

East Africa: The 2016 Season

Severe Drought in the Horn of Africa



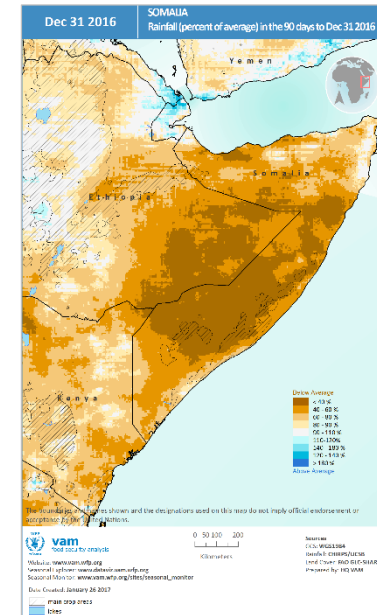
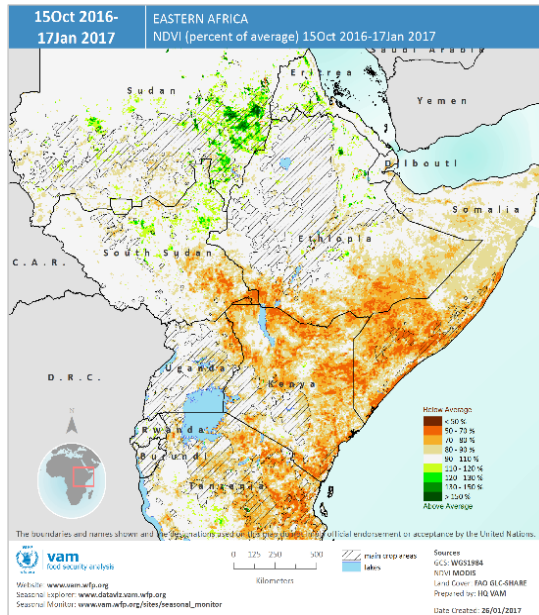
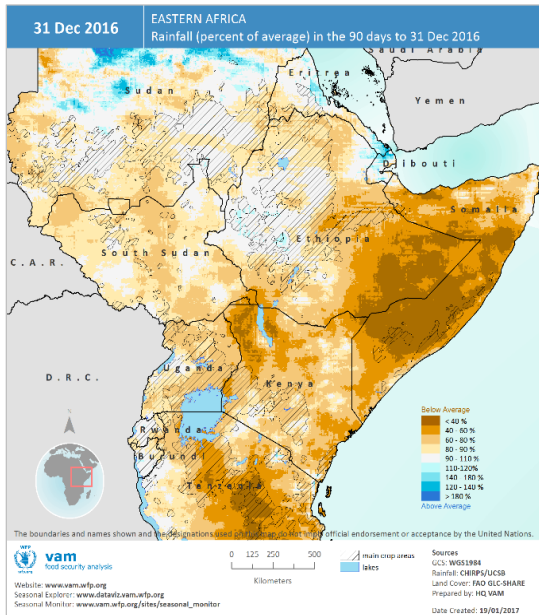
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HIGHLIGHTS

- The rainfall season in the Horn of Africa has ended in a **severe drought**. Extensive growing season failures and record low vegetation are observed across **Somalia** and **southeast Ethiopia** and **coastal Kenya**.
- Northern and western **Kenya**, southwest **Ethiopia** and the eastern half of **Uganda** are also affected, although with more moderate consequences.
- Severe **crop production losses** will occur in **Somalia** and **coastal Kenya**. Irrigated crop production will also be impacted as the drought extends over the key river basins.
- **Pasture and water resources** for human and livestock consumption are at critically low levels across wide swaths of the region, particularly Somaliland to southern Ethiopia.
- This drought is largely **comparable to Oct-Nov 2010 and like worse** in coastal Kenya, northern Somalia and SE Ethiopia. Unlike the 2010 drought which was preceded by a good season, the coping capacities of the most vulnerable households this year are already reduced due to poor rains in the last season.
- The **outlook** for the next months is **pessimistic**, as available evidence points to drier than average conditions during the next rainfall season.
- Yet another **drought** affected season could lead to a humanitarian crisis **similar to 2010-2011**.

HIGHLIGHTS: Widespread Drought Conditions Across East Africa

Oct-Dec 2016



Somalia, SE Ethiopia, Coastal Kenya

This region is the more severely affected of all. In many areas, drought conditions are comparable to 2010.

Large scale failure of crop production and absence of pastoral resources will cause large increases in both extent and depth of food insecurity among vulnerable populations, already suffering from the impacts of the poor performance of the previous rainfall season (March-May 2016).

Pessimistic forecasts for the next rainfall season raise the possibility of a third drought affected season in a row, that would lead to a situation similar to the 2010-2011 humanitarian crisis.

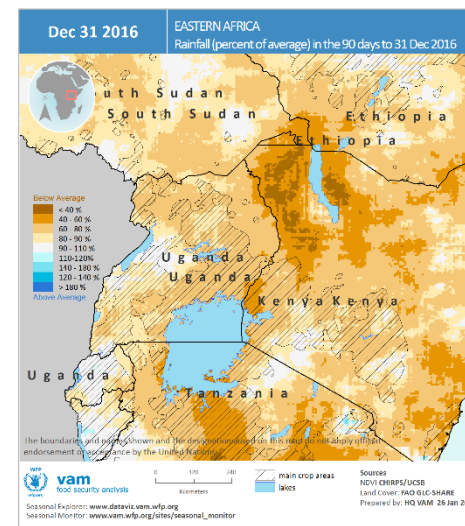
Regional Scale Droughts Across East Africa

The regions of East Africa where a growing season starts from October onwards have been affected by drier than average conditions – these have varied in intensity from extreme to relatively mild. It is striking that nowhere across such a vast region has rainfall been on or above average – this feature extends into Tanzania and reaches into Madagascar.

This drought will have a major impact on the food security of vulnerable populations across the region, in particular in the eastern areas of the Horn.

A good performance of the next growing season (generally starting in March across the region) is now critical to avoid a major humanitarian crisis. However, evidence from seasonal forecasts and statistical analysis indicates that the next season may be drier than average across parts of the region.

If the next season is also drought affected, serious humanitarian crisis are likely to emerge particularly in semi-arid areas of the Eastern Horn, subject to recurrent drought episodes interacting with conflict and insecurity.



Uganda, SW Ethiopia, Western Kenya

Pronounced dryness since early October has affected the second growing season in bimodal agricultural areas particularly in south and south-eastern Uganda. This has also affected late cycle crops in eastern South Sudan, as well as pastoral areas in Eastern Equatoria region.

South west Ethiopia has also been drier than average in the SNPPR and western Somali regions.

