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Food and Agriculture Organization
of the United Nations

GIEWS Update

El Niño Southern Oscillation (ENSO)

Possible impact on agricultural production during the second half of 2015

Highlights:

- In March 2015, the arrival of El Niño was officially declared and, according to the latest forecast, there is a 80-90 percent probability that it will continue until the end of the year
- Currently, El Niño-related weather anomalies are a concern especially in the areas where the 2015 main cropping season has just started, including southern Asia, East Africa and West Africa
- Close monitoring of developments is, therefore, warranted to help devise appropriate response measures

El Niño 2014/15 - Overview

The long-anticipated El Niño Southern Oscillation (ENSO)[1] has finally arrived, according to forecasters at the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Centre. In their updated monthly outlook released at the beginning of March 2015, the arrival of the ocean-atmospheric phenomenon was marked by warmer-than-average sea surface temperatures in the central Pacific Ocean near the equator.

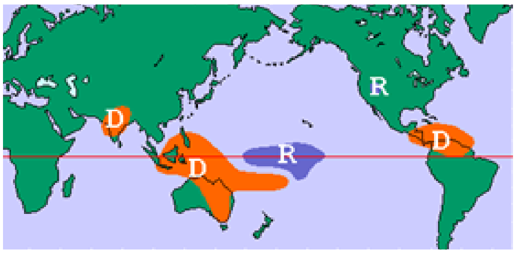
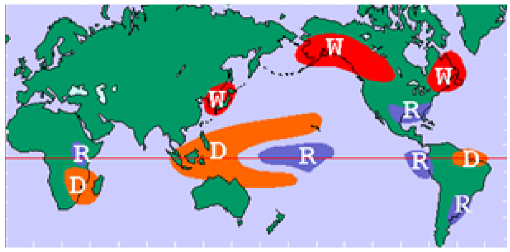
According to latest forecasts, there is a very high likelihood (90 percent) that El Niño conditions will continue through the 2015 summer in the Northern Hemisphere and a greater than 80 percent probability that it will last until the end of the year.

Although no precise quantitative correlation between the occurrence of El Niño and its impact on agricultural production has been established, the possible impact during the second part of 2015 will depend on the severity/duration of the phenomenon as well as the phenological phase of crops during the peak period of influence of the event. Main concerns about possible weather anomalies associated with El Niño conditions in the Northern Hemisphere are related to the areas where the 2015 main cropping season has just started, such as southern Asia, East Africa and West Africa. In particular, rainfed paddy production in south and southeast Asia could be affected by below-average monsoon rains. Similarly, dry weather conditions may affect winter wheat in key growing areas in Australia as well as first and second season production of maize and beans in Central America. By contrast, the southern portions of the Horn of Africa (including parts of Somalia, Kenya and southern Ethiopia) may experience abundant rainfall (with risk of flooding) during the short rainy season (October-December). Above-average rains at the end of the year may also affect planting operations in major cereal growing areas of Argentina, southern Brazil and Uruguay.

More details on potential changes in weather patterns and related impact on agriculture that may occur due to El Niño episodes are provided in Table 1 (based on historical incidents).

[1] See Annex for definition of El Niño Southern Oscillation (ENSO).

[2] Rojas, Li, Cumani (2014). Understanding the drought impact of El Niño on the global agricultural areas: an assessment using FAO's Agricultural Stress Index (ASI), FAO, Rome.

Table 1: Potential climatic variations due to El Niño, 2014/15		
REGION	**NORTHERN HEMISPHERE SUMMER** **April-September**	**NORTHERN HEMISPHERE 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
Asia	Increased chance of below-average precipitation, historically concentrated in southeastern areas, Indonesia and the Philippines in particular. 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 increase the probability of growth retardation, negatively impacting on crop yields. In addition, a prolonged period of poor rains may also impact the irrigated crops.	Similar conditions to the April-September anomalies (see left column) tend to transpire during this period. 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 the year, 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 mainly impact on secondary season crops, but long-term below-average precipitation could dampen irrigated crop production.
South 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.

REGION	NORTHERN HEMISPHERE SUMMER April-September	NORTHERN HEMISPHERE WINTER October-March
East 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.
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. 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.

REGION	NORTHERN HEMISPHERE SUMMER April-September	NORTHERN HEMISPHERE WINTER October-March
North America	Sowing of the summer cereal crops begins in March, with harvesting activities normally commencing in October. Northern parts of the United States of America, 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.

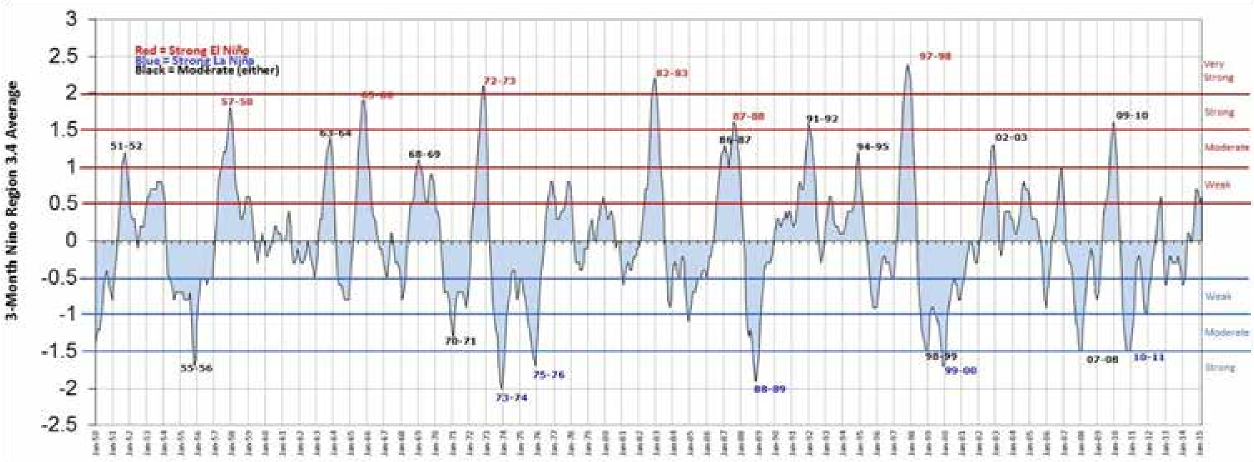
ANNEX

Definition of El Niño 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[3], with fixed occurrence periods and a constant intensity. 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 2015 a total of 23 El Niño episodes have 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, 1950-2015



Source: http://ggweather.com/enso/oni.htm

Table 2: 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	
2014-15		

Out of the 23 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 2). The El Niño episode that occurred between May 1997 and April 1998 was the strongest, while the most prolonged phenomenon on record was between 1986 and 1988, when two consecutive warm events influenced the climate for 19 months without interruption.

[3] Processes or projects having only one outcome are said to be deterministic; their outcome is "pre-determined". A deterministic algorithm, for example, if given the same input information will always produce the same output information.

This report is prepared by the **Global Information and Early Warning System (GIEWS)** of the Trade and Markets Division of FAO. The updates focus on developing anomalous conditions aimed at providing early warnings, as well as latest and more elaborate information than other GIEWS regular reports on the food security situation of countries, at both national and sub-national levels. None of the information in this report should be regarded as statements of governmental views.

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