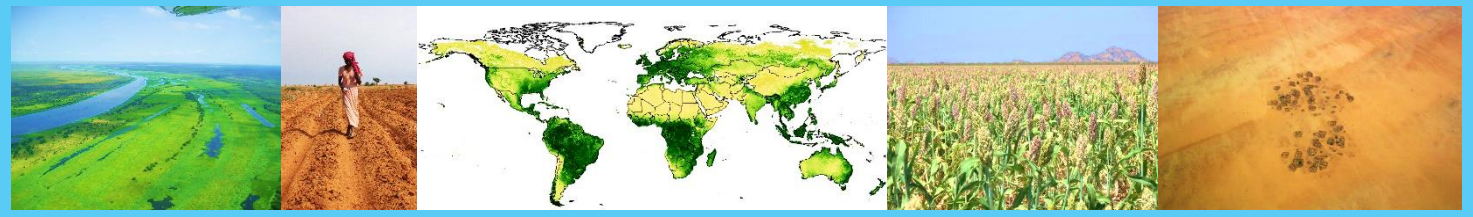

East Africa: The 2016 Season

Severe Drought in the Horn of Africa

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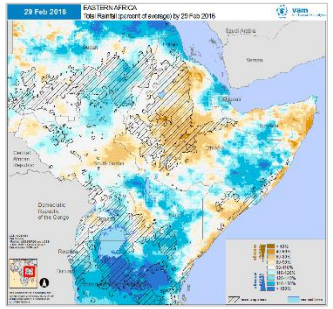
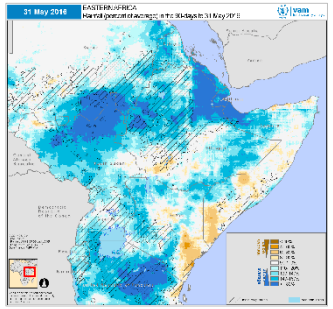
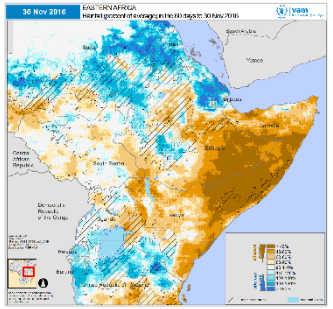
HIGHLIGHTS

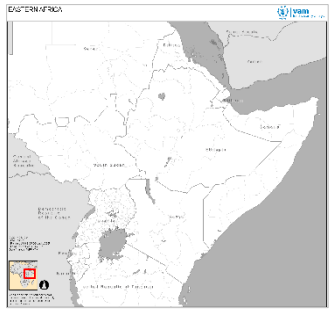
- Large scale **failure of the rains** during October and November 2016 led to **severe drought** conditions across **Somalia**, northern and eastern **Kenya** and southeast **Ethiopia**, resulting in extensive growing season failures and record low vegetation.
- Across most of **Somalia and SE Ethiopia**, **recovery is no longer possible** as the rainfall season has ended. In **Kenya** and southern Somalia, a longer season and better rains from mid November can still allow **some recovery** in pastoral areas.
- **Severe impacts** on **crop production** are inevitable in **Somalia** and **eastern Kenya**. Even irrigated crop production will be affected as the drought extends over the key river basins. **Pastoral resources** are also s**everely hit**, particularly in SE Ethiopia and central and north Somalia (Somaliland).
- The drought is largely **comparable to Oct-Nov 2010 except for** coastal Kenya, northern Somalia, SE Ethiopia where it may be worse. Unlike the 2010 drought which was preceded by a good season, in 2016 the coping capacities of the most vulnerable households are already reduced given poor March-May rains.
- **Forecasts** for the **March-May 2017 rainfall** are variable. However, alternative analysis suggest that eastern Horn of Africa could face another season with **below average rainfall**.
- A scenario of a third drought affected season in a row should be considered, potentially leading to a situation similar to the 2010-2011 humanitarian crisis.

Highlight: Recurrent Droughts in Somalia and Coastal Kenya









2015 | 2016 | 2017

Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun

Region mixed, poor in SE Somalia and Coastal Kenya

Drier than average Somalia and Coastal Kenya

Severe Drought in Somalia, NE and Coastal Kenya

Below average rainfall likely

SOMALIA AND PARTS OF KENYA SUBJECT TO RECURRENT DROUGHTS

Somalia and parts of Kenya are in the grip of a severe drought affecting their Deyr / Short Rains season. Large delays in the start of the season, significant rainfall deficits and the quickly approaching end of the season, lead to extremely pessimistic perspectives for crop and pasture production.

This drought, in many areas is comparable to 2010. It will have a major impact on the food security of vulnerable populations as it follows a poorly performing previous season of March-May 2016 (Gu / Long Rains). In Somalia, this led to a drop in crop production of more than 20% compared to the 5 years average, reducing household's food supply and their capacity to cope with the currently developing shock.

The next season (Gu / Long Rains) will start in early March and the harvest will not occur before late May. Current production levels are unlikely to cover requirements until then.

A good performance of the next growing season is now critical to avoid a major humanitarian crisis. However, evidence from statistical analysis of East Africa rainfall and sea surface temperatures indicates that the next season may be drier than average.

A scenario of a third drought affected season in a row should be considered, potentially leading to a situation similar to the 2010-2011 humanitarian crisis.

Current Status

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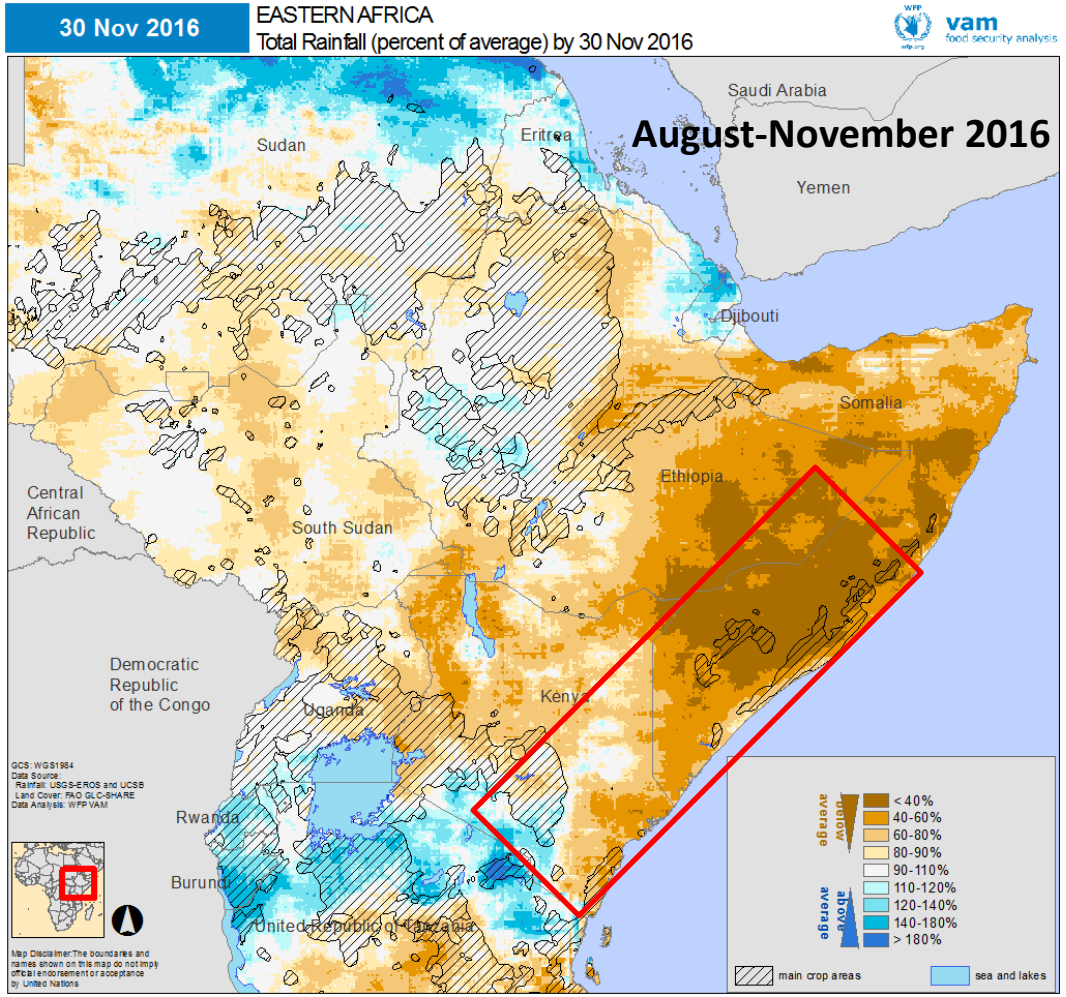
Current Rainfall Season Status: Severe Drought

