Food Security Early Warning System

Agromet Update

2016/2017 Agricultural Season

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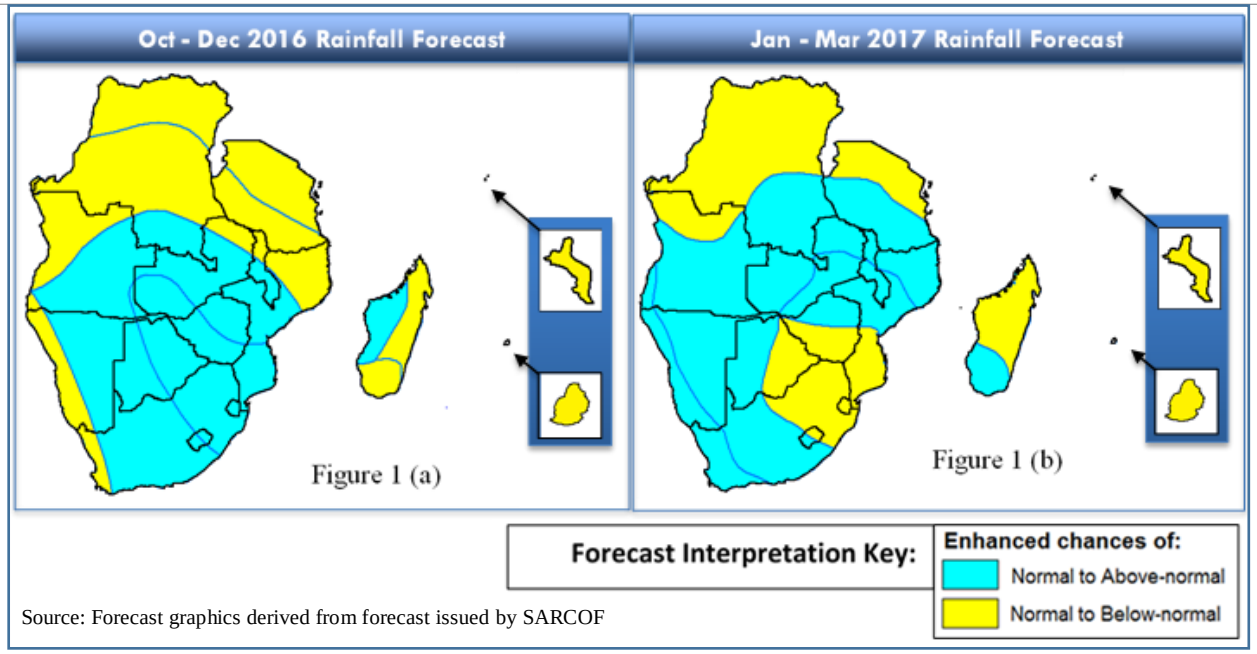
Implications of Seasonal Climate Forecasts for Agrometeorology in 2016/2017

HIGHLIGHTS

- **SARCOF is predicting normal to above normal rainfall in the southern parts of the region, while normal to below normal rainfall is expected in the northern areas**
- **The latest model forecasts have reduced La Niña expectations, and suggest near-equal chances for neutral ENSO and weak La Niña conditions through end of 2016.**
- **International temperature forecasts suggest normal temperatures are likely in the southern half of the region, and above normal temperature in northern SADC**
- **Although existing regional water deficits are unlikely to be eradicated this season, there is potential for a good agricultural season if farmers have timely access to inputs, climate-smart agriculture is practised, and appropriate support for drought affected farmers is provided**
- **Continual seasonal monitoring, in consultation with national meteorological agencies is required. Special attention is needed for drought affected areas that have a forecast for normal to below normal rainfall.**



Source: Forecast graphics derived from forecast issued by SARCOF

Overview of the SARCOF Forecast

The Southern Africa Regional Climate Outlook Forum (SARCOF) was held from 24 to 26 August 2016 in Harare, Zimbabwe to present a seasonal rainfall forecast for the 2016/2017 season over the SADC region. A series of rainfall outlooks covering the period October 2016 to March 2017 was prepared by climate scientists from the National Meteorological and Hydrological Services of the SADC region and the SADC Climate Services Centre (CSC).

