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**REVIEW OF RAINFALL DURING THE “LONG RAINS”, MARCH TO MAY (MAM) 2016
& JUNE-JULY-AUGUST (JJA) 2016 SEASONS AND THE OUTLOOK FOR THE
OCTOBER-NOVEMBER-DECEMBER (OND) 2016 SEASON**

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1. HIGHLIGHTS

1.1 Review of the Rainfall in March-May 2016

Most parts of the country recorded near-normal to enhanced rainfall that was well distributed both in time and space. The rainfall impacted positively on the agriculture, water resources, livestock, energy and other rainfall dependent sectors.

The heavy rainfall that occurred in April and May, however, resulted into floods and landslides/mudslides in a few of areas of the country claiming several human and animal lives and destroying property worth millions of shillings.

1.2 Review of the Rainfall in June-August 2016

During June, July and August (JJA) 2016 period, most parts of the country experienced generally sunny and dry weather conditions. However, depressed rainfall was recorded over several parts of western Kenya while cool and cloudy conditions were dominant over the Central Highlands and Nairobi area.

1.3 Forecast for the October-November-December (OND) 2016 “Short Rains” Season

The Climate Outlook for the October-November-December (OND) 2016 “Short Rains” season indicates that much of the country is likely to experience generally depressed rainfall that will be mainly driven by the evolving La Niña conditions in the eastern and central equatorial Pacific Ocean and cooler than average Sea Surface Temperatures (SSTs) over the western Equatorial Indian Ocean (adjacent to the East African coastline) and warmer than average SSTs over the eastern Equatorial Indian Ocean (adjacent to Australia) that constitute a negative Indian Ocean Dipole (IOD). The distribution of the rainfall in time and space is, therefore, expected to be generally poor over most places.

2. WEATHER REVIEW DURING MARCH-APRIL-MAY AND JUNE-JULY-AUGUST 2016

2.1 Review of March-April-May (MAM) 2016

An assessment of the rainfall recorded from 1st March to 31st May 2016 indicates that the rainfall was generally good over most parts of the country despite the late onset. Various meteorological stations recorded between 75 and 125 percent of their seasonal Long-Term Means (LTMs) for March to May. A few stations in western Kenya, Nairobi and the Coastal strip, however, recorded above-normal (enhanced) rainfall (more than 125 percent of their seasonal LTMs), while several stations in Northeastern Kenya and a few stations in the central Highlands and Southeastern Kenya recorded depressed rainfall (less than 75 percent of their seasonal LTMs). The most depressed rainfall of 55 percent was recorded at Machakos Meteorological Station (**see figure 1**).

The rainfall distribution, both in time and space, was also generally good in April and May over most parts of western and central Kenya. Generally sunny and dry weather conditions were, however, dominant over the entire country during the onset month of March 2016. Much of the rainfall was recorded during the second half of April and throughout the month of May 2016.

2.2 Review of June-July-August (JJA) 2016

Most parts of the country remained generally sunny and dry as reminiscent of the JJA season. Several meteorological stations in Northwestern, Northeastern, Central, Southeastern and southern parts of central Rift Valley recorded monthly rainfall totals of less than 30mm. Some stations like Makindu and Mandera recorded no rainfall at all throughout the JJA season. The central highlands and some parts of Rift Valley experienced cool cloudy conditions with occasional chilly spells.

Several stations in Western Kenya recorded significant amounts of rainfall. The rainfall was, however, depressed at most stations as compared to the JJA Long-Term Means (LTMs) as seen in **figure 2**. Kitale and Eldoret stations that are in the maize basket areas of Kenya as well as Nakuru station recorded near-average rainfall (105, 112 and 109 percent of their LTMs respectively) during the season. Nyahururu was the only station that recorded above-average (more than 125 percent) rainfall that was 132 percent of the JJA seasonal LTM.

Most stations along the Coastal strip recorded highly depressed rainfall. The highest percentage of just 57 percent was recorded at Mombasa station while Msabaha, Malindi, Mtwapa and Lamu stations recorded just 50, 43, 22 and 38 percent of their JJA LTMs respectively.

