaboration between IRI and AGRHYMET. This collaboration goes back over ten years. The first MoU between IRI and AGRHYMET was signed in 2004.

As we have learned through our close partnership, generating climate information products and making them available online may not necessarily lead to their use. Stakeholders need to be involved in the generation of the products and receive training on how to use them. This cannot be accomplished with a single workshop. There should be constant dialogue and interactions between users and AGRHYMET. This workshop is the first step in that direction. Thank you for your attention and participation in this critical forum for exchanging information, experiences and demands to allow ENACTS and our work to have a greater impact in the region.

Official welcoming, Oumarou Moulaye, Representative of Director General, AGRHYMET

The Representative of UNDP, The Representative of the IRI, Distinguished experts of the AGRHYMET Regional Centre, Distinguished trainers, Dear guests, Ladies and Gentlemen, it is my pleasure to be here today to chair the official opening ceremony of the "Regional Workshop on Resilience to Climate Impacts through Improving Availability, Access and the Use of Climate Information: Dialogue with Users." This workshop, organized by AGRHYMET Regional Centre in collaboration with the International Research Institute for Climate and Society (IRI) at Columbia University (USA), with the financial support from USAID, the United Nations Development Program and CCAFS. This workshop targets meteorological services and early warning systems in CILSS member countries and river basin organizations. Dear all, participants, trainers and learners, I would like to welcome you and wish you a pleasant stay in Niamey.

Beyond the importance of the workshop and your interest in it, your presence at AGRHYMET Regional Center constitutes an initial step in advancing the ways and means to improve availability, access and use of climate information.

Ladies and Gentlemen, as you know, the West African region is facing the effects of climate variability and change, with adverse consequences on the living conditions of populations. Indeed, phenomena such as floods, droughts, coastal erosion and desertification increase the vulnerability of populations and lead to repetitive food crises and environmental degradation. This is why climate change should be considered as a priority in development plans. However, the existing data quality, accessibility and use to enable, through improved climate information, better climate impact management for appropriate decisions at different levels are limited. In this context AGRHYMET Regional Centre and IRI are currently committed to activities in West-Africa that include:

An unprecedented thirty-year time series of ten-day rainfall data for every 10 km grid across eight CILSS countries;

An online mapping service installed at AGRHYMET providing user-friendly tools for the analysis, visualization, and download of climate information products;

We can also add the creation of an online platform which currently includes three components: historical data analysis, seasonal monitoring and climate forecasts. As you can see this workshop therefore stands to encourage discussion of stakeholders on the quality and the application of these products. Recognizing the need for dialogue and interaction with the various user groups, the workshop also aims to identify a network of users of climate information to improve climate resilience in West Africa.

Dialogue is necessary between all stakeholders to achieve the key objectives of the workshop that is to enable participants to understand and use new tools, data and products of CRA. The workshop also intends to improve the understanding of participants on the basic concepts of climate variability and change, to get feedback from stakeholders and to explore the possibility of forming a community of users.

Ladies and Gentlemen, taking into account the level of expertise of the participants, I am convinced that the topics that will be presented and discussed during this workshop will allow us improve our vision in this area of improving availability, access and use of climate information.

Before concluding my remarks, let me express my sincere and grateful thanks to all development partners who support us to strengthen resilience to climate impacts. I especially thank IRI for its technical support, USAID, UNDP for their financial support and CCAFS for helping us organize this workshop. Wishing you a successful workshop, I declare the "Workshop on Improving Resilience to Climate Impacts in West Africa through Improved Availability, Access and Use of Climate Information: Dialog With Users" officially opened. Thank you for your kind attention.

Abdou Ali: Introduction to the workshop and expected outcomes

AGRHYMET's Dr Abdou Ali provided an overview of the workshop's objectives, its organizing institutions and format, including the four major components identified in the agenda. IRI's Tufa Dinku then provided a brief overview of the new climate information and ENACTS products and experiences from other countries.

Additionally, there were two short presentations to provide background on climate variability and change, as well as the concept of climate risk management. The abstracts of those talks as well as discussion that followed the talks are given below.