East Africa: The 2016 Season



ABOVE: Cumulative rainfall August to November 2016 as a percentage of the long term average.
RIGHT: Cumulative rainfall March to May 2016 as a percentage of the long term average.
Red box highlights area enduring consecutive droughts in the two seasons of 2016.

Blues for wetter than average, orange and browns for below average conditions

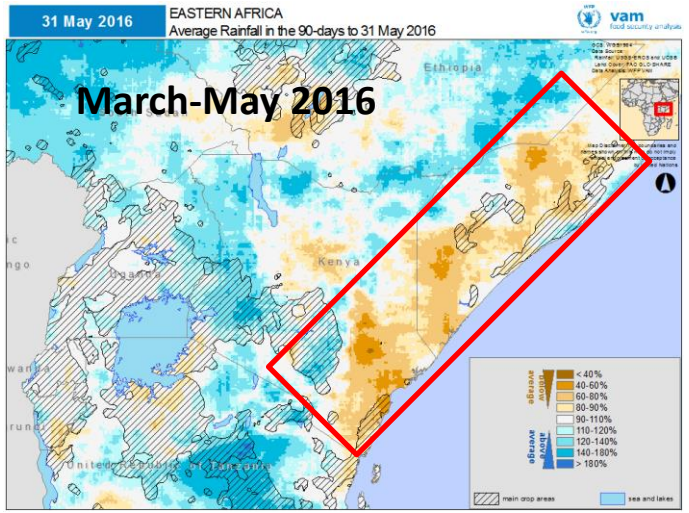
OCTOBER-NOVEMBER 2016: RAINFALL SEASON ALL BUT FAILED

The October to December rains that make up the Deyr or Short Rains season in East Africa have largely failed across Somalia and SE Ethiopia and to a lesser extent in coastal and semi-arid regions of Kenya.

The cumulative rainfall from August to November shows extensive and extreme rainfall deficits with areas of central and southern Somalia registering only a third of the usual rainfall so far (see map left).

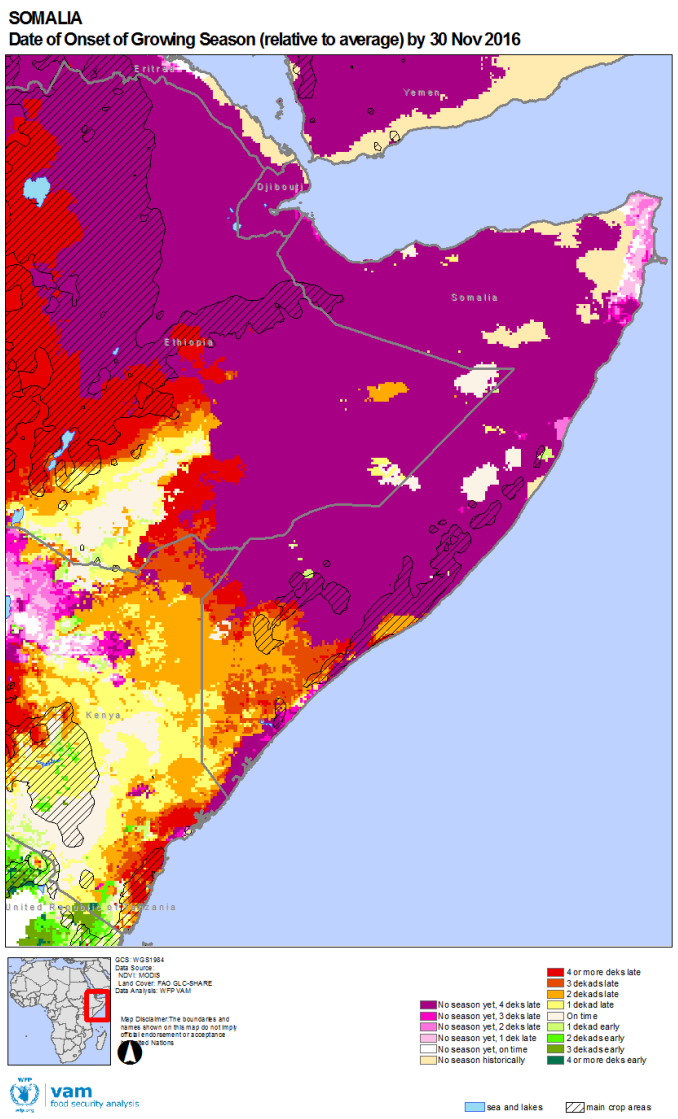
There is no chance of recovery for most of Somalia and SE Ethiopia as typically December bring very little rainfall to significantly improve the situation. In Kenya, there is some room for improvement as the season is longer and even average rains might allow a modest recovery.

This drought on its own is severe enough to cause major humanitarian crisis. However, the situation is even further compounded due to the poor performance of the last season (March-June).



