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Workshop report: Advancing the Use of Gridded, Online Climate Information for Risk Management in the Horn of Africa Mombasa, Kenya

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Advancing the use of gridded, online climate information for risk management in the Horn of Africa

Mombasa, Kenya

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

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Abstract

This report summarizes the discussions, deliberations and recommendations made during the side event, Advancing the use of gridded, online climate information for risk management in the Horn of Africa, to the Forty Eighth Greater Horn of Africa Climate Outlook Forum (GHACOF 48). This event was co-organized by the Climate Services for Africa project—led by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)—and the Weather and Climate Information Services for Africa (WISER) - Enhancing National Climate Services initiative (ENACTS), that was held on 13 February 2018 in Mombasa, Kenya. The main aim of the event was to advance shared understanding, between climate information users and providers on how the GHACOF process and member country National Meteorological and Hydrological Services (NMHSs) can support more effective use of climate information.

The meeting was geared towards raising awareness on recent developments in climate information products developed for the agriculture and food security sector through the ENACTS approach and demonstrate ICPAC capabilities to support member countries in the development of gridded historical and seasonal forecast climate information Maproom products tailored to user needs. Agro-climatic variables showcased included rainfall onset dates (both in historical and forecast mode), cessation dates, historical wet and dry spells, and rainfall intensity. The meeting was also intended to bring an informed agriculture user perspective into a discussion with ICPAC and NMHSs about how the GHACOF process can be made more useful for the agriculture and food security sector.

The workshop brought together representatives from member country NMHSs, experienced agricultural and food security users and champions of climate information, ICPAC, WMO, and WISER and Climate Services for Africa project partners. Workshop participants appreciated the importance of these agro-climatic variables in making timely and informed decisions.

Keywords

Maprooms; Gridded climate information; ENACTS; Onset, Cessation; Wet/dry spells, Rainfall intensity

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The opinions expressed in this report are those of the authors, and do not necessarily reflect the views of USAID or DfID.

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Acronyms

ACMAD	African Centre of Meteorological Applications for Development
API	Application Programming Interface
CCAFS	Research Program on Climate Change, Agriculture and Food Security
CGIAR	Consultative Group on International Agricultural Research
CHIRPS	Climate Hazards Infra-Red Precipitation with Station
CIAT	International Centre for Tropical Agriculture
CSA	Climate Services for Africa
CSRD	Climate Services for Resilient Development
DFID	Department for International Development
ENACTS	Enhancing National Climate Services
FSNWG	Food Security Nutrition Working Group
GHACOF	Greater Horn of Africa Climate Outlook Forum
ICPAC	IGAD Climate Prediction and Applications Centre
IGAD	Intergovernmental Authority on Development
IRI	International Research Institute for Climate and Society
KMD	Kenya Meteorological Department
MAM	March, April and May
NMHSs	National Meteorological and hydrological Services
PICSA	Participatory Integrated Climate Services for Agriculture
PRs	Permanent Representatives
RCCs	Regional Climate Centres
RCOF	Regional Climate Outlook Forum
UCSB	University of California at Santa Barbara
UKMO	United Kingdom Meteorological Office
USAID	United States Agency for International Development
WISER	Weather and Climate Information Services for Africa
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting

Executive Summary

In February 2018, ICPAC convened a meeting at the Forty-Eighth Greater Horn of Africa Climate Outlook Forum (GHACOF48), in Mombasa, Kenya. The meeting was co-organized by the International Research Institute for Climate and Society (IRI) and the CGIAR research program on Climate Change, Agriculture, and Food Security (CCAFS). The meeting was sponsored by the U.S. Agency for International Development (USAID) through the Climate Services for Africa project; and by the UK Department for International Development (DfID) through the Weather and Climate Information Services for Africa (WISER) – Enhancing National Climate Services (ENACTS) project. The event intended to support collaboration between climate information users and providers, explore ways to improve climate services for planning, and the overall GHACOF process.

Presentations and discussions showcased and discussed IGAD Climate Prediction and Applications Centre (ICPAC)’s provision of climate products to the user community, including through Maprooms. They highlighted the different Maproom applications as well as the products that can be generated from the Agriculture Maproom. A panel discussion on agro-climate user needs and dissemination strategies highlighted the important opportunities and challenges involved in using gridded observational datasets and derived online products. Finally, there was a discussion on ways to make the GHACOF more useful for agriculture and food security, such as engaging users from different sectors as well as establishing the needs of the agricultural community. Participants agreed that the GHACOF had improved in recent years, while others underline the need for further training by ICPAC. Other topics discussed included data quality and data availability.