Ousmane Ndiaye: Overview of climate variability and change

The purpose of this talk was to present the scales of climate variability for users to consider in their applications of climate products. Climate predictions have maturities ranging from hours, days or years. Weather prediction covers one to five days, with skill at a few days to hours in advance. Seasonal forecasts cover two or several months and may provide skill at 1 to 6 months depending on the existing oceanic forcing (1-3 months in West Africa). There are climate changes that are based on the greenhouse effect due to human impacts. Forecasts or projections can cover 10 to 150 years; though they are uncertain they provide some indication of potential trends. When the forecasted period is long, prediction accuracy is less. For climate change, each projection has a scenario which is a set of assumptions. It is important therefore always to understand and refer back to the scenario being considered. It should also be noted that each forecast is accompanied by an uncertainty measure regarding the accuracy of the forecast. We must therefore take into account this uncertainty and communicate it with precision.

Molly Hellmuth: Overview of climate risk management: learning from practice

Climate risk management seeks to promote sustainable development by helping to manage vulnerability associated with both short term climate variability and longer term climate change. In particular, in climate-sensitive areas such as agriculture, water resources, food security, health and disaster risk management. The presentation laid out three key factors to successful implementation of climate risk management: 1) that development needs and relevant/priority decisions are clearly identified upfront, 2) that data and information is available, accessible and useable, 3) that partnerships and collaborations are established, sustained and iterative.

The identified development needs may include those at planning time scales (e.g., project investments, policy development, etc.), or operational time scales (e.g., disaster preparedness, crop planting and harvesting, etc.). Critical to achieving improved decision making is that the information is useful and useable (i.e. tailored to the specific decision), accessible, and available (i.e. it exists). The ENACTS product, presented at this workshop, helps to overcome some of these limitations by creating high spatial and temporal resolution rainfall and temperature data through blending of observations and satellite data.

Development of partnerships and iterative processes is a critical component to ensuring climate information is integrated into decision making, and that climate risks are ultimately managed to improve resilience today and over time. For the purposes of this workshop, it will be critical to establish a process, to identify ways of ensuring that products are developed through consultation to support decisions being made by water, food security, and agricultural managers.

Following the presentation, participants asked about the added value of the ENACTS products. Three areas of contribution were elaborated on:

- Availability: With ENACTS, products and climate data are available for each 10km * 10km grid in West Africa.
- Accessibility: Data are available online. Any user can therefore access them at any time. In addition, it is technically possible to make them accessible by phone.
- Usage: Provided weather services and users are trained, using data and products from ENACTS will be easy.

The fact that raw weather data is not free was raised. The added value of merging was discussed as a major benefit of combined satellite and ground products. A participant asked NBA how climate change has been mainstreamed in development programs in the basin of the Niger. NBA responded that a recent study on the impact of climate change on water resources indicates a decline of stream flow in the Niger basin of 20% and explained that programs are factoring in this decline. The problem of easily accessible internet in Africa was discussed, in particular on “how measures can be taken to facilitate the smooth running of the Data library in our country.” It was proposed that the implementation of the ENACTS project at the country level would need to take internet connectivity into account. One participant

asked for an explanation of the methodology behind the combination of satellite data and those from the observation networks. The trainer responded that the method of merging was based on generalized linear models and inverse distance interpolation. The product merges data from observations with ancillary data such as satellite estimates, terrain elevation, even latitude and longitude.

Technical session: the use of climate information in the sectors

Jacob Tumbulto: Water resources and the experiences of the Volta Basin Authority

This presentation provided an introduction to the Volta Basin and Volta Basin Authority (VBA), including the uses of climate information in water resources management in the Volta Basin, and the need for improved capacity to generate data and use existing climate information effectively. The mandate and statutes of VBA were presented, putting particular emphasis on those in line with data and information acquisition and management. It was emphasized that VBA is relatively young. Cases were presented in which climate data in the form of historic long-term averages are used in Water Resources Management (WRM) in the Volta basin, including the designs of hydraulic structures such as bridges, dams, irrigation canals, diversion weirs, culverts. Other applications presented included the use of: the results of GCM models to assess the impact of climate change on water resources with the view to proposing appropriate adaptation measures; climate forecasts to assess annual water availability projections for WRM; and the results of the annual seasonal climate and hydrological forecasts (PRESAO) in water resources management.

Introducing the WEAP Volta Decision Support System (DSS), the presenter indicated that the last version of the tool heavily relied upon climate data to assess water resources availability before proceeding on the resource allocation to meet various demands. Many other flood management initiatives in the basin were reported to rely partly on climate data for their effective operation. Finally, the Water Resources Information System (WRIS) developed by DHI for VBA was briefly introduced, with specific reference to the many climate data sets it contains, giving sample products of this tool.