East Africa: The 2016 Season

Impacts on Growing Season



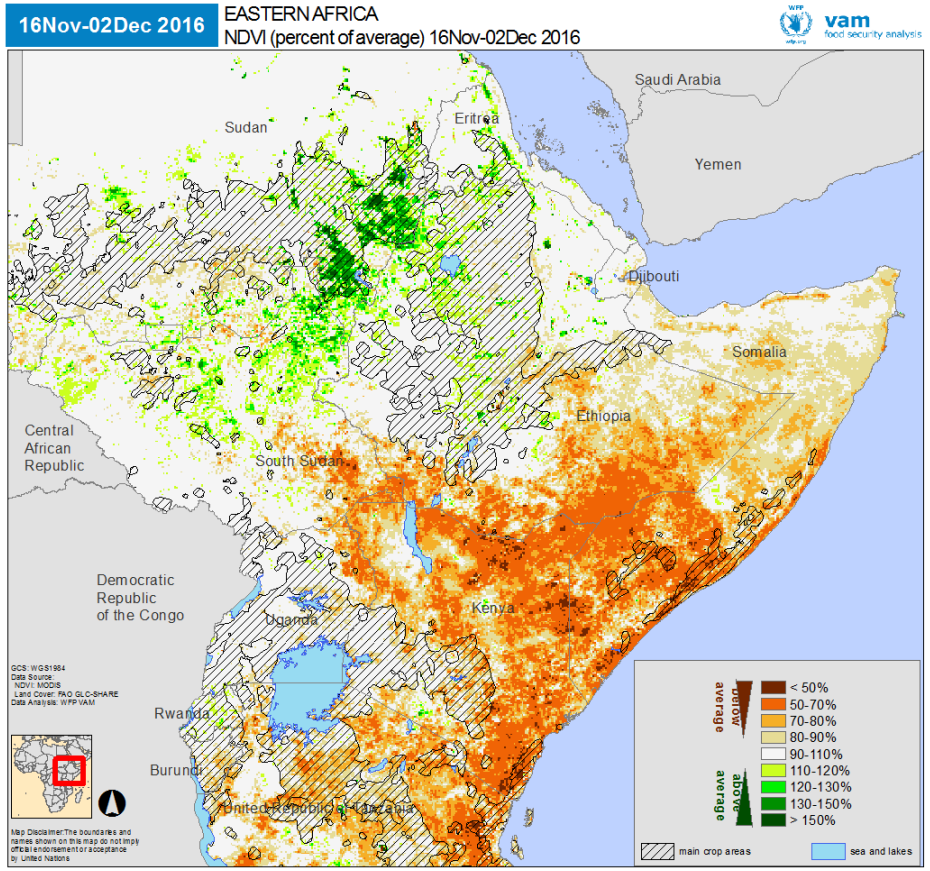
Variations in start of the season compared to normal by late November 2016.
Purple/Pink shades for delays in areas where the season has not started yet. Reds/Oranges for delays where season has started, green shades for areas where season started ahead of time.

EXTENSIVE GROWING SEASON FAILURE IN SOMALIA

As a result of the extremely dry conditions, the growing season across most of Somalia and NE Kenya is either delayed or altogether failed –see purple areas in the map left. In Somalia, growing season started only in southernmost areas with a delay of 3-4 weeks. Significant delays were also experienced in coastal and NE Kenya.

These delays and the fast approaching end of the rainfall season, lead to very pessimistic perspectives for crop and pasture production.

The next growing season will start in early March and harvests will not be available until late May 2017.



Late November 2016 NDVI as a percentage of theGreens for wetter than average, orange shades for below average conditions.

RECORD LOW VEGETATION COVER

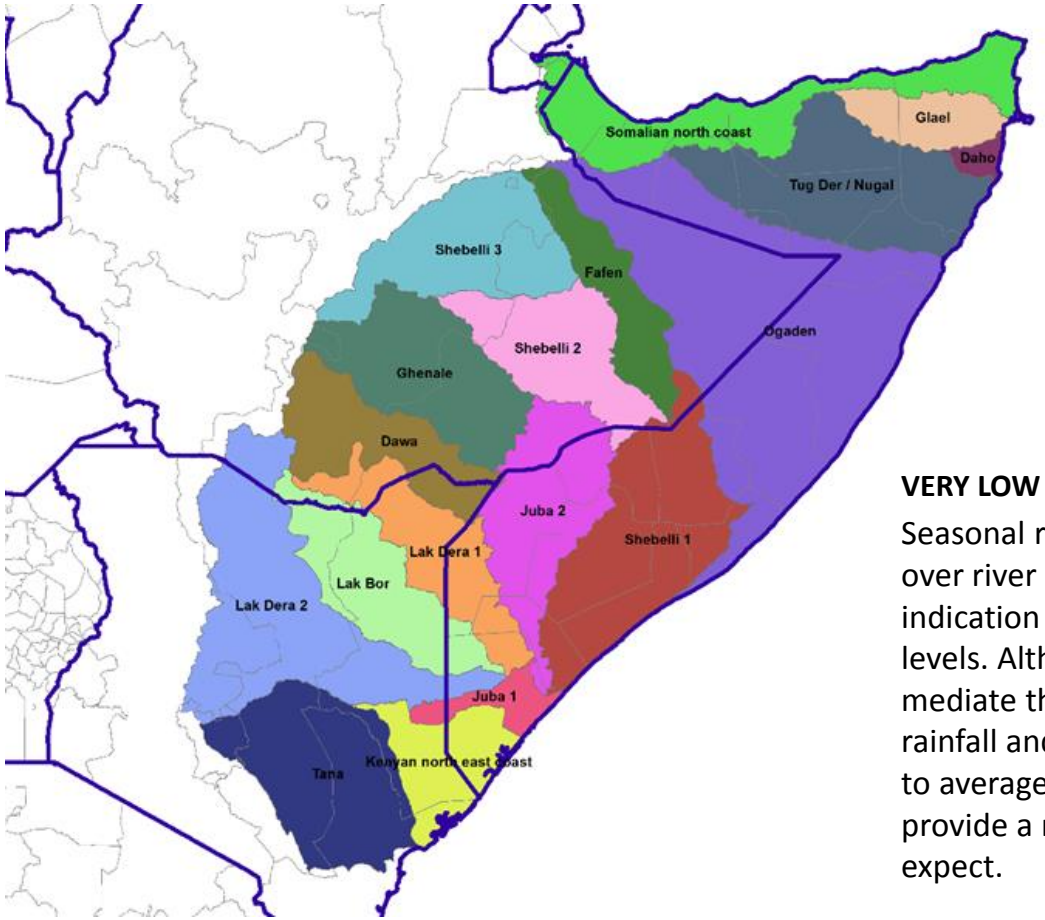
Vegetation cover was already depressed before the season started due to the poor rains of the previous season and the intervening long dry season.

The current drier than average conditions led to further degradation in vegetation cover. This reached record low levels across eastern and NE Kenya, southern Somalia and SE Ethiopia in early November.

During the second half of November rainfall has improved with closer to average amounts in NE Kenya and southern Somalia. Although this led to some recovery in vegetation cover, severe impacts cannot be avoided.

