

# El Niño: Implications and Scenarios for 2015/16

*December 2015*



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# El Niño: Summary Highlights for 2015-2016

Red=Negative; Orange=Watch; Green=Positive

Region	Current Status	Outcomes / Outlook	Impacts
Central America	Postrera season at an end	<p>Widespread drought during Primera (first) season (provides &gt;60% of regional maize production).</p> <p>Postrera season (major bean production) should end with near average harvests</p>	<p>Most affected are Haiti, Salvador, Honduras, Guatemala and Nicaragua. Affected countries maize production may drop 20% (FAO). Better Postrera crop production will improve the situation</p>
West Africa	Rainfall season ended in Sahel	<p>Sahel: after a very poor start, wetter than average conditions and a later than usual end of season</p> <p>Drier than average conditions along Gulf of Guinea</p>	<p>No significant impacts expected in the Sahel, apart from localized worries in Chad</p> <p>Dryness in Ghana affecting second season crops</p>
East Africa	Main rainfall season ended in Ethiopia (except SE), Eritrea, Sudan and most of South Sudan	<p>Ethiopia's Belg and Meher growing seasons ended with both affected by drought. Overall may be worst drought in 50 years, Sudan also affected by poor growing season as well as Eritrea and Djibouti. Karamoja (NE Uganda) growing season also performed poorly.</p>	<p>Ethiopia now dealing with a major drought related emergency. Sudan facing rainfed production shortfall and very poor conditions for pastoralists in East and centre. Poor season in Karamoja and some localized impacts in South Sudan,</p>
Indian subcontinent and South Asia	Main season in Indonesia and secondary season in the Philippines	<p>Favourable season in Pakistan and Afghanistan.</p> <p>Unfavourable monsoon season in India and most of SE Asia countries. Indonesia, Philippines and Pacific islands endured drier than average conditions until now and are forecast to continue until January 2016.</p>	<p>Strong negative impacts already felt in PNG are likely to worsen. Indonesia expected to face impacts on national crop production, and on livelihoods of poorer communities in eastern province.</p>
Horn of Africa	Final stages of the Short Rains (October – December)	<p>Widespread wetter than average conditions; October flooding in Somalia, flash floods and landslides in Kenya.</p> <p>Good vegetation development, except NE Kenya</p>	<p>Flooding so far at manageable scales and no major catastrophic flooding is expected.</p> <p>Favourable pasture and marginal agricultural conditions in semi-arid areas due to enhanced rainfall. Worries remain in NE Kenya</p>
Southern Africa	Early stages of the 2015/16 season (October to April)	<p>Severe rainfall deficits in the early stages of the season, with delays in the start of the season and poor vegetation status. There is still time for recovery</p>	<p>Possible maize production drops in South Africa (main producer), Zimbabwe and Malawi; the resulting high prices and low availability will put additional stress on households.</p>
South America	Early stages of the 2016 season	<p>Drier than average in northern areas of continent, wetter than average in southern Brazil, Paraguay and along coasts of Peru and Ecuador.</p>	<p>Possible drought in NE Brazil and dryness in Bolivia. Enhanced risk of flooding and landslides in Paraguay, Peru and Ecuador.</p>

# The El Niño 2015-16 in the Historical Context

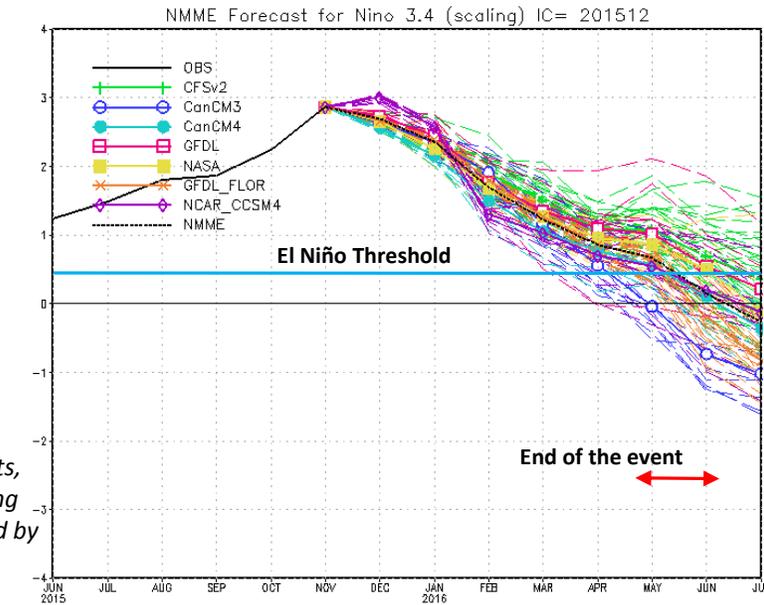
## The 2015/16 El Niño Event

The current El Niño was officially declared in March 2015. It has just reached its peak intensity and will now start unwinding back to neutral conditions, which will probably be reached in the second quarter of 2016.

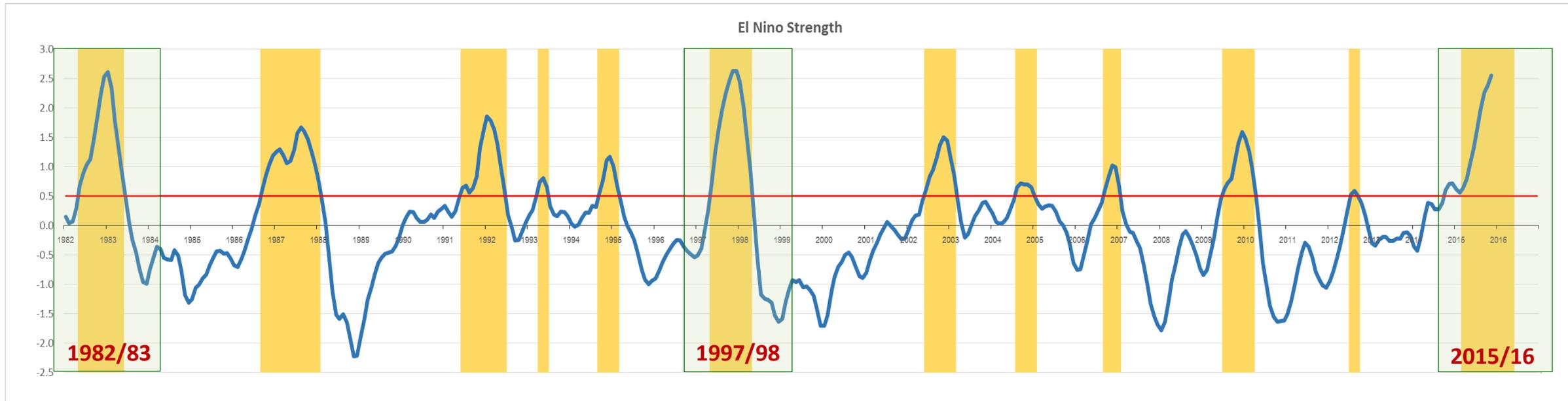
This El Niño event has some particular features with relevant implications for the food security of many populations around the globe:

- It had been in the making for a long while before its official declaration
- it is one of the strongest in the available record
- it is likely to be relatively longer lived

See next slide for a summary infographic.



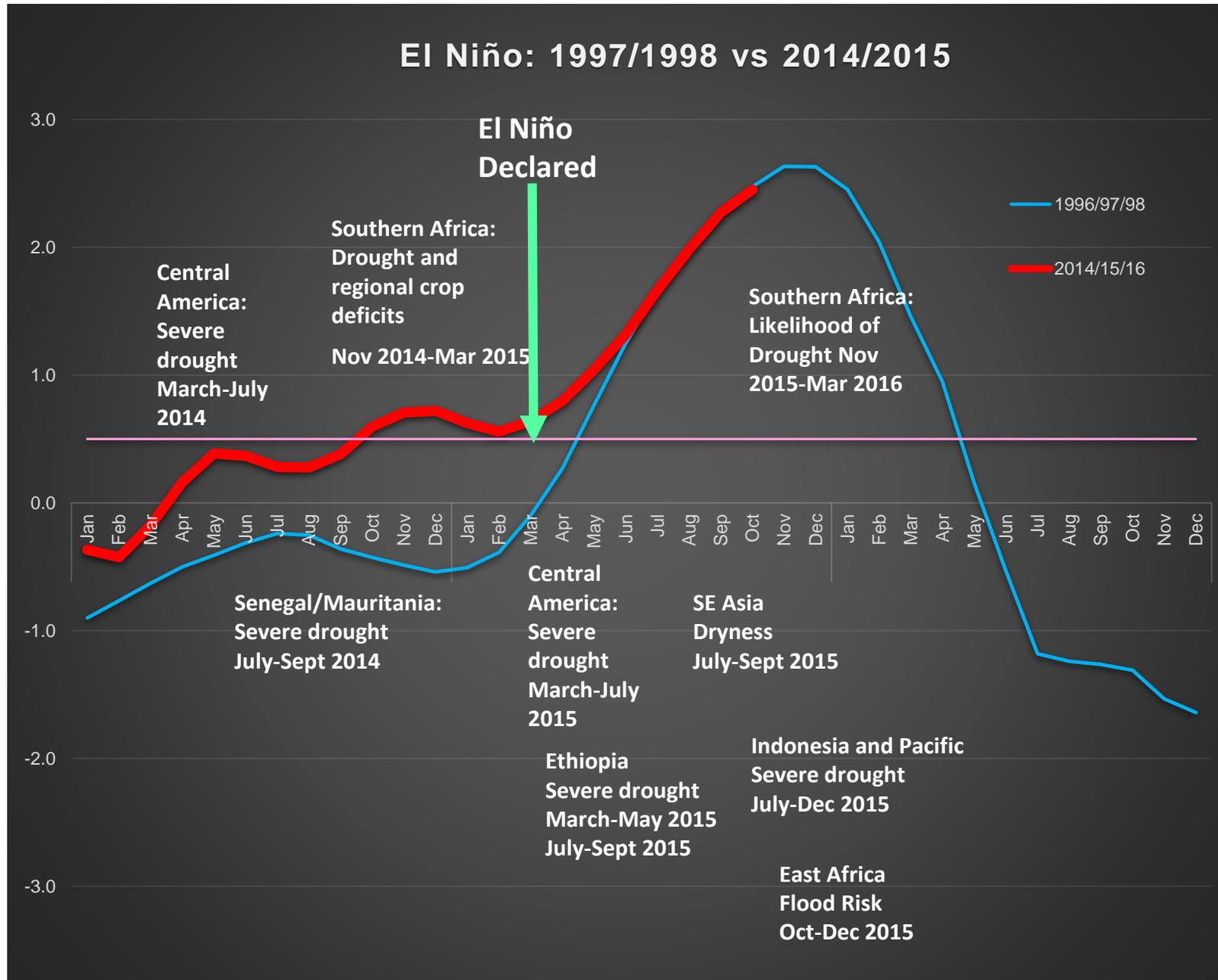
Latest El Niño forecasts, showing the peak being reached now, followed by its steady decay.



Inter-tropical Pacific Sea Surface Temperature anomalies from 1982 to present. The current event and the two most intense events in record are highlighted. Red line is the El Niño threshold

# The El Niño 2015-16: A Long Build Up to Record Intensity

## The 2015-2016 El Niño Event



### A quasi El Niño before the real event

Although the current El Niño was officially declared in March 2015, the El Niño indicator(s) floated about the standard El Niño declaration threshold from the second quarter of 2014.

In mid 2014 the probability of an El Niño event by late 2014 was about 75%. The El Niño threshold was actually exceeded in October 2014, but not all criteria were fulfilled for a declaration.