According to the SARCOF, the southern part of the SADC region is forecast to receive normal to above-normal rainfall (light blue colours, Figure 1) in the October through March forecast period, while the northern parts of the region are expected to receive normal to below-normal rainfall (yellow colours, Figure 1) in the same period. The main exception is the south-eastern part of the region, including eastern Botswana, northern South Africa, Swaziland, southern Mozambique, and southern Zimbabwe, which are forecast to receive normal to below normal rainfall in the Jan-Feb-Mar (JFM) 2017 period (Fig. 1b). Madagascar is forecast to receive

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normal to below normal rainfall in the northern and central parts, and normal to above normal rainfall in the southern parts during the JFM period. The potential impacts of these most likely outcomes need to be considered in the context of area-specific typical rainfall amounts, rain bearing systems, pre-existing soil moisture levels and water availability, grazing conditions, and current food security status in the different areas where the forecast is being applied.

Interpretation of Forecast Maps (Figure 1)

Figure 1 is a simplification of the SARCOF forecast. The figure represents chances of 3 different rainfall scenarios occurring, namely above-normal, normal, or below-normal rainfall. The rainfall scenarios considered are focusing on 3-month rainfall totals (total rainfall for October to December, and January to March, for figures 1a and 1b, respectively). The colours on the maps can be interpreted as follows:

: The light blue areas ("Normal-to-above") are areas where the highest likelihood is for normal rainfall, though there are significant chances of above-normal rainfall. Below-normal rainfall is less likely in these areas, though there are still some chances that it can occur.

: The yellow areas ("Normal-to-below") are areas where the highest likelihood is for normal rainfall, though there are significant chances of below-normal rainfall occurring. Above-normal rainfall is less likely in these areas, though there are still some chances that it can occur.

Using SARCOF Forecasts

Users should note that the SARCOF forecast is a consensus forecast designed for a regional audience. The forecast is aggregated over large zones (demarcated by blue lines, Figure 1), and is applicable only at very large scales. Additionally, the forecast zone-boundaries shown in the map are not exact, and can transition over large areas due to the variability of rain-bearing climate systems. Users requiring higher accuracy forecasts available at national level should contact the respective national meteorological agencies for downscaled national seasonal forecasts, as well as updates to those forecasts, which can increase in accuracy as the lead time to the forecast decreases.

Related Forecast Indicators

It is common practice in weather and climate forecast analysis to consider various forecast indicators and models. An important forecast indicator is the El Niño Southern Oscillation (ENSO), a phenomenon that is observed in the equatorial Pacific Ocean, and affects climate in many parts of the world. ENSO has 3 phases, each of which occurs every few years; namely, (1) El Niño, (2) neutral and (3) La Niña. El Niño is usually associated with below-normal rainfall in many parts of southern Africa; La Niña is often associated with above-normal rainfall in some southern/central parts of the region; and neutral conditions often, but not always, present little predictive power. In north-eastern areas, including Tanzania, the typical effects of ENSO are reversed from what occurs over the rest of Southern Africa. During the 2015/16 rainy season, a strong El Niño was associated with severe drought in many parts of the region. Weak La Niña conditions close to the ENSO-neutral threshold are currently prevailing. The latest forecasts suggest that ENSO is likely to remain in this state, with near-equal chances for either ENSO-neutral or weak La Niña conditions until the end of 2016. Neutral conditions are forecast to be more established by early 2017. Under the current weak La Niña to borderline ENSO neutral conditions, typical La Niña impacts may still nonetheless be felt over Southern Africa, especially through the end of 2016. Another important driver of SADC rainfall is the pattern of Indian Ocean sea surface temperatures, which can help suppress or enhance rainfall in the region. This, and other factors will be closely monitored by climate scientists at national, regional and international level, through the course of the rainfall season, to provide informative forecast updates on expected seasonal climate outcomes.

Several international climate forecasts are in general agreement with the SARCOF forecast, with increased chances of above average rainfall in the southern half of the region, and chances of below average rainfall in the northern parts of the region. Some of the most recently issued international forecasts (as of Sep 2016) however suggest slightly lower chances of above average rainfall in the Oct-Dec period, now favouring normal to below normal rainfall in many areas, while others are going for climatology. Climatology means there are equal chances of above-normal, normal or below normal rainfall occurring. Scientifically, such forecasts often arise when the signals being provided by the climate predictors are not strong and consistent enough for a forecast to confidently express a particular outcome. Some mainstream international models have revised upwards their mid-to-late season forecasts (from December to March), showing higher expectations of above-normal rainfall during in the second half of the season, while others now favour climatology for the same

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period. This lack of agreement between the various models is also a telling indicator, highlighting the need for particularly careful, comprehensive and wide-ranging preparations for the coming season. The South African Weather Service gave a similar advisory recently in light of the recently developed uncertainty over whether ENSO would be neutral or La Niña in the coming season.