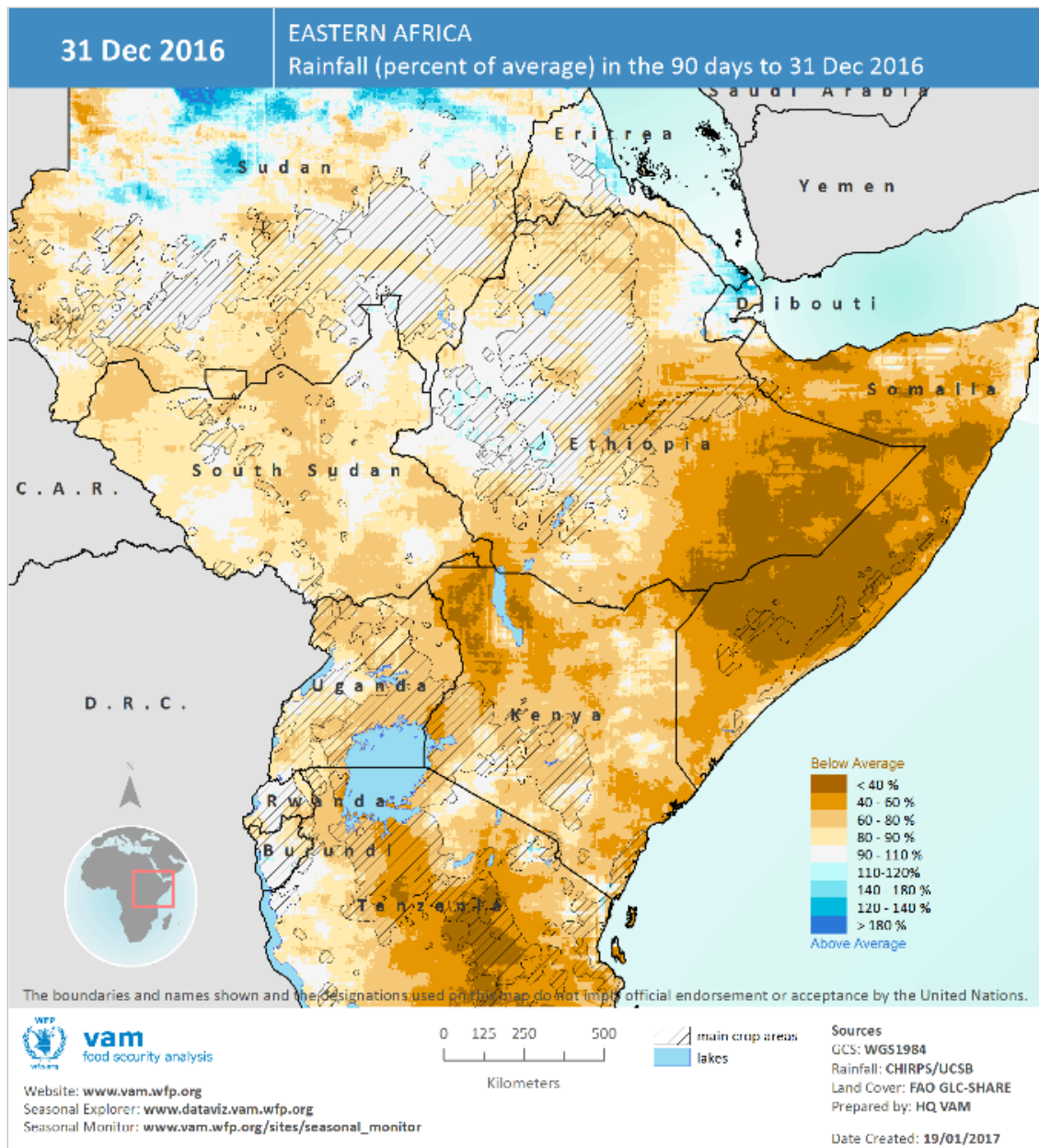
Similar conditions are leading to major problems in pastoral areas of northwest Kenya around Lake Turkana.

Seasonal Status



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October-December Rainfall Season: Severe Drought Conditions



OCTOBER-DECEMBER 2016: Severe Drought Affects the Region

The October to December rainfall season (Deyr or Short Rains season) in East Africa has ended with very severe rainfall deficits across Somalia and SE Ethiopia and to a lesser extent in coastal and semi-arid regions of Kenya. Drought conditions also extend to NW Kenya, western Uganda and SW Ethiopia. The drought pattern extends into Tanzania and as far south as Madagascar.

The cumulative rainfall from August to December 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). Elsewhere, deficits are more moderate but still significant, in particular in areas with poor and vulnerable populations.

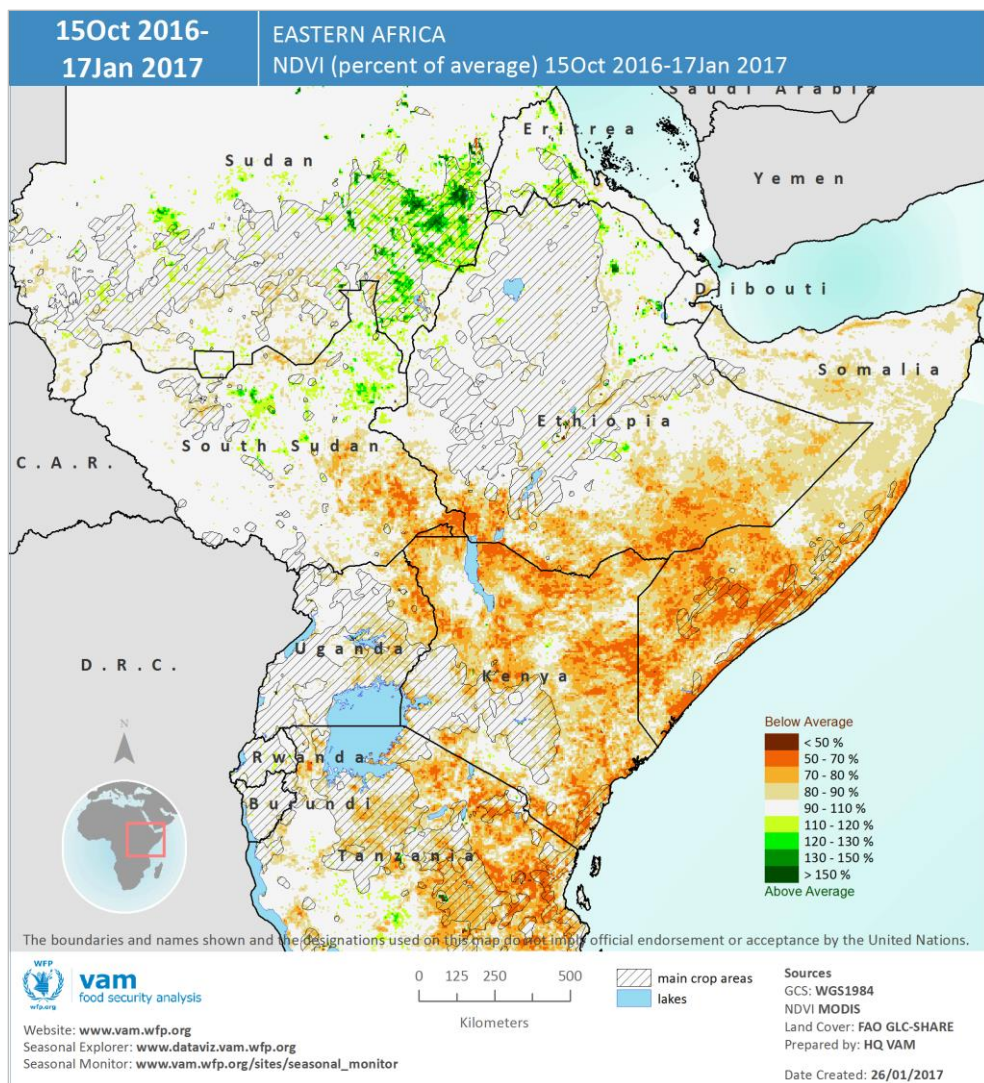
The drought was particularly intense in the first half of the October-December season. Improved rainfall from mid November allowed a modest recovery in some areas of NE Kenya, parts of Uganda and southern Ethiopia. However, December brought the return of much drier than average conditions that are extending into January.