Even if this didn't reach the status of full blown El Niño, many areas of the globe endured El Niño-like impacts, which usually hit the poorest, most food insecure populations:

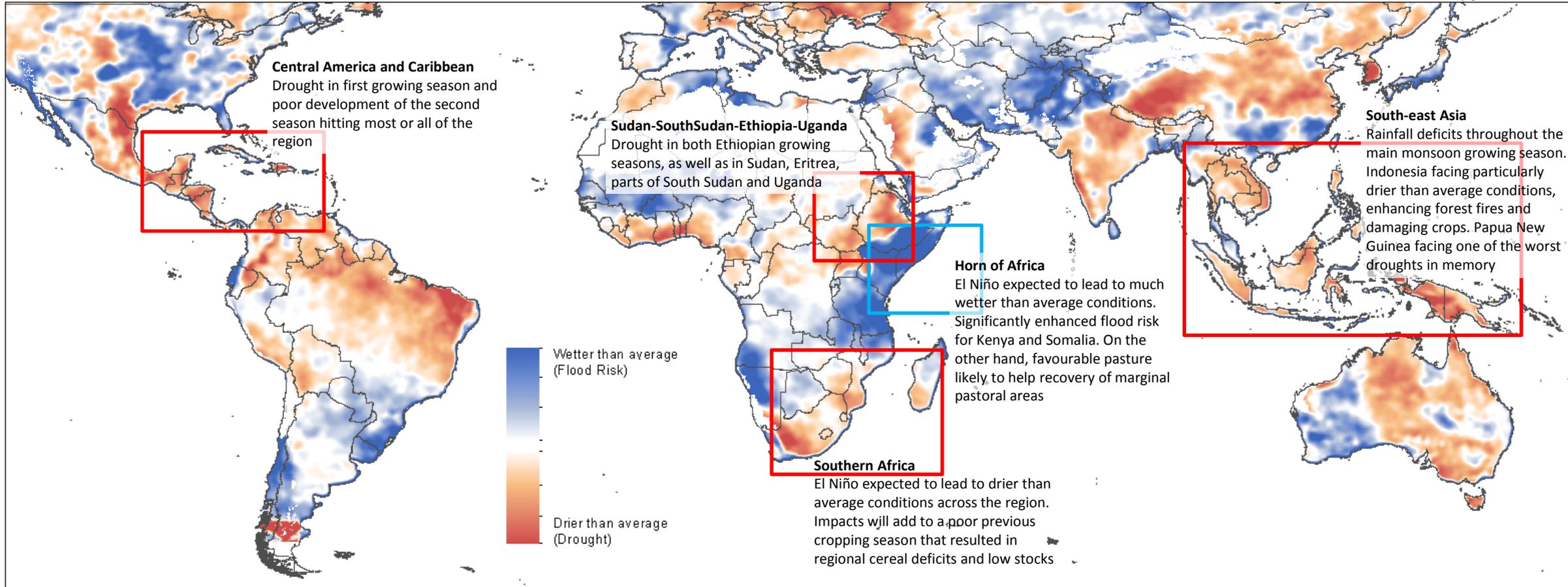
- In Central America, during the *Primera* season of 2014, many areas registered some of the lowest rainfall in 30 years.
- The Sahel had a very poor start to the 2014 season and Senegal and Mauritania were hit by the worst drought in 20 years.
- Southern Africa endured drought conditions during its October-April growing season of 2014-2015 that led to staple maize crop production declines and a decrease in the regional stocks.

These climatic events weakened the coping ability of poor and food insecure households, heightening their vulnerability before the proper El Niño event had even begun.

This was particularly the case for Southern Africa and also for Central America.

# Overview of El Niño Impacts

## Global El Niño impacts 2015



### An Event with a Global Reach

El Niño has a global reach, with a variety of impacts spread throughout the world and the year. The mapgraphic above blends both already observed impacts on rainfall (3<sup>rd</sup> quarter of 2015) with expected rainfall seasons outcomes for the last quarter of 2015.

The global impact of this El Niño event is clearly apparent – many of its manifestations are on the drought side, but quite a few areas (e.g. Horn of Africa) see a significant enhancement in rainfall and hence on the likelihood of large scale floods.

# East Africa:

*A complex pattern of El Niño impacts*



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# Timings of El Niño Impacts

## Overview of El Niño impacts in East Africa

The current El Niño event has influenced East Africa since its official onset in March 2015. To better understand the geography and timing of El Niño impacts, East Africa's complex pattern of growing seasons is represented by two broad fairly simplified regions and a transition region shown on the map below:

### Region A:

Most seasonal rains fall from March to October, mostly in a single continuous season, though some areas register two separate rainfall seasons (Ethiopia's Belg and Meher seasons, March to May and July to September).

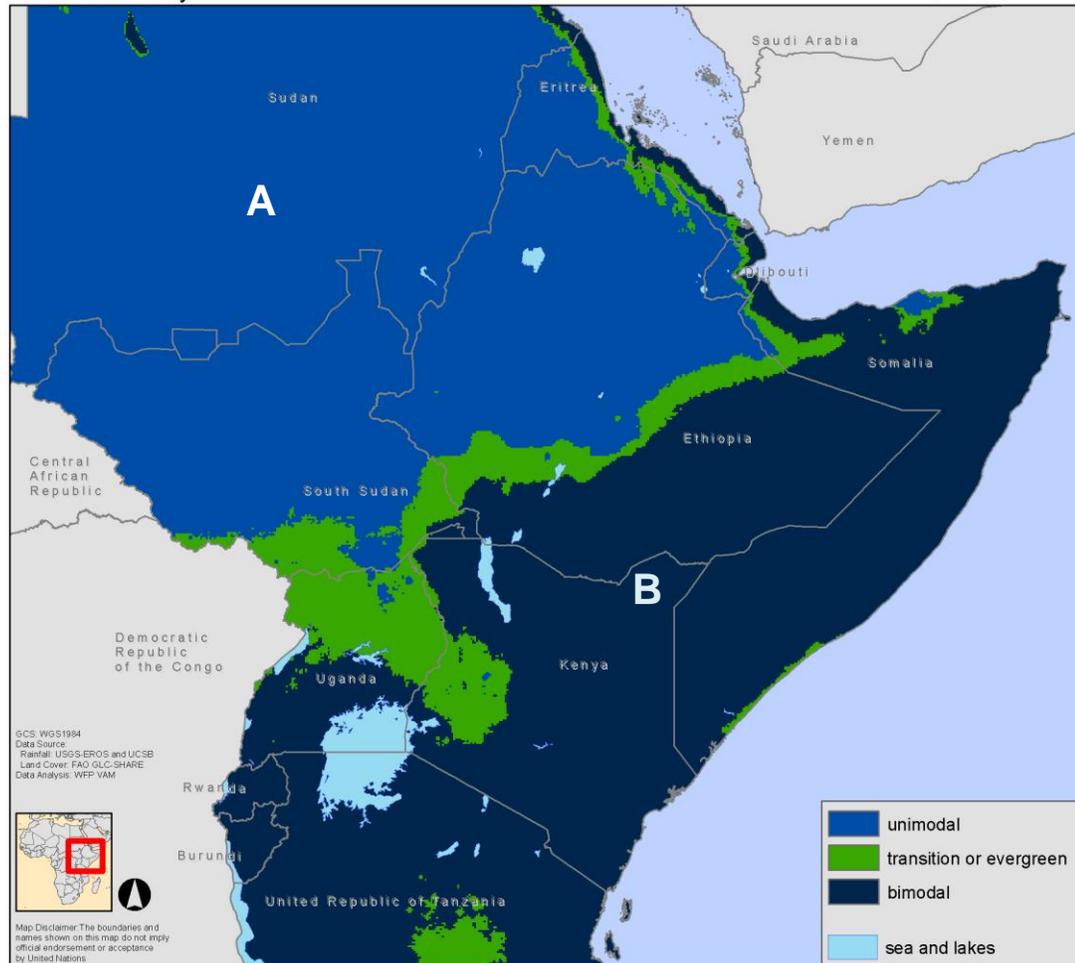
In region A, rainfall is effectively over and **El Niño impacts are now resolved**; they have resulted primarily in **drier than average** conditions ranging from transient **rainfall deficits** to full blown **droughts** with crop and pasture shortfalls as an outcome.

The consequences for households and livelihoods will be mostly felt during the typical hunger period in the early stages of the next growing season (March to July 2016).

### Transition:

Areas with complex rainfall patterns, frequently with a long season with pronounced peaks in rainfall. Likely to suffer a mix of two El Niño influences, drought in July-September and wetter than average conditions from October onwards.

EASTERN AFRICA  
Rainfall Seasonality



### Region B:

Seasonal rains fall within October to May, mostly in two separate rainfall seasons, October to November and March to May (e.g. Kenya's Short Rains and Long Rains).

In this region, the first rainfall season is currently under way and **El Niño impacts are now developing**; they are expected to result mostly in **wetter than average** conditions that may cause significant **flood** events but may also **enhance crop and pasture** production.

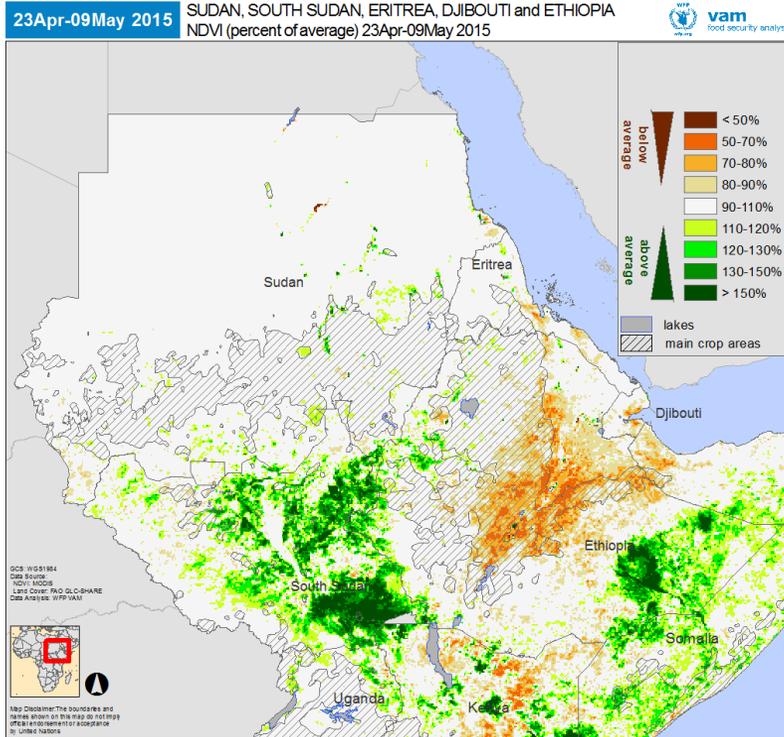
In the absence of major flood events, consequences for households and livelihoods should be beneficial and result in shorter hunger gaps in early 2016.

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# El Niño 2015 Outcomes: Region A and Transition Areas

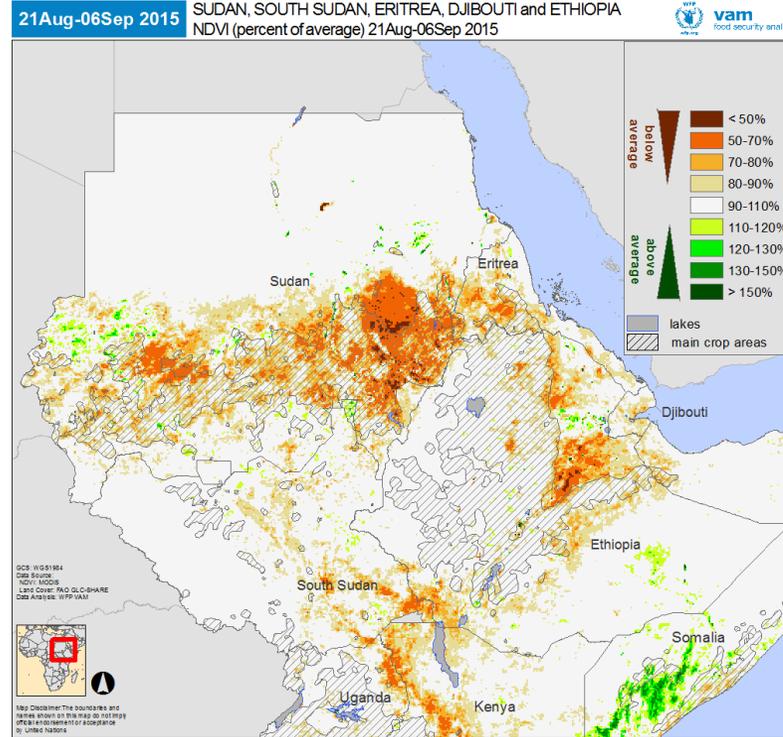
East Africa: A complex pattern of impacts

**APRIL 2015**



NDVI in early May 2015 as a percentage of the average. This is a time of peak vegetation development for the Belg season. Blues and greens for above average, oranges and browns for below average

**AUGUST 2015**



NDVI in late August 2015 as a percentage of the average. This is a time of peak vegetation development for the main (Meher) season. Blues and greens for above average, oranges and browns for below average

## Summary

The rainfall season over most of this region (Ethiopia, Sudan, South Sudan, Eritrea, Djibouti) is now effectively over and El Niño impacts mostly resolved.