Various temperature forecasts suggest a likelihood that temperatures may be normal to above normal in the southern half of the region, while northern areas have a greater chance of above-normal temperatures.

Agrometeorological Interpretation of Seasonal Forecast in the Context of Current Conditions

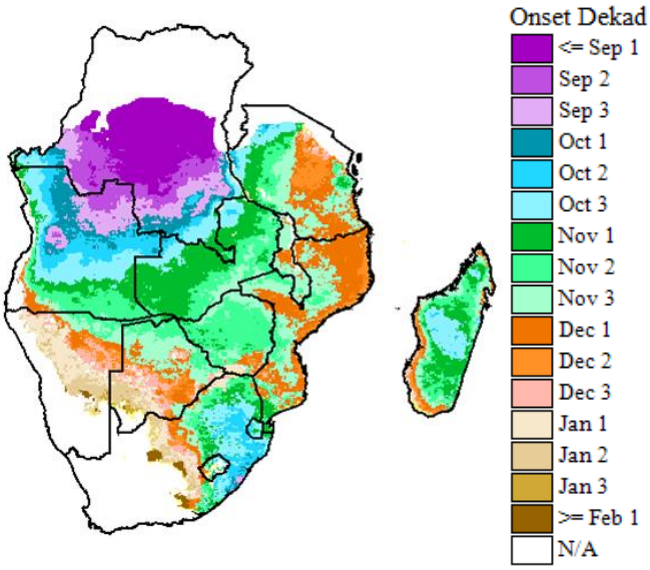

Figure 2. Median onset of rains (in dekads) based on 2001 to 2015 analysis

SARCOF's normal to above-normal rainfall forecast in most areas in the southern half of the region suggests moderate to good prospects for agriculture. In general, most areas in the SADC region experience an onset of rains between October and December (Figure 2), and the October-November-December (OND) forecast can therefore provide some indication on the expectations for the start of the rainfall season. From this perspective, the expected normal to above-normal rains may be associated with a possibly normal onset of rains in the southern half of the region, and a potentially slow or erratic start in the northern areas. This assumption was validated by an independent experimental forecast for the 2016 onset of rains, which suggested possibility of an early to timely onset in some southern and central parts of the region, while a few northern areas were forecast to have varying levels of delayed onset. Further analysis of the historical onset of rains also indicated that the southern parts of the region have a more variable onset than the northern areas, with typical variability of 30 days not uncommon in the south.

The information presented in Figure 2 shows the date, in dekads, that the rainfall season normally starts in earnest, based on a 15-year analysis of data. Farmers practising rainfed agriculture need to have procured inputs and prepared their land a few weeks before the dates indicated in each area. Related to this, organizations that provide inputs and input procurement support should ensure that these inputs are available locally to farmers well before the onset dates in order to maximize the growing season's potential. Such support will be critical this season where farmers in many areas have had their ability to purchase inputs eroded by consecutive severe droughts in the last two seasons – this is reported to be the case in some countries. In many areas, the ideal time to plant is often with the summer rains, due to the available energy associated with the changing seasons. However two caveats need to be noted. Firstly, if the rains are much earlier than usual, such rains are often unseasonal, and may be followed by a short dry spell. This may be the case in some southern areas where experimental onset forecasts have suggested an early onset may occur. It is therefore recommended to undertake planting decisions in consultation with short term advisories from national meteorological departments, and avoid planting unseasonably early. Secondly, the practice of staggered planting is often used to reduce the risk of an entire crop being equally affected by dry spells, which are a seasonal occurrence in some areas with unpredictable timing/onset and duration.

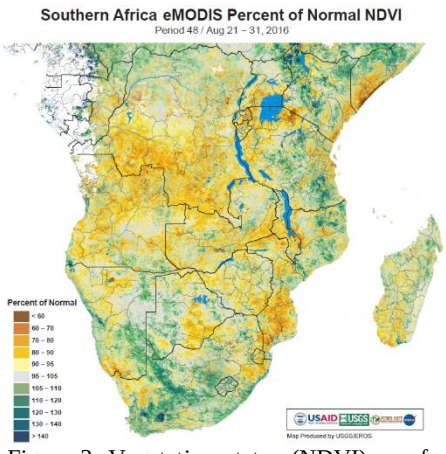

Figure 3. Vegetation status (NDVI) as of August 31 2016. *Source: USGS/FEWS NET*

The 2014/2015 and 2015/2016 agricultural seasons were characterized by low rainfall, as well as abnormally high temperatures that raised evapotranspiration rates. As a result, pasture, soil moisture, surface and underground water sources are in poor condition and low levels in many areas across the region. Figure 3 shows satellite-estimated