In terms of temperatures, most parts of the country including the Central highlands recorded warmer than average conditions during the season. Analysis of the JJA 2016 air temperature indicated that both the minimum (night-time) and maximum (day-time) temperatures for the season were warmer than average at most stations with sunny conditions dominating. The daytime temperatures in the Central highlands and

Nairobi area, however, occasionally fell below 20°C. The lowest daily maximum temperature of 15.2°C was recorded at Nyeri station on 6th August 2016.

2.3 Impacts Associated With the MAM 2016 “Long-Rains”

The heavy rainfall experienced over most parts of the country during March-April-May 2016 impacted both positively and negatively on various sectors such as agriculture and livestock, disaster management, energy, water resources and health among others. The impacts included:

- Good foliage and crop performance in the southeastern lowlands, eastern highlands, central Rift Valley and western highlands;
- Good pasture conditions and water availability in pastoral areas due to the enhanced rainfall;
- Filling up to capacity of the Seven-Forks hydroelectric power generation dams due to enhanced rainfall in the catchment areas of Tana River in the central highlands;
- Outbreak of water-borne diseases, like cholera, in some parts of the country;
- Loss of human and animal lives in different parts of the country as a result of raging rivers, floods and landslides/mudslides as well as displacement of people by floods; and
- Destruction of transport infrastructure due to floods; several roads in the country were rendered impassable, with some bridges being swept away.

3. FORECAST FOR OCTOBER-NOVEMBER-DECEMBER (OND) 2016

The “Short Rains” October to December (OND) season constitutes an important rainfall season in Kenya and more so in the Central highlands and Southern lowland areas. During OND 2016, it is expected that most parts of the country will experience depressed rainfalls that will also be poorly distributed both in time and space. The expected depressed rainfall will be mainly driven by the evolving La Niña conditions in the eastern and central Equatorial Pacific Ocean. The current weak La Niña is forecasted to strengthen with time to peak towards the end of the year (2016) and persist to the beginning of next year, 2017. The rainfall will also be driven by the cooler than average Sea Surface Temperatures (SSTs) over the western Equatorial Indian Ocean (adjacent to the East African coastline) and warmer than average SSTs over the eastern Equatorial Indian Ocean (adjacent to Australia) that constitute a negative Indian Ocean Dipole (IOD).

The expected onsets, cessation and the distribution of rainfall are derived from statistical analysis of past years (1998 and 2010), which exhibited similar characteristics to the year 2016.

The specific outlook for October-November-December (OND) 2016 is as follows:

The areas likely to receive **near-normal** rainfall with a tendency to slightly above normal rainfall include: **the Western Counties** (Busia, Vihiga, Kakamega, Bungoma, etc.); **Nyanza Counties** (Kisumu, Siaya, Homa Bay, Nyamira, Migori, Kisii, etc.); **Some Counties in southern, central and north Rift Valley**; (Kericho, Nandi, Bomet, Uasin

Gishu, Trans Nzoia, Nakuru, Narok); These areas are shown in light green colour in **figure 3**.

The areas likely to receive **below-normal to near-normal** rainfall include: **North Eastern Counties** (Mandera, Wajir, Garissa, Isiolo etc.); **Counties in Coast region** (Mombasa, Kilifi, Kwale, Lamu, Tana River, Taita Taveta), **Counties in Central Kenya** (Kiambu, Kirinyaga, Nyeri, Murang'a, Nyandarua), **Nairobi County**, Central and North Rift, North Western, Eastern Kenya Counties (Machakos, Kitui, Makueni, Meru, Embu, Tharaka, Isiolo, Marsabit). These areas are shown in yellow colour in **Figure 3**

4. ONSET AND CESSATION DATES

The expected onset and cessations dates for individual areas are as follows:

- Nyanza and Western Counties (Kisumu, Siaya, Homa Bay, Nyamira, Migori, Kisii, Busia, Vihiga, Kakamega, Bungoma etc): These counties are expected to receive rainfall from the month of September which is expected to continue into the first week of October. The rains are expected to cease during the third to fourth week of December;
- Northern Rift Valley Counties: The onset in the Northwestern parts of the country (Turkana, West Pokot counties etc.) is expected during the fourth week of October to first week of November while cessation is expected during the last week of November to first week of the December;
- Central Counties: Central Highlands (Meru, Embu, Nyeri, Murang'a, Laikipia etc) and Nairobi County (Dagoretti, Kabete, Eastleigh etc) are expected to experience their onsets in the third to fourth week of October. The rains will cease during the second to third week of December;
- Northeastern Counties (Mandera, Wajir, Garissa, Marsabit) are expected to experience their onsets in the third to fourth week of October and the cessation during the fourth week of November to the first week of December;
- Central Rift Valley: The Central Rift Valley areas (Nakuru, Narok, Nyahururu etc) are likely to experience the onset during the third to fourth week of October and the cessation during the third to fourth week of December;
- Counties in the Southern lowlands (Machakos, Kitui, Makueni) and some counties in the Coastal region (Taveta Taveta, Tana River): are likely to realize the onset during the first to second week of November and cessation during the second to third week of December.
- The Coastal strip (Mombasa, Malindi, Kilifi, Lamu etc) is likely to experience the onset during the fourth week of October to the first week of November. The cessation is likely to occur during first to second week of December.

The onset and cessation dates are as depicted in **figure 4a and 4b** respectively.

5. EXPECTED DISTRIBUTION

The OND 2016 rainfall is expected to be poorly distributed both in time and space. Most of the eastern sector of the country is likely to experience long dry spells in

October and most of December. Significant amounts of rainfall are, however, expected during the peak month of November.

6. POTENTIAL IMPACTS OF THE OND 2016 RAINS

In view of the above forecast, many sectors are likely to be impacted either positively or negatively. With adequate preparations the country can avoid some of the negative impacts while taking full advantage of the positive impacts. Some of the most likely impacts are highlighted below:

6.1 Agriculture, Livestock Development and Food Security Sectors

Depressed rainfall is expected over most of the agricultural areas of the country. It is also expected that the rainfall will be poorly distributed with prolonged dry spells. This will highly interfere with agricultural activities in most of the areas. Farmers are, therefore, advised to liaise with the Ministry of Agriculture to make best use of the rains by planting appropriate crops. Foliage and pasture conditions in the pastoral areas of Northeastern, Northwestern and Southeastern Kenya are expected to deteriorate as a result of expected poor rainfall performance during the season. The Livestock Department should consider working closely with pastoralists and do close monitoring of the situation to avoid loss of animals.

6.2 Environment and Natural Resources Sectors

The anticipated depressed rainfall is likely to result in land degradation through wilting of vegetation including drying up of grass that exposes the top soils to erosion. However, people are encouraged to make use of the good rainfall expected in November to plant trees in order to increase the forest cover.

6.3 Water and Sanitation

Water resources in urban areas such as Nairobi, Nakuru, Mombasa, Garissa, Eldoret etc. should be well managed following the forecasted rainfall deficits in the catchment areas. This should be more so in the marginal areas in order to cater for the animal and human population needs and minimize the likelihood of conflicts. Inadequate domestic water supply can lead to diseases associated with poor hygiene.

6.4 Disaster Management Sector

Problems related to water scarcity are likely to occur in the pastoral areas of the northwestern and northeastern parts of the country even after the heavy rains that occurred during the 2015 "Short-Rains" (October-December) and 2016 "Long Rains" (March-May) seasons. There is also potential for Human-Wildlife conflicts over limited pasture and water resources in these areas. Close monitoring of the situation by the relevant Departments and contingency measures are necessary in order to adequately cope with the situation. In western Kenya where near-average rainfall is expected, rapid cloud development during the day may lead to associated lightning strikes that occur especially in districts like Kisii, Kisumu, Kakamega and Mt. Elgon areas. Caution should be taken by avoiding to stay in open grounds or sheltering under trees during rain-storm days.

6.5 Economic Development

Many economic sectors are weather and climate sensitive. It is likely that the expected poor rainfall performance will exert stress on many socio-economic sectors and may slow down economic development if appropriate strategies are not put in place. The Government may consider setting aside resources to cater for emergency situations such as provision of famine relief, especially in areas that are under stress in terms of food and water supply.

6.6 Health Sector

Diseases associated with water scarcity and poor sanitation such as typhoid and cholera may emerge in various parts of the country that are expected to receive depressed rainfall. The Ministry of Health is advised to be on the lookout for such cases. Prepositioning of necessary supplies in medical facilities should be considered so as to make it easy to deal with such situations as they arise.