With respect to challenges, the presenter noted that the VBA Member States (like many of the African countries) are challenged in delivering climate data or products to support water resources management. Some specific problems include: (a) lack of appropriate application

software; (b) the need to upgrade operational infrastructure to support WRM data collection, (c) the need for technical training on production of climate e-products and services, (d) the lack of effective co-ordination with other agencies involved in water resources data collection and use, (e) the need for establishing relevant networks, including Technical and Financial partnerships, to support data and information generation and management (data collection instruments, rehabilitation and extension of national networks) and (f) improving upon ICT infrastructure to enhance the capacity of countries to take advantage of a wide range of robust climate products and information management.

Malang Diatta: Water resources and the experiences of the OMVS

After a brief presentation of the Organisation pour la Mise en Valeur du fleuve Sénégal (Senegal River Basin Development Authority, OMVS), the presentation focused on the collection of hydrometric and rainfall data from networks of stations of the Member States. These data are centralized and processed, depending on the needs. They are a set of hydrological information to enable the Permanent Commission of Water (CPE) to adapt dam management to meet the water needs of users and produce a target quantity of energy for the year. The publication of hydrological information enables users to monitor the water flows. Other data are also collected for the purposes of the Environmental Observatory.

In addition, the Communication System of Early Warning was also presented. It is an early warning system for catastrophic floods. Communication relies on tools installed in areas called warning zones (90 zones) along the river between the city of St. Louis and Manatali Dam. These tools are managed by local government representatives and include maps, hydrological data (including stage heights, flowrates, etc.).

The presentation concluded by highlighting the constraints of data collection in the upper basin of the Senegal River. Difficulties of the OMVS member countries were also highlighted, and included those related to non-compliance with respect to data exchange protocols and information exchange between OMVS and suppliers of data.

Kone Sougalo: Water resources and the experiences of the Niger Basin Authority

The NBA presentation focused on the use of climate data to assess the impact of climate change on the Plan for Durable Development (PADD) in the Niger Basin. The PADD's implementation has necessitated the development of water management and allocation tools,

that include a flow forecasting model of the Niger River and its tributaries. The runoff appears to be the driving force for the performance of the PADD and projection of climate, which is necessary to evaluate its performance.

An initiative called the Climate Change Study is in progress in the NBA, with the support of the World Bank, and aims to assess the impact of climate change on the Plan for Durable Development of the basin. Different scenarios of climate change are being tested to infer impacts on various areas of PADD (agriculture, energy, navigation, etc).

The results of climate models are used in hydrologic models to simulate the response of the flow. The latter is used as input in models of water to simulate the performance of the PADD. Knowledge of current and future climate needs to be incorporated into decision making tools.

Ousmane Ndiaye: Agriculture and the experiences of CCAFS

CCAFS in partnership with the National Agency of Civil Aviation and Meteorology (ANACIM) of Senegal has established a demonstration project on the added value of climate information. This project takes place in Kaffrine/Senegal one of five project sites of CCAFS West Africa. ANACIM collaborated with an existing multidisciplinary group that involves all agencies working on food security, including through research, agriculture, extension agencies and soils experts. At the local level, a multidisciplinary working group was established, bringing together local decision makers, technical partners, farmers, and the press.

A survey indicated the need for climate information to be integrated into the decision-making system of the local farmers. Climate information is downscaled to Kaffrine by ANACIM, and interpreted by the local GTP for better adoption by local farmers. Depending on the conditions observed in the field, advice is given to farmers through rural radio, messages, social activities, and newsletters. The local knowledge of farmers is also used. Farmers, through the use of their own gauges also are actively involved in the collection and interpretation of climate information. This process is very dynamic. A first evaluation has shown that there is a high rate of adoption of the use of climate information. Local leaders also participate in this process, along with banks (for example, Crédit Mutuel Sénégalais) and WFP. Farmers still require additional information and more materials for better cultivation.

Alkhalil Adoum: the use of climate information in disaster risk management and early warning

The Famine Early Warning System Network (FEWS NET) was created in 1985 by USAID after devastating famines in West Africa and East Africa to develop early warnings on food security and to provide objective, evidence-based analysis to help government decision-makers and relief agencies plan for and respond to humanitarian crises. It is now present in West, Central, Eastern and Southern Africa, in Central America, the Caribbean and in Afghanistan. In West Africa and the Sahel, its birth place, FEWS NET is present in 6 countries (Chad, Nigeria, Niger, Burkina Faso, Mali and Mauritania) with remote monitoring in Liberia, Sierra Leone and the Central African Republic.