Impacts on River Flow

East Africa: The 2016 Season

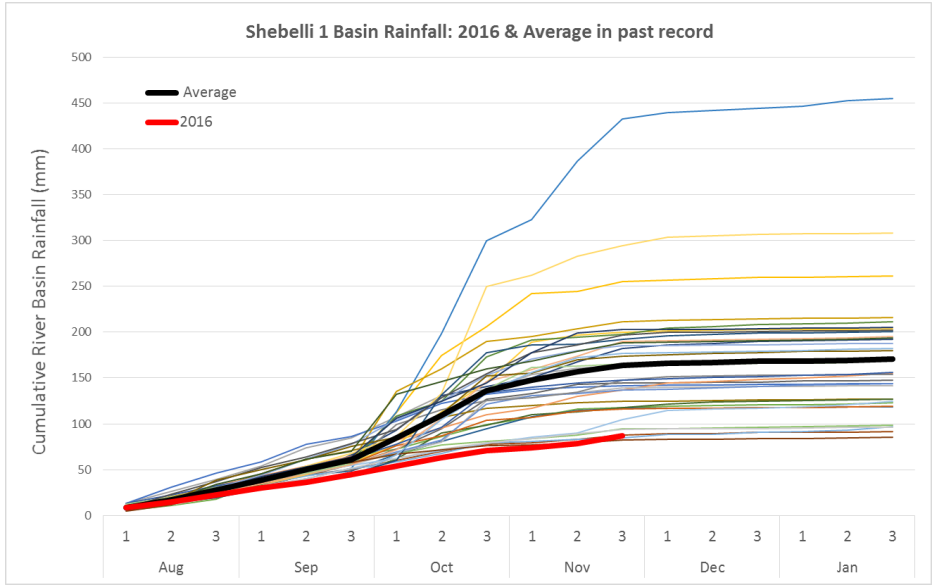


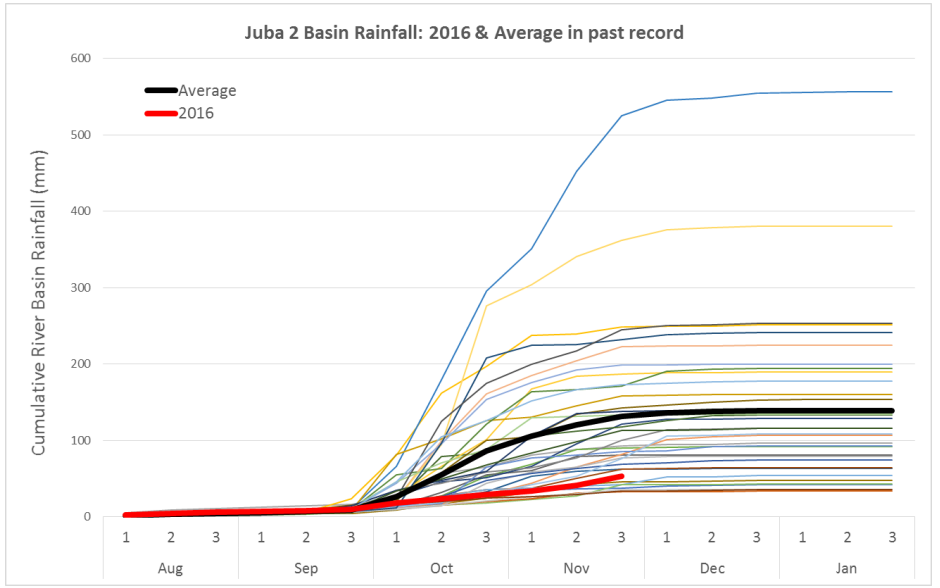
VERY LOW RIVER BASIN RAINFALL

Seasonal rainfall can be accumulated over river basins to give an indication of the likely river flow levels. Although many factors mediate the link between river basin rainfall and river flow, comparisons to average and the historical record provide a measure of what to expect.

Results (charts right) reflect the extremely low rainfall not only within Somalia but also in SE Ethiopia: cumulative river basin rainfall is tracking at its lowest levels for the larger Shebelli-1 basin and at one of the lowest for the Juba-2 basin. A similar story emerges for other basins. Comparable dry years include 2010, 2005, 2003, 1991.

Therefore, we expect irrigated agriculture along the Shabelle and Juba rivers in Somalia to be seriously affected and irrigated crop production to reach very low levels, possibly comparable to 2010 and 2005.





Cumulative rainfall over river basins (Shebelli 1 above, Juba 2 below) within the period August to January.
Average curve in black, current 2016 in red. Other years as thin un-labelled lines. The upper outlying lines correspond to flood years (1997 and 2006).

Comparison with 2010

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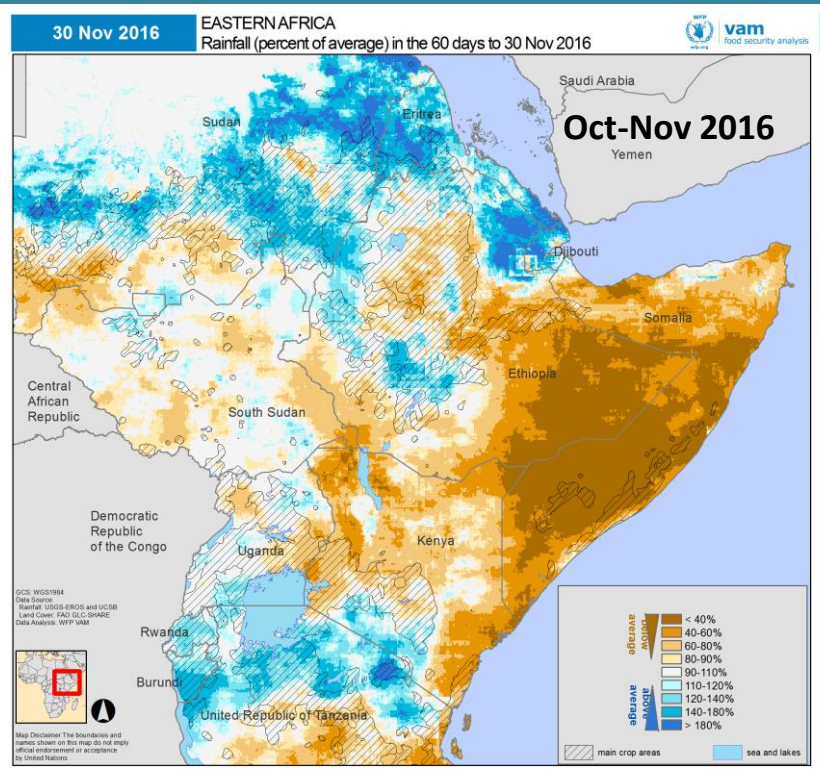
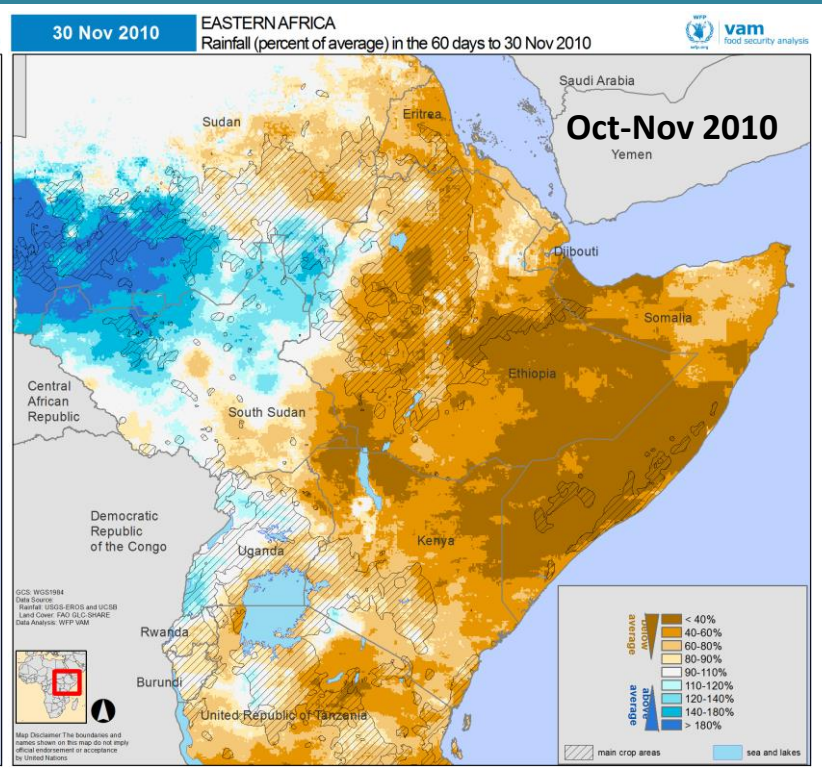
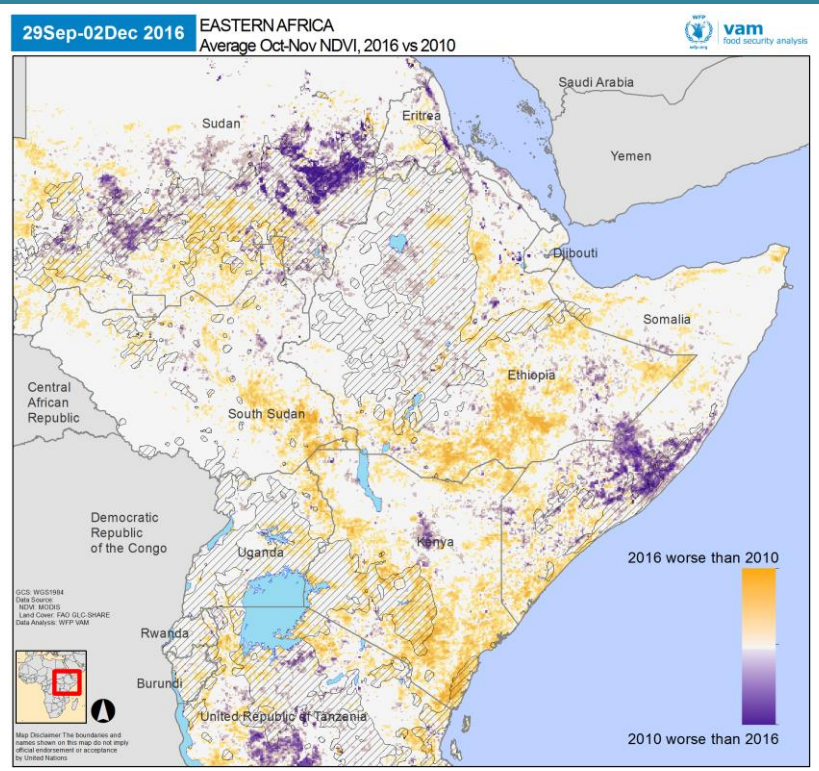
Rainfall and Vegetation Cover Comparison