Several recommendations came out of the discussion, including:

- Migrate ICPAC Maprooms to a faster server
- Member countries to strongly take ownership of the GHACOF
- Employ a communications expert at ICPAC to strengthen the dissemination and use of climate information
- Use the GHACOF process to introduce objective, downscaled, gridded, seasonal forecasts, in parallel with the current consensus forecasts

Introduction

ICPAC, in collaboration with IRI, has developed a regional suite of climate information that are provided via an easy to use “Maproom” interface and linked to a powerful Data Library developed by the IRI. The interface provides location-specific agrometeorological information that is of great relevance to agricultural user communities across the Greater Horn of Africa.

Building on experience of ICPAC and several member countries with gridded data sets and online Maprooms, ICPAC convened an evening side event to GHACOF48, in Mombasa, Kenya, 13 February 2018. The meeting aimed to advance shared understanding, between climate information users and providers, of how the GHACOF process and member country NMHS could support more effective use of climate information. The objectives of the meeting were to:

- Raise awareness of recent developments in climate information products developed for the agriculture and food security sector through the ENACTS approach;
- Demonstrate/highlight ICPAC capabilities to support member countries in the development of gridded climate information Maproom products tailored to user needs; and
- Bring an informed agriculture user perspective into a discussion with ICPAC and NMHS about how the GHACOF process can be made more useful for the agriculture and food security sector.

The meeting comprised of participants from IGAD member states: Sudan, South Sudan, Djibouti, Ethiopia, Kenya, Uganda, Somalia, as well as Rwanda and Burundi. The participants included agriculture focal persons, countries’ Permanent Representatives (PRs) with World Meteorological Organization (WMO), ICPAC, United Kingdom Meteorological Office (UKMO) and IRI scientists and a representative from WMO. This report summarizes the discussion and resulting recommendations.

The two projects that sponsored the meeting also supported ICPAC to develop the Maproom products that were the focus of discussions. Climate Services for Agriculture is a three-year initiative (2015-2018), led by CCAFS and supported by the U.S. Agency for International

Development (USAID). Its main aim is to enhance the capacity of regional institutions in Africa to support climate services for agriculture and food security management. In East Africa, the project partners work with ICPAC to develop regional climate information products tailored to agricultural and food security decision-makers, strengthen ICPAC's support to member country NMHSs, and enhance awareness and capacity of national and regional agriculture and food security stakeholders to use and to communicate new climate information products.

The Enhancing National Climate Services (ENACTS) initiative is led by IRI in partnership with National Meteorological Agencies and is a unique, multi-faceted effort designed to bring climate knowledge into national decision making by improving availability, access to, and use of climate information. The goal of ENACTS is to provide reliable and readily accessible climate data at high resolution to decision makers across Africa. ENACTS delivers robust climate data, targeted information products and training that is relevant to user needs, enabling them to apply climate information to decision making with confidence. The Weather and Climate Information Services for Africa (WISER) Programme supports ENACTS development in five countries in East Africa and plans are afoot to expand this to a further three countries. The WISER Programme's mission is to deliver transformational change in the quality, accessibility and use of weather and climate information services at all levels of decision making for sustainable development in Africa. WISER is funded via U.K. Agency for International Development (UKAID) and managed by the UKMO.

Workshop Proceedings

Welcome remarks

The meeting started with opening remarks from ICPAC, WISER and IRI representatives and was chaired by Mr. Mark Majodina, the WMO representative for Eastern and Southern Africa. In his remarks, ICPAC Director Dr. Guleid Artan noted that the meeting's goal was to exchange ideas between climate producers and users on how to improve climate services for better agricultural planning. It was also an opportunity to showcase ICPAC capability in providing quality climate products. ICPAC has tremendously improved on its provision of climate services to the user community through different platforms including the GHACOFs, Food Security Nutrition Working Group (FSNWG), and Maprooms, just to mention a few. He reiterated ICPAC's willingness to collaborate with other institutions to improve its service provision for the benefit of the member states. Mr. John Mungai, on behalf of WISER, was enthusiastic about sharing ideas especially on the use of gridded climate data in overcoming the problem of sparse density of in situ stations in the GHA. He noted that WISER, through ENACTS, has been very active in supporting this.