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vegetation status as of late August 2016 compared to average conditions. The image shows that most parts of the region are currently experiencing below average vegetation conditions, as indicated by the yellow and brown colours on the map. From an agricultural perspective, the current situation has severely affected livestock: over 640,000 cattle succumbed to drought-related deaths in 2015/16, primarily driven by a shortage of water and pasture, and many more cattle are likely to be in poor body condition – with a consequent significant reduction of available draught power in some of the more severely affected areas for the coming season. The low water levels also affect irrigation potential, as well as water for domestic use. Reports indicate that irrigated area for 2016 winter cropping was reduced in some countries including Malawi and Zambia, and these effects are likely to continue into the 2016/17 summer cropping. In some areas where retained soil moisture is also used for cropping, such as in parts of South Africa and Mozambique, the current soil moisture levels are low due to the poor rains and high temperature of the 2015/16 season. Well-above average rainfall will be required to significantly reduce these water deficits that have accumulated over the last two seasons. There are moderate chances of this occurring in the coming rainfall season, given the forecasts: The SARCOF January-March forecast paints a picture of normal rainfall as the most likely outcome for the whole region, with southern areas generally tipped for above normal; northern and south-eastern areas for below normal, which is somewhat consistent with the diverse picture painted by the analysis presented earlier in this document on related forecast indicators. However, the normal to above-normal rainfall expected over most areas, combined with near normal temperatures expected, suggests chances for a good agricultural season. Agricultural preparations thus need to be implemented accordingly.

Climate-smart agricultural decisions for the coming season are particularly important in light of the poor rainfall received in many areas during the last two seasons. There is a need to encourage the use of crop production portfolios that minimize risk and maximize productiveness in ways commiserate with each area's climate and with the 2016/17 seasonal rainfall forecasts. For example, areas that usually experience low annual rainfall totals, and have a forecast for normal to below-normal rainfall for the coming season, need to prioritize drought-tolerant agricultural activities, such as planting of drought tolerant crops and short maturing varieties, and conservation agriculture techniques. Farmers in higher rainfall areas that sometimes experience dry spells and other seasonal water deficits should consider an appropriate crop mix between higher yielding varieties that may be less drought tolerant, and lower yielding varieties and crops with higher drought tolerance. The use of water harvesting and irrigation need to be upscaled where appropriate. These technologies are particularly useful for minimizing the negative impacts of dry spells, which occur seasonally in many areas.

Special mention is made of the northern parts of the region, as well as the south-eastern area around eastern Botswana, Lesotho, northern South Africa, Swaziland, southern Mozambique and southern Zimbabwe, where normal to below normal rainfall is expected according to the SARCOF forecast. The south-eastern area was negatively affected by drought in the past season, and a repeat poor season could have severe impacts on agricultural livelihoods, if low rainfall is realized this season. The forecast for normal to below rainfall in the north, combined with forecasts for above normal temperatures, may also have negative implications for water resources and agriculture in those areas.

In flood prone areas, preparedness and contingency measures need to be taken as part of the normal seasonal planning processes. Widespread regional flooding is unlikely given the forecast for normal to above normal as well as the preceding dry conditions and low river levels in many areas. This conclusion does not however account for the possibility of very high rainfall events such as cyclones, which can cause large floods in a short space of time. Flash floods should not be ruled out, particularly in flood-prone areas.

Outbreaks of crop pests and diseases tend to increase under conditions of high rainfall. For example, pests such as armyworm favour rainy seasons that follow periods of prolonged drought. Surveillance and monitoring for potential outbreaks are therefore needed, particularly in areas where outbreaks are common. The International Red Locust Control Organization for Central and Southern Africa (IRLCO-CSA) released a report in August outlining the status of locust outbreaks in Malawi, Mozambique, Tanzania and Zambia.

Continual monitoring of the seasonal progress, and close consultation with national meteorological agencies is strongly advised in order to receive updated short to medium-term forecasts. Weather systems that are highly unpredictable months in advance, such as tropical cyclones and persistent low or high pressure systems, have the potential to completely change seasonal rainfall totals when they occur, and should be monitored.

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