East Africa: The 2016 Season





October-November rainfall compared to Average for 2016 (left) and 2010 (middle). Blues for wetter than average, brown shades for below average conditions.



October-November average vegetation cover for 2016 compared to that of 2010. Orange shades for areas with worse vegetation cover in 2016 than 2010, purple worse in 2010 than 2016

Rainfall and Vegetation Cover Comparison 2016 vs 2010

The Oct-Dec 2010 season is a well known event in the humanitarian community and it makes sense to compare current conditions to those of 2010: The maps above show the two month Oct-Nov rainfall as a percent of average for the two years (2016 left and 2010 middle).

Although the 2016 drought is less widespread across the region, it is comparable in terms of intensity and extent over Somalia. In Kenya, the coastal areas are worse than in 2010, but northern and NE Kenya have performed better in 2016; this is due to improved rainfall from mid-November, since the early season performance was similar if not worse than in 2010.

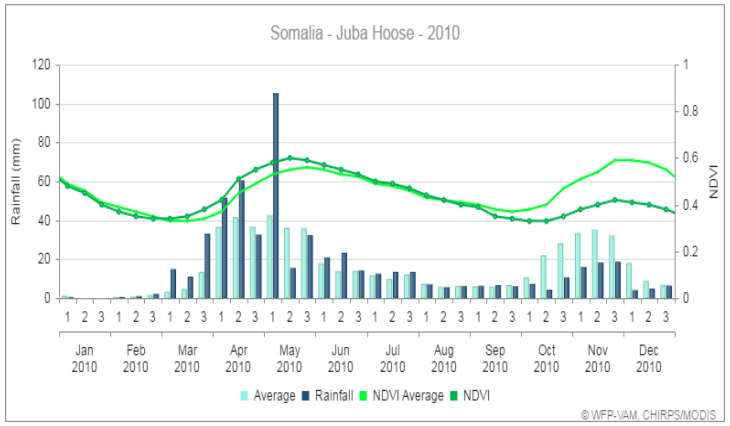
A direct comparison (map above right) shows that the 2016 Oct-Nov average vegetation cover across most of coastal Kenya, SE Ethiopia and southern Somalia is worse than 2010. Where 2010 is (markedly) worse is in central Somalia, specifically in the provinces of Hiraan and Shabelle Dhexe.

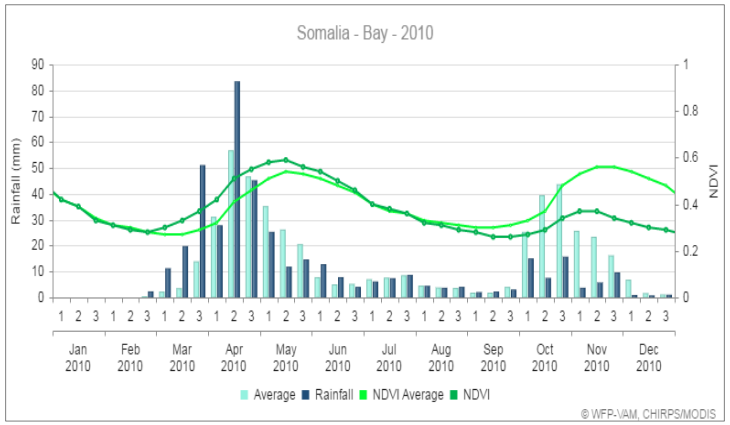
However, the increased rainfall from the second half of November will lead to late increases in vegetation cover in Kenya and southern Somalia which may balance the situation a bit more by end December.