Dr. Hansen, representing CCAFS and IRI, thanked the participants for taking time to join the discussion. He noted that this was the third meeting following the initial ones held at the GHACOF44 in Kampala, Uganda and the GHACOF47 in Zanzibar, Tanzania. In the earlier meetings, discussions were held with the meteorological services about the direction the project should take. In Zanzibar at GHACOF47, the CSA project collaborated with WISER and Climate Services for Resilient Development (CSRD) to provide training, and shared experience with products and their uses between users and producers.

The occasion of the 20th anniversary of GHACOF provides an opportunity to reflect on the many tools and products that have been developed. The development of the Regional Climate Outlook Forum (RCOF) process was a huge milestone, convening regional meteorological services and users around seasonal climate forecasts. There have also been advances in new tools that are being used by the food security early warning community. They are very relevant and meet the needs and gaps of the agriculture sector at the farm level, but many of these tools and products have not reached the farm level yet. Dr. Hansen asked participants whether there is something that needs to change at the GHACOF given the plethora of

advances in the past twenty years and whether we are doing all we can technically and politically in exploiting this to make it accessible to the users in the agriculture sector.

Demonstration of Regional and National Climate Data and Maprooms

The opening remarks were followed by presentations and demonstration on ICPAC regional and national climate data and Maprooms, and national user experience, by Mr. Oliver Kipkogei (ICPAC), Dr. Asher Siebert (IRI) and Dr. Desire Kagabo (CIAT Rwanda). The presenters touched on the overview and demonstration of the ICPAC Maproom. They highlighted the different applications that the Maproom offers, including generating maps/products and downloading data on the domain of interest in different data formats. Furthermore, they showed some of the products that can be generated using the Agriculture Maproom, including intraseasonal rainfall characteristics like total rainfall, number of wet and dry spells/days, rainfall intensity, historical and forecasted onsets, forecasted length of growing period and flexible forecasts within the Maproom (Fig.1-5). The Maproom is therefore an easy to use interface with the capability to compute different statistics and explore the intraseasonal characteristics of rainfall such as the rainy season onset and cessation based on user-defined thresholds.

For purposes of referencing, onset is defined by first choosing your search window (start at 15 February and execute your search for the next 60 days for this case). The search is done based on a defined criterion which can be changed based on location and user needs. For instance, for this case its defined as first three days that totals 20mm or more and with at least one wet day that is not followed by a seven-day dry spell within the next 21 days.

Dr. Desire Kagabo highlighted the developments and lessons learnt in using the Rwanda Maproom. He noted that the Participatory Integrated Climate Services for Agriculture (PICSA) approach provides a structured approach for farmers to understand and incorporate climate information. He also indicated importance of the Twigire Muhinzi national agriculture extension system, which is a true “home-grown” solution to ensure that all farmers in Rwanda have access to climate advisory services.

The presentation was followed by comments from the participants. The representative from Sudan noted that some of the boundaries used in the maps were not the correct ones and thus needed to be rectified. Moreover, Sudan does not have this maproom facility and needs to

explore ways to remedy the situation. It is better if all member states are at the same level of knowledge and capacity. However, it was noted that the regional maproom can still serve individual member countries as it has an option to subset to regions of interest. The need for co-production between climate producers and users was also a point of concern, which must be addressed for products to have maximum utilization. Climate products should always cascade to the lowest level as opposed to the current practice where mostly elite users have access. In this regard, small holder farmer representatives should be part of the GHACOF process since they are the most vulnerable group as opposed to the current setup. Some of the agro-climatic products showcased are as shown in figures below.

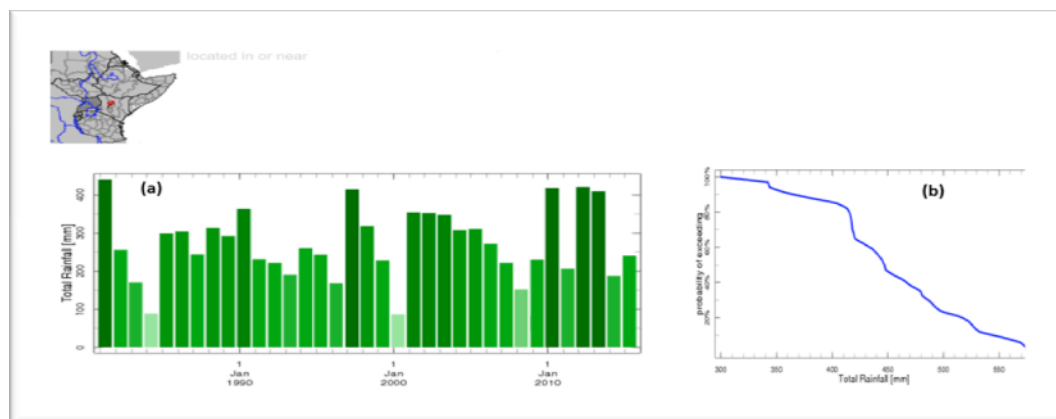


Figure 1: Graph showing total rainfall from 1981-2015 (a) and average (1981-2010) probability of exceedance (b) for MAM season for a particular location in Kenya.