Support from the US Geological Survey (USGS) and USAID to FEWS NET activities consist of: processing and making available to FEWS NET and its partners remote sensing data useful to monitor the growing season and other food security aspects; developing tools and methods to detect and monitor remote sensing of climate variable anomalies, assess their prevalence (length in time and spatial extent), their severity and particularly assess their impact on the growing season outcome; and reporting on such anomalies. Remote sensing advantages include: adequate spatial coverage and availability in near real time.

Disadvantages do exist but they are easily overcome through analyst experience and the convergence of evidence approach.

The following table gives a list of the major FEWS NET products. In addition, the Forecast Interpretation Tool (FIT) can be used to enhance the information provided by the seasonal climate outlooks. FEWS NET considers long term climate change and the implications of population growth, agricultural gaps, soil degradation and crop failures. The FEWS NET Data Portal (<http://earlywarning.usgs.gov/fews/africa/index.php>) provides a complete list of products.

Table 1. Select FEWSNet data products.

Product	Description	Use
RFE and anomalies	Combination of CCD, GTS and Radar data	Monitor rainfall amounts and distribution
NDVI and anomalies	Biomass indicator	Monitor crop and range conditions
WRSI and anomalies	A crop-specific model based on water supply and demand	Monitoring crops and range conditions

Amadou Djibrill

In addition to presentations outlined above, Amadou Djibrill (CNEDD) provided brief remarks on collaborations with UNDP under the AAP program and the need for information systems to support early warning systems and flood forecasting. He summarized efforts underway on a review of institutional capacities the development of a national database and the requested support to ensure synergies with partners.

Session questions and discussion

The issue of data collection, quality control and ownership was raised by participants. In the case of water basin authorities, for example, participants asked NBA to clarify how their data is collected and how their seasonal forecast differs from that of AGRHYMET. NBA responded that its data is collected at the country level and that it supports this through new methods, training initiatives and equipment. They also shared that they rely on a “debit-debit” forecasting model and that a newer flood forecasting model taking water charts into account was not yet operational. The issue of who should issue an early warning was raised. Participants discussed the need for local authorities and populations to be engaged. Following Ousmane N’Diaye’s presentation on experiences with CCAFS, participants inquired how climate change concerns were addressed with farmers in Kaffrine. Ousmane Ndiaye responded that assessments were made at the local level to see the usefulness of seasonal forecasts and the needs of farmers to better address the concept of resilience, as well as current and longer term planning. Participants discussed how to tailor climate information to be more relevant to specific users. The need to translate the climate information to a more digestible language easily understood by users (farmers, water managers, etc.) was raised. CCAFS raised the idea of dedicated trainings with farmers and communication tools (radio, social media) to reach partners throughout the value chain of climate information and services.

Discussion: mechanisms for strengthening collaboration

A moderated discussion was facilitated by Ousmane N’Diaye to stimulate discussion on mechanisms for strengthening collaborations between AGRHYMET and user communities in West Africa. IRI’s Tufa Dinku provided an introduction to the discussion and Abdou Ali provided background on AGRHYMET’s experiences to date. ICF’s Molly Hellmuth added

thoughts on best practices and on the need to lead from decision-maker's needs, before opening the floor for discussion.

The discussion mainly focused on country needs for product improvement and climate data. During the discussion, the optimization problem of hydrometeorological networks emerged. It was suggested that this optimization should take into account the needs of different stakeholders and sectors, including meteorology, agriculture, the environment and the services of early warning systems. It was suggested that this would require the multidisciplinary working groups to be revitalized. The problem of data collection in many countries was also highlighted as a barrier. Techniques combining the data were also raised as an issue.

Hands-on training: access to data and information products

Rémi Cousin: Introduction to the IRI Map Rooms & online demonstration

This talk presented a brief overview of the IRI Data Library¹ and the Map Rooms. The Data Library is a freely accessible online data repository and analysis tool that allows a user to view, manipulate, and download the world's broadest collection of accurate climate data together. It contains a wide variety of publicly available data sets, including station and gridded atmospheric and oceanic observations and analyses, model-based analyses and forecasts, and land surface and vegetation data sets, from a range of sources. It also has a suite of analytic tools and an unmatched ability to transform and integrate that data with sectoral data to meet user needs. The broader IRI Map Rooms were also briefly introduced to demonstrate additional features that could be added to AGRHYMET's locally installed Data Library. These included: IFRC Forecasts; El Niño/Southern Oscillation (ENSO); Food Security; Climate and Agriculture; Desert Locust Monitoring; Climate and Health.