In Somalia, SE Ethiopia and NE Kenya there will be no further rainfall at least for the next 6 weeks, until the start of the next rainfall season in March-May 2017. Other drought affected regions are now in a low rainfall period until substantial rains arrive in March. Dry conditions during this intermediate period will enhance the impact of previous rainfall deficits.

This drought will lead to a major humanitarian crisis in Somalia, SE Ethiopia and coastal Kenya. Its impacts will be amplified by the poor performance of the last season (March-June).

Cumulative rainfall August to December 2016 as a percentage of the long term average.
Blues for wetter than average, orange and browns for below average conditions

Impacts on Vegetation Resources and Cropping Season



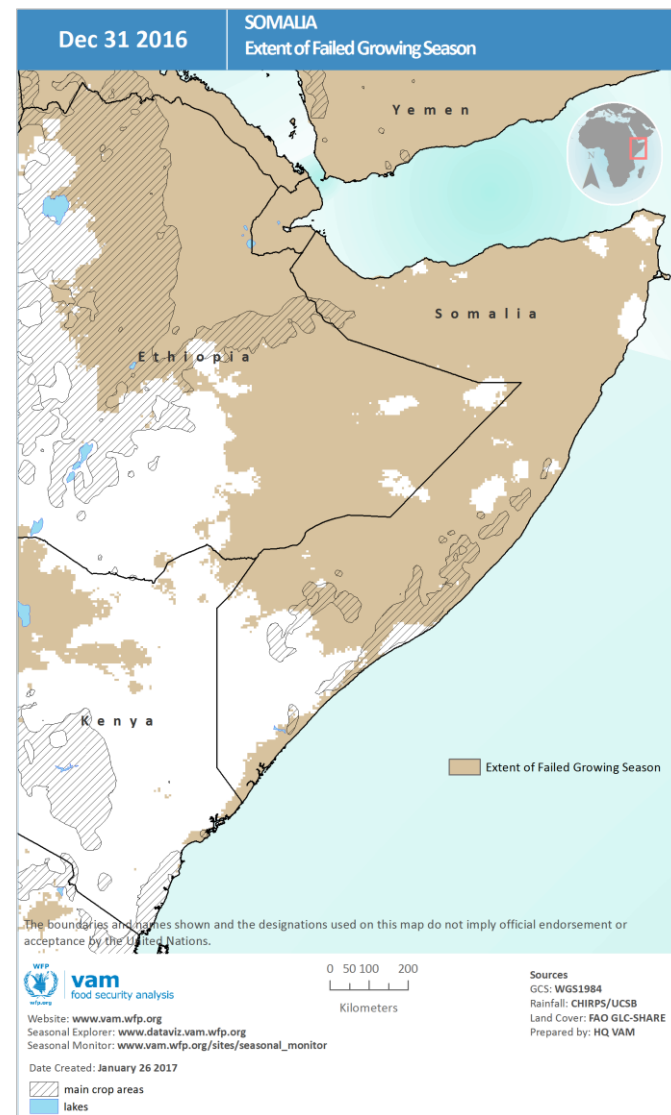
Extensive Growing Season Failures and Very Low Vegetation Cover

As a result of the extremely dry conditions, there were widespread failures of the growing season across most of Somalia and NE Kenya (map right) where moisture conditions were never enough for planting and early crop growth or to trigger substantial vegetation development.

The October-January average vegetation index (map left) shows low vegetation cover across the region, an impact amplified by the poor rains of the previous season in Somalia and Kenya and the intervening long dry season.

The early stages of the season saw record low vegetation cover across eastern and NE Kenya, southern Somalia and SE Ethiopia in early November. The brief improvement in rainfall during late November brought only localized benefits and was unable to revert the situation.

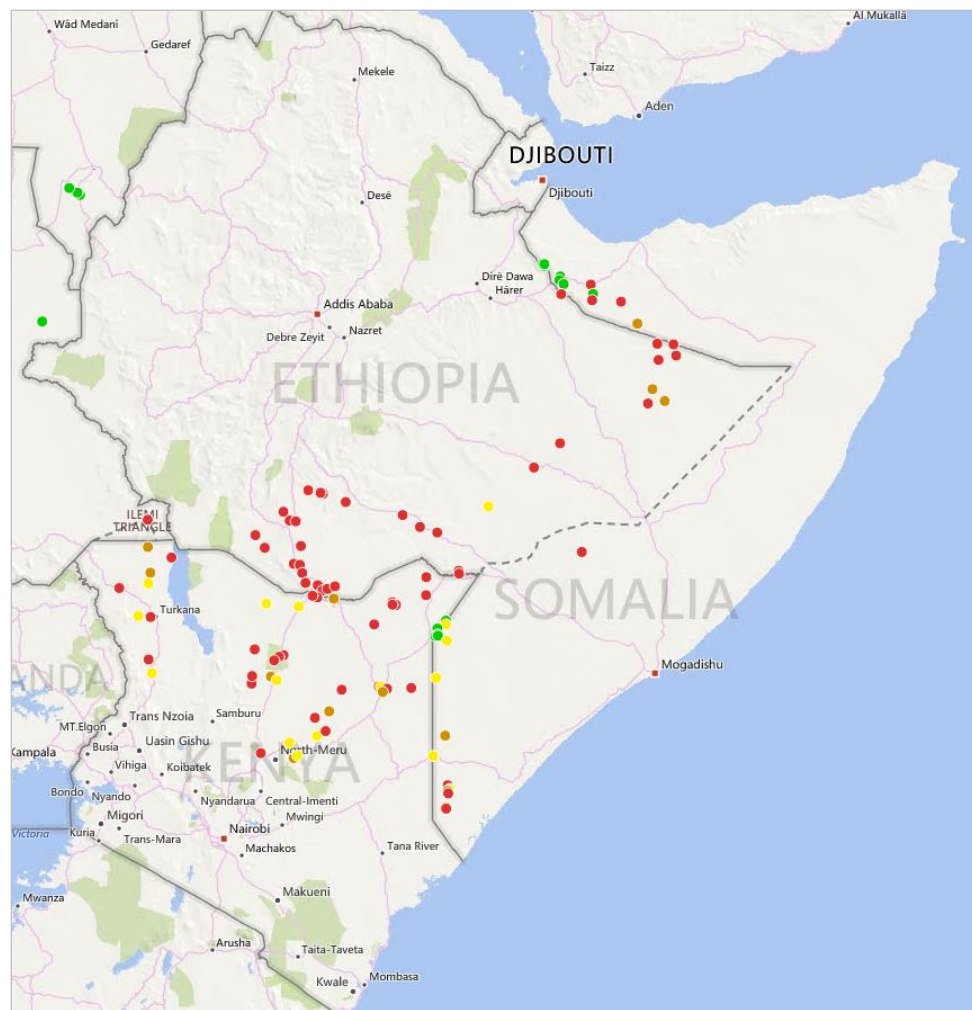
Further dryness in December led to the current scenario of major negative impacts on crop production and extremely scarce pasture resources over very large areas with new rainfall and vegetation growth not expected until mid March at the earliest.



Extent of failed growing season areas in the season of Oct-Dec 2016.

