SOUTHERN AFRICA Special Report: 2014/15 El Niño Event July 2014

Potential impacts of an El Niño event in southern Africa are likely to vary significantly

KEY MESSAGES

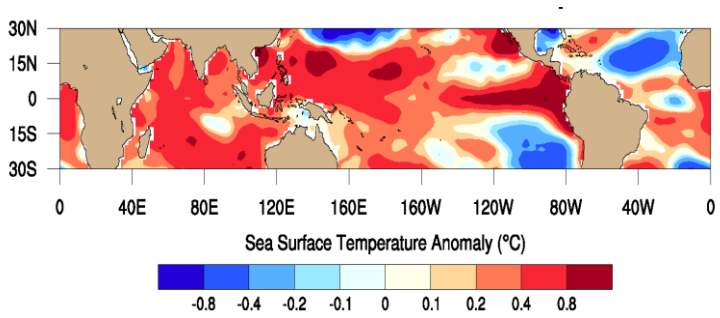
- According to forecasts provided by the Climate Prediction Center (CPC)-International Research Institute for Climate and Society (IRI), there is an elevated chance for an El Niño event to develop between August and October 2014 and continue through early 2015.

- Historically, El Niño raises chances of receiving below-average rainfall during the main crop-growing season in southern Africa. However, not all locations are equally affected by El Niño in the region.

- The most common impact of an El Niño is reduced rainfall during the main December to March crop-growing season in southern Africa. Areas most frequently affected by below-average rainfall are situated along a belt that extends from southern/central Mozambique in the east and stretches westwards to Namibia, as well as the western half of South Africa. Conversely, the northeastern and western parts of the region are more likely to receive above-average rainfall from October to December during an El Niño.

UNDERSTANDING EL NIÑO

Figure 1. Sea surface temperature (SST) anomalies for June 2014



Source: *Extended Reconstructed Sea Surface Temperature (ERSST) data set, curated by NOAA National Climatic Data Center (NCDC)*

El Niño - Southern Oscillation (ENSO) is a naturally occurring phenomenon that involves fluctuations of sea surface temperatures (SSTs) and winds across the equatorial Pacific Ocean. In general, every three to seven years, ENSO varies between its three phases: El Niño, La Niña, and neutral conditions. It remains in each phase on average between eight and twelve months, though this time can be much longer. An El Niño occurs when the equatorial easterly (from east to west) winds over the Pacific are lighter than average, resulting in warmer than average SSTs in the central and eastern Pacific Ocean. La Niña occurs when the equatorial easterly winds over the Pacific are stronger than average, resulting in cooler surface water in the central Pacific Ocean. ENSO neutral conditions occur when the equatorial winds are near average strength, and when SSTs across both the eastern and central Pacific Ocean are also close to average. These ENSO-related changes in the equatorial Pacific Ocean are related to major weather and climate fluctuations around the world, with varying consequences for populations in different locations.

CURRENT CONDITIONS AND FORECAST

Sea surface temperatures in the equatorial Pacific Ocean have been increasing since early 2014 and are currently above average (Figure 1). Forecasts from most major forecast centers expect the SSTs to continue increasing over the next several months. A July 2014 consensus forecast from the NOAA Climate Prediction Center (CPC) and the International Research Institute for Climate and Society (IRI) indicates an increased chance of approximately 80 percent for El Niño to develop by around September 2014 and continuing through early 2015. The CPC/IRI forecast is informed by outputs from over 25 climate models from major forecasting centers around the world. There is considerable uncertainty associated with the strength of the predicted El Niño, and the forecasts will continue to be updated every month. Although reports often make reference to the strength of an El Niño (i.e. *weak*, *moderate,* or *strong* El Niño), the relationship between the strength of an

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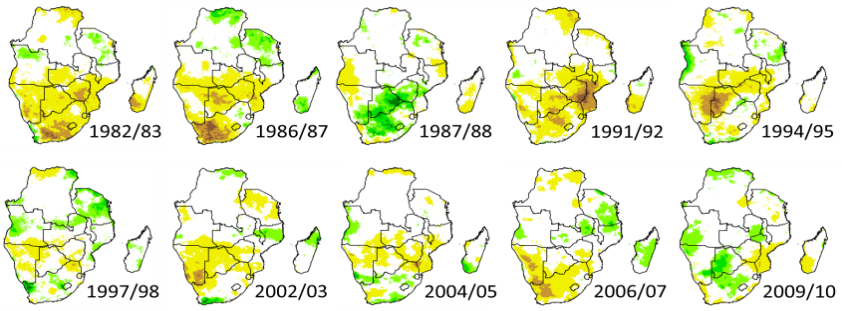
El Niño and the magnitude of rainfall deficits in southern Africa is statistically very small. Over remote areas from the equatorial Pacific it is generally the response to ENSO of local oceans that determines the impacts on precipitation. In the case of southern Africa, the Indian Ocean plays an important role in the nature of the precipitation patterns associated with ENSO.