Ethiopia was the country most severely affected, having endured two severe drought events in the same calendar year:

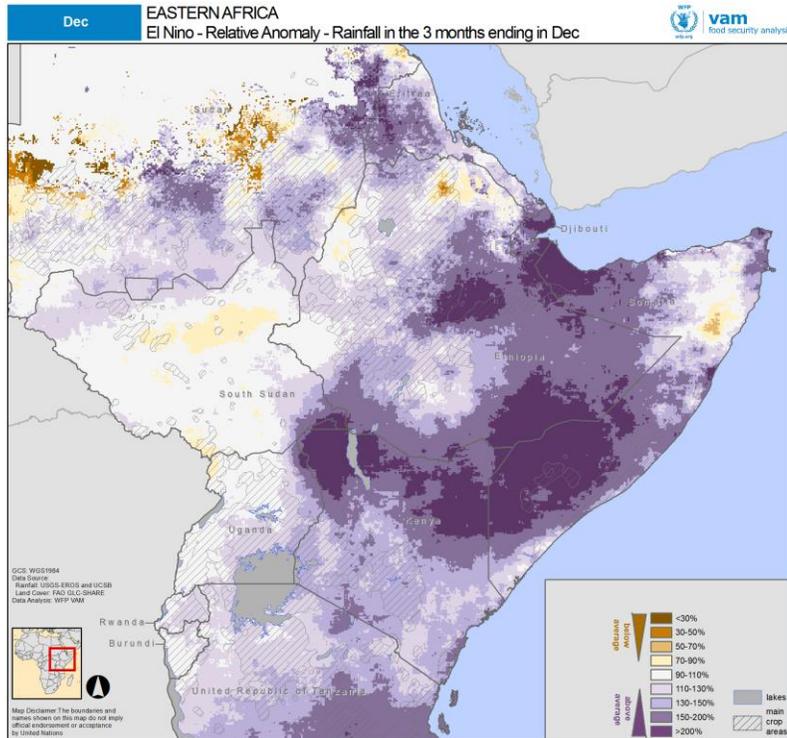
- The first occurred in March to May and affected pastoral semi-arid regions (specially Afar) as well as areas where the first (Belg) of two growing seasons takes place.
- The second developed during July-September and affected most northern and central areas where a single main season and the second (Meher) of two seasons takes place.

The second event was part of a geographically wider drought that also impacted Sudan, Eritrea, Djibouti, Somaliland as well as parts of eastern South Sudan and Karamoja-Turkana (borders between Uganda and Kenya).

These latter regions are also influenced by the Short Rains season; as a result they have been enjoying significantly enhanced rainfall in late 2015, early 2016, as El Niño leads to a wider reach of the Short Rains and enhanced rainfall amounts.

Elsewhere, the rainfall season has also lasted for longer than usual, but this came too late to be of any benefit and significant crop production shortfalls are expected across the region as well as impacts on pasture.

# El Niño 2015 Expectations: Region B and Transition Areas

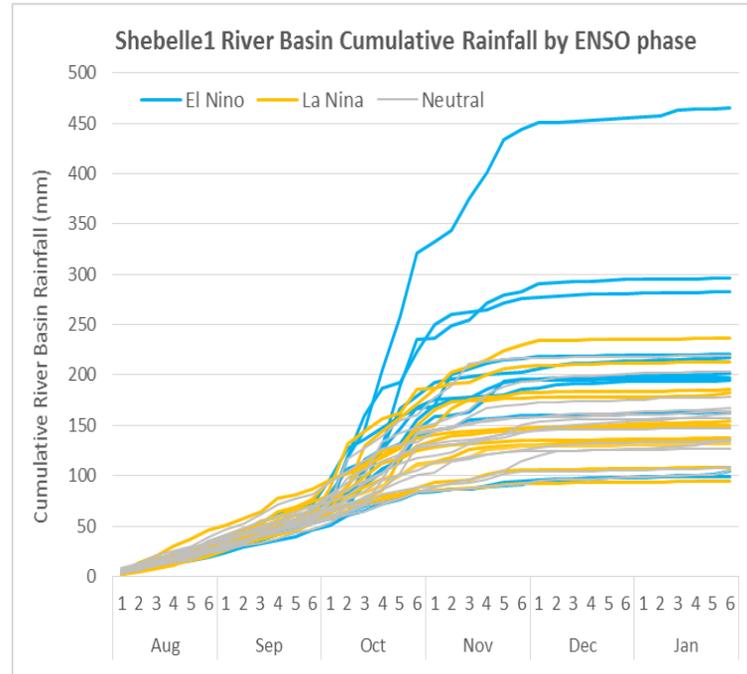


## Historical data 1981-2014: El Niño leads to widespread above average rainfall

The map compares October-December rainfall between past El Niño seasons and Neutral seasons during the past 34 years.

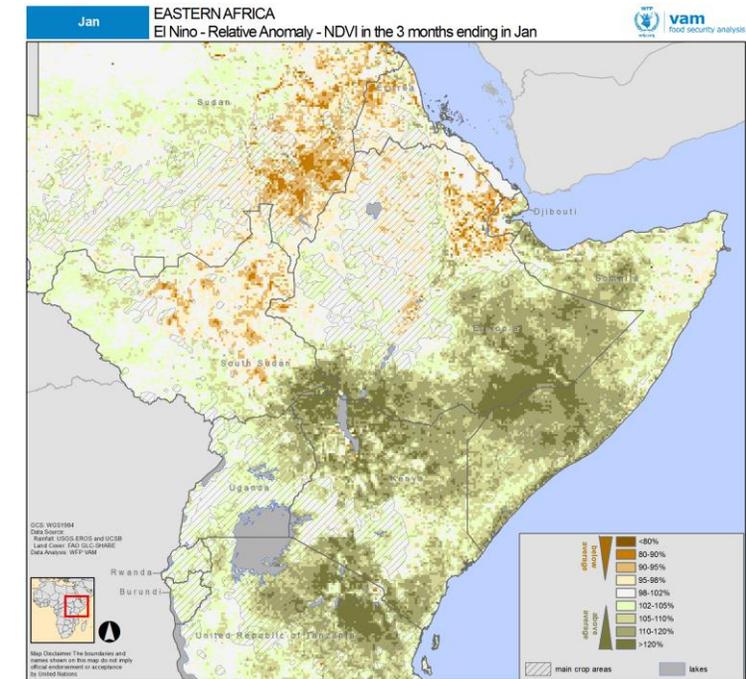
The purple shades clearly show that El Niño on average leads to much wetter than average Short Rains seasons, in many areas doubling the seasonal rainfall amount.

This effect is particularly pronounced in northern Kenya from Turkana to the Somalia borders, southeast Ethiopia, southern Somalia and the Djibouti-Somaliland region.



## Implications: Enhanced Flood Risk

- Plot shows historical river basin cumulative rainfall (Shebelle, Somalia) color coded according to El Niño (blue), La Niña (orange), Neutral (grey). The three extreme seasons are all El Niño seasons.
- Increased flood risk along the river systems of Somalia and Kenya, possibly leading to a repeat of the catastrophic flooding of 1997 and 2006.
- This possibility was based on the current El Niño reaching (maybe exceeding) the intensity of the 1997 event.



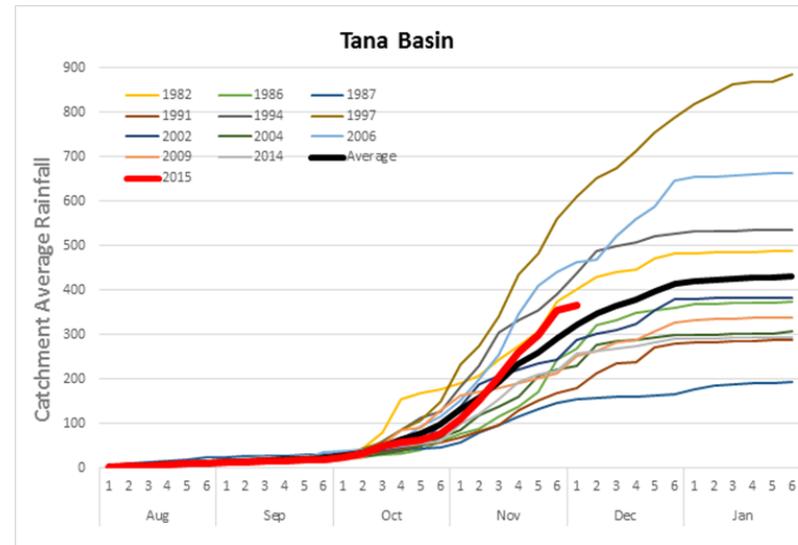
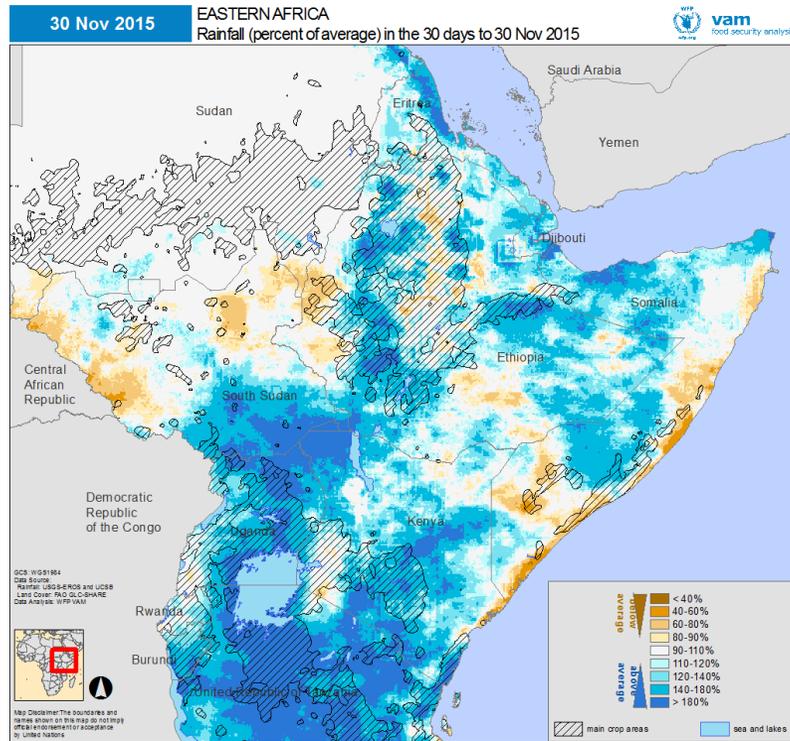
## Implications: Prime pasture conditions

- Wetter than average conditions will lead to much improved production in marginal agricultural areas and in particular in semi-arid grasslands dominated by pastoralist livelihoods.
- Historical data (map above) shows much higher levels of vegetation cover in El Niño seasons, with similar patterns to that of El Niño rainfall

