Supplementary Report: The 11th Greater Horn of Africa Climate Outlook Forum

FEWS NET FAMINE EARLY WARNING SYSTEM NETWORK

March 2003
This document was produced for review by the United States Agency for International Development. It was prepared by Chemonics International Inc.

FEWS NET
Famine Early Warning System Network

Contract No. AOT-I-00-00-00142-00 – Task Order 1

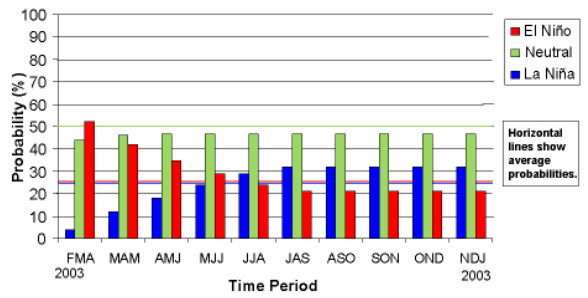
The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Supplementary Report
The 11th. Greater Horn of Africa Climate Outlook Forum March 11, 2003

This document presents an interpretation of the 11th. Greater Horn of Africa Climate Outlook Forum (GHACOF11). The GHACOF11 was held in Entebbe, Uganda, from 3-5 March 2003. The workshop was organized by the Drought Monitoring Center Nairobi (DMC-N) in collaboration with the Uganda Meteorological Department (UMD) and sponsored by the National Oceanic and Atmospheric Organization (NOAA), the World Meteorological Organization (WMO) and the NOAA/Office of the Global Program (NOAA/OGP).

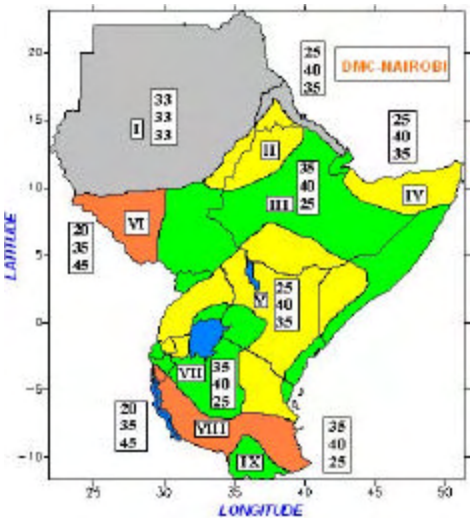
The forecast interpretation presented here suggests potential rainfall deficits in parts of northern, central, southwestern and the coastal strip of Tanzania. Other areas with potential negative impacts are southern Ethiopia, parts of northern, western, central Rift Valley, central and southeastern Kenya and southwestern Sudan. These are areas to watch during this season, as there are already concerns in some of these areas due to prolonged drought. In Tanzania, the below normal rainfall forecast over the grain basket regions of southern highlands could have severe consequences for domestic supplies and trade to southern Africa.

Figure 1: Probabilistic ENSO Forecast (Source: IRI)



This season's forum focused on the recent cooling of sea surface temperatures (SST) over the equatorial Pacific Ocean. This cooling has resulted in the significant weakening of the current weak to moderate El Niño event. The IRI forecast (Figure 1) shows that the highest probability is for 'neutral" conditions in the March – May 2003 period, as compared to the occurrence of La Niña or El Niño events. This suggests that SSTs over the equatorial Pacific Ocean are near normal. In addition, the prevailing atmospheric weather patterns in the region coupled with the SST in southwest Indian Ocean point towards a near normal rainfall performance over parts of the agricultural areas in the equatorial sector of the GHA (Figure 2).

Figure 2: Greater Horn of Africa Consensus Climate Outlook for the Period March to May 2003



Source: DMC-Nairobi

The green shaded zones in Figure 2 represent areas that are likely to receive normal to above normal rainfall amounts for the period of March-May, 2003. The yellow shaded areas are expected to receive normal to below normal rainfall amounts. The areas expected to have rainfall deficits are the brown shaded regions, which are forecast to receive below normal to near normal rainfall during the same period. The March to May period, constitutes a very important agricultural production season in the equatorial sector of the GHA. Therefore the areas of greatest concern are the regions where food insecurity is already heightened coming into the current season, which coincide with the zones shaded in brown and yellow.

