# First Objectively Consolidated Seasonal Forecast for Eastern Africa

The Greater Horn of Africa Climate Outlook Forum (GHACOF) is organized three times a year jointly by the IGAD Climate Prediction and Applications Centre (ICPAC) and National Meteorological and Hydrological Services (NMHSs) in Eastern Africa. GHACOF aims to provide seasonal climate information to different stakeholders/sectors over the region for informed decision-making processes. The forum brings together national, regional and international climate experts as well as decision makers and information users on an operational basis to assess the likely implications of the outlook and formulate mitigation strategies for key socio-economic sectors. The seasonal forecasts are given as probabilities for three (tercile) categories -- below normal, normal and above normal. In the week preceding GHACOF, NMHSs climate experts, researchers and international climate experts meet at ICPAC to develop the objective seasonal outlook.

In the past, seasonal forecasts are generated through consensus. The consensus approach, however, has several limitations. First, the forecasts are not available in digital/numerical form and thus cannot be objectively verified and their skill assessed. Second, the forecasts cannot be used in application models. Third, the forecasts cannot be identically reproduced/replicated by a different forecast group due to the subjective nature of arriving at the final climate outlook. To address such deficiencies, the World Meteorological Organization (WMO) executive council at its 69$^{th}$ session in 2017 recommended that regional and national climate centres produce objective, traceable and reproducible seasonal forecasts. With this in mind, ICPAC through the support of *WISER-W2SIP*, *GCRF African SWIFT* and *SHEAR-ForPAc* projects produced the first objective consolidated forecast for the June-September 2019 rainfall season.

To produce the objective consolidated forecast, predictions from 7 global dynamical models have been used. The 7 models participating in multi-model ensemble are CMC1-CanCM3, CMC2-CanCM4, CFSv2, CCSM4, GFDL-FLOR-AO2, ECMWF and GloSea5.

The models utilised were initialized in May and statistically downscaled. Statistical downscaling was done using 2 distinct techniques: (1) Ensemble linear regression technique and (2) Canonical Correlation Analysis as implemented in the Climate Predictability Tool (Mason and Tippett, 2017). The techniques are outlined below:

a) ICPAC implementation of ensemble regression: Model ensemble mean values are regressed against observations, locally at each grid-point. Tercile-based forecast probabilities are estimated with respect to the hindcast by applying a Gaussian fitting method (e.g.,

https://www.wmolc.org/seasonPmmeInfo/information) using predicted and hindcast means and standard deviations as in Min et al. (2009).

b) A Canonical Correlation Analysis (CCA): It identifies the optimal temporal co-variability/correlation between GCM-predicted rainfall over the global tropics and observed rainfall over the GHA. Forecast probabilities for tercile categories are determined using the implementation of CCA in the Climate Predictability Tool (CPT) software package.

The forecasts produced using the two techniques were then combined to form an objective forecast for the first time over the region. Together, these methods address GCM errors associated with both local systematic biases as well as spatial teleconnection response positioning errors (e.g., Bellprat et al. 2016; Barnston et al and Tippett, 2017). Thus, seasonal forecasts produced over the region are now reproducible and traceable.

As mentioned earlier, previous evaluation of the forecast skill was subjective and limited. With objective forecasts, more comprehensive evaluations are being conducted and hence the potential to improve the forecasts over the region. Improved seasonal forecast methods make the climate outlook more reliable and effective for enhancing resilience to climate related risks over the region.

**References**

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