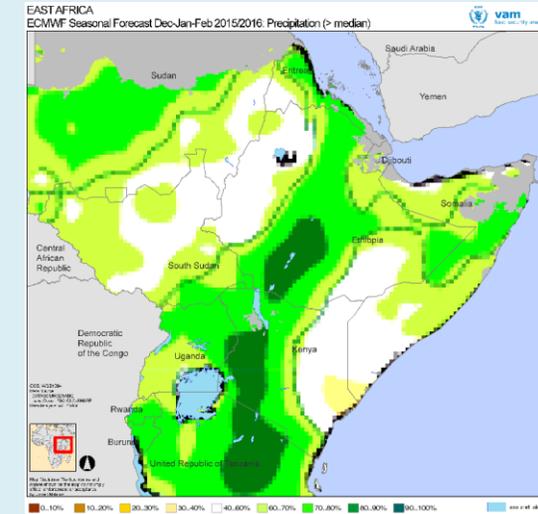
# El Niño 2015 Current Status: Region B and Transition Areas

# Outlook

East Africa: A complex pattern of impacts



**Large scale floods do not materialize**



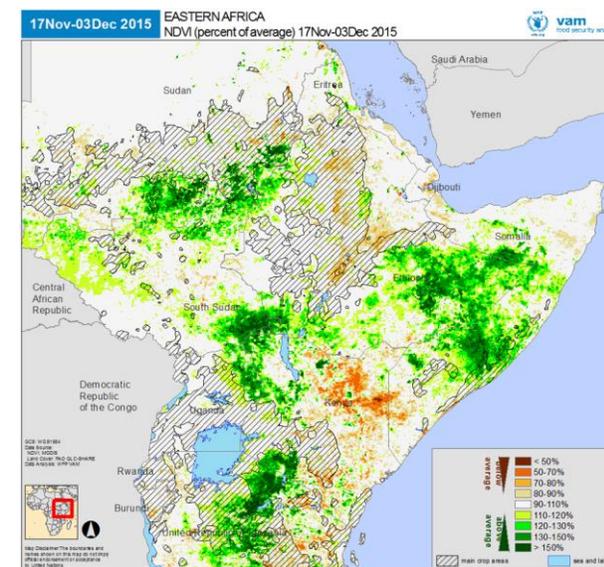
ECMWF forecast for December 2015-February 2016 rainfall:  
Green shades = wetter than average conditions more likely.  
Brown shades drier than average conditions more likely.

**Wetter than average conditions across most of the region**

Wetter than average conditions predominate across the region as is typical of an El Niño season, but not as much as might be expected from the strength of the event. The situation so far is variable, and includes poor performance in northern and eastern Kenya and SE Somalia. Tanzania and the Great Lakes have been fairly wetter than average.

Large scale flood events (such as 1997 and 2006) are now extremely unlikely as river basin rainfall amounts have tracked along the average for El Niño years. This still led to flash-floods, landslides and displacement, particularly in Kenya. Somalia registered floods in mid October 2015

Vegetation cover is well above average, except for NE Kenya, due to patchy rainfall performance. In general, good conditions for pastoralist livelihoods.



**Vegetation cover mostly above average**

**Wetter than average end of season:**

For December-February (later stages of the season), areas of northern Tanzania, western Kenya and SW Ethiopia should expect much wetter than average conditions – in Kenya, this further raises the likelihood of continued flash floods, landslides and river floods.

Above average rainfall elsewhere, will enhance the favourable outlook for semi-arid pastoral and marginal agricultural areas such as East Equatoria in South Sudan, Turkana in Kenya and south west Ethiopia regions.

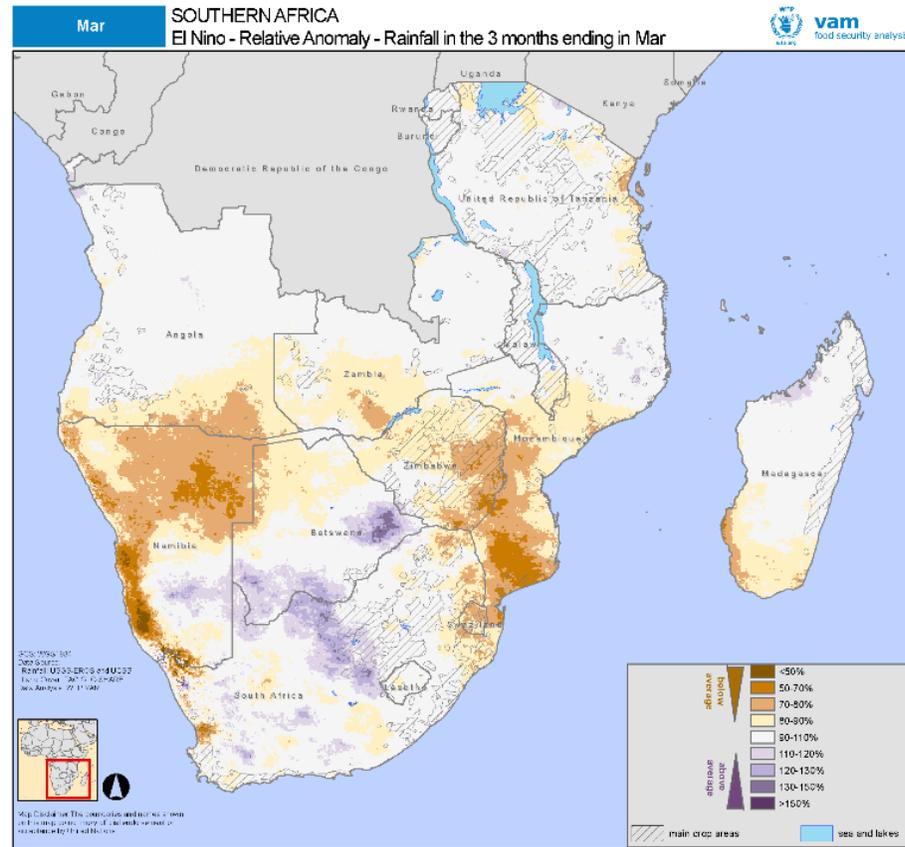
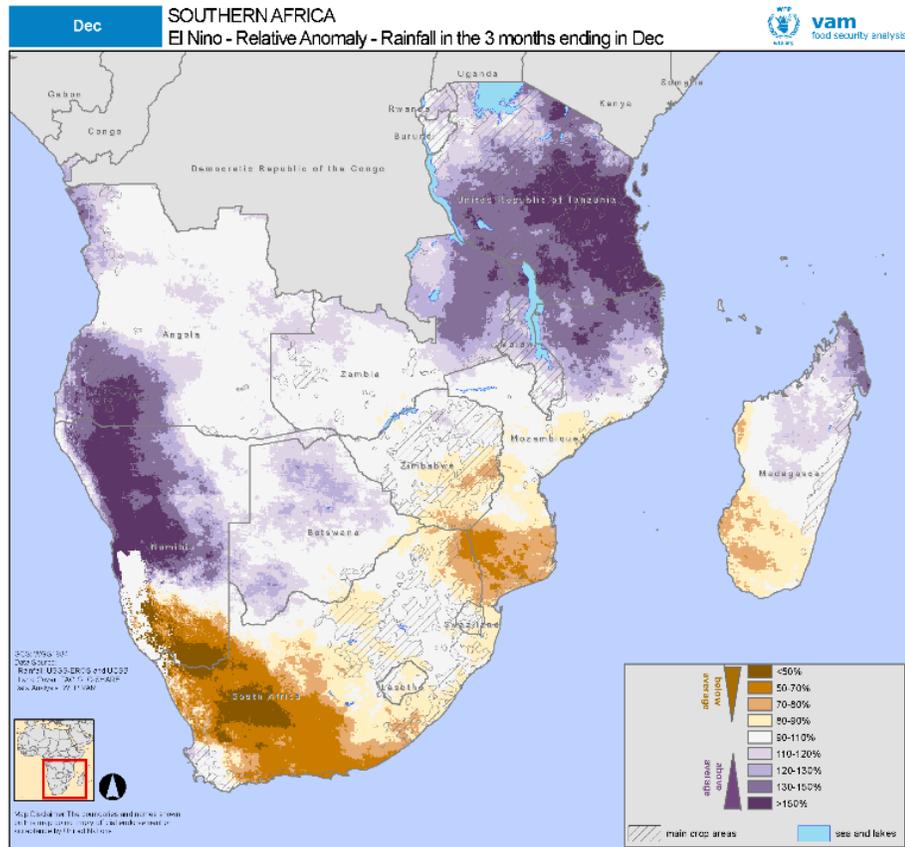
# Southern Africa:

*As if facing a second El Niño*



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# Expectations: Historical El Niño Rainfall Patterns



Average 3 month rainfall in El Niño seasons compared to Neutral Seasons.  
Left: Oct-Dec, Right: Jan-Mar.  
Based on 34 years of data (1981 to 2013)

## Long term data shows El Niño seasons typically drier than average

The maps compare rainfall between El Niño seasons and Neutral seasons over the past 34 years. The comparison is made for two key periods of the season, October-December (planting and early crop development) and January-March (including the time when maize is most sensitive to water deficits).

In El Niño seasons, during October-December, drier than average conditions affect mostly the border areas of NE South Africa, Mozambique and Zimbabwe as well as southern Madagascar. Similar conditions affect SW South Africa though rainfall amounts are small and the main rains arrive towards late December.

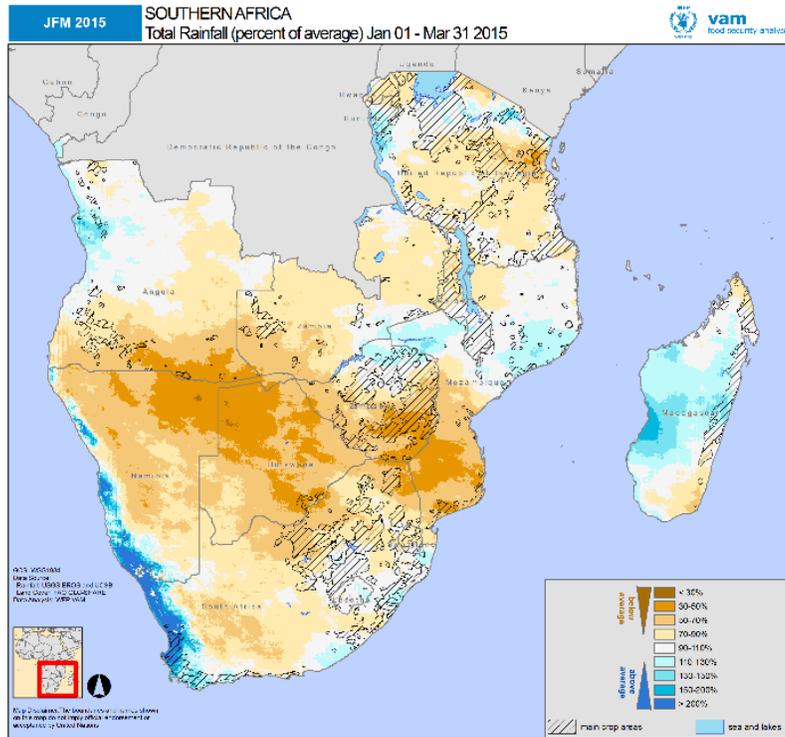
These early season rainfall deficits are expected to lead to delays in the arrival of the rains and to a late start of the growing season.

Midway through El Niño affected seasons, drier than average conditions are widespread, extending from Namibia across Zambia, Zimbabwe and into Mozambique and NE South Africa and Swaziland. These patterns typically result from significant dry spells during this period, which can have severe impacts on maize crop production.