Quantitative interpretation of the probabilistic forecast

Using the Forecast Interpretation Tool[1] (FIT) it is possible to translate the GHACOF11 forecast into estimates of expected[2] rainfall and expected rainfall anomalies. These maps (Figure 3a and 3b) were developed in support of contingency and response planning in the region. Further, sector specific interpretations were analyzed to provide more specific analysis on its potential impacts on the pastoral, agro-pastoral and agricultural zones.

The Forecast interpretation

Figure 3a shows the expected median rainfall amounts for March-April-May 2003. The high cumulative rainfall amounts (red to pink shaded) will be confined within key agricultural zones, while low rainfall amounts of at least 200mm (≥200mm) are likely to occur mainly over the pastoral zones (shaded in green). Of more interest is the cumulative anomaly map (Figure 3b). From this it becomes apparent that zone II, V, VI and VIII (Figure 2) region translates to rainfall deficits amounts of between 10 - 60mm. This could be a substantial rainfall deficit for some of these marginal areas.

The regions that are likely to be impacted most negatively by the March-April-May (MAM) forecast are: southwestern Sudan, parts of southern Ethiopia, parts of northern, western, central Rift Valley, central and southeastern Kenya; northern, central, southwestern and the coastal strip of Tanzania. These are areas to watch during this season, as there are already concerns in some of these areas due to prolonged drought.

Figure 3a: Potential rainfall amounts (mm)

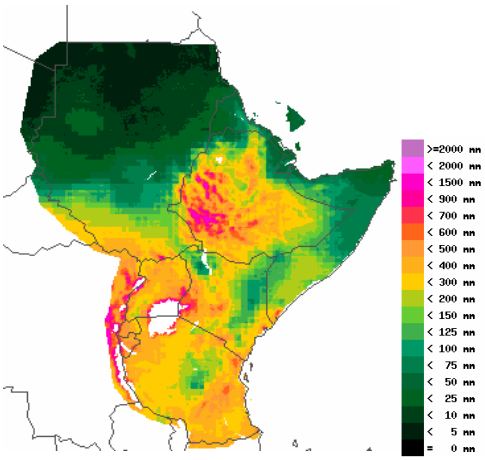
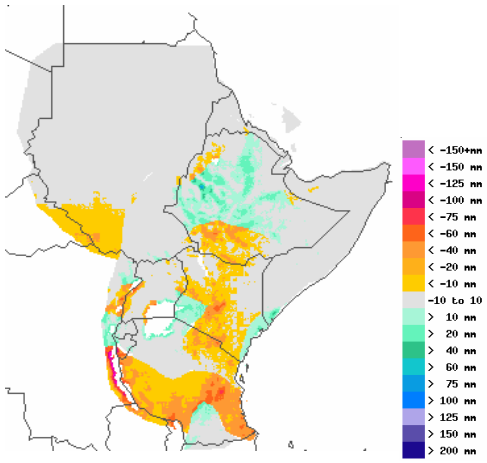


Figure 3b: Rainfall anomalies (mm)



Source: USGS/UCSB

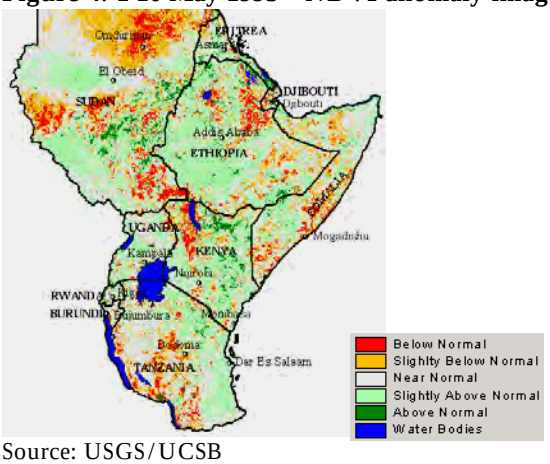
Regions III, VII and IX which have forecast probabilities of 40%, 35%, and 20%, (see Figure 2) show near normal to surplus rainfall amounts of between 10 and 60 mm. Whereas, this is might be good for agricultural production, too much rainfall might cause flooding in flood prone areas and destroy crops.