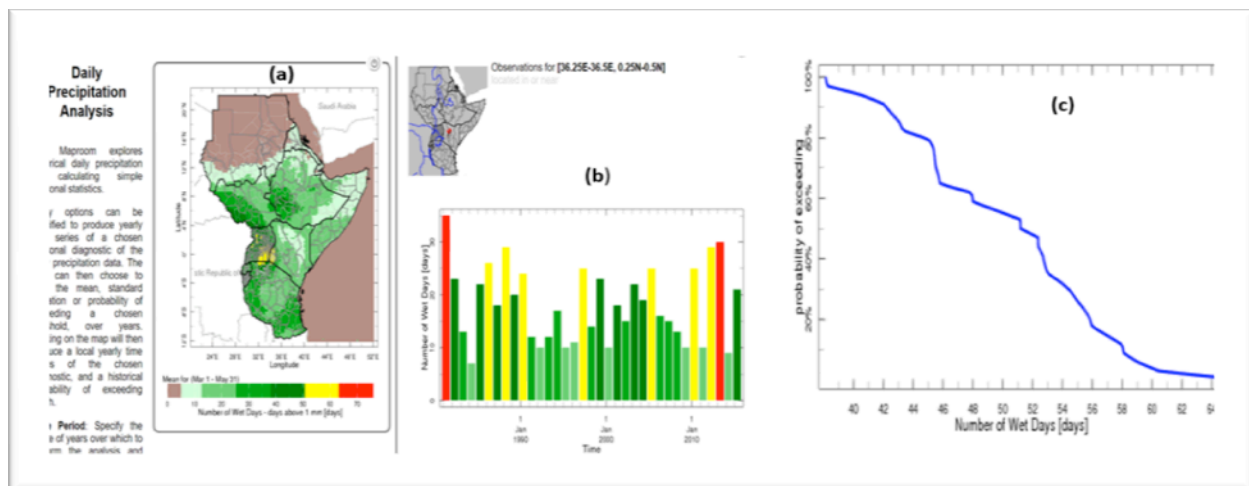


Figure 2: Graph showing mean (1981-2015) number of wet days (a), number of wet days for each particular year from 1981-2015 (b), and average (1981-2015) probability of exceedance (c) for a particular location in Kenya for MAM season.