# Context: Depressed stocks, heightened food insecurity

Southern Africa: As if facing a second El Niño

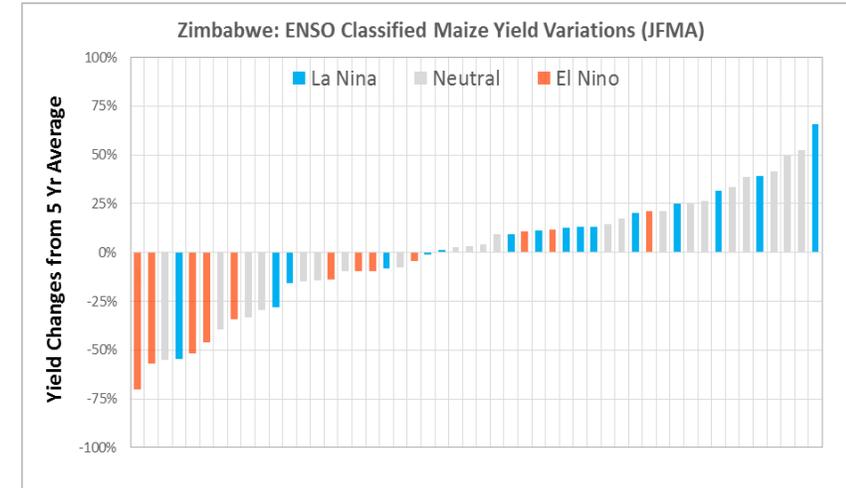
## Previous Season: Q1 2015



Country	2014/15	5yr Avg	Ratio
Angola	1749	1110	58%
Botswana	15	62	-75%
Lesotho	81	92	-12%
Malawi	2945	3883	<b>-24%</b>
Mozambique	2255	2338	-4%
Namibia	51	126	-60%
RSA	13149	14420	-9%
Swaziland	82	78	5%
Tanzania	7382	6973	6%
Zambia	2846	2943	-3%
Zimbabwe	800	1373	<b>-42%</b>

2014-15 all cereal production vs 5 year average. Severe rainfall deficits during the season (left) led to regional crop losses. The two countries of most concern are highlighted: sharp falls on important production volumes (and requirements). SADC figures.

## Long Term Agricultural Statistics & El Niño



Zimbabwe: ranked national maize yield variations from the 5 year average, coded according to ENSO phase. Note how largest drops are systematically associated with El Niño. Data: FAOSTAT, CPC. Analysis: WFP-VAM

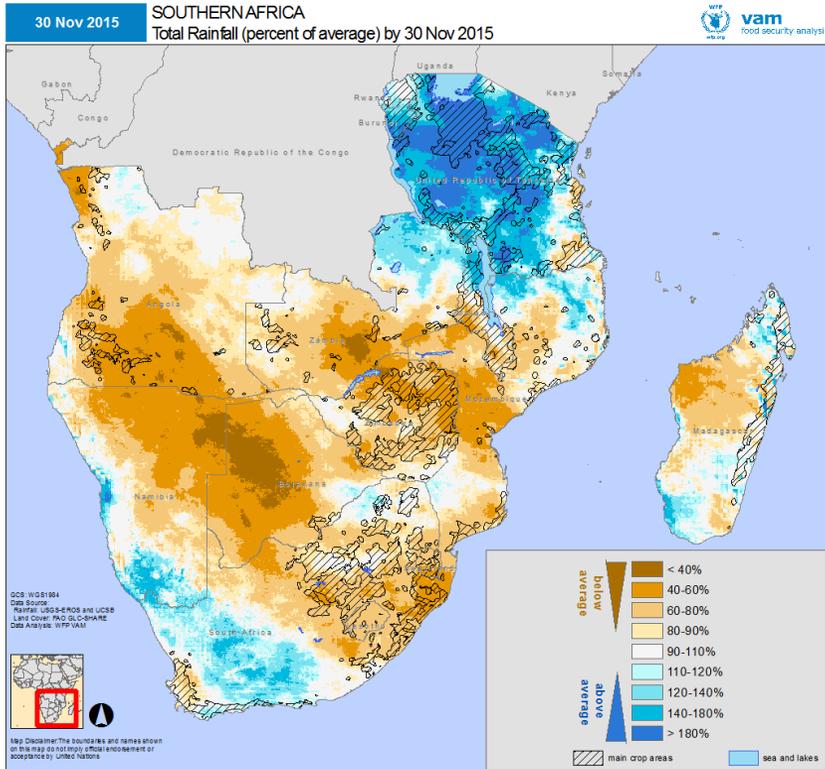
## Previous poor season depresses regional stocks, raises food insecurity

The previous growing season of October 2014 to April 2015 was characterized by extensive rainfall deficits during key stages of the staple maize crop development (planting and flowering/grain filling). Significant, though localized, flooding in Malawi and northern Mozambique further compounded the problems.

This resulted in crop production deficits across the region which were particularly acute in South Africa, Zimbabwe and Malawi. The extensive stocks from the high production of the 2013-2014 bumper harvest alleviated much of the problems, but were depleted as a result (from 4400 to an estimated 1750 million tons, SADC figures) and are now much decreased at the beginning of what may be another poor cropping season.

Historical data on national maize yields (FAOSTAT) and ENSO indicators reveal a strong linkage between drops in national maize yield and El Niño dominated growing seasons. The linkage is strongest for the largest producer (South Africa) and the most food insecure country (Zimbabwe).

# Current growing season status

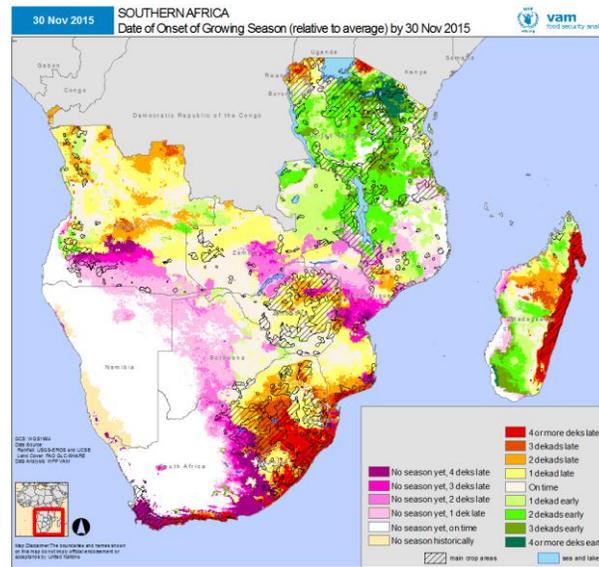


**Severe rainfall deficits in the very early stages of the season**

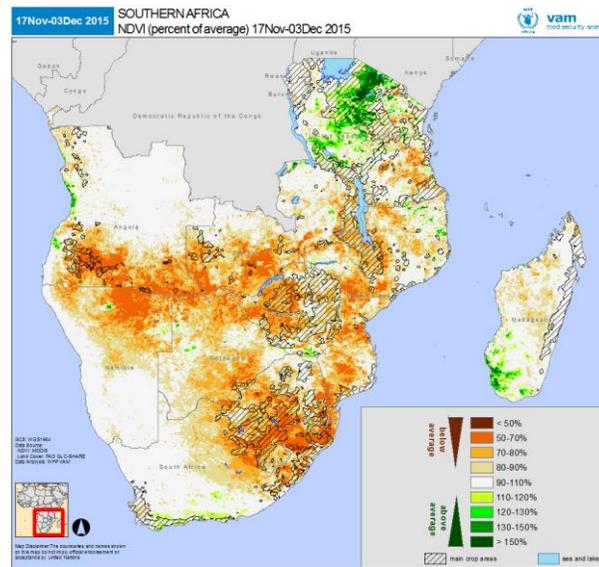
## An ominous start, but still time to recover

The early stages of the rainfall season have already been characterized by severe rainfall deficits, with wide areas receiving less than 50% of the usual rainfall. Tanzania and northern Zambia are enjoying wetter than average conditions as they are mostly influenced by the enhanced Short Rains of East Africa.

These early rainfall deficits result in delays to the start of the growing season. There is still plenty of time for a full recovery, but the later the start of the season, the better conditions need to be at a later stage (above average rainfall and longer than usual season). Vegetation cover is already at much below average levels.

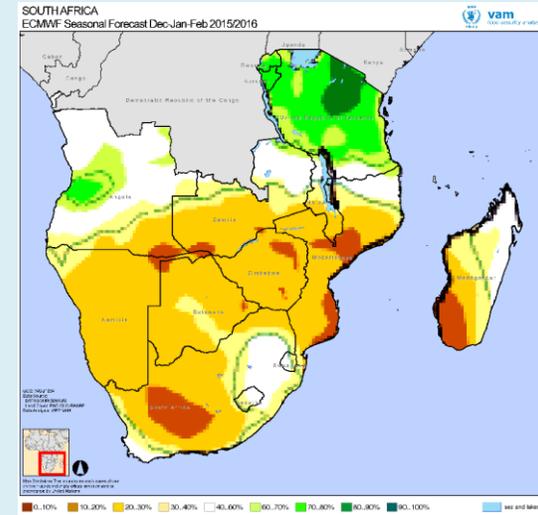


**Delays in the start of the season**



**Vegetation cover strongly affected**

# Outlook



ECMWF forecast for December 2015-February 2016 rainfall :  
Green shades = wetter than average conditions more likely.  
Brown shades drier than average conditions more likely.

**Drier than average conditions expected:**

The forecast for the next three months (Dec-Feb) indicate a continuation of drier than average conditions across most of the region, except central and northern Angola, NE Zambia and Tanzania, where above average rainfall is expected.

The key maize growing areas of eastern South Africa may see improvements in rainfall up to average levels. But perspectives for the rest of the region are pessimistic, especially given the current delays in the start of suitable moisture conditions for planting and early crop development.

# Central America:

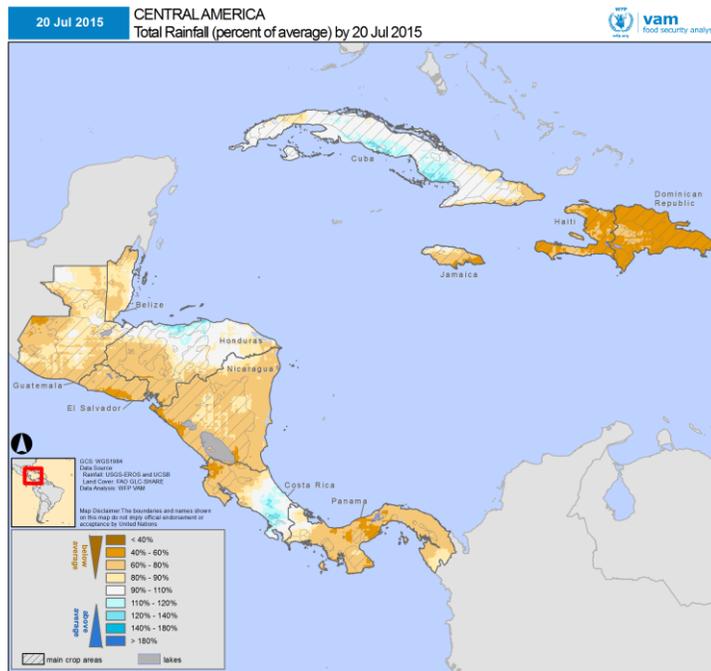
*Poor Primera, average Postrera*



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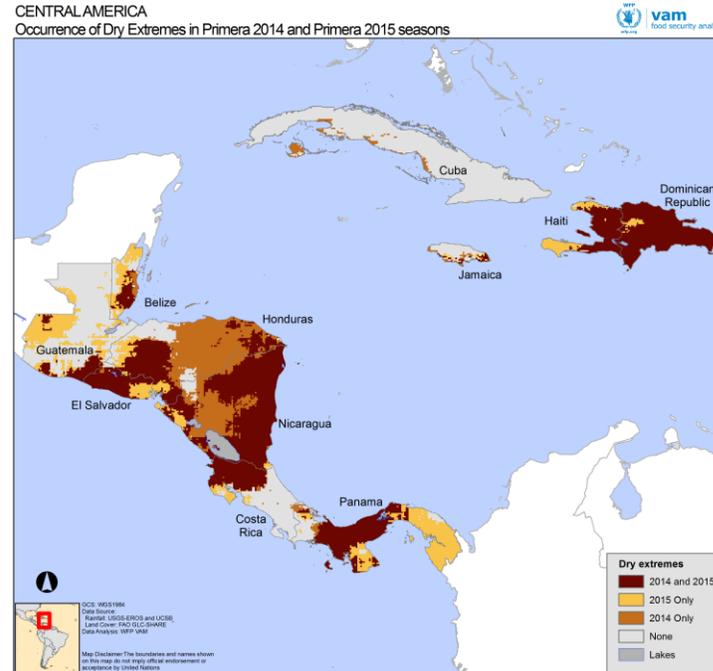
# El Niño 2015 Outcomes