This analysis and interpretation assumes a good temporal distribution of rainfall, which might not be the case this season. An alternative way to anticipate the actual impacts of this forecast is the use of analog years – these are years where the weather patterns are almost similar to the current year. Additional information on the expected spatial and temporal distribution of MAM 2003 rainfall can be garnered by comparison with the MAM 1995 season (Figure 4), which was identified as one of the analog years in the region to this MAM forecast. Although, the temporal rainfall estimate is presently not available, the Normalized Difference Vegetation Index (NDVI) image is available and is used as a good indicator of the possible magnitude of the forecast impacts, perceived indirectly as impacts on vegetation.

[1] The FIT was developed by the USGS/FEWS NET in collaboration with the University of California, Santa Barbara.
[2] The median rainfall value was used to determine the 'expected' amounts.

There are some similarities in terms of rainfall and vegetation condition anomalies shown in Figure 3b and Figure 4 respectively, especially in agricultural areas discussed earlier. However, it is not surprising that there are some areas that are not in agreement between the two maps, i.e. some parts of the southeastern and northern districts of Kenya. This could be attributed to various reasons, such as, the identified analogue year is not quite representative of the entire GHA region, or, the rainfall distribution was good, or, the rainfall deficits were not large enough to affect vegetative growth.

Figure 4: 1-10 May 1995 - NDVI anomaly image



Source: USGS/UCSB

Generating rainfall probabilities

The FIT can provide an estimate on how the probabilities of receiving rainfall above critical 'thresholds' is affected by the forecast.

In order to provide user-specific interpretations of the forecast we have estimated the change in the probability of several critical thresholds being exceeded. Figures 5a, b, and c show the change in the probability of each location receiving at least 200, 300 or 400 mm of rainfall in March-April-May. The 200mm of cumulative rainfall amounts are considered to be adequate for pasture in marginal areas, if the distribution is good. Figure 5a, shows the probability ratio map of the occurrence of this event given the forecast and climatology. The resulting ratio field is quite interesting; it indicates decreased chances for receiving cumulative rainfall amounts of $\geq$200mm in areas shaded in orange to pink. For example in north eastern Kenya and neighboring areas of Somalia and Ethiopia the probabilities of achieving the 200mm threshold are decreased by 10 to 30%, given this forecast. Other parts of central, southern and northern Tanzania, southeastern and northwestern Kenya, southwestern and northern Somalia and western Ethiopia bordering Sudan and southwestern Sudan show similar patterns of reduced likely of adequate rainfall being received.