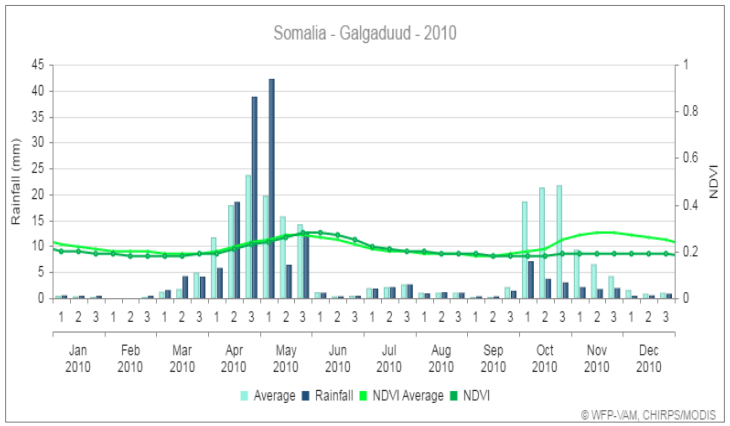
East Africa: The 2016 Season

Somalia: Comparisons 2010 vs 2016

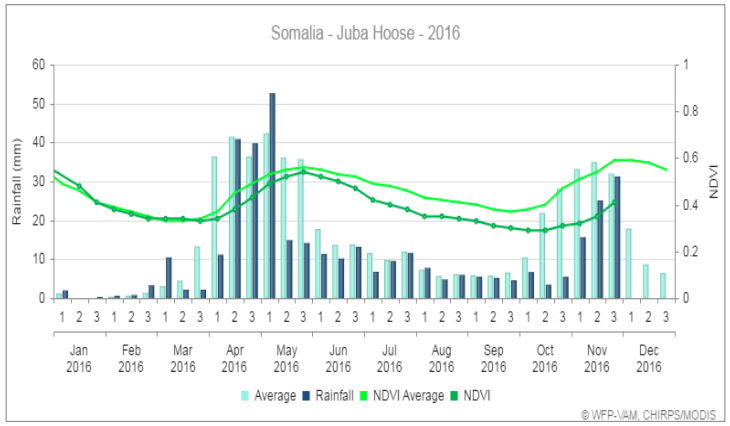
2010

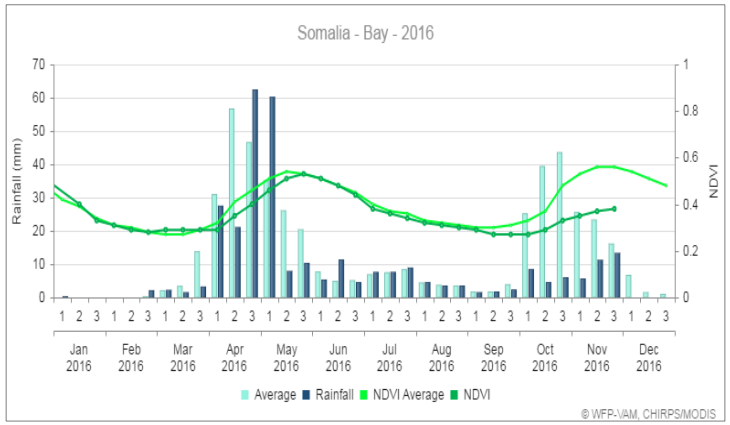


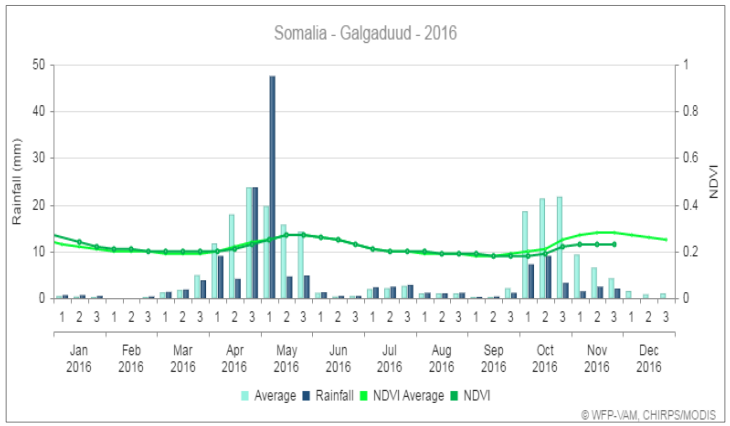




2016







Seasonal charts for 2010 and 2016 provide a comparison of rainfall and vegetation patterns. Charts are shown for three relevant locations: Juba, Bay and Galgaduud.

The charts indeed show better rainfall during March-May of 2010 compared to 2016. The lower than average rainfall and vegetation during the second season in both years is also evident.

In 2016, the more southern areas (Juba, top charts) benefitted from improved rainfall in late November. After a record low start, vegetation cover may reach higher levels than in 2010 if improved rains in December hold out a bit longer.

A similar situation is seen in Bay (middle charts) where vegetation cover has not fallen as low as in 2010 and may still recover.

Further north in Galgaduud (bottom charts), the situation is somewhat better than in 2010.

These are comparisons against an extreme event – severe impacts can be expected to result from the current situation alone.

Dark blue bars: current rainfall season
Light blue bars: long term average (LTA) rainfall
Dark green line: current vegetation index
Light green line: long term average (LTA) NDVI

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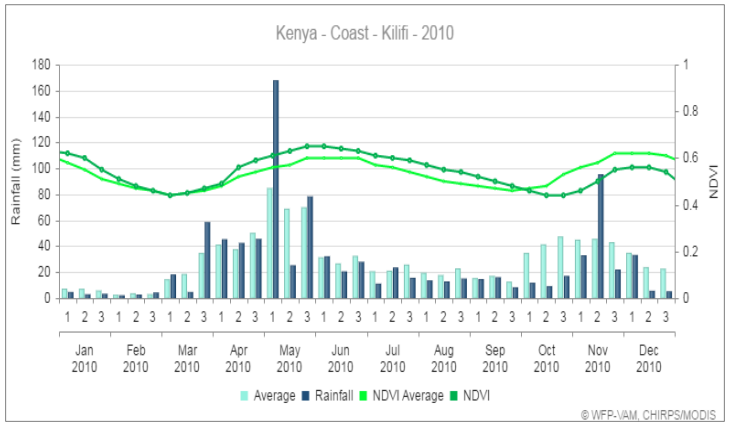
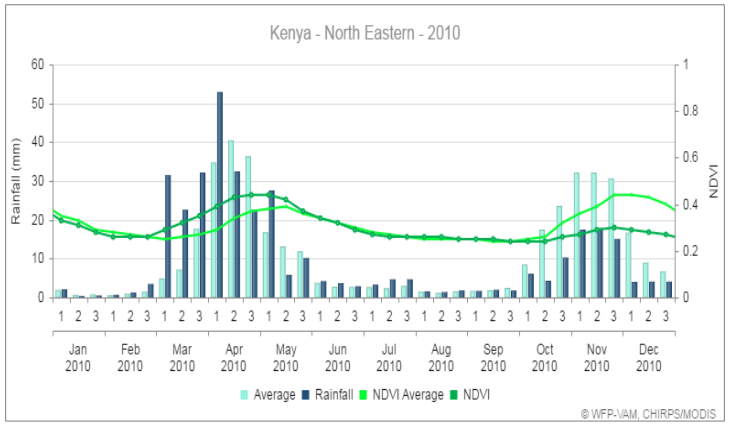
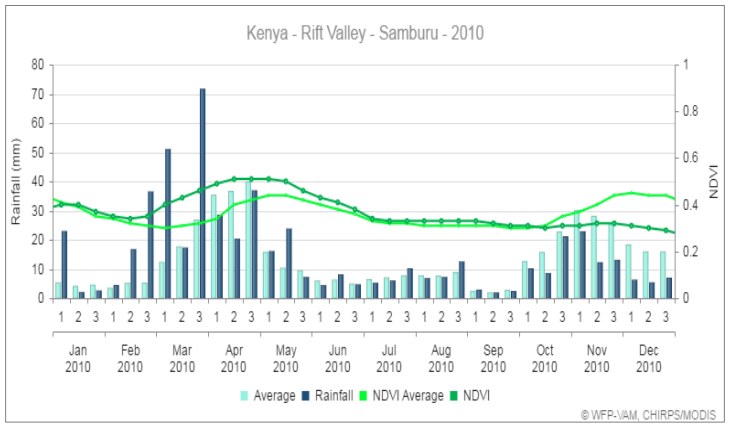
Kenya: Comparisons 2010 vs 2016