Average Oct 2016 – Jan 2017 NDVI as a percentage of the long term average.
Greens for above average vegetation, orange shades for below average vegetation.

Impacts on Water Resources



Map showing condition of water points across East Africa by late 2016. Note the majority of monitored water points in Near-Dry condition, showing poor water availability for livestock and human consumption. The map does not contain an exhaustive list of water points in the region. Source: <https://earlywarning.usgs.gov/fews/waterpoint/index.php>

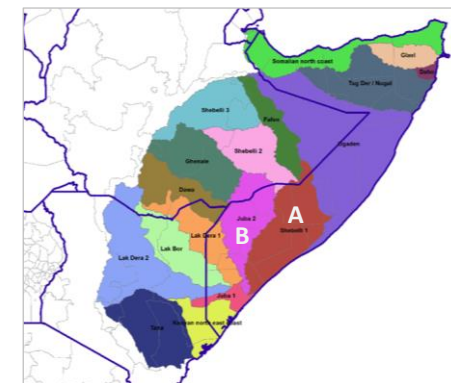
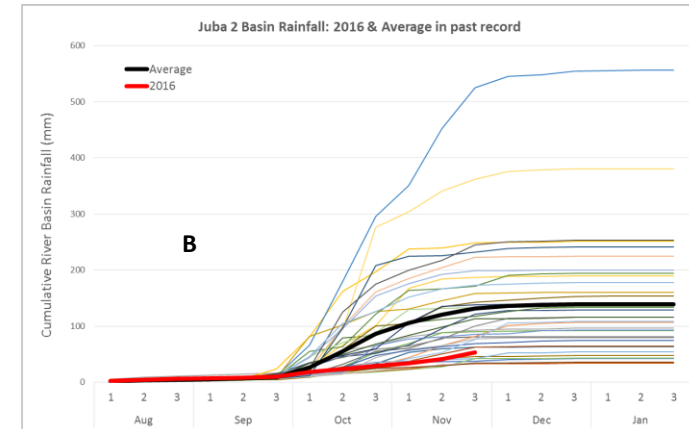
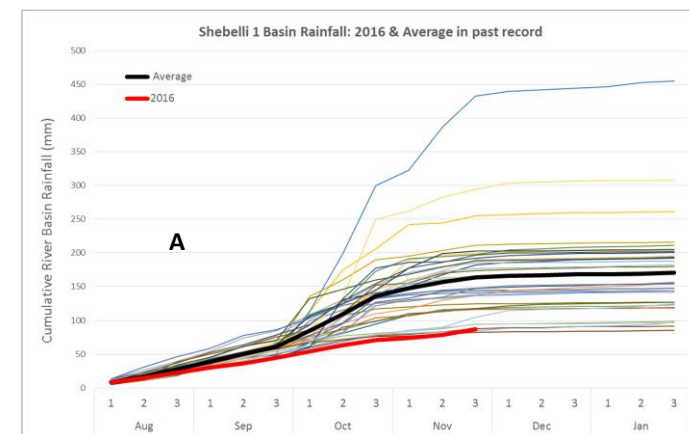
Water Resources at Extremely Low Levels

The severe and extensive drought has had a major impact on water resources, both on river flow levels and water availability for human and livestock consumption.

Map left shows the status of water levels for a number of water points across the region – most of the water points in S and SE Ethiopia and Kenya are in Near-Dry status (less than 3% of the long term usual level). Non monitored water points within Somalia are expected to be in similar condition, as rainfall patterns have been even more unfavourable.

River basin rainfall totals at the end of season remained at its lowest levels for the larger Shebelle basin (A) and at one of the lowest for the Juba-2 basin (B). A similar story emerges for other basins. Comparable dry years include 2010, 2005, 2003, 1991.

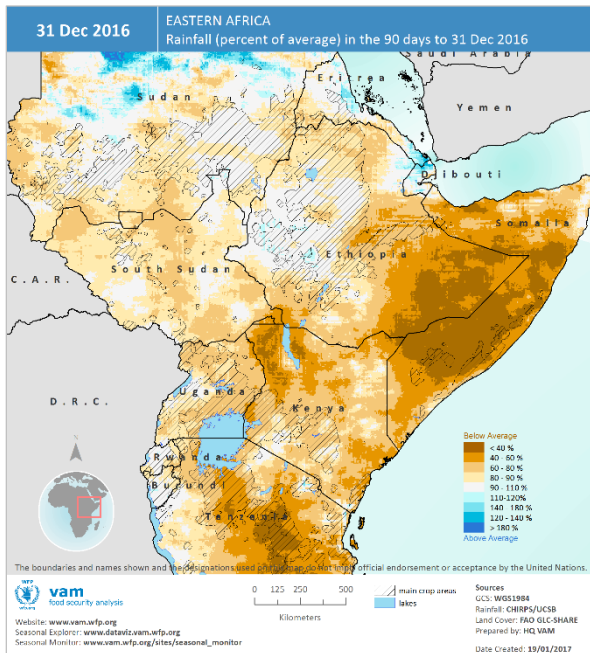
This implies that irrigated agriculture along the Juba and Shabelle rivers in Somalia has been seriously affected and irrigated crop production will be at very low levels, possibly comparable to 2010 and 2005.



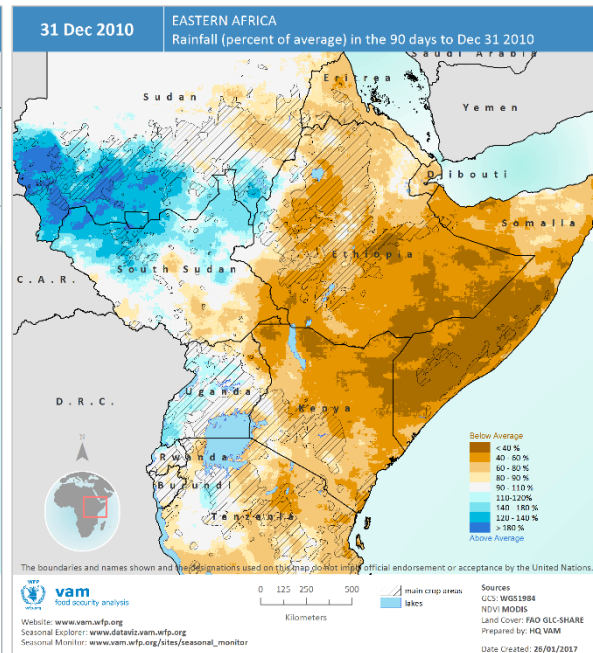
Cumulative rainfall over river basins (Shebelle 1 above, Juba 2 below) within the period August to January. Map shows location of basins. Average curve in black, current 2016 in red. Other years as thin un-labelled lines. The upper outlying lines correspond to flood years (1997 and 2006).

