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Caribbean Agro-Meteorological Initiative
Enhancing Farming through Weather and Climate Information

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ANNOUNCEMENTS

Most of the Caribbean would highly likely experience drought relief by the end of May/June 2016 as rainfall increases, better supporting farming activities. However, until then farmers should continue to conserve water and apply the relevant techniques to preserve soil moisture and maximise any available irrigation water; until then, higher than normal temperatures are also likely to accompany the dry conditions. Attention should also be paid to the likely below normal conditions in the July to September period, raising the possibility of water-stressing dry spells during this time.

REGIONAL OVERVIEW ON WEATHER AND CLIMATE FOR MARCH 2016

Rainfall was mixed in the eastern Caribbean islands for the month. Trinidad was moderately dry; Tobago, Barbados, St. Vincent and Antigua normal; Grenada slightly dry; St. Lucia wet; and Dominica very wet. Conditions in Guyana ranged from normal in the north to severely dry in southern areas. Conditions in Jamaica ranged from moderately dry in the west to normal in the east, while in Belize they ranged from moderately dry in the south to normal in the north.

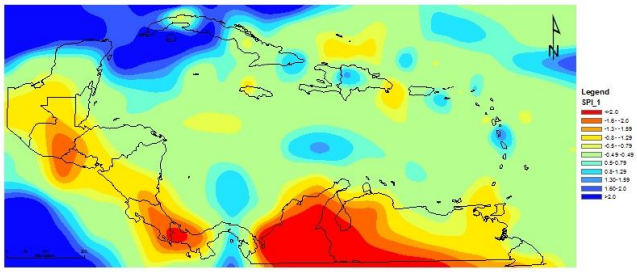

Figure 1. SPI for the Caribbean for March 2016. More information on the SPI can be viewed at http://rcc.cimh.edu.bb/climate-monitoring/spi-monitor/.

For the three month period, normal to below normal rainfall was experienced in the eastern Caribbean and Guyana. Trinidad was severe to extremely dry; Tobago and St. Lucia normal; Grenada extremely dry; Barbados slightly dry; St. Vincent and Antigua moderately dry; Dominica very wet; and Guyana from normal in the north to extremely dry further south. Conditions in Jamaica were normal, while in