POTENTIAL CLIMATIC IMPACTS IN SOUTHERN AFRICA

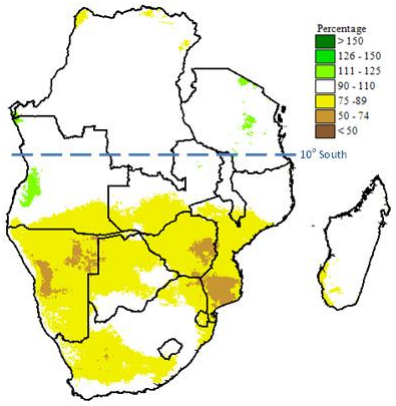
In southern Africa, not all locations are equally affected by El Niño. El Niño has historically had the most impact in areas south of the 10 degrees south latitude (Figure 3). The most common impact is reduced rainfall during the main December to March crop-growing period. On average the cumulative December to March rainfall over the past ten El Niño events were depressed south of 10 degrees south latitude. However, an analysis of individual El Niños in Figure 2 shows that there is considerable variation in countries from one event to another. Variations exist both in terms of whether rainfall is below average or not, and the location of those dry conditions. Some El Niño events did not result in reduced rainfall. During the 1987/88 and 2009/10 El Niños, some large areas received above-average rainfall. During the 1986/87 El Niño, western South Africa was the driest area in terms of percent average rainfall, but in 1991/92, these areas were in southern Mozambique and eastern Zimbabwe (Figure 2).

Figure 2. December-March rainfall as a percent of the long-term average (1981-2013) for each El Niño season from 1982/83 to 2009/10



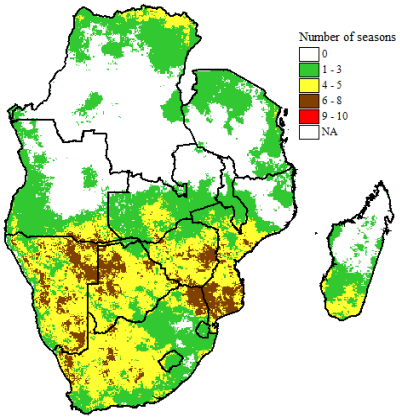
Source: *USGS/FEWS NET*

Figure 3. Average December-March rainfall during the last ten El Niños as percent of the long-term average (1981-2013)



Source: *USGS/FEWS NET*

Figure 4. Number of El Nino seasons between 1981 and 2013 with below average December-March rainfall totals



Source: *USGS/FEWS NET*

The frequency of the occurrence of below-average rainfall during El Niños historically varies by location. The area which is most frequently affected by below-average rainfall is the belt that extends from southern/central Mozambique in the east and stretches westwards to Namibia, as well as the western half of South Africa. Many areas in this belt received below-average rainfall approximately 5 out of 10 El Niños (Figure 4). On average, reduced rainfall during an El Niño occurred more frequently than this in a few areas including southern Mozambique, northern South Africa, eastern Zimbabwe, northern Namibia, and northern Botswana. Analysis of crop water balance models suggests that below-average rainfall during El Niños is likely to result in reduced crop yields during the main agricultural season.

One more subtle impact of El Niño in southern Africa is its influence on October to December rainfall totals. Northeastern parts of the region tend to experience above-normal rainfall during this time, with northern Malawi, eastern Zambia, northern Mozambique, and Tanzania receiving rainfall greater than 125 percent of average in around 6 out of 10 El Niños. In the past, much of Botswana, Namibia, and Angola also had above-normal rainfall during around 4 out of 10 El Niños. Above-normal rainfall is also more likely for the October to December *Vuli* rains in the northern, bimodal areas of Tanzania. In contrast, parts of southern Mozambique, southern Zambia, and southern Zimbabwe have a 50 percent likelihood of having below-average October to December rainfall during El Niño years, which means that the start of season can be delayed along with planting for the main agricultural season.