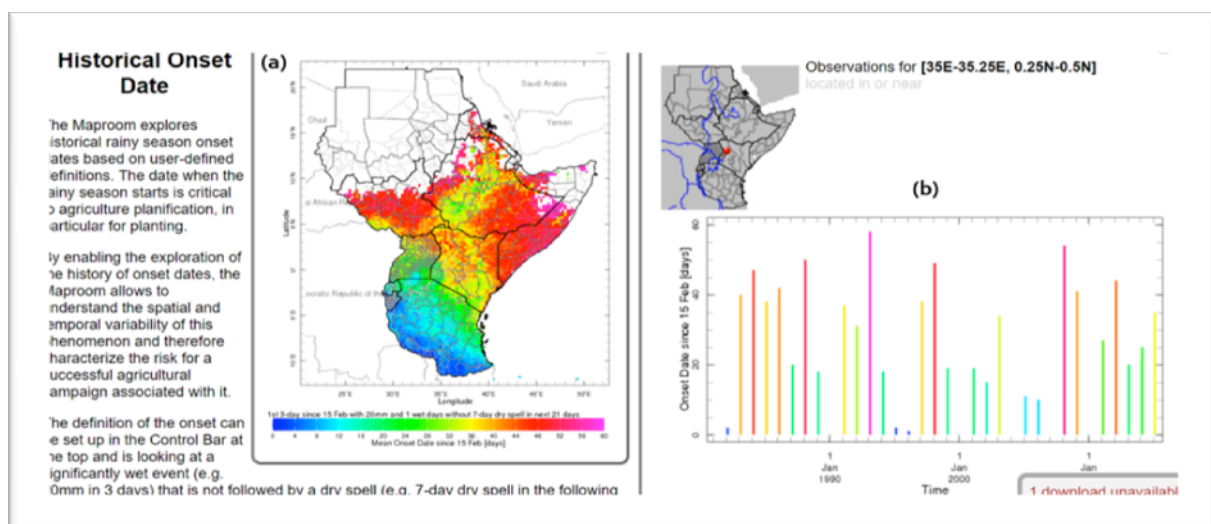


Figure 3: Graph showing Historical mean (1981-2015) onset dates for the GHA region based on a defined threshold (a), and onset dates for each particular year from 1981-2015 (b), for a particular in Kenya for MAM season.

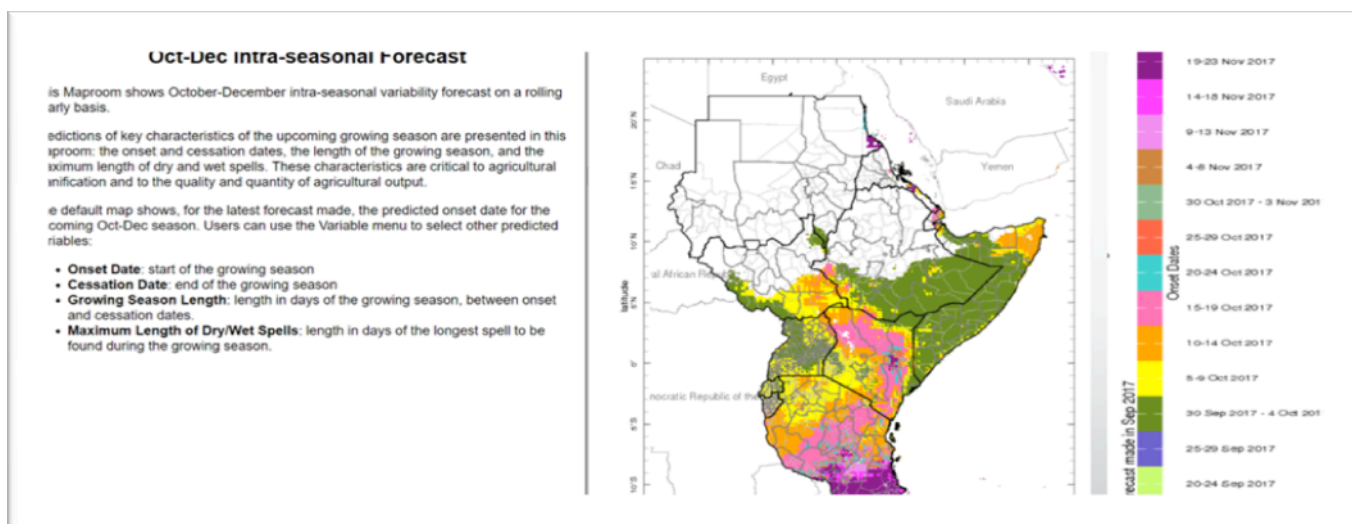


Figure 4: Forecasted onset dates for October, November, and December (OND) 2017 based on Weather Research and Forecasting (WRF) model.