2010-2016 Comparison

Oct-Dec 2016



Oct-Dec 2010



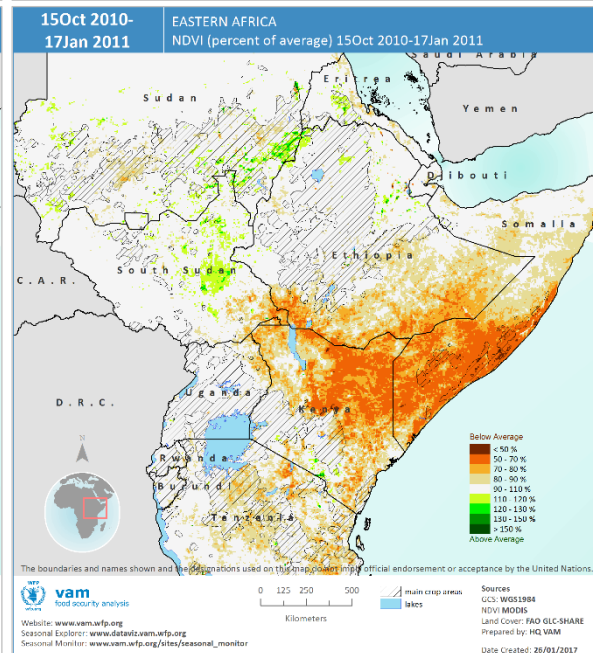
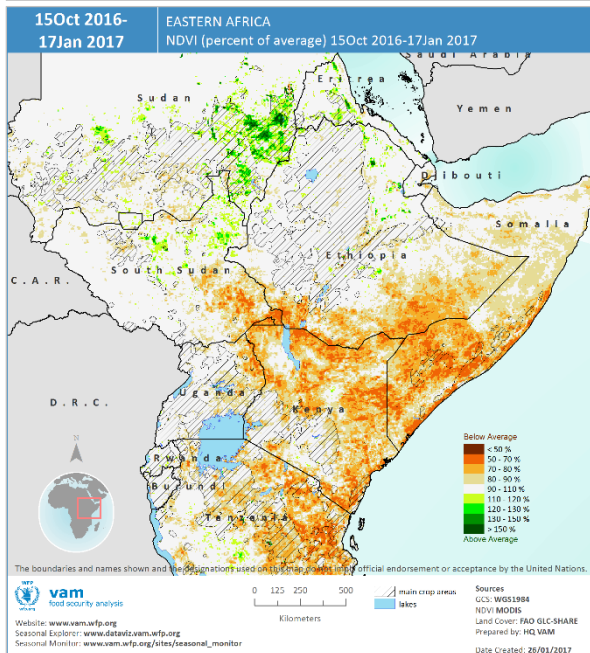
Rainfall and Vegetation Cover Comparison 2016 vs 2010

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 left show the October-December seasonal summaries of total rainfall and average vegetation cover for the two years.

At regional level, 2016 is slightly more widespread, extending into Uganda, more of South Sudan and more intensely in Tanzania. Specific features that stand out:

- The drought event is similar in intensity over most of Somalia, SE Ethiopia and coastal Kenya.
- NE Kenya and southern Ethiopia have been less intensely affected, though the situation remains serious. South Sudan had a drier late stage of the season.
- Uganda and bordering regions of NW Kenya are currently in much worse condition than in 2010 and so is Tanzania.
- Patterns in Sudan and northern Ethiopia correspond to fairly late seasonal stages and have little relevance

The region will face multiple challenges in the coming months with extreme impacts in Somalia, parts of Ethiopia and Kenya and serious consequences for poor and vulnerable populations in Uganda and Tanzania, adding to the worsening situation in South Sudan.



Comparison between 2016 (left) and 2010 (right) in terms of October-December total rainfall (above) and (below) average vegetation cover. Both indicators shown as comparisons with their long term average. Blues/greens for above average, browns/oranges for below average conditions.

Perspectives For the Next Season (2017)

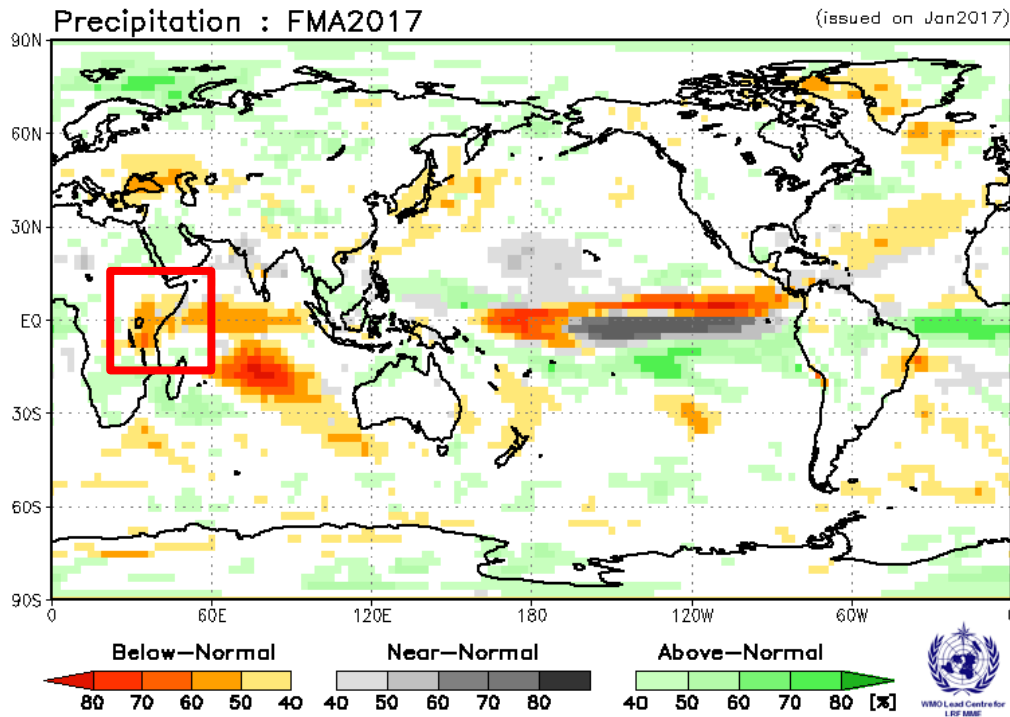


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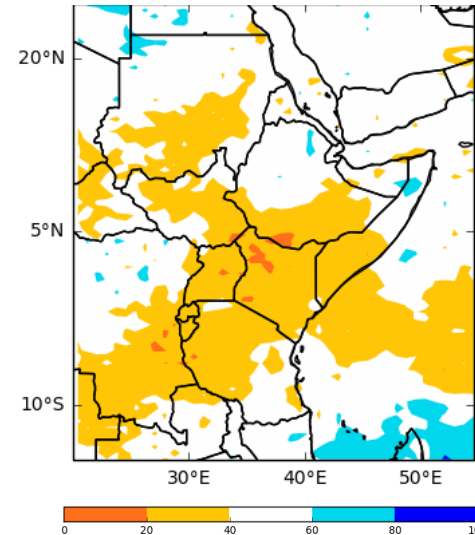
Outlook for the March-May 2017 Season

Probabilistic Multi-Model Ensemble Forecast

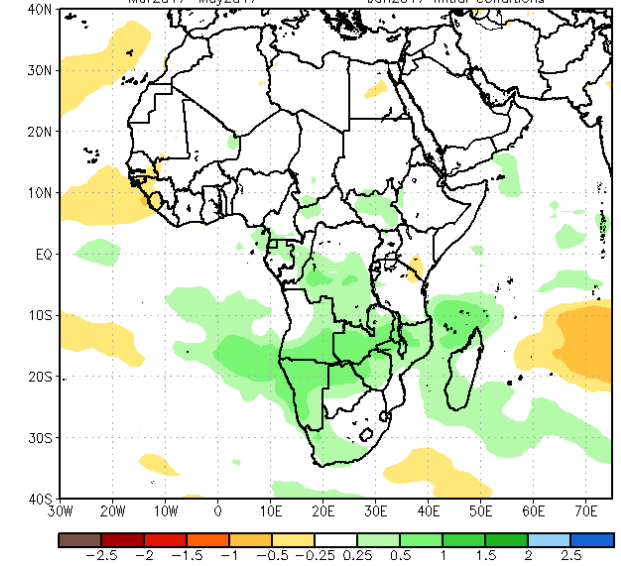
/GPC_seoul/GPC_washington/GPC_melbourne/GPC_cpctec/GPC_montreal/GPC_ecmwf