Figure 5a: "Pasotoral" areas

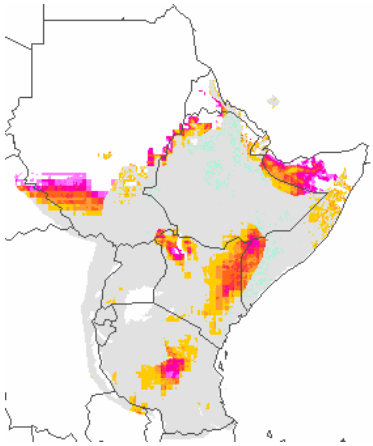


Figure 5b: "Agro-pastoral" areas

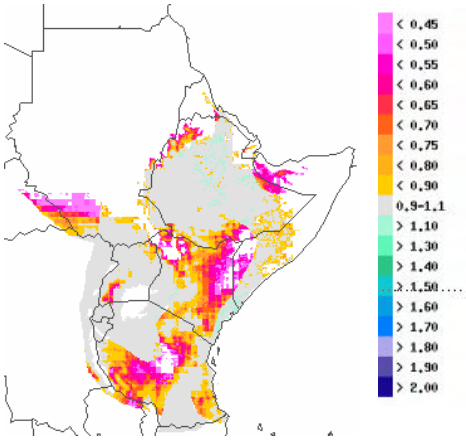
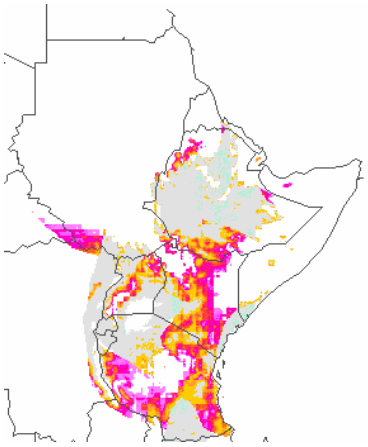


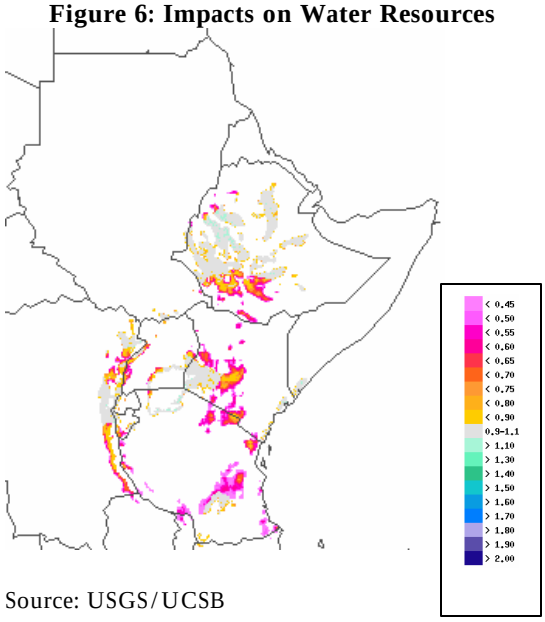
Figure 5c: "Agricultural" areas



In the higher rainfall and traditionally agricultural areas, which are largely shaded gray there is relatively little change in the probabilities as the 200mm rainfall threshold is almost certain to be exceeded despite the forecast.

The cumulative rainfall threshold of at least 300mm has been chosen to represent agro-pastoral areas. Key areas to watch are the marginal agro-pastoral areas under orange to pink colors: e.g. parts of central, southern and northern Tanzania, southeastern and northwestern Kenya. Other agropastoral areas likely to be affected by this forecast are southwestern and northern Somalia and western Ethiopia.

Figure 6: Impacts on Water Resources



Source: USGS/UCSB

Figure 5c, shows a more extensive area with reduced chances of achieving rainfall totals of at least 400mm during the growing season. This amount is chosen to represent the typical cumulative amount of rainfall required to support staple crop production. Areas of concern are important agricultural production zones, which coincide with the areas shaded pink or orange.

In terms of water resources management, a modest criterion of at least 750mm of rainfall was used to identify potential flood risk areas (Figure 6)

There are reduced chances of heavy rainfall in most areas. Thus it appears that reduced hydro-electric power may be a greater risk this season than floods or excessive moisture. However, flush floods are also expected during the season.

Small areas of enhanced probabilities of rainfall over 750mm are identified in:

- Kenya: Nyando, Nzoia, Yala and lower parts of Tana River basins.
- Tanzania: The Lake Victoria shore near Musoma and Mwanza and some parts of the Rufiji basin.

The start of the season, temporal distribution, and cessation of the seasonal rains will be the determining factor to the overall performance of the agricultural production. It is therefore important to monitor this situation through the widely available products on the USGS/FEWS NET website: http://edcintl.cr.usgs.gov, http://www.dmcn.org, http://iri.columbia.edu and the national meteorological services departments.

Acknowledgment
USGS/FEWS NET would like to thank all institutions mentioned in this report for accepting to use their information.

Disclaimer
The algorithms contained in this package are experimental, as any maps produced with this software. Users should use them cautiously. USGS, FEWS-NET and UCSB are not liable for any damages related to the use of this software. We hope you will find them useful.