6.7 Transport and Public Safety Sector

The expected depressed rainfall is likely to lead to dusty conditions on the roads and in urban areas, in some parts of the country. This may result into poor visibility due to the dust blown by vehicles. Motorists are, therefore, advised to drive carefully in order to avoid accidents that may emanate from such poor visibility.

Despite the generally poor rainfall expected in many parts of the country, flash floods may still occur in some parts of the Western Counties. This may lead to transport problems and disruption of normal activities, especially during rush hours and more so in areas where the roads become impassable when it rains. Slippery roads may also pose danger to motorists and pedestrians on unpaved roads. All should, therefore, take utmost care during the rainy period.

6.8 Energy Sector

The major river catchment areas for the country's hydroelectric power generating dams are forecast to receive near-average to below-average rainfall. This means that inflows into rivers Sondu Miriu, Tana and Athi may be average to below-average. This may lead to decreased water levels in dams, and decreased capacity for hydroelectric power generation in the hydropower dams.

N.B: This forecast should be used in conjunction with the five-day, weekly and monthly forecasts including updates issued by this Department.



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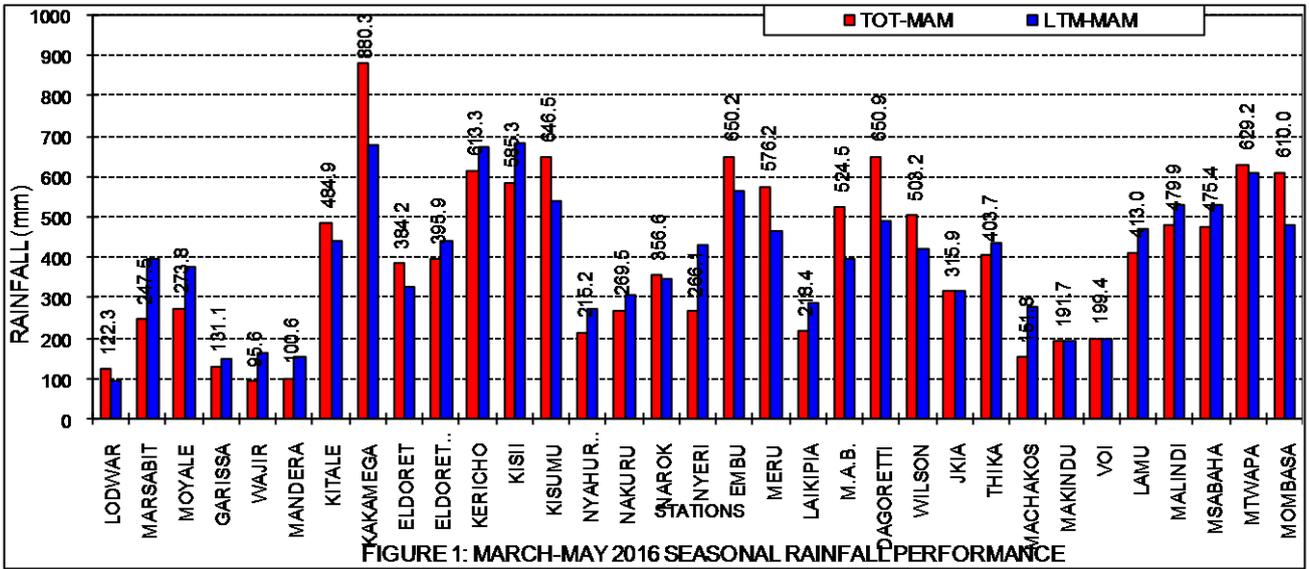