## Primera, April-August 2015



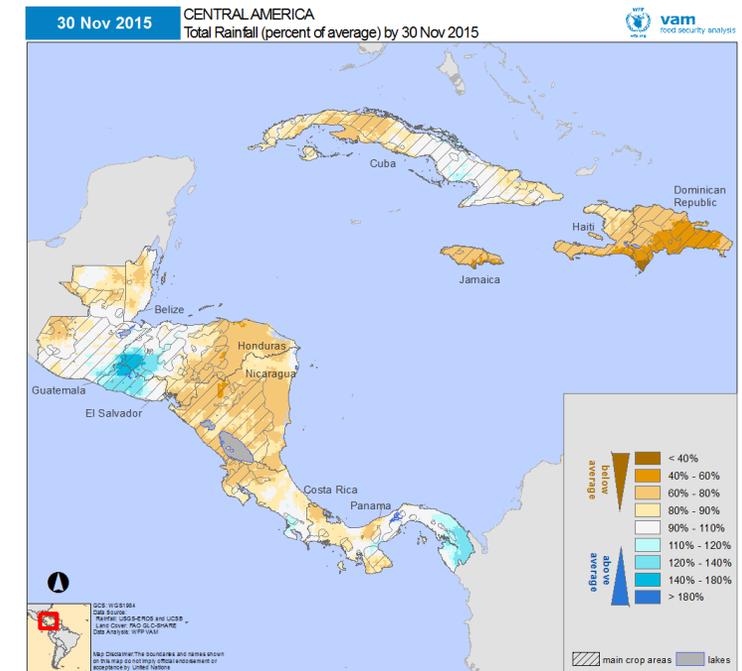
Seasonal rainfall by end of July 2015 as percent of average. Blues for above average, oranges and browns for below average

## Primera 2014 and 2015



Area enduring extremely dry Primera seasons in 2014 and 2015, 2014 alone and 2015 alone

## Postrera, August-December 2015



Seasonal rainfall by end of November as percent of average. Blues for above average, oranges and browns for below average

### A repeat of 2014

The first growing season (Primera) in the region (April to August) was affected by delayed starts and severe rainfall deficits throughout its duration. This resulted in very poor overall performance with expected crop production impacts in Guatemala, Honduras, Salvador and Nicaragua (possibly a drop of over 20% off the 5 year average). Haiti endured an even worse seasonal development.

This poor Primera season of 2015 follows another in 2014, which had already affected in particular poor subsistence farmers in the drier areas of the region (Corridor Seco).

The second growing season (Postrera) is ending. Although it developed under a strong El Niño, it was a more favourable season than the Primera: greater importance of beans relative to maize, decreases the vulnerability to drier than average conditions, while rainfall was more abundant and better distributed in spite of seasonal deficits.

# South America:

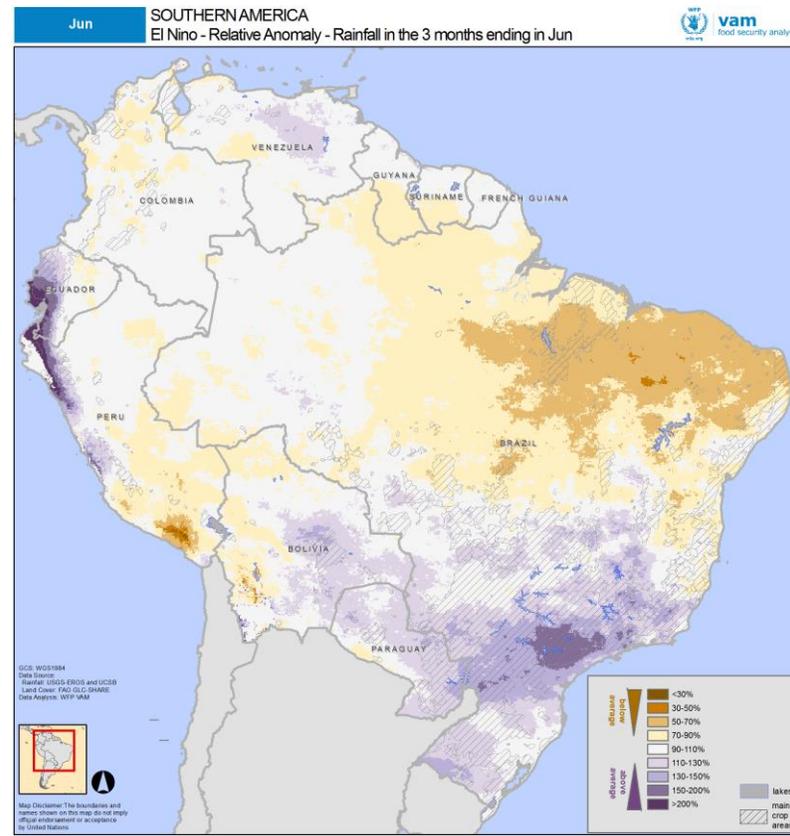
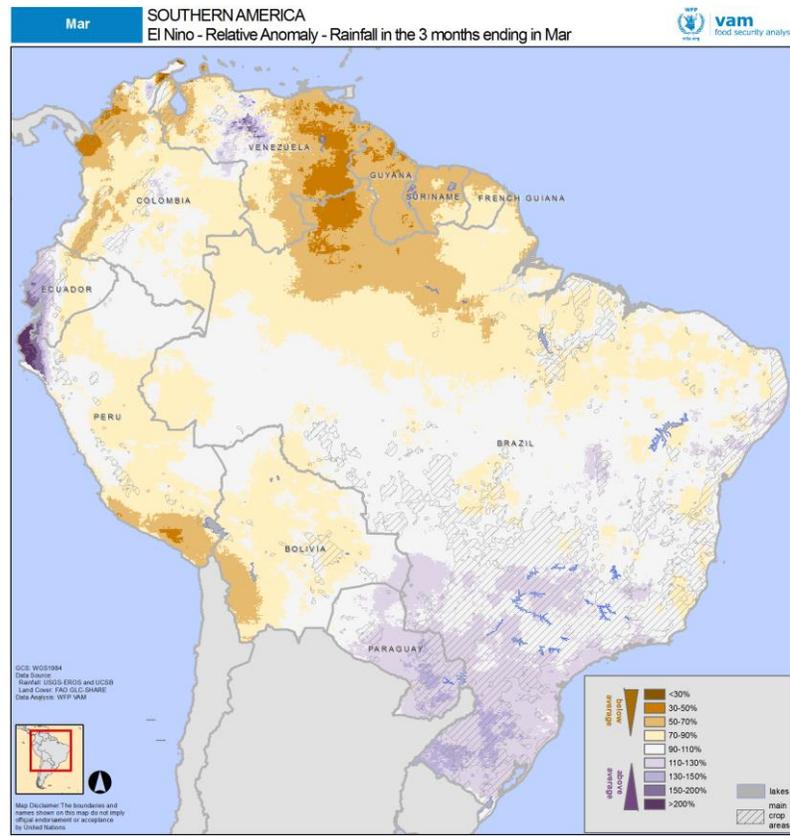
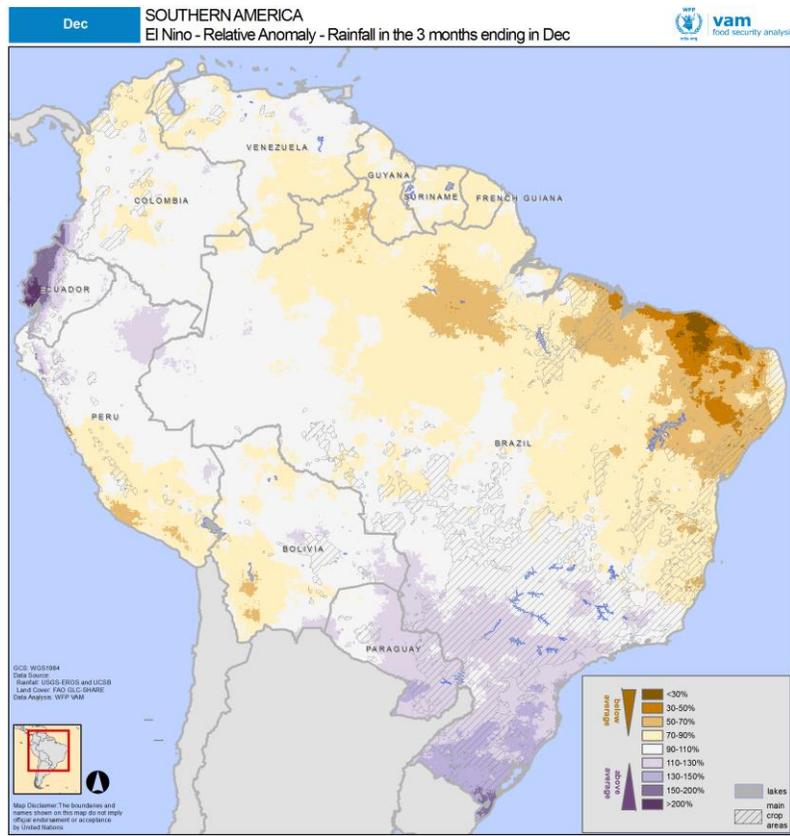
*A typical El Niño season*



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# Expectations: Historical El Niño Rainfall Patterns

South America: A typical El Niño season



## Long term data shows varied El Niño impacts

The maps compare rainfall between El Niño seasons and Neutral seasons over the past 34 years. The comparison is made for October-December, January-March and April-June, to cover different stages of the growing season across the continent.

