17 June 2014

GIEWS Update

El Niño-Southern Oscillation (ENSO):
Review of possible impact on agricultural production in 2014/15 following the increased probability of occurrence

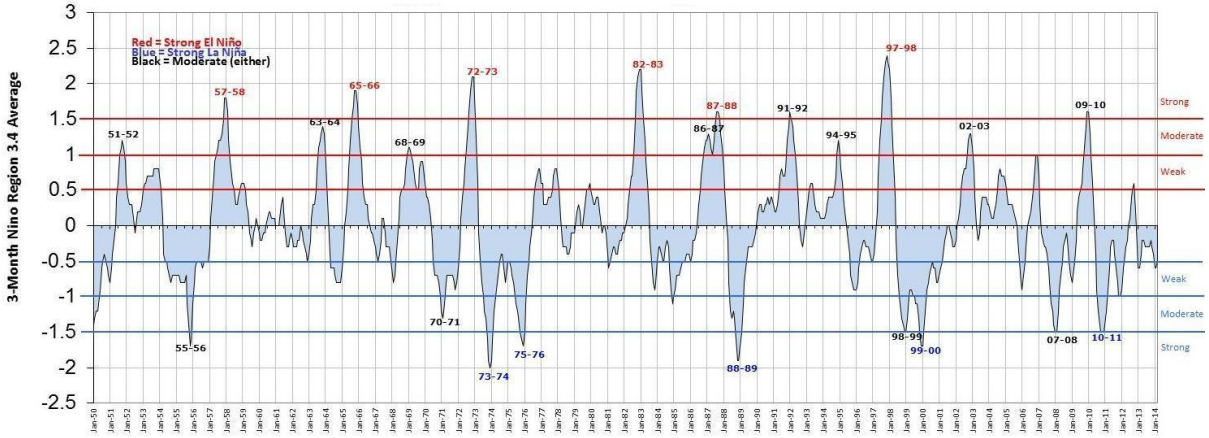
EL NIÑO – Definition and historical episodes

El Niño is a recurrent weather phenomenon that takes place approximately every two to seven years and usually lasts between 12 and 18 months. An El Niño event is defined by a high Oceanic Niño Index (ONI), which is based on Sea Surface Temperature (SST) departures from the average in a central equatorial Pacific region. An El Niño episode is associated with persistent warmer-than-average SSTs and consistent changes in wind and rainfall patterns. Despite their periodic and recurrent manifestations, El Niño episodes do not have a deterministic trend, with fixed occurrence periods and a constant intensity. As a result, stochastic models have been developed to predict the beginning and the intensity of El Niño episodes. However, while the accuracy of these models in predicting the onset of an El Niño episode is relatively high, forecasting the intensity is more uncertain due to random atmospheric disturbances which may dampen or amplify the intensity.

As a result, since El Niño episodes cause major global weather and climate fluctuations and have a significant impact on agriculture and food security, El Niño conditions are closely monitored by major meteorological institutes, and forecasts are updated accordingly.

Between 1950 and 2013 a total of twenty-two El Niño episodes had occurred. Figure 1 highlights the occurrences of moderate and strong El Niño and La Niña events (red lines on the upper half of the chart refer to El Niño, blue lines on the lower part to La Niña).

Figure 1: Oceanic Niño Index, 1950-2014



Source: National Oceanic and Atmospheric Organization

Out of the twenty-two El Niño episodes, eight were categorized as weak and another eight were moderate, while the remaining six occurrences of El Niño (1957-58, 1965-66, 1972-73, 1982-83, 1987-88 and 1997-98) were categorized as strong (see Table 1). The El Niño episode that occurred between May 1997 and April 1998 was the strongest and most prolonged on record.