FIGURE 1: MARCH-MAY 2016 SEASONAL RAINFALL PERFORMANCE

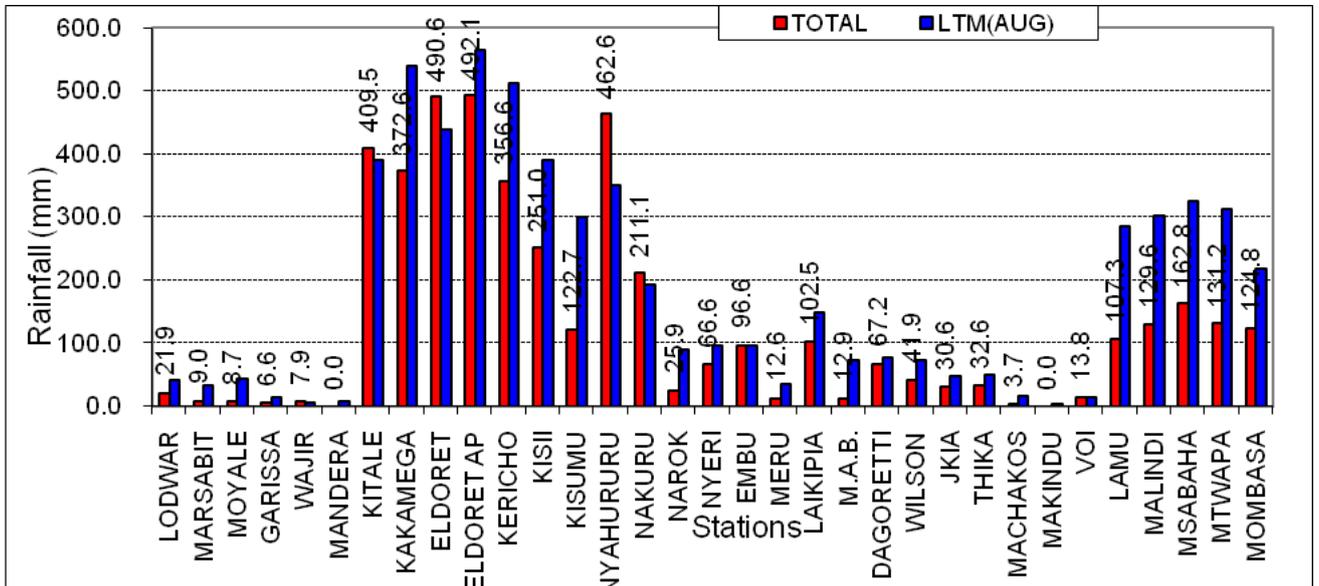


FIGURE 2: JUNE-JULY-AUGUST (JJA) 2016 RAINFALL PERFORMANCE

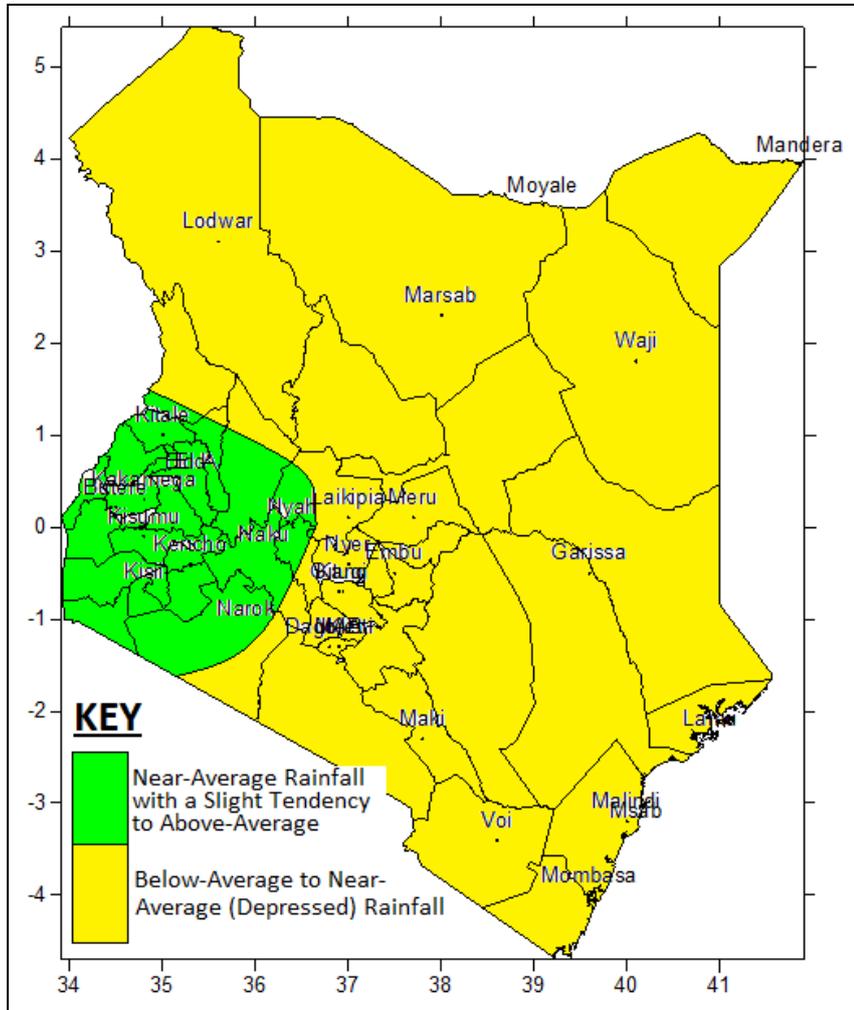