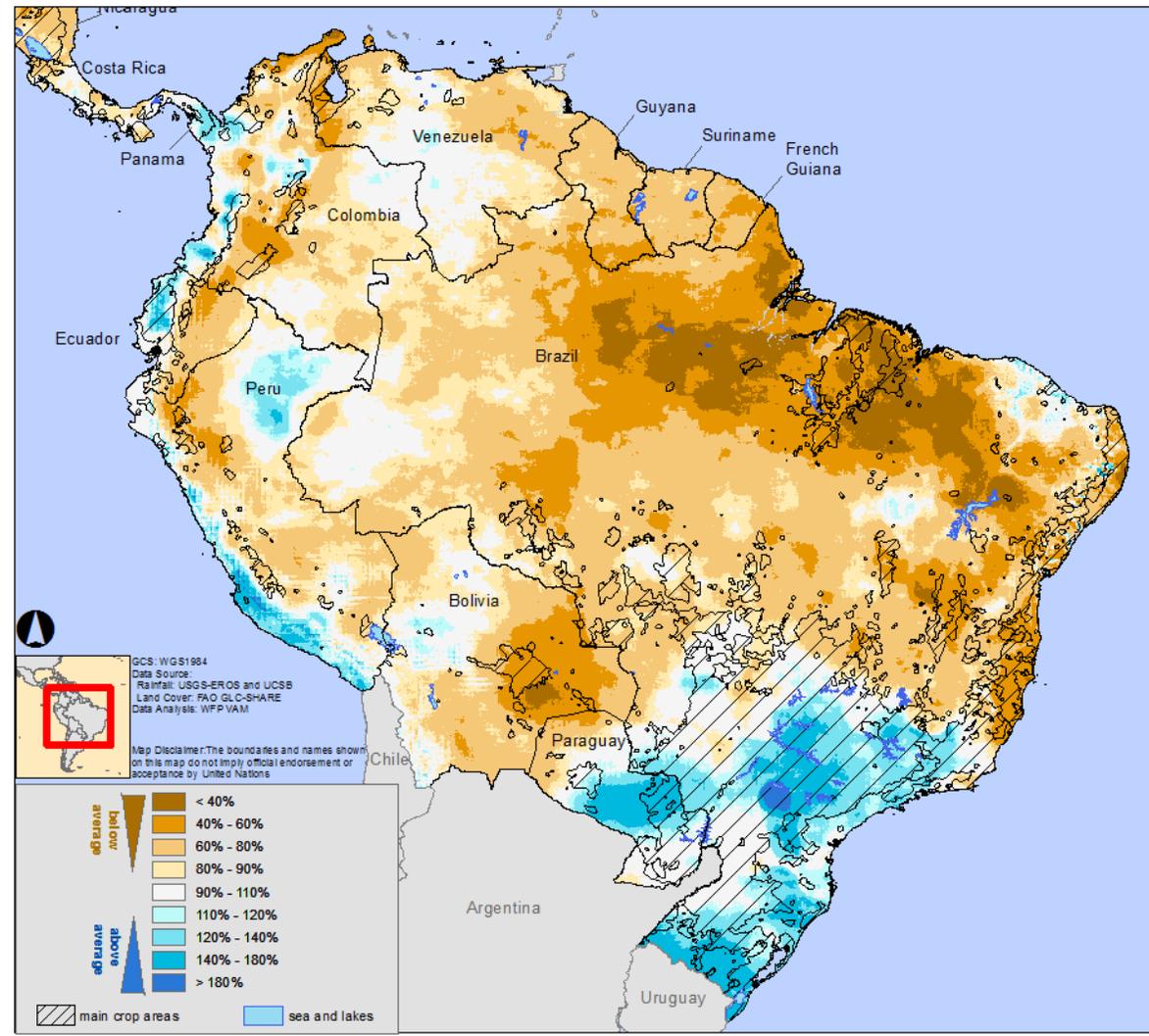
El Niño influences during this period will become progressively weaker as its strength decreases towards Neutral levels; in fact this should take place sometime within April-June.

The overall pattern remains broadly similar throughout the season: Northern and NE Brazil usually endure pronounced drier than average conditions which extend to Venezuela and the Guyanas, in the first quarter of the year. Southern Peru and Bolivia also display a tendency for drier than average conditions.

In contrast, Paraguay and southern Brazil which includes much of the country's prime agricultural land, usually enjoy wetter than average conditions throughout. Above average and heavy intense rainfalls also affect coastal areas of Peru and Ecuador.

# Current growing season status

10 Dec 2015 CENTRAL AMERICA  
Total Rainfall (percent of average) by 10 Dec 2015



Seasonal rainfall by early December 2015 as percent of average. Blues for above average, oranges and browns for below average

# Outlook

## Early season rainfall deficits

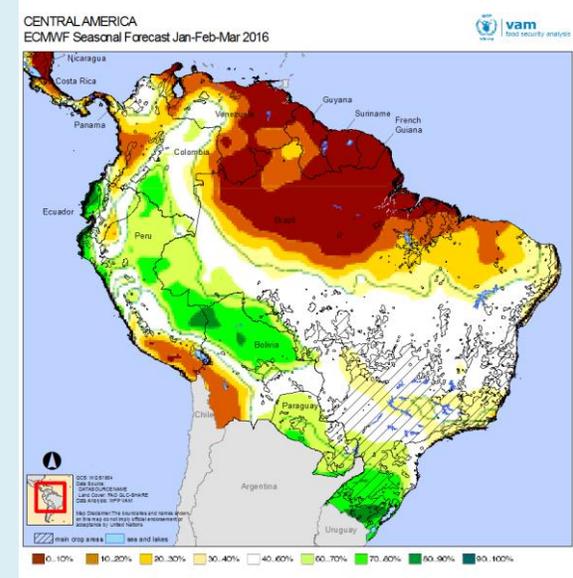
Pronounced rainfall deficits have affected the early stages of the rainfall season across the continent with some areas of north-eastern Brazil receiving less than 50% of the usual rainfall.

Other area with drier than average conditions include most of Bolivia, Peru and Colombia.

In contrast, the eastern coastal areas have been wetter than usual as well as southern Brazil and Paraguay, where above average rainfall has been the norm.

The overall pattern is fairly typical of what the long term data has identified as the pattern of main El Niño influences across the continent: Compare map on the left with those in the previous slide and the major features of drier than average NE Brazil and wetter than average S Brazil and Paraguay, can be seen on both maps.

Considering current seasonal forecast information and the typical El Niño patterns from long term data, the features described may remain in place for the next few months



ECMWF forecast for January-March 2016 rainfall : Green shades = wetter than average conditions more likely. Brown shades drier than average conditions more likely.

## Typical El Niño patterns expected:

The rainfall forecast for the next three months (Jan-Mar) indicate much drier than average conditions for northern Brazil, Venezuela and the Guyanas. This will also be expected to affect SW Bolivia and south coast of Peru and parts of Colombia.

Elsewhere wetter than average conditions should prevail, in particular in southern Brazil, Paraguay and Uruguay and inland along Bolivia and Peru.

The pattern of drier and wetter than average areas shown in the forecast is fairly similar to the typical El Niño situation shown before.

# Asia and the Pacific:

*Dryness across the Pacific*

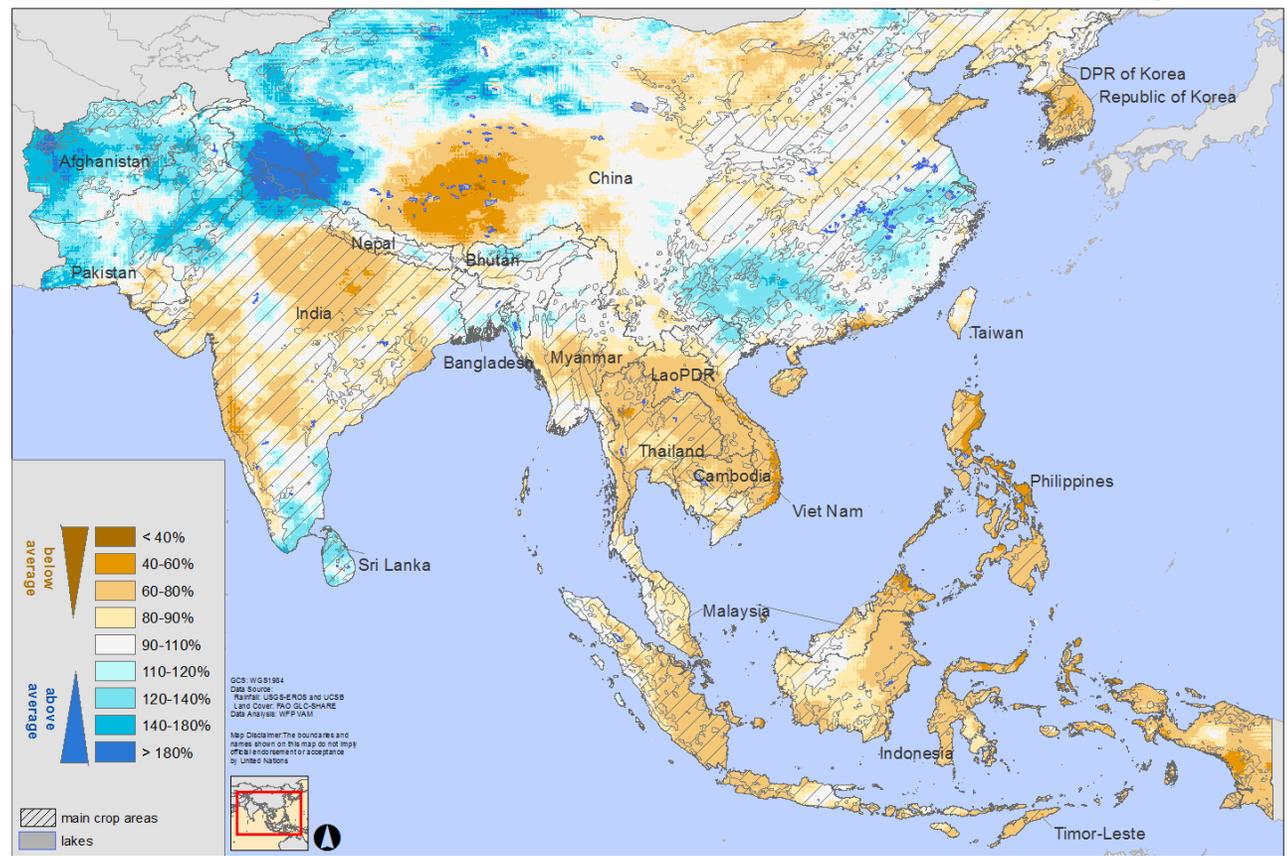


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# Growing seasons 2015: current status

30 Nov 2015

SOUTH-EAST ASIA  
Total Rainfall (percent of average) by 30 Nov 2015



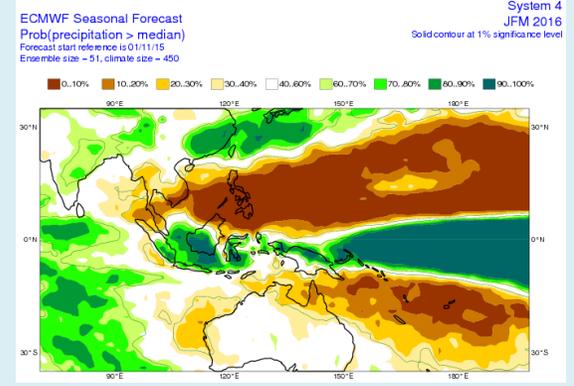
Seasonal rainfall by end of November 2015 as percent of average.  
Blues and greens for above average, oranges and browns for below average

## Overall dryness, but mostly localized impacts

The general tendency across Asia and the Pacific this year has been for drier than average conditions. Above average rainfall has been limited to Pakistan, Afghanistan and NW and SE China.

Below average rainfall dominated across SE Asia (from northern Burma to southern Vietnam), though the most severe rainfall deficits were in the earlier stages of the season. In general this is expected to lead to modest decreases in national crop production, but there may be significant localized impacts among poor crop farmers who depend solely on rain.

# Outlook



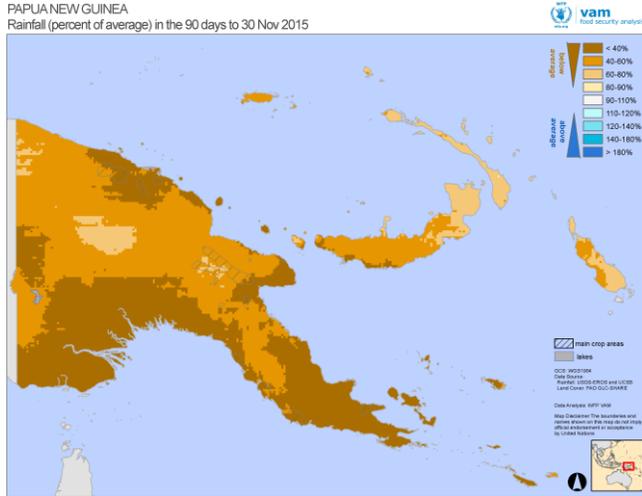
ECMWF forecast for December 2015 – February 2016 rainfall.  
Green shades = wetter than average conditions more likely.  
Brown shades = drier than average conditions more likely

## Forecasts for the season:

Rainfall forecasts for early 2016 indicate an improvement in conditions with above average rainfall forecast across most of Indonesia and PNG. This would bring much needed improvement, in particular to PNG, now dealing with an all time record drought.

However, the outlook is not optimistic for the Philippines, where much drier than average conditions are still forecast to remain dominant throughout the first quarter of 2016.