Rémi Cousin, Omar Boukari, Aziz Boubacar, Henri Songoti: Demonstration of the AGRHYMET Map Rooms and Data Library

This talk presented the AGRHYMET Map Rooms² and introduced current products available for the CILSS region (and also showcased placeholders for Map Rooms that could be

¹<http://iridl.ldeo.columbia.edu>

²<http://41.138.51.76/maproom/>

developed, e.g. Climate and Water, Access to Market). Importing IRI technology, AGRHYMET currently offers a Climate Map Room. The Climate Map Room has three components: Climate Analysis, Climate Monitoring, and Climate Forecast. The Climate Analysis Map Room provides information on the mean climate (in terms of rainfall), at dekadal and monthly time scales and for any point or administrative boundary. It can also show the performance of the rainfall seasons over the last 30-years as compared to the mean. The Climate Monitoring Map Room enables monitoring of the current season. Different maps and graphs are available to compare the current season with the mean or recent years. This information can be extracted at any point or for any administrative boundary. Data is updated every ten days, which enables close monitoring of the season. The Climate Forecast Map Room translates the seasonal forecasts to rainfall values that can easily be understood by users. It presents the forecasts in the context of historical rainfall data. Another Map Room in this section highlights the connections between ENSO phases and rainfall distribution in the CILSS region. There is the opportunity to further develop this product with other variables impacting on the region's climate, but the current Climate Forecast Map Room can serve as a resource to policy makers and the public for its translation of probabilistic forecasts to expected rainfall amounts.

Session questions and discussions

Participants raised concerns with accessing the IRI Data Library and generally with deployment of new technologies and online resources with local bandwidth constraints. Installation of IRI Data Library at AGRHYMET would help overcome some of these challenges, but AGRHYMET is also awaiting improved network infrastructure in the next month.

Participants asked about overlay of shape files and integration of this catchment versus administrative boundaries. It was explained that shape files of all sorts could be added (health district data, river basins, etc) and time series derived.

Participants inquired about how to analyze historical climate variability in the Climate Analysis Map Room. Presenters directed them to the Climate Anomaly graph.

A question was raised on why the 30 year time series (1981-2010) was not available for the Climate Analysis Map Room, e.g. only 1983 to 2009. It was explained that TAMSAT rainfall

estimates from satellites started only in 1983. After 2009, data is available and can be updated- just a question of staff capacity (and is already more up-to-date in Climate Monitoring Map Room).

Participants inquired about the methodology and protocol to develop further Map Rooms of interest. AGRHYMET responded that upon agreement and with resources, their trained staff could support further product development.

Participants asked about broader variables measuring climatology, e.g. evapotranspiration, onset of season, end of season, etc. It was explained that at the national level, ENACTS includes rainfall, maximum and minimum temperature. The additions of further parameters depend on status of current national data and agreements with national met services to share this AGRHYMET. With improved data collection and sharing, evapotranspiration and soil moisture data could for example be added in the next version of ENACTS.

A question was raised on the choice of TAMSAT versus other remote sensing products. Tufa Dinku explained that while others may have advantages, TAMSAT was overall the most appropriate (owed primarily to homogeneity of data and long time series).

The issue was raised about responsibility of updating the merged data moving forward and how to sustain the ENACTS products moving forward. AGRHYMET responded that it intends to update every dekad and to work towards an automatized system.

Participants requested that uncertainty of data and margins of error were openly shared and discussed, in particular that process for data validation was prioritized so that ENACTS products and subsequent analyses could be trusted and used with confidence.

Participants asked about access to raw data time series and not just visualization tools. AGRHYMET indicated that these were publicly available online on its website.

Participants asked about the limitation of the ENACTS data for the ENSO Map Room analysis, indicating 30 year time series was not sufficient and that it currently only takes into account Pacific influences on region. Suggestion was made to further develop (and include data on Atlantic parameters).

Continuation of practical training

At the end of the afternoon session of Day 2, participants were invited to test the AGRHYMET products and Map Rooms for their own intended use and were guided through practical exercises.

During open discussion on the data and products, participants asked for a more detailed explanation of the graph on seasonal forecasts with El Nino events in the Pacific Ocean. They inquired about other oceanic phenomena beyond El Nino that might help explain precipitation over the Sahel. Participants asked about probabilistic forecasts as expressed as terciles (normal-above normal and below normal) and how to interpret these categories given different rainfall distributions over different regions. Participants asked about using geographic coordinates in order to extract specific data for a point. It was reinforced that seasonal forecasts represent a consensus forecast over large areas. Participants suggested using CPT (Climate Predictability Tool) for seasonal forecasting. Participants asked for improved graphics and user interface for a better understanding and interpretation of what is available through AGRHYMET Map Rooms. For example, many graphs do not include legends. To improve the quality of seasonal forecasting, participants also asked about the ability to forecast rainfall distribution during the season.