Table 1: El Niño episodes and intensities, 1950-2013

El Niño intensity		
Weak	**Moderate**	**Strong**
1952-53	1951-52	1957-58
1953-54	1963-64	1965-66
1958-59	1968-69	1972-73
1969-70	1986-87	1982-83
1976-77	1991-92	1987-88
1977-78	1994-95	1997-98
2004-05	2002-03	
2006-07	2009-10	

EL NIÑO 2014/15 - Overview

Although El Niño conditions remained neutral as of early June 2014, current meteorological forecasts (from IRI[1] and NOAA[2]) indicate a 70 percent probability of El Niño occurring during the Northern Hemisphere's summer and 80 percent during the autumn or winter (see Table 2). This followed a rise in the equatorial SST in the preceding months. However, there still remains uncertainty as to exactly when El Niño will develop and an even greater uncertainty regarding its potential severity.

Table 2: El Niño current status and forecasts

Period	Probability of occurrence	
	Neutral (%)	**El Niño (%)**
May 2014 - Jul 2014	39	61
Jun 2014 - Aug 2014	30	69
Jul 2014 - Sep 2014	26	73
Aug 2014 - Oct 2014	22	77
Sep 2014 - Nov 2014	19	80
Oct 2014 - Dec 2014	17	82
Nov 2014 - Jan 2015	17	82
Dec 2014 - Feb 2015	18	80
Jan 2015 - Mar 2015	22	76

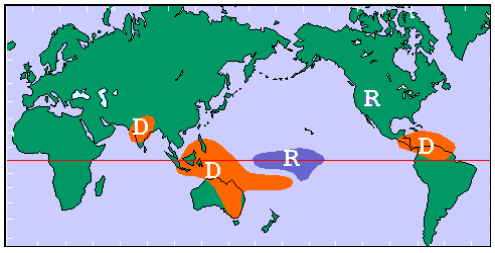
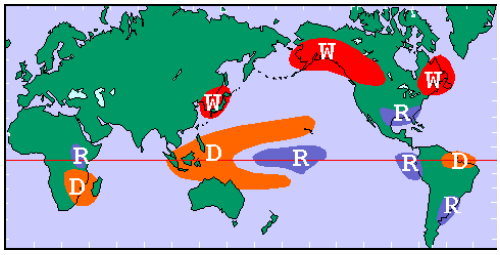
Source: National Oceanic and Atmospheric Organization

[1] IRI, 5 June 2014
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_update

[2] NOAA, 5 June 2014
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.pdf

The Table 3 below provides an overview of the potential changes in weather patterns that may occur due to an El Niño episode (based on historical incidents). However, no precise quantitative correlation between the occurrence of El Niño and changes in agricultural production has been established and it is, therefore, difficult to accurately map the impact of El Niño. The effect on agriculture will depend on the timing and severity of the El Niño, as well as the crop calendar in a particular region. The descriptions below are, therefore, only indicative of potential impacts on crop production.

Table 3: Potential climatic variations

REGION	FULL STRENGTH: NORTHERN HEMISHPHERE SUMMER April-September	FULL STRENGTH: NORTHERN HEMISHPHERE WINTER October-March
	 *R = Above average rains* *D = Drier than average* *W = Warmer than average*	 *R = Above average rains* *D = Drier than average* *W = Warmer than average*
Southern Africa	Towards the end of the main cropping season's harvest and during the dry season. No significant variation from normal weather patterns has been observed during past events.	An increased probability of below-normal precipitation during the main rainy season between October and March; however, the intensity and area affected has varied during preceding El Niño events. In general, below average rains during this period coincide with the main cropping season (crops planted in October-November and harvested from March), and could, therefore, result in stressed vegetation conditions, limiting crop development and impacting potential yields.
Eastern Africa	During the main cropping period, March-November, previous El Niño events have not been associated with a significant divergence from normal weather patterns and consequently the impact on crop production has been marginal.	High probability of above-normal rainfall has the potential to benefit secondary season crop production (harvested in February-March), but it may also disrupt harvesting of the main season cereal crops between October and November. Exceptionally heavy rains are likely to increase the potential for flooding, negatively affecting food production and livestock conditions, as was the case during the strong event of 1997/98. However, good moisture levels in the first quarter of the calendar year may also create favourable cropping conditions for the main season, beginning in April.