# Poor rainfall across the Philippines, Indonesia and the Pacific



September-November 2015 rainfall as a percent of average for PNG. Blues and greens for above average, oranges and browns for below average

**Papua New Guinea** is facing its worst ever drought, accompanied by widespread night frosts in the highlands due to the reduced rainfall and cloudiness typical of El Niño conditions.

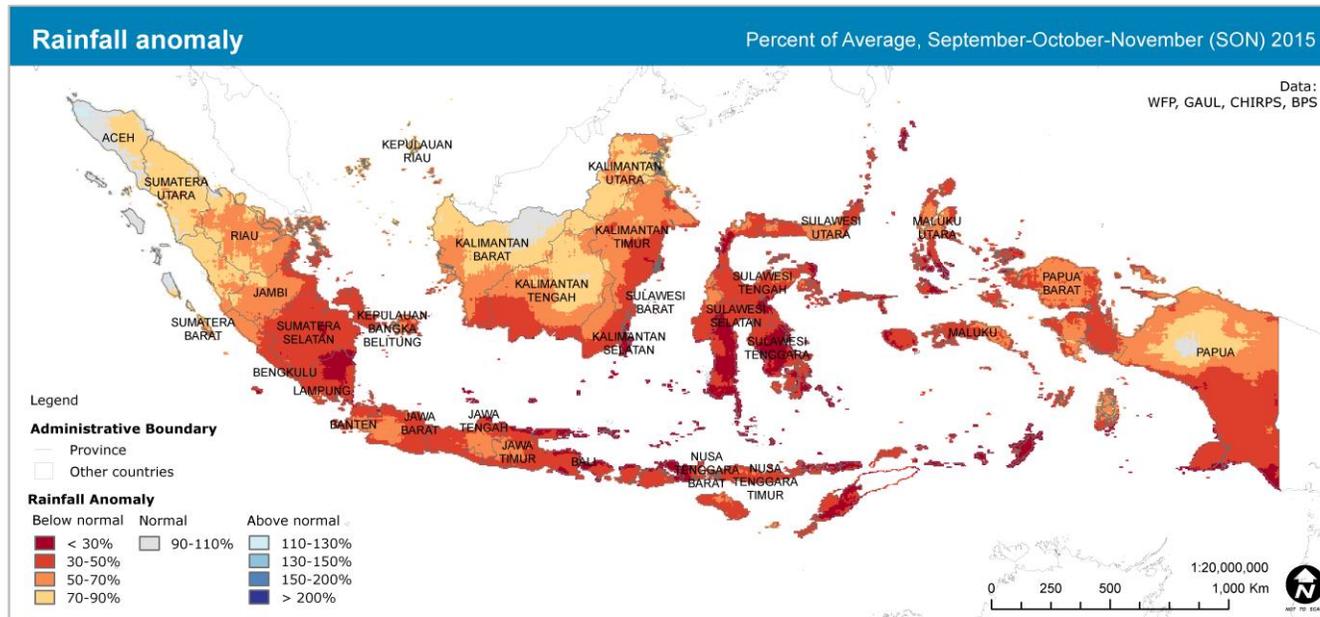
The record lack of rainfall has been lasting since early 2015 and conditions were already extremely poor even before the current El Niño started approaching its most intense stages.

This resulted in very severe impacts on crops and other resources such as fishing, requiring a major humanitarian intervention.



**The Philippines** have endured drier than average conditions throughout most of 2015. So far these have led to reductions in are planted for main season crops of rice and maize, though impacts on national production might be modest (-3% according to FAO). The dryness has continued and intensified in late 2015, affecting the secondary maize and rice production season.

November 2015 rainfall as a percent of average for Philippines. Blues and greens for above average, oranges and browns for below average



September-November 2015 rainfall as a percent of average for Philippines and Indonesia. Blues and greens for above average, oranges and browns for below average. Map: WFP-VAM Indonesia Country Office

**Indonesia** has been enduring much drier than average conditions throughout most of 2015. Impacts had been circumscribed to the secondary crop cycles in mid 2015, but drier than average conditions are now well established during the early stages of the season.

Though aggregate impacts maybe modest, concerns are rising regarding poorer vulnerable communities from eastern Java to West Timor and Sulawesi.

# West Africa:

*Warm Atlantic prevents a major crisis*

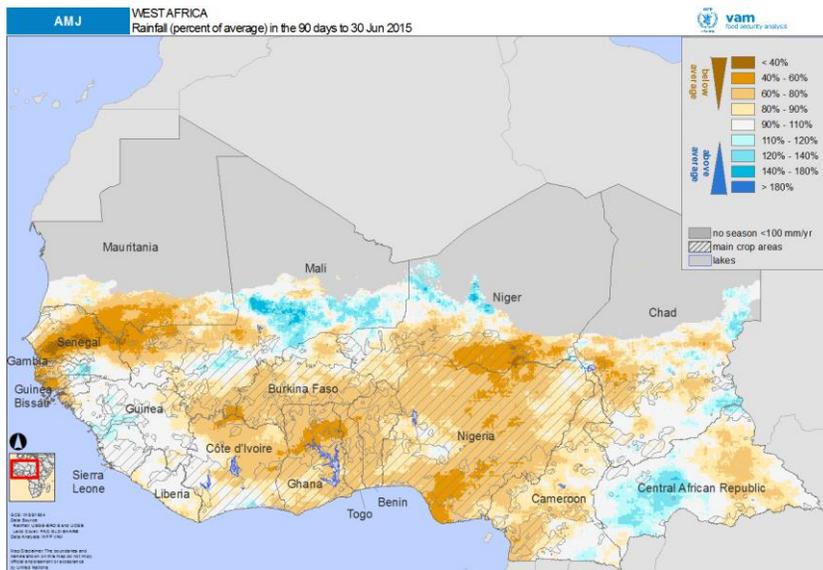


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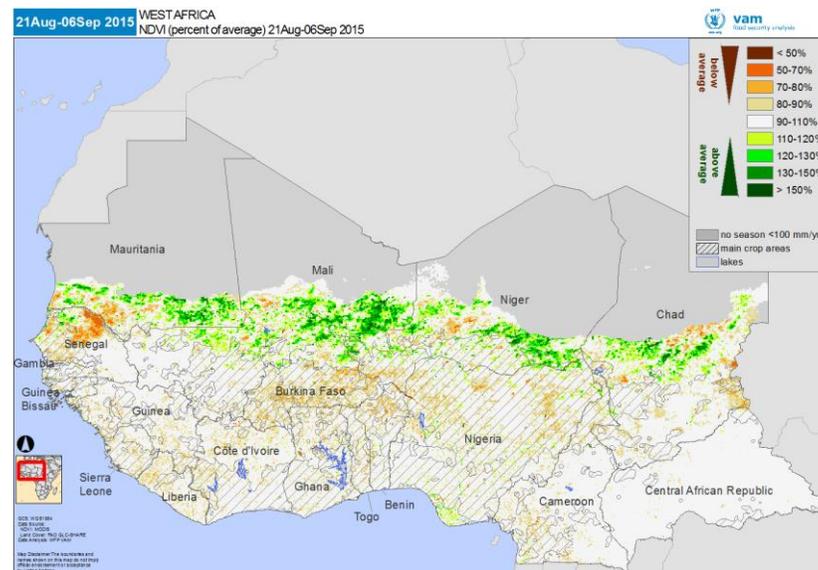
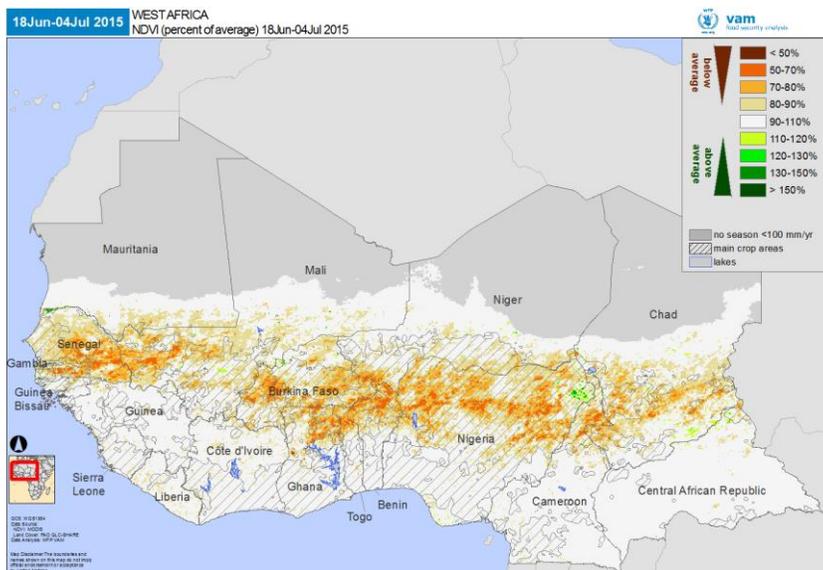
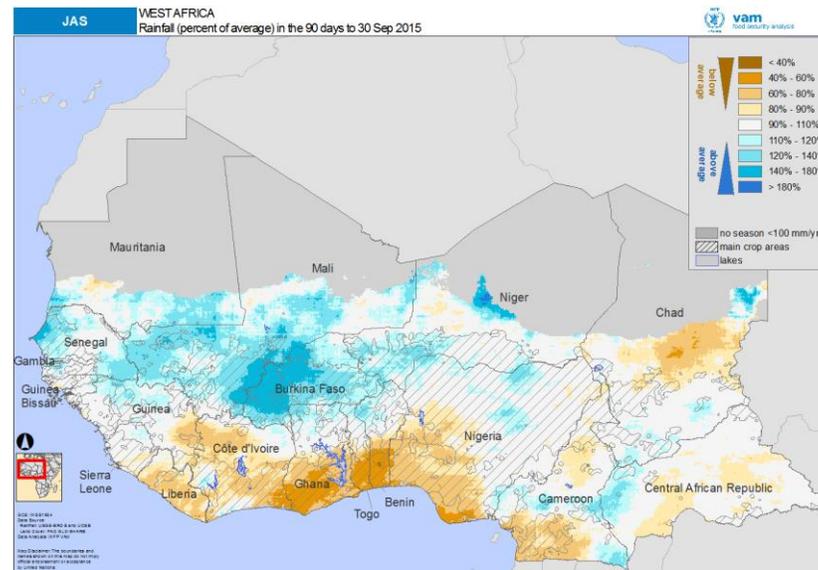
# El Niño 2015 outcomes

West Africa: Warm Atlantic averts a major crisis

## April-June 2015



## July-September 2015



April-June rainfall (above) and late June NDVI (below), as a percentage of average. Blues and greens for above average, oranges and browns for below average

July-September rainfall (above) and early September NDVI (below), as a percentage of average. Blues and greens for above average, oranges and browns for below average

## A timely reversal of fortunes

As the first stage of the Sahelian season ended, the region seemed to be heading for a major crisis: by the end of June, extensive and pronounced rainfall deficits dominated across most of the region.

This lasted until early July, after which regular and abundant rainfall that lasted longer than usual, led to a noticeable recovery in conditions: cumulative rainfall and vegetation reached on or above average levels, except for areas of central-eastern Chad.

This reversal is due to a change in sea surface temperature patterns in the Atlantic; from July these became warmer on the west coast, colder in the Gulf of Guinea; this has the effect of balancing and overcoming earlier El Niño influences.

However, the factors that saved the Sahel from a major crisis, also led to the spread of markedly drier than average conditions from the southern half of Ghana to southern Nigeria and SW Cameroon, which has continued until late in the year.

## Data Sources:

Rainfall: CHIRPS, Climate Hazards Group, UCSB

Vegetation: MODIS NDVI, EOSDIS-NASA

Land Cover: FAO GLC-Share

Seasonal Forecasts: ECMWF, Regional COFs, CPC, UKMetOffice

## Processing:

VAM software components, ArcGIS

## For more information, please contact:

Rogério Bonifacio

[rogerio.bonifacio@wfp.org](mailto:rogerio.bonifacio@wfp.org)

+39 06 6513 3917



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