Probability of above median precipitation Mar/Apr/May
Issued January 2017



NMME Precipitation Standard Anomalies
Mar2017–May2017 Jan2017 initial conditions



Seasonal Forecasts for March-May 2017 rainfall:

Left: WMO Ensemble multi-model forecast – note below normal conditions over East Africa

Centre: UKMet Office for East Africa, with below average (orange shades) tendencies

Bottom: CPC/NOAA, mostly on average tendencies

Outlook for the March-May 2017 Season

Forecasts: Seasonal forecasts show considerable variability linked to well known low predictability and poor skill over Eastern Africa during the northern hemisphere spring. Shown above are UKMet (centre) showing drier than average tendencies across the region and NOAA/CPC (right), with mostly neutral tendencies (such as forecasts from ECMWF).

Combining a number of models into a single “ensemble” forecast (WMO, left) allows a better picture. The overall most likely outcome is for below average rainfall during the coming March-May season.

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 outlook for these methods is also for below average rainfall during the March-May rainfall season.

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

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

Areas of Concern:

Somalia, Ethiopia, Kenya, Uganda

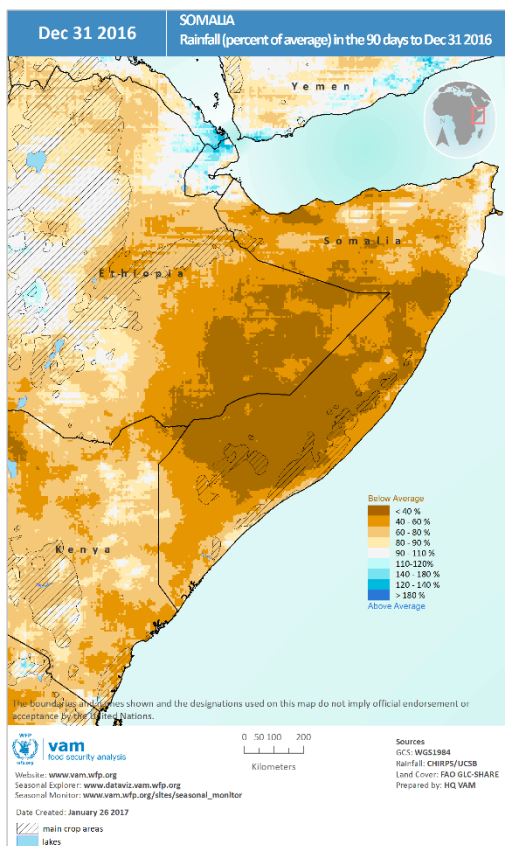


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Somalia: Shades of 2010

Somalia was affected by an extreme drought in Oct-Nov 2010, the first of two that led to a major humanitarian disaster. The current severe drought inevitably raises the question of how it compares to that event. Seasonal charts for 2010 and 2016 allow us to provide such a comparison. Sample charts are shown for Juba, Bay and Galgaduud.

All charts show better rainfall during March-May of 2010 compared to 2016 and drier than average conditions during October to December on both years.



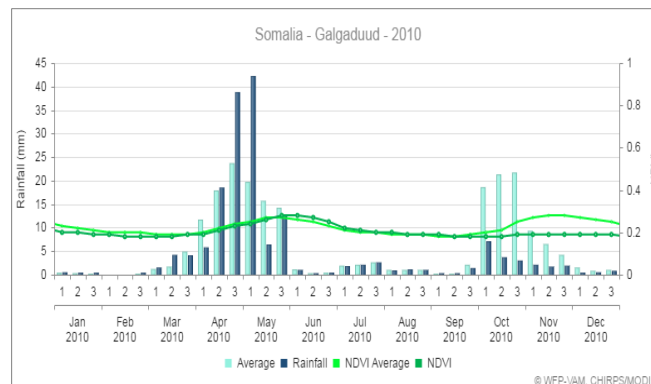
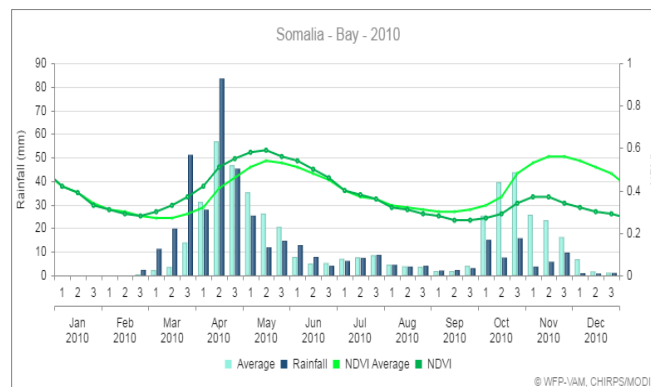
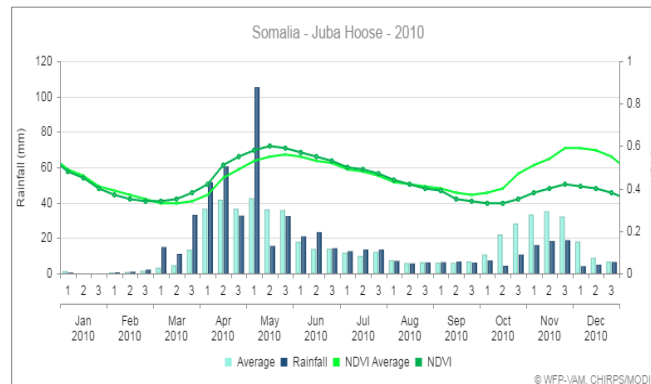
In 2016, after a record low start, southern areas (Juba, top charts) enjoyed improved rainfall from late November, that allowed vegetation to recover to levels above those of 2010.

In Bay (middle charts) rainfall and vegetation are similar to 2010, though with different timings.