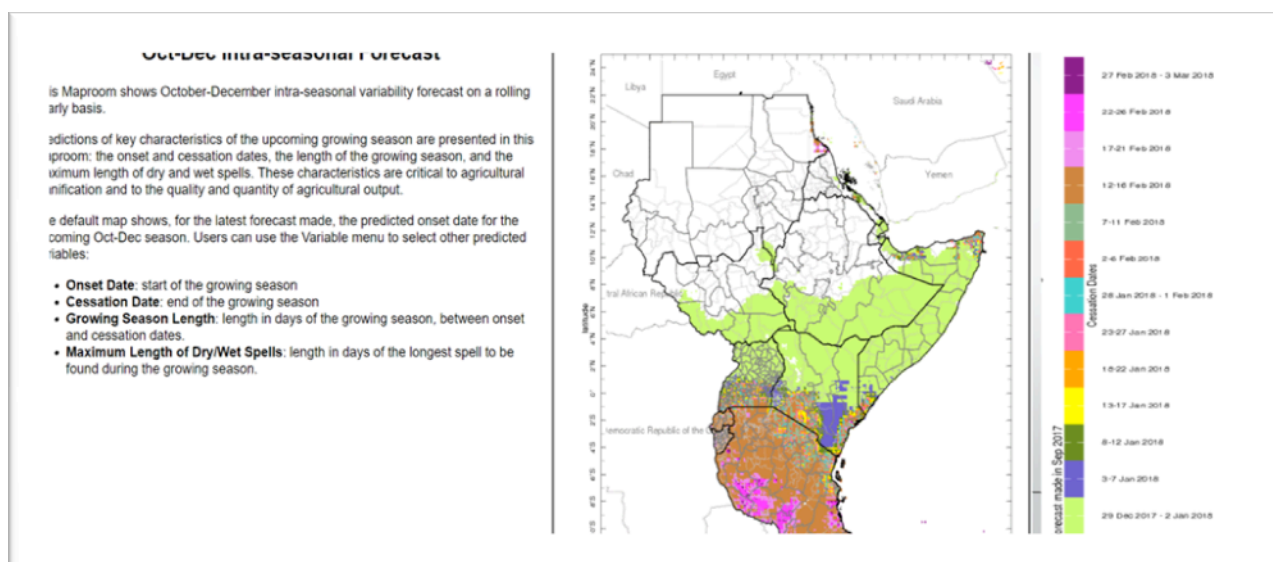


Figure 5: Forecasted cessation dates for October, November, and December (OND) 2017 based on Weather Research and Forecasting (WRF) model

Panel on agro-climate user needs and dissemination strategies

Mr. Mark Majodina (WMO) chaired a panel discussion, which was moderated by Mr. John Mungai (WISER). The panellists comprised regional and national climate producers and users that included Dr. Zewdu Segele and Dr. Philip Omondi from ICPAC, Dr. Evelyne Kumutunga from Uganda, Ms. Claudette Nkurunziza from Burundi and Dr. Desire Kagabo from Rwanda. The discussion focused on the following two questions:

1. What are the important opportunities and challenges involved in using gridded observational datasets and derived online products?
2. How can we make the GHACOF process and products more useful for agriculture and food security?

Dr. Zewdu Segele gave an overview of ICPAC's involvement with the Maprooms and noted that GHACOF process could be made more useful by engaging users from different sectors. As producers, it is paramount to establish the needs of the agricultural community. This reinforces the element of co-production that has been widely recommended by different actors. In this case, the GHACOF becomes a forum where co-produced products are made available to users and thus increasing the utility of the information that we provide. The key question is on the downward cascade of climate information once released. ICPAC is interested to know how far the information cascaded down to the local community and how useful it was. This kind of feedback will help us improve service provision.

Dr. Philip Omondi noted that ICPAC has moved through an era of information sharing. Data used to be very difficult to obtain; but with the blending of in situ data and satellite estimates, we are exposed to much more climate information than previously. The products that ICPAC provides currently are more refined. The Greater Horn of Africa (GHA) is mostly characterized by sparse density of in situ stations and thus data is not quite representative. With the advent of blending, location specific climate information is now possible. He however expressed the challenges faced when relying on another data provider as, in most cases, there are delays in updating data. For instance, sometimes there is a delay in updating CHIRPS satellite from the UCSB site, which makes it impossible for ICPAC to provide timely products. Information also needs to move to a lower level so that farmers can give feedback on how they are affected. People attending GHACOF forums in most cases are not

the direct beneficiaries and thus need to improve on this to include representatives of the small holder farmers to share their experience, bring up new points and/or give critical feedback on the nature of the forecast products they require.

Dr. Evelyne Kumutunga, Ms. Claudette Nkurunziza and Dr. Desire Kagabo all agreed that GHACOF products have improved over time, including the dissemination channels to the users. Dr. Komutunga was of the idea that ICPAC should concentrate on training staff from the member states' meteorological services, and that extension officers prefer climate information to be channelled through their administrative household leaders to achieve maximum utilization. Ms. Nkurunziza highlighted that farmers in Burundi get climate information through the national downscaling meetings after which they create crop suitability maps and apply appropriate practices. However, the data in the country is not well spread out, and thus gaps still remain a challenge.