East Africa: The 2016 Season

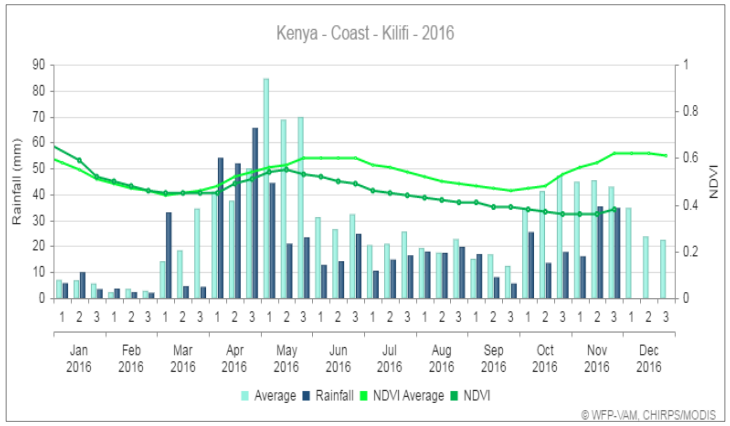
2010

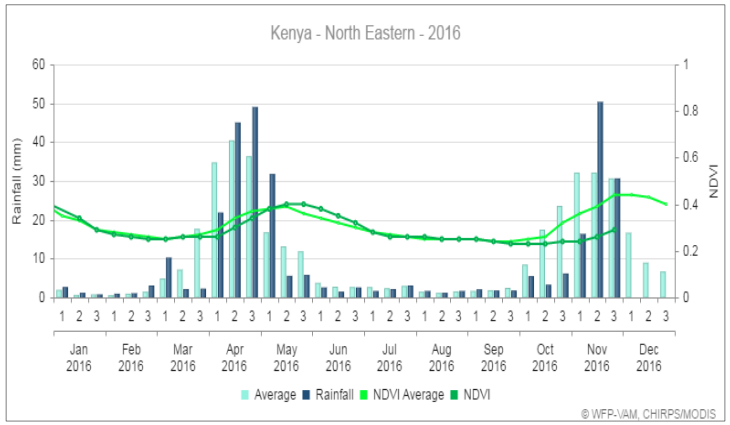


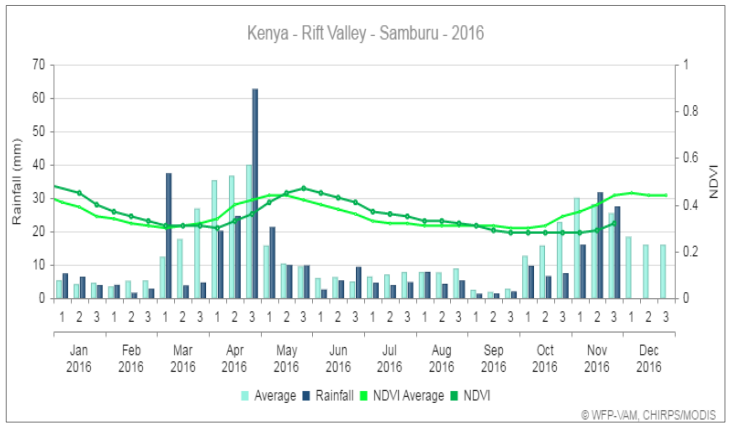




2016







Kenya was also affected by a severe drought during the Short Rains season of 2010 (Oct-Nov): this was more confined to the NE and northern regions and was preceded by a favourable season. In 2016, the season of March-May was fairly poor but mostly in coastal areas.

Seasonal charts for three relevant locations are presented comparing 2010 with 2016: Coastal; North Eastern and Samburu.

In coastal Kenya (top row), vegetation cover is at much worse levels than in 2010, a situation partly arising from the poor performance of the March-May 2016 rains – however, late improvements in rainfall may allow some limited recovery.

In NE areas and northern Rift Valley provinces, better rainfall since mid-November has improved vegetation and pasture conditions. The rainfall recovery come too late to meaningfully benefit crop recovery.

Overall, the 2016 short rain drought is very likely to be worse than 2010 in eastern coastal areas. In the NE and northern areas, it will not be as severe as 2010 due to late improved rains. However, as was the case with Somalia, serious impacts have to be expected.

Dark blue bars: current rainfall season
Light blue bars: long term average (LTA) rainfall
Dark green line: current vegetation index
Light green line: long term average (LTA) NDVI

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Perspectives For the Next Season (2017)

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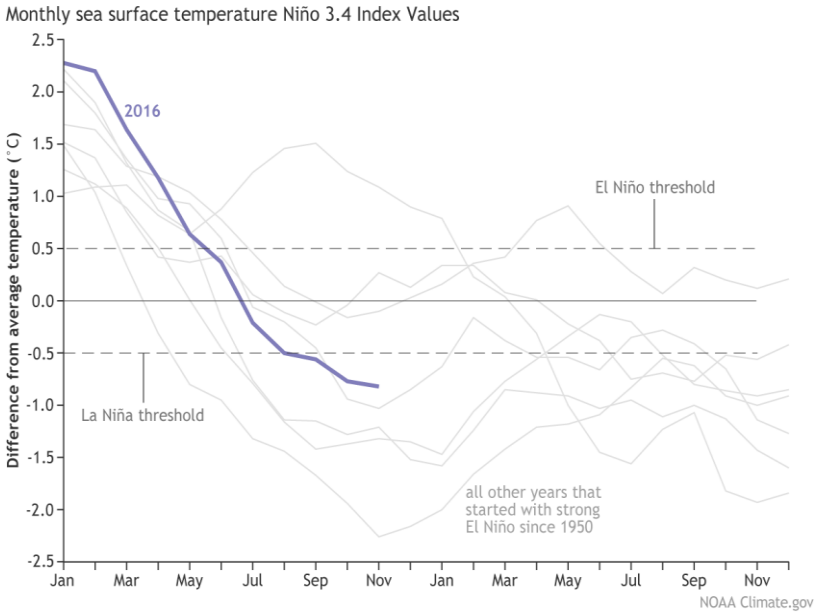
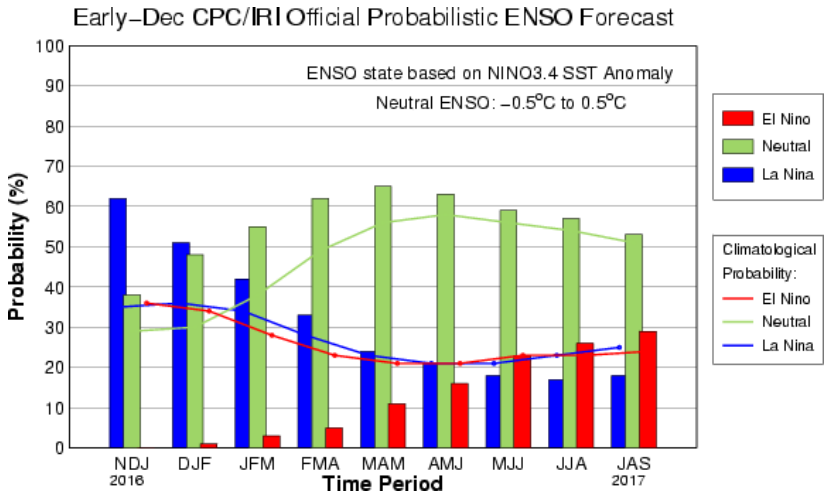
Latest La Nina Outlook