Workshop assignment

At the end of Day 2, participants were asked to reflect on the assignment below before final recommendations were drafted during the Closing Session on Day 3. Questions included:

- Part 1: How useful are the presented data and information products? Which information product(s)? For what purpose? In what way?
- Part 2: What needs to be improved or added? Which/what specific data or information product(s)? For what purpose?
- Part 3: Any suggestions or comments not covered above?

Continuation of practical training

ICF's Molly Hellmuth began Day 3 with a few slides to prompt discussion on what types of decisions could be supported by improved climate information and tools citing examples from

work of the Volta Basin Authority, IFRC and CCAFS. Participants were then invited to continue testing the AGRHYMET Map Rooms further.

Following the testing of the Map Rooms, participants made the following suggestions: Have information on the different watersheds in addition to those already available across administrative entities. Provide information on the flow and return periods of major floods coefficients. Integrate management models of water tanks in the system. Generate information on evapotranspiration in order to make the water balance of watersheds.

CCAFS also indicated that AGRHYMET could learn from their experience and leverage the ENACTS products to address: the development of seasonal forecasts by downscaling; the calculation of indices of rainfall for agricultural insurance; and early warning systems for food security.

Feedback session

Abdou Ali facilitated an open discussion on group feedback regarding the assignment, the existing tools presented and the requirements for new data and information products. The group also explored the formation of an Advisory Group and nomination of focal persons for improving climate services by AGRHYMET. To facilitate the discussions, the participants were divided into thematic groups (hydrology, climatology and agriculture and food security). The resulting recommendations are summarized in the Conclusion and Recommendations section.

Closing session

Closing remarks were given by Mallang Diatta (Representative of the participants), Abdou Ali and Matty Ba Diao (AGRHYMET), Tufa Dinku (IRI), and Seon-mi Choi (UNDP).

Dr. Abdou Ali, the main organizer of the workshop was the first to thank the trainers, the participants for their involvement in achieving the objectives of the workshop. He proposed the creation of a network of exchanges to improve the tools and products developed.

M. Malang Diatta, representative of participants, thanked the organizers of the workshop, in collaboration with the IRI in the success of the workshop. On behalf of the participants, he also thanked the financial partners of the workshop (UNDP, USAID and CCAFS).

The main facilitator Dr. Tufa Dinku thanked the host institution of the workshop, namely the CRA participants for their suggestions to improve the tool and the financial partners of the workshop. He hoped that stakeholders would maintain contact to improve the tool.

UNDP, a financial partner of the workshop, reiterated their readiness to accompany the CILSS in the activities of building resilience to the impacts of climate change in the sub-region.

The closing speech was made by Ms. Maty Ba Diao, representative of the Director General of the CRA. She apologized for any shortcomings that the participants experienced during the workshop. She thanked the IRI for their technical and scientific partnership with the CRA for the design of tools, the development of climate information products and their involvement in the organization of the workshop. She thanked the contributors for their renewed confidence in CRA. She finally wished the participants safe return to their respective countries and declared the workshop closed.

Conclusion and recommendations

This workshop was part of an effort to improve the use of new climate data, information products and tools that are now available at the AGRHYMET Center. These information products and tools are based on methodology developed under the IRI-led ‘Enhancing National Climate Services’ (ENACTS) initiative. This is the first implementation of ENACTS at the regional level.

Overall, the workshop provided a valuable forum to introduce the recently launched AGRHYMET products. The workshop met its basic objectives to introduce data, products and decision tools to support improved resilience to climate impacts, across sectors, initially targeting agriculture, water and disaster. The workshop also provided a platform for stakeholders to share their feedback on the value of the new information products and tools for their activities and on recommendations for what is further needed. These recommendations are very valuable for improving the information products and developing new tools targeting specific applications. The workshop also explored mechanisms for continued engagement and collaborations. The workshop participants identified the ‘Groupe de Travail Pluridisciplinaire’ (GTP) as a clear mechanism for stakeholder engagement.