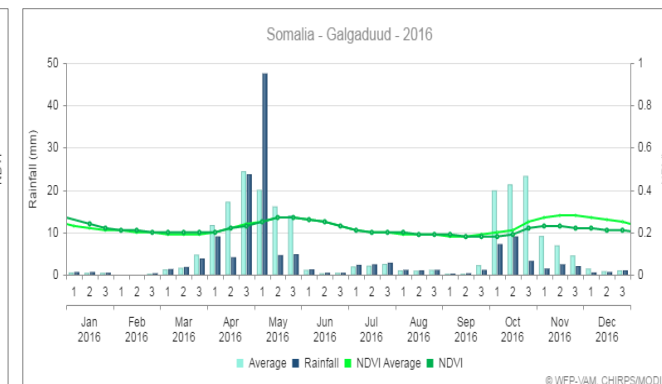
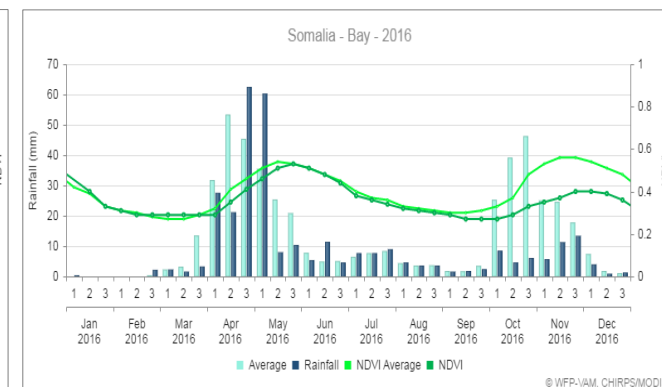
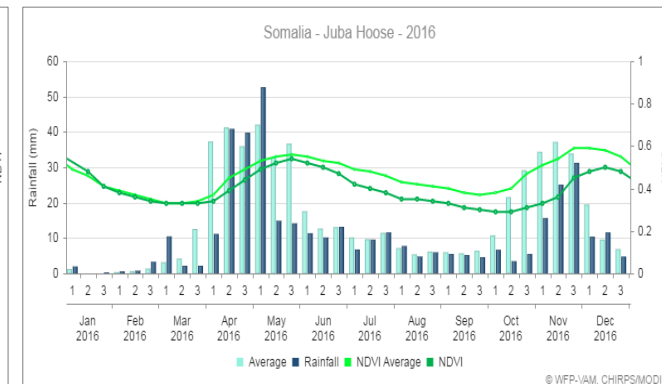
Further north in Galgaduud (bottom charts), the situation is marginally better than in 2010.

Note that comparisons are being made against a worst case scenario – even where the current situation is better than 2010, very severe impacts will affect the country.

2010



2016



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

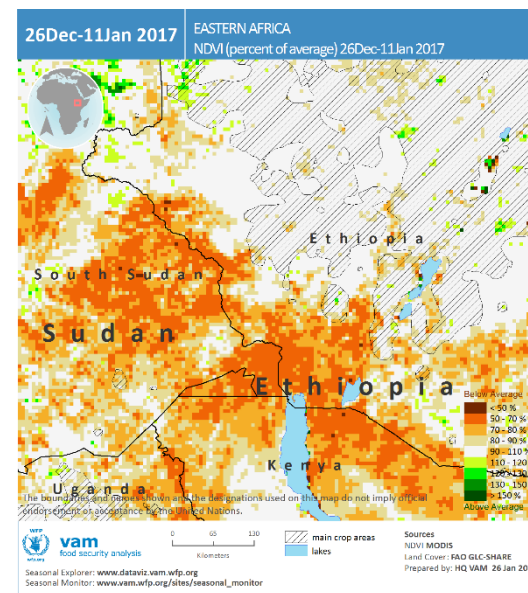
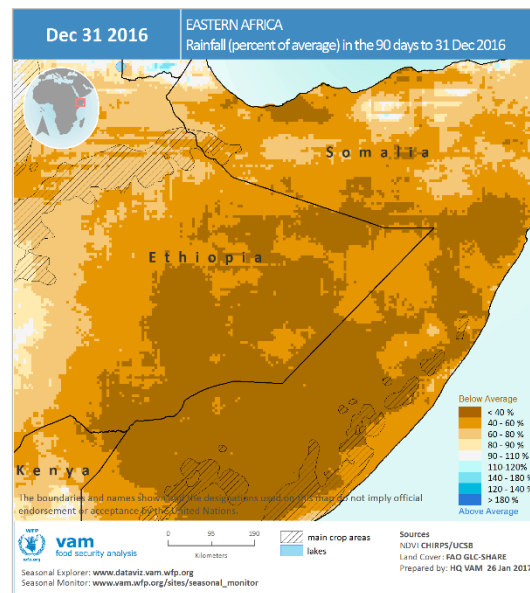
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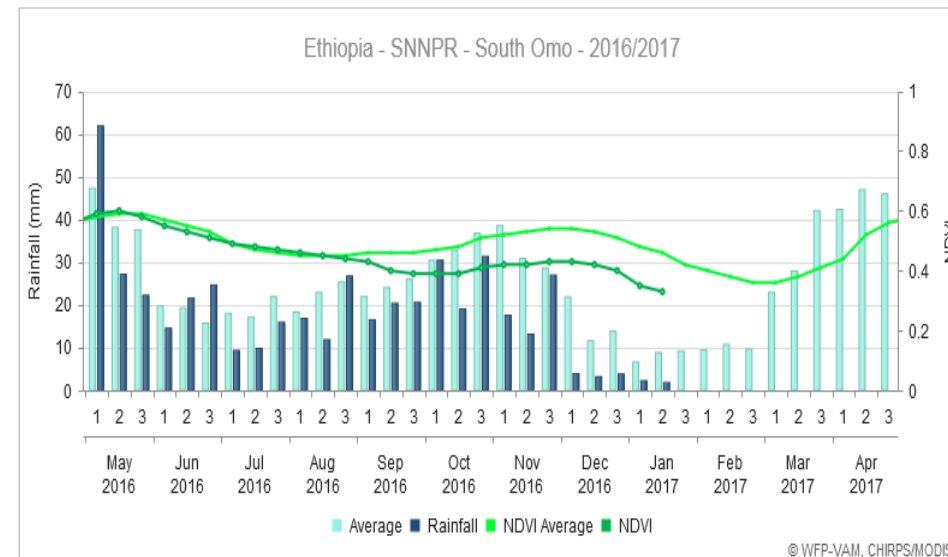
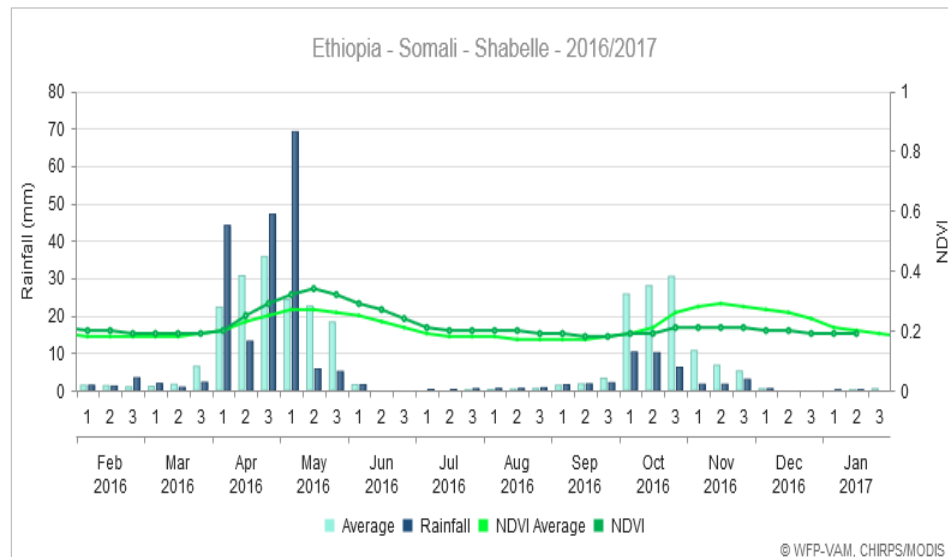
Ethiopia: Somali region and Southwest areas of concern

Southeast Ethiopia (Somali Region) has been affected by the same drought as Somalia and to the same degree. In fact, these areas are the same from the point of view of the prevailing weather and rainfall patterns.