Dr. Kagabo highlighted the experience the Rwanda Climate Services for Agriculture project has with use of gridded online climate information in Rwanda, and that they have the most cutting-edge data and a well-distributed network of automatic weather stations that has been blended using the ENACTS approach. The data are merged and are being streamed live in the Maprooms. The Maprooms have been an opportunity for the government to disseminate climate information to farmers including the PICSA approach. Any user who needs PICSA information can go to the Maproom, click and download the type of information needed for that specific location provided he/she has access to Internet and the relevant training. Further, Rwanda Meteorology Agency (Météo Rwanda) has an Application Programming Interface (API) that allows users with smartphones or any advanced tool to get data from the Rwanda Maprooms website.

Open discussion on making GHACOF more useful

This session was followed by questions, comments and reactions from the participants. They appreciated the fact that the issues being discussed are very pertinent to why we are all here at GHACOF. Data availability is one of the biggest challenges in provision of quality climate information. The data in most of countries in the region has been on a decline. This is a very worrying trend, especially to the WMO and Regional Climate Centers (RCCs) like ICPAC and ACMAD. Member countries should strongly take ownership of the GHACOF, as it is the only way to improve the process. Co-production and proper communication strategies is

perhaps an area to invest in, possibly with ICPAC, since different sectors need different information, a key aspect which is envisaged in the upcoming WISER project.

One participant raised his concern with regard to the GHACOF funding, mentioning that WMO used to fund the GHACOF processes but is not doing so currently. It has become a challenge for RCCs, such as ICPAC, to organize regional climate outlook forums on a sustained basis, since these institutions are mainly dependent on projects. He suggested that member countries should take the lead in organizing and funding GHACOFs in future.

Another point of discussion focused on farmers' needs. It was noted that user engagement is a fundamental concept in understanding needs. ICPAC produces information at a regional level through the support of NMHSs. NMHSs need to help reach out to users by taking advantage of existing national systems. For example, Kenya has a well-developed agriculture extension services that can be readily utilized. Dissemination strategy is thus a fundamental issue to address, and a communication expert is recommended to work with ICPAC in the near future to further improve on this.

ICPAC was applauded for championing provision of user-relevant information including intra-seasonal characteristics of rainfall such as rainfall onset, cessation, length of growing period, dry spells and wet spells just to mention a few. These products however need to be improved in future through research.

The final discussion point was on the idea of consensus versus purely objective based rainfall and temperature forecasting which was fronted by Mr. John Mungai. The discussions centered on which approach was best suited going forward. Dr. Richard Graham from UKMO clarified to the audience that there are different types of input that go into a consensus forecast, including dynamical, statistical, and the expert judgement—which is sometimes subjective. It is not known which of these are the best inputs and whether the subjective input makes the forecast better or worse. Dr. James Hansen from IRI emphasized that with a consensus or subjective-based approach, the seasonal forecast products that were showcased tonight could not be possible. Based on the above discussion, a parallel study was proposed where purely objective verses consensus-based forecasting is adopted for a period of 2-4 years with recommendations being made after on the way forward.

Conclusion and Recommendations

Maprooms are an important tool for providing more tailored information to the user community. The use of new high-quality gridded historical data sets makes it possible for NMHS to provide historical and forecast climate information at a local scale relevant to farm decision-making, with complete national coverage. Intra-seasonal rainfall characteristics, which are provided within the Maproom interface, play an integral part in agricultural planning and day-to-day decisions that a farmer makes. Technical users need to know how to navigate the Maprooms and interpret the agro-meteorological information available. Maproom information products can be provided to farmers through intermediaries, including extension officers, who are trained to interpret, communicate and support the use of the information.

Several recommendations came out of the discussion, including:

- Migrate ICPAC Maprooms, with assistance from IRI, to a faster server so that users can fully utilize the information available through the interface.
- Member countries should strongly take ownership of the GHACOF, as it is the only way to improve the process.
- Employ a communications expert at ICPAC to strengthen the dissemination and use of climate information.
- A key recommendation was to use the GHACOF process to introduce objective, downscaled, gridded, seasonal forecasts, in parallel with the current consensus forecasts; followed by an evaluation in 2-4 years to determine which seasonal products best serve the user community. Participants proposed both an evaluation of forecast skill, and an assessment of the value of the different seasonal forecast products to the user community.