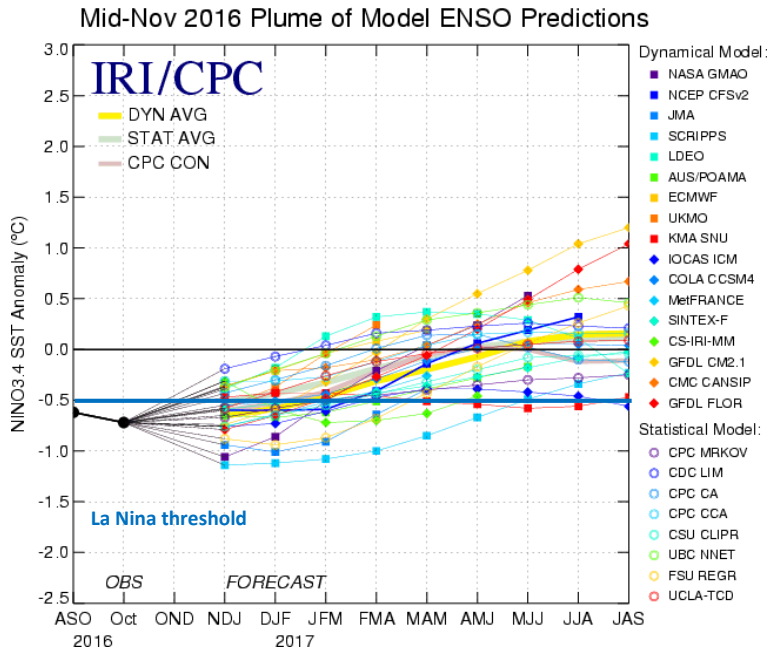
East Africa: The 2016 Season



Left: Evolution of central Pacific sea surface temperatures (blue line) Thin grey lines represent this evolution for all years that followed a strong to moderate El Nino.

Right: La Nina forecasts from IRI/CPC – overall probabilities of the event (top) and ensemble model forecasts of SST evolution (below)





Weak La Nina conditions are present… and not likely to last…

After an uncertain start, La Nina conditions settled in October and have continued normally since then. Forecasts show a return to neutral conditions by February-March 2017 when probabilities of a La Nina come close to average (down from 60% presently).

The intensity of the La Nina is expected to remain weak to borderline throughout its duration.

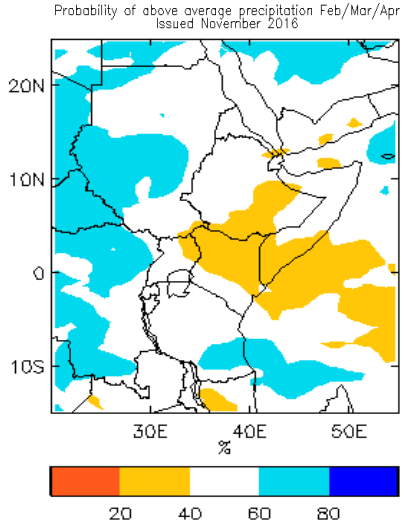
However, it must be noted that a weak La Nina does not mean that its impacts will also be weak – the current drought in Somalia is a striking example. For East Africa, in particular, what happens in the Indian and western Pacific is as important as a La Nina event itself.

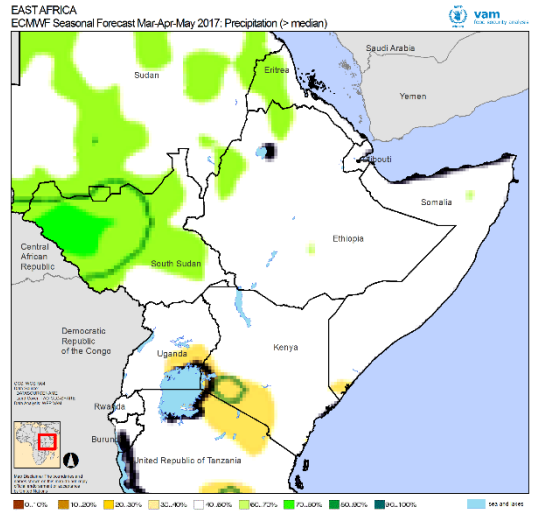
Outlooks: March-May 2017

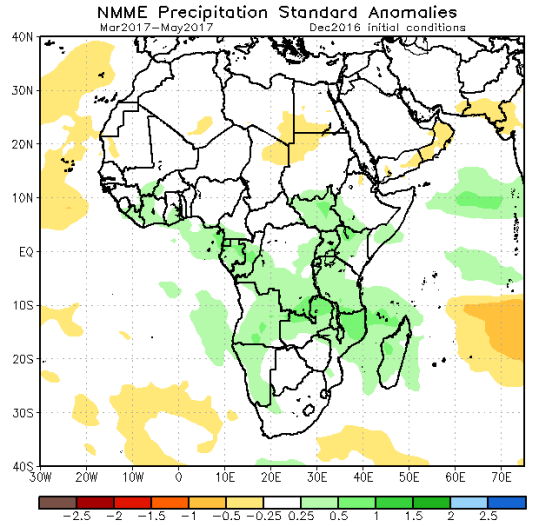
OUTLOOK FOR THE 2017 SEASON (March to May)

Seasonal Forecasts: Long range forecasts from ECMWF show a return to average conditions during the upcoming Long Rains of March-May 2017. Identical, if slightly more favourable scenarios are available from NOAA/CPC. The UKMet Office forecasts indicate below average rainfall in Kenya, southern Somalia and parts of Ethiopia.

The variability among forecasts is linked to the well known low predictability and poor skill of seasonal forecasts over Eastern Africa during the northern hemisphere spring.







Seasonal Forecasts for March-May 2017 rainfall:
Top left: UKMet Office with on or below average (orange shades) tendencies
Top left: ECMWF, mostly on average tendencies
Bottom: CPC/NOAA, on average or above average (green shades) tendencies

Statistical Approaches: To provide an outlook for the next season, scientists from the Climate Hazards Group at the University of California have developed predictive statistical linkages between October-December SST patterns in three regions of the Pacific Ocean and March-May rainfall in the eastern Horn of Africa.

The results indicate that current SST patterns have been associated in the past to lower than average rainfall in East Africa. The chances of below average March-May 2017 rainfall are estimated at 75 percent. These results for this year are consistent with analog year analysis under similar weak La Nina conditions.

This scenario must be seriously considered, given that a third consecutive poor season will lead to a humanitarian crisis comparable in magnitude to the 2010-2011 event.

Full technical details, background and supporting papers can be found in the University of California Climate Hazards Group blog:

http://blog.chg.ucsb.edu/

This work is updated regularly by monitoring the evolution of SST patterns in the tropical Pacific.

Data Sources:

Rainfall: CHIRPS, Climate Hazards Group, UCSB

Vegetation: MODIS NDVI, EOSDIS-NASA

Land Cover: FAO GLC-Share

Processing:

VAM software components, ArcGIS

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