Hence, the current seasonal behavior and outcomes as well as the comparisons to the 2010 season are very similar to those for Somalia shown in the previous slide.



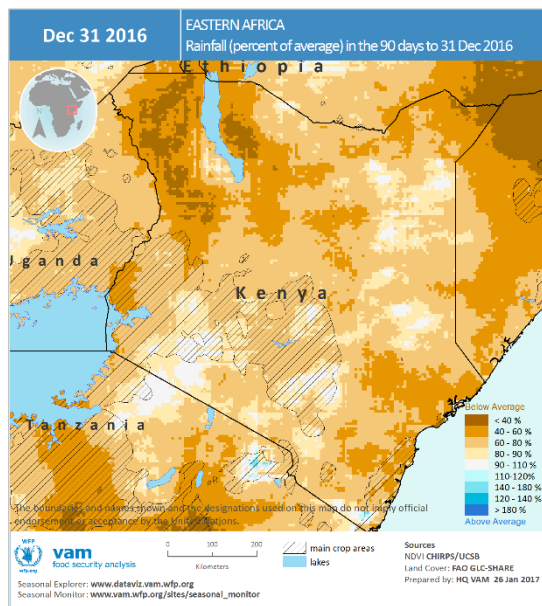
Other areas of the country are also affected by this regional drought – southern and southwest regions (southern Oromia and SNPRR) have endured persistent dryness from late November with failure of the rains from early December. Similar patterns emerge across the border in easternmost Eastern Equatoria.



Kenya: Coastal areas severely affected

Kenya was also affected by a severe drought in Oct-Nov 2010 particularly in northwestern semi-arid regions. Seasonal charts for both years allow a comparison between the two seasons; shown here are charts for locations in Coastal, North Eastern and Samburu provinces.

All charts show much better rainfall during March-May of 2010 and drier than average conditions during October to December on both years.



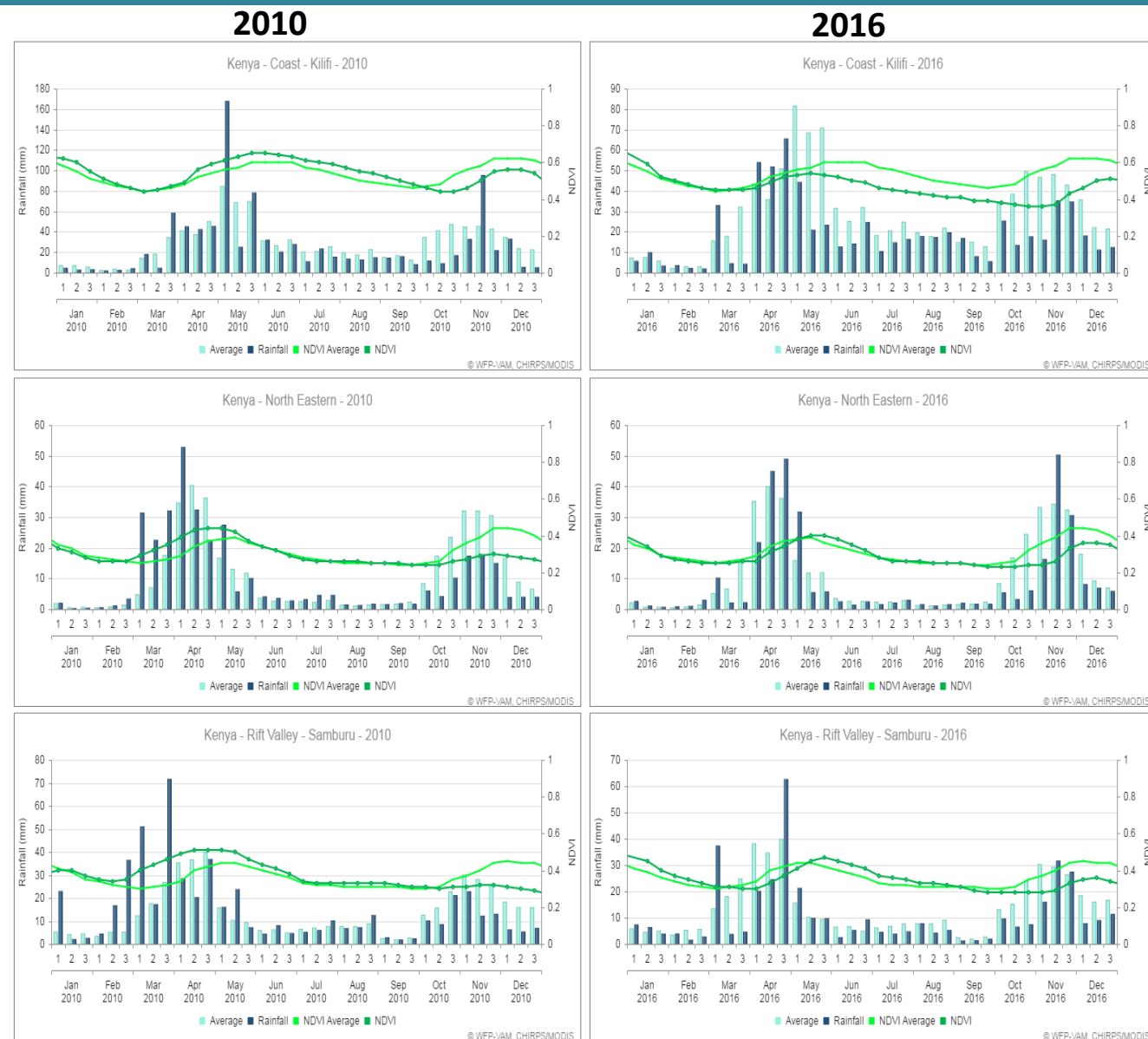
In Kenya Coast (top), vegetation cover is much worse than in 2010, due to poor performance of the rains through 2016, in spite of late improvements in rainfall. This results in severe impacts on crop production and livestock

In NE areas, northern Rift Valley and Turkana area, improved rainfall from mid-November allowed some recovery in pasture conditions, but came too late for crops. Pastoral areas are better than 2010, but still seriously hit.

Note that comparisons are made against an extreme event – in spite of the late improvements in rainfall in northern areas, serious impacts will still take place.

Western Kenya: Severe dryness has hit western Kenya (Nyanza, Western and southern Rift Valley) from early December onwards. Impacts are compounded by drier than average episodes in August and October.

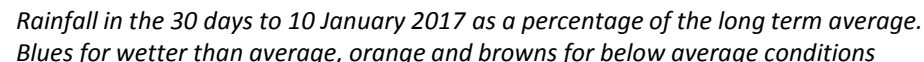
This is part of the same pattern affecting western Uganda and details can be found in the next slide.



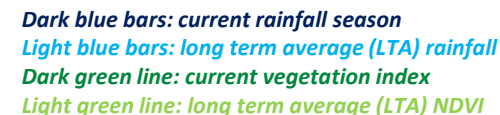
Dark blue bars: current rainfall season
 Light blue bars: long term average (LTA) rainfall
 Dark green line: current vegetation index
 Light green line: long term average (LTA) NDVI

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Typically October is the time of peak rainfall, while December is the later stage of the season and January the driest period of the year before rainfall picks up again in late February to start the next growing season.



However, the outlook for the next season is not favourable and Uganda may be affected by delays in the start of the season and drier than average conditions.

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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