Following presentations, technical hands-on sessions and open discussions, participants were asked to respond to the questions below. Included here are the consensus recommendations and feedback of the participants at the workshop:

1. What needs to be improved in the current AGRHYMET data, products and tools?

- Update administrative boundaries.
- Improve the quality of graphics, including legends and captions.
- Improve the presentation of terciles in the seasonal forecasts.
- Enable the integration of national climate forecasts in addition to the regional ones such as PRESAO.
- Provide options for choosing years of interest, rather than the last three, in Fig (c) of the Climate Monitoring Map Rooms and also add the mean in addition to individual years.
- Improve the flexibility of tools by providing access to spatial and temporal data so that users can integrate the data into pre-existing tools.
- Incorporate validation of the different data products.
- Make the suggested improvements before the onset of the next season.

2. What new products and tools need to be developed?

- Add more climate parameters such as temperature, RH, PET, etc.
- Refine temporal resolution to daily time scale.
- Extend the time series of ENACTS data beyond the current 30 years to facilitate a better understanding of the Sahel climate.
- Provide additional information products such as the start of the growing season, rainfall intensity and frequency, drought index, maps of drought risks, maps of flood risks, plant water requirements, pasture conditions, climate and health Map Rooms, etc.
- Add information on climate change scenarios.
- Create specific Map Rooms for water resources management, food security, and disaster early warning applications.

- In addition to administrative boundaries, also enable analysis by intervention areas or livelihood zones.
- Make tools more user-friendly.
- Conduct analysis in order to provide more information and tools on the relationship between climate and health.
- Enable the integration of non-climate data from different sectors.

3. What additional capacity is needed by the user community in order to make the best use of climate information?

- Continue capacity building, particularly after improvements to ENACTS data and information products.
- National focal points should assess local capacity needs.
- Train users at regional, national and river basin levels, as well as at technical and non-technical levels.
- Develop a tutorial for self-guided training.
- Mobilize resources for capacity building.
- Include these activities in other capacity building proposals/projects.

4. What collaborations are priorities?

- Contribute to the revitalization of the ‘Groupe de Travail Pluridisciplinaire’ (GTP) or promote the establishment of multi-working group structures similar to GTP.
- Countries should strengthen collaborations with GTP to be partners at the national level and ensure the involvement of all sectors (Weather, Food Security, Hydrology, Agriculture, Early Warning).
- Two focal persons (one climate person and one user) who participated in the current workshop should be identified and agreed.
- Activities that have synergies with the current project and that are already funded, or for which financial resources are already available, should be identified.

5. *What are concrete next steps?*

- Suggested improvements should be implemented before the start of the next rainy season.
- Countries should send updated administrative boundaries to AGRHYMET so that the shape files used for the Maprooms are up-to-date.
- AGRHYMET should send a letter to national institutions for the designation of two focal points from each country.
- Countries should use the system/tools starting from the next season.
- National focal points should provide feedback to AGRHYMET.
- A follow-up workshop should be held in October or November 2014.
- A French translation of the existing modules should be made available before the start of the next rainy season.

Improving the use of climate information products is an iterative process. The current workshop is just an initial iteration. AGRHYMET and IRI need to improve products, and add new ones, as recommended by the workshop and should seek resources to organize a second workshop. Further follow-up should be committed, as needed for sustained capacity to respond to and plan for climate impacts across sectors.

Appendix 1: Agenda

Day-1 (January 21):

8:30-9:00

Registration

*Chair of Morning sessions: **Malang DIATTA, AGRHYMET***

*Rapporteur of Morning sessions: **Hamidou Coulibaly, DNM-Mauritanie & Bernard Minoungou, AGRHYMET***

Opening Session

9:00-9:45

Round Table Introductions

Opening Remarks:

- **Tufa Dinku (IRI)**
- **Molly HELLMUTH (ICF, 'stand in' for USAID)**
- **Seon-mi Choi (UNDP)**
- **Director General (AGRHYMET)**

9:45-10:45

- Introduction to the Workshop and Expected Outcomes (**Abdou Ali, AGRHYMET**)
- Overview of the ENACTS (Enhancing National Climate Services) Approach and Its Implementation in Some Countries (**Tufa Dinku, IRI**)
- Introduction to New Data and Products at AGRHYMET (**Abdou Ali, AGRHYMET**)
- Questions and Discussions

10:45-11:15

Coffee Break & Group Photo

11:15-12:30

- Overview of Climate Variability and Change (**Ousmane Ndiaye, Senegal National Met Agency**)
- Overview of Climate Risk Management (**Molly Hellmuth, ICF**)
- Questions and Discussions

12:30-14:00

Lunch

Technical Session I: Overview

*Chair of Afternoon: **KATIELLOU Gaptia Lawan, DNM-Niger***

*Rapporteur of Afternoon: **Tinni Halidou, AGRHYMET***

14:00-15:30

The Use of Climate Information in the Sectors:

- Water Resources (**Jacob Tumbulto, VBA and Malang Diatta, OMVS**)
- Agriculture (**Ousmane Ndiaye, CCAFS West Africa/Senegal National Met Agency**)

- Disaster Risk Management/Early Warning (**Alkhalil Adoum, FEWS NET West Africa**)
- Improved Climate Information & UNDP Initiatives (**Seon-mi Choi, UNDP**)
- Questions and Discussions

15:30-16:00

Coffee Break

Discussion

16:00-16:45

Discussion on Mechanisms for Strengthening Collaborations between the AGRHYMET Center and User Communities in West Africa (**Moderated by Ousmane Ndiaye, CCAFS West Africa/Senegal National Met Agency**)

- Introduction (**Tufa Dinku, IRI**)
- AGRHYMET perspective (**Abdou Ali, AGRHYMET**)
- How to make it work (**Molly Hellmuth, ICF**)
- Open Discussion

16.45- 17.00

- Wrap-up (**Morning/Afternoon Chairs**)

Day-2 (January 22)

Technical Session II: Hands-On Training

Chair of Morning: Tufa Dinku, IRI

Rapporteur of Morning: Barbara Platzer, Columbia Global Center- Africa

8:30-10:00

Access to Data & Information Products (**Rémi Cousin & John Del Corral, IRI**)

Introduction to the IRI Map Rooms & Online Demonstration

10:00-10.30

Coffee Break

10:30-12.30

Demonstration of the AGRHYMET Map Rooms & Data Library (**Rémi Cousin & John Del Corral, IRI; Omar Boukari, Aziz Boubacar & Henri Songoti, AGRHYMET**)

- Climate Analysis Map Room: Monthly (**Omar Boukari, AGRHYMET**)
- Climate Analysis Map Room: User Interface (**Aziz Boubacar, AGRHYMET**)
- Climate Analysis Map Room: Dekadal (**Omar Boukari, AGRHYMET**)
- Climate Analysis Map Room: Daily (**Rémi Cousin, IRI**)
- Climate Monitoring Map Room (**Henri Songoti, AGRHYMET**)
- Climate Forecast Map Room: ENSO/Precip (**Rémi Cousin, IRI**)
- Climate Forecast Map Room: Seasonal Forecast (**Climate Forecaster**)

12.30-14:00

Lunch

Chair of Afternoon: Tufa Dinku, IRI

Rapporteur of Afternoon: Hamidou Djibo, AGRHYMET

14:00-15:30

Continuation of Practical Training.

Participants to explore AGRHYMET Map Rooms.

15:30-16:00

Coffee Break

16:00-17:00

- Q&A and Open Feedback on Data and Products.
- Wrap-up & Assignment (**Morning/Afternoon Chairs**)

Assignment to Prepare for Tomorrow's Discussion and Final Recommendations:

Part 1: How useful are the presented data and information products?

- Which information product(s)?
- For what purpose?
- In what way?

Part 2: What needs to be improved or added?

- Which/what specific data or information product(s)?
- For what purpose?

Part 3: Any suggestions or comments not covered above?

Day-3 (January 23)

Technical Session II: Hands-On Training continued.

*Chair of Morning: **Molly Hellmuth, ICF***

*Rapporteur of Morning: **Rémi Cousin, IRI and Henri Songoti, AGRHYMET***

8.30 -10:00

Continued Practical Training: Participants to test AGRHYMET products for their own specific applications.

10:00-10:30

Coffee Break

10.30 -12:30

Feedback Session

- Group Feedback about Assignment
- Open Discussion on the Existing Information Products and Defining Requirements for New Data and Information Products
- Discussion on the Formation of an Advisory Group/ Focal Persons for Improving Climate Services by AGRHYMET

12:30-14:00

Lunch

*Chair of Afternoon: **Abdou Ali, AGRHYMET***

*Rapporteur of Afternoon: **Rémi Cousin, IRI and Henri Songoti, AGRHYMET***

14:00-15:30

Closing Session

Final Recommendations to AGRHYMET and IRI:

- What needs to be improved in the current AGRHYMET data, products and tools?
- What new products and tools need to be developed?
- What additional capacity is needed by the user community in order to make the best use of climate information?
- What Collaborations are priorities?

15:30-16:00

Closing Remarks (**AGRHYMET, IRI, UNDP, USAID**).

Appendix 2: Participants

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Appendix 3: Workshop photo