Figure 3: OND 2016 Rainfall Outlook

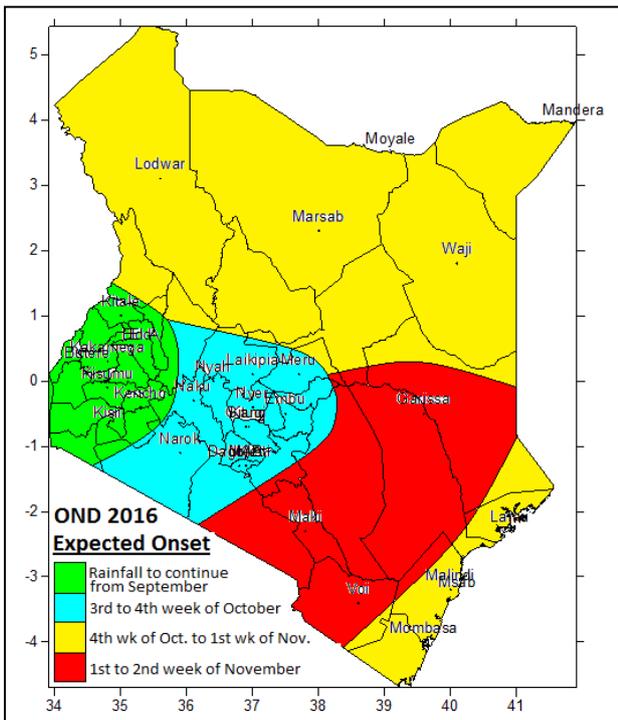


FIGURE 4A: EXPECTED OND 2016 ONSET DATES

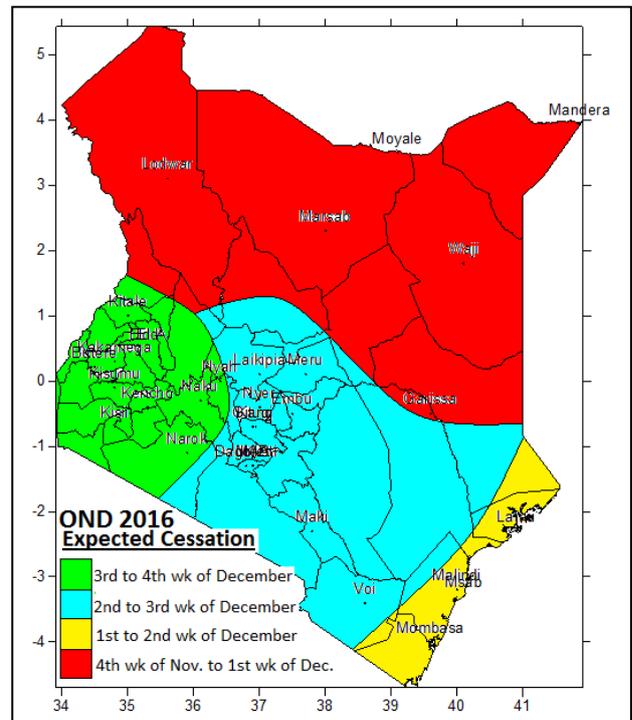


FIGURE 4B: EXPECTED OND 2016 CESSATION DATES