Outlook for Crop Growing Conditions in Southern Africa for 2003/2004

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Seasonal cumulative satisfaction of maize water requirements is poorly correlated with early season rainfall. Scant early rains do not necessarily imply poor crop production for the 2003-04 season. Statistical interpretations of climate forecasts suggest that near-normal end-of-season maize crop water conditions are likely. Western Zimbabwe and Northern Namibia have below normal forecasts. Prospects for the season will come more clearly into focus by the end of January, once the quality of the December-January rains is known.

Highlights

- In non-El Niño years, October-November rainfall is poorly correlated with seasonal cumulative crop water satisfaction in the Southern Africa crop growing regions examined here.
- A statistical downscaling of IRI climate forecasts suggests near-normal crop growing conditions for most crop growing areas.
- Below normal forecasts for western Zimbabwe warrants concern.
- The Climate Prediction Center's precipitation forecasts suggest near-normal rainfall in eastern southern Africa, and below-normal rainfall in western southern Africa. Deficient rainfall in northern Namibia could be a concern.
- Prospects for the season will be considerably clearer by the end of January 2004.

Introduction

Much of Southern Africa is coming out of a series of poor seasons in which production was generally below normal. Apart from South Africa, most of the countries highlighted in this report had below-average maize production in the last few years. After several years of poor harvests, Zimbabwe is in a food security emergency, and particularly the southern provinces of Matebeleland North and South are highly food insecure[1]. Relatively modest shocks associated with below-normal rainfall could produce troubling outcomes. Recent FEWS NET reports *'indicate that between 4.36 and 5.02 million will need food aid between January and March'*, while *'severe constraints on seeds and other inputs will limit agricultural production[2]'*. In Swaziland, IRIN reports suggest that by January 2004, WFP will be feeding approximately 245,000 people, about a quarter of the population[3]. Swaziland is also coming out of several years of poor harvests. Namibia recently issued an appeal for international assistance for immediate food assistance for 643,000 people. Although crop production was poor in the previous two seasons, food insecurity in southern Mozambique may not be at critical levels, because of household reliance on sources other than crop production[4]. South Africa is the biggest grain producer in the region, and normally produces a surplus permitting export to nearby countries. However, the poor rains so far may cause large reductions in area planted, potentially compromising crop production quite significantly.

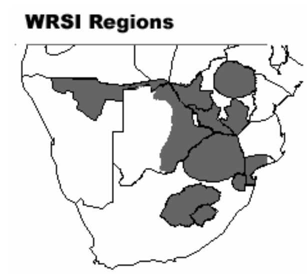


Fig 1. Crop growing regions analyzed

Given this bleak picture of the current food security conditions, the outcome of this growing season is of paramount importance. This report examines the 2003/2004 crop water satisfaction outlook for eleven crop-growing regions in Southern Africa. Time-series of mean maize Water Requirement Satisfaction Index (WRSI) were extracted for each region, compared to historical rainfall values, and predicted for 2004 based on a statistical downscaling of forecast precipitation and wind fields from the International Research Institute for Climate Prediction (IRI). The results indicate that: i) early season rainfall bears little relationship to end-of-season WRSI, and ii) the December-January-February outlook appears close to normal. This outlook is broadly consistent with a range of probabilistic forecasts provided by the National Ocean and Atmospheric Administration (NOAA) Climate Prediction Center (CPC) and IRI, though their forecasts tend to be slightly more pessimistic. It should be noted that this study only adresses crop water availability, while many factors influence production.

[1] http://www.fews.net/current/updates/gcontent.cfm?submit=y&gc_id=1000286&f=al&d=0&i=1022

[2] FEWSNET Executive Summary of Food Security Threats in Sub-Saharan Africa, December 3, 2003

[3] http://www.irinnews.org/report.asp?ReportID=38194&SelectRegion=Southern_Africa&SelectCountry=SWAZILAND

[4] Mozambique FEWSNET Report – 15 December 2003. www.fews.net

Historical Relationships between End-of-Season WRSI and Seasonal Rainfall Accumulations

Recent rainfall anomaly images produced by the CPC (Figure 2) show that portions of Mozambique, Zimbabwe, Lesotho, Swaziland, Mozambique and the Republic of South Africa have been experiencing below normal rainfall. Figure 3 displays the correlations between progressive seasonal rainfall totals and end-of-season maize WRSI. The correlations were calculated for each of the 11 crop-growing regions in Figure 1, and then averaged. October-November (ON) rainfall accumulations show virtually no correlation (r=0.1) with end-of-season WRSI. October-November-December (OND) correlations are modest (r=0.5) and October-November-December-January (ONDJ) correlations are strong (r=0.8). Below normal early rains (Figure 2) do not necessarily imply poor harvests in 2004. Early assessment of crop water satisfaction conditions can more confidently be made at the end January. The next six weeks of rainfall will be critical for crops in southern Africa.

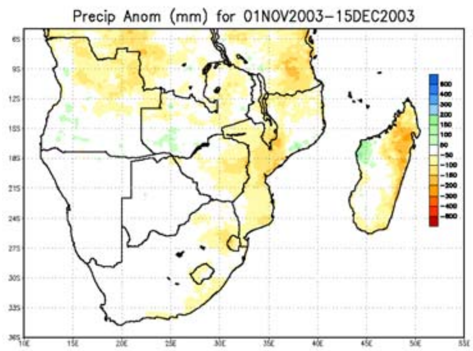


Fig 2. Map of November-December precipitation anomalies

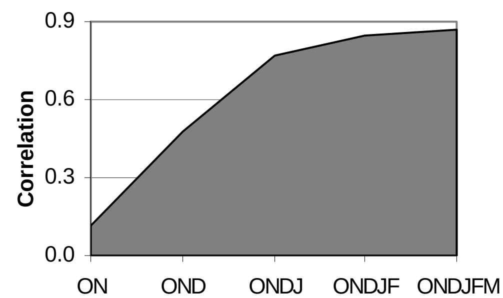
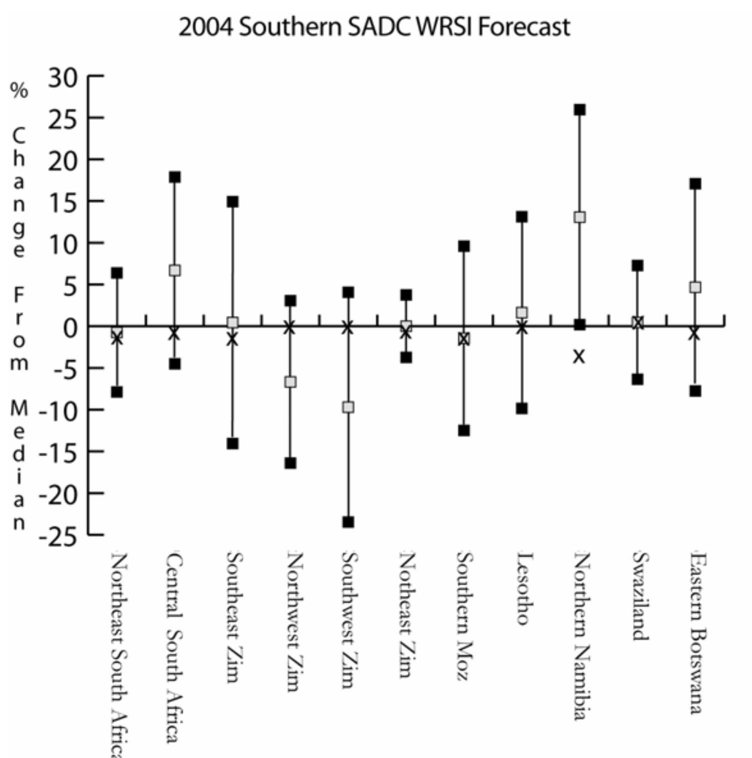


Fig 3. Correlation between rainfall accumulations and end-of-season WRSI.

Downscaled Forecasts of WRSI

This section presents forecasts of end-of-season WRSI values for the 11 selected regions based on a statistical downscaling of DJF precipitation and wind fields provided by the IRI[5]. Figure 4 shows the 2004 WRSI forecasts, expressed as a percent change from the 1971-2001 medians, plus and minus one mean absolute error. The range of these forecasts suggests fairly normal crop water conditions are likely for most regions except for North and South Matabeleland (Western Zimbabwe).

Also shown are WRSI estimates based on a statistical interpretation of the CPC's most recent precipitation forecasts. These values, created by regressing rainfall and WRSI in each region, and marked by x's in Figure 4, are broadly consistent with the downscaled WRSI estimates except for northern Namibia.



[5] A technical write-up describing the technique used (matched filter regression) will be made available at: http://www.geog.ucsb.edu/~chg/SADC2004tech.pdf. Cross-validated skill statistics for the downscaled models were about 0.5, and the mean absolute errors were between 4 to 20% of the median WRSI values for each region.

Other Factors that Will Affect Harvests

It is important to note that the projections in Figure 4 are based solely on agro-climatic factors, and do not take into account economic or institutional factors such as availability of seed or fertilizer, farmer access to production credits, incentives/disincentives of price controls and quality of extension services that also have a bearing on final yields and production levels. It is also important to note that vulnerability is also a function of pre-existing conditions. Reductions in area planted, caused by the scant early rains, are another potential cause of reduced production[6]. The modestly below-normal forecasts for western Zimbabwe threaten to compound present food shortages in that region, and warrant special concern.

Summary

Given the weak relationship between early rains and end-of-season maize WRSI, it appears possible, but not certain, that favorable December-January rainfall will produce healthy yields. Given fairly neutral sea surface temperature conditions, near-normal crop growing conditions in the southern SADC countries for the remainder of the season appear likely. However, the CPC has noted a warming trend in the Indian and Pacific oceans that could adversely affect Southern Africa precipitation in the remainder of the season. Prospects for the season will come more clearly into focus by the end of January. A follow-up report to this one will be issued at that time.

[6] Maize Vision Number 53, Johan van den Berg, produced by Enviro Vision and the Institute for Soil, Climate and Water Agricultural Research Council