REGION	FULL STRENGTH: NORTHERN HEMISHPHERE SUMMER April-September	FULL STRENGTH: NORTHERN HEMISHPHERE WINTER October-March
	Ethiopia: *Increased probability of above-average Belg rains (March-May), thus benefiting the secondary Belg harvest (which accounts for about 10 percent of the total cereal output), unless excessive rains disrupt harvesting and marketing* operations*.* *The impact on the Kiremt rains (June-September), which provide moisture for the main Meher harvest (which accounts for about 90 percent of the total cereal output), is uncertain: the 4 out of the 9 latest El Niño episodes coincided with unfavourable crop growing conditions, while the remaining 5 were associated with adequate rainfall and moisture levels.*	
Asia	Similar conditions to the October-March anomalies (see right column) tend to transpire during this period. In addition, northern India has tended to receive below-average monsoon rains (June-October). This is likely to have a limited affect on the secondary Rabi season crops (harvesting begins in April), but a more pronounced impact on the main Kharif season crops (predominantly rice), which are planted from May and harvested during the last quarter of the year. The crop is largely rainfed (monsoon rains) and low-cumulative seasonal rains increases the probability of growth retardation, negatively impacting on crop yields. In addition, a prolonged period of poor rains may also impact the irrigated crops.	Increased chance of below-average precipitation, historically concentrated in southeastern areas, Indonesia and the Philippines in particular. As rice production across the region is nearly continuous throughout the year, the occurrence of an El Niño event would be expected to have some impact on crop production. The increased probability of below-average precipitation will have implications on yields mainly for rainfed crops, the bulk of which are grown during the second half of 2014, while persistent dryness may result in lower reservoir levels and diminished water supply, impacting irrigation supplies. As the bulk of the rice crop is irrigated, short-term dryness would be expected to have a more limited negative impact on mainly secondary season crops, but long-term below-average precipitation could dampen irrigated crop production.

REGION	FULL STRENGTH: NORTHERN HEMISHPHERE SUMMER April-September	FULL STRENGTH: NORTHERN HEMISHPHERE WINTER October-March
Oceania	Tendency for reduced precipitation in eastern Australia between June and November (winter/spring), with significant negative variations in New South Wales and southern Queensland, both large wheat producing regions. The eastern regions contribute to about 50 percent of the total national wheat output. This period constitutes the main growing months for the winter wheat crop, harvested from November onwards. A period of below-average rains between June and November may result in growth retardation, limiting yields.	There is a tendency for below-normal rains in October, during the winter wheat harvest period, though the impact of El Niño generally weakens towards the end of the year. Previous events have caused wetter than normal conditions in Western Australia during the first quarter of the year, prior to the planting period in April and, therefore, the impact on cereal production is likely to be limited.
Latin America and the Caribbean	In Central America, an El Niño event is largely correlated with below-normal precipitation, and fewer or less intense hurricanes during the Atlantic hurricane season. This period corresponds to the main cereal cropping season and a period of below-normal rains could potentially dampen production. In South America, the El Niño phenomenon is associated with below-normal precipitation in northern parts of the subregion, but these areas do not represent the large producing regions. However, reduced crop production could impact local supplies.	Southern parts of Latin America have tended to receive heavier rains, which include the major cereal growing areas of Argentina, southern Brazil and Uruguay. The heavy rains late in the year may delay plantings of the cereal crops, to be harvested from March onwards.
North America	Sowing of the summer cereal crops begins in March, with harvesting activities normally commencing in October. Northern parts of the United States, including the Corn Belt in the Midwest, have tended to receive below-average rains during the first six months of the year during an El Niño episode. However, the impact on rainfall variations weaken in the second half of the calendar year. Below-average rains early in the cropping season may negatively impact crop growth, but a more limited impact would be expected as the season progresses.	Strong El Niño conditions are generally correlated with above-normal precipitation in southern and western states, but drier conditions in northern and eastern parts. This period corresponds to the winter wheat cropping season (crops planted in September-October and harvested from May). However, drier conditions at the end of a calendar year could also negatively impact on late-planted maize crops, harvested in November, in the north central states. In central and southern areas, short-term periods of excessive rains would be expected to have a limited negative impact or possibly be beneficial for winter crop production, but could delay plantings.