Appendix 1: Participant List

NO.	NAME	ORGANIZATION	COUNTRY
1	Mr. Augustin Ngenzibono (M)	Hydrometeorology IGEBU	Burundi
2	Ms. Claudette Nkurunziza (F)	ISABU/MINAGRI	Burundi
3	Mrs. KomutangaEverline (F)	NARO	Uganda
4	Dr.Philip Omondi (M)	ICPAC	Kenya
5	Ms. Rosemary Kajuju (F)	ICPAC	Kenya
6	Mr. PaulinoOmoj (M)	ICPAC	S.Sudan
7	Mrs. Fatima Eltahir (F)	ICPAC	Kenya
8	Mr. Hamza A. Siror (M)	Food Security	Sudan
9	Mrs. Hafsa Ahmed (F)	HAC	Sudan
10	Dr.Desire Kagabo (M)	CIAT-Rwanda	Rwanda
11	Mr. Alfred Rotich (M)	ICPAC	Kenya
12	Mr. Okello Makmot (M)	M/A	Uganda
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14	Mr. Abebe Tadege (M)	ICPAC	Ethiopia
15	Mr. FeteneTeshome (M)	NMA	Ethiopia
16	Mrs. Tracy Small (F)	Met Office	UK
17	Ms. Pamela Jordan (F)	IRI	USA
18	Dr.Richard Graham (M)	Met Office	UK
19	Dr.Joseph Mutemi (M)	ICPAC/University of Nairobi	Kenya
20	Mr. MojwokOgawiModo (M)	South Sudan Met agency	S.Sudan
21	Mr. Ismail Nour (M)	National Met Agency (NMA)	Djibouti
22	Mr. Abdallah Nodaneb (M)	Water Resource Depart.	Djibouti
23	Mr. Omar Shurie (M)	Ministry of Agriculture	Somalia
24	Mr. Festus Luboyera (M)	UNMA	Uganda
25	Mr. John Mungai (M)	WISER East Africa	Kenya
26	Mr. Stephen Njoroge (M)	WMO	Kenya
27	Mr. Zachary Atheru (M)	ICPAC	Kenya
28	Mr. KeflemariamSebhatu (M)	ICPAC	Eritrea
29	Dr.Abdi Jama (M)	ICPAC	Somalia
30	Dr.GuleidArtan (M)	ICPAC	Kenya
31	Mr. Peter Ambenje (M)	KMD	Kenya
32	Mr. Paul Ombai (M)	ICPAC	Kenya
33	Dr.Zewdu J. Segele (M)	ICPAC	Kenya
34	Mr. Nshimiyimana Octave (M)	Ministry of Agriculture and Animal Resources	Rwanda
35	Mr. Steven Higirow (M)	Meteo-Rwanda	Rwanda
36	Mr. BadrEldinMamoun Mohamed (M)	ICPAC	Sudan
37	Dr.HussenSeid Endris (M)	ICPAC	Ethiopia
38	Mr. George Kabaka (M)	ICPAC	Kenya
39	Mr. Farah Abdulsamed (M)	ICPAC	Kenya
40	Mr. Mohamed Moalim (M)	Ministry of Home Affairs	Somalia
41	Mrs. Victoria Minayo (F)	ICPAC	Kenya
42	Mr. Oliver Kipkogei (M)	ICPAC	Kenya
43	Mr. Mark Majodina (M)	WMO-Nairobi Sub Regional Office	Kenya
44	Dr.James Hansen (M)	CCAFS/IRI	USA
45	Dr.Asher Siebert (M)	IRI	USA

Appendix 2: Workshop Programme

Time	Activity	Presenters
18:00 - 18:30	Registration and Dinner	
Session 1: Welcoming Remarks, Chair Mr. Mark Majodina		
18:30 - 18:40	Welcoming Remarks from sponsors: <ul style="list-style-type: none">• ICPAC• WISER• CCAFS	Dr.GuleidArtan Mr. John Mungai Dr. James Hansen
Session 2: Chairperson, Mr. Mark Majodina Demonstration of Regional and National Climate Data and Maprooms		
18:40 - 18:55	Overview and demonstration of ICPAC Maproom	Mr. Oliver Kipkogei and Dr. Asher Siebert Dr. Desire Kagabo
18:55 - 19:10	Demonstration and use of Rwanda Maproom	
19:00 - 19:40	Discussion	
Session 3: Chairperson, Mr. Mark Majodina , Moderator: Mr. John Mungai Panel Discussions: Agro-climate User needs and dissemination strategies		
19:30 -20:30	Panelists Dr.ZewduSegele (ICPAC) Dr. Philip Omondi (ICPAC) Dr. Evelyne Kumutunga (Uganda) Ms. Claudette Nkurunziza (Burundi) Dr. Desire Kagabo (Rwanda)	
20:30 - 20:40	Closing Remarks and Vote of Thanks	Dr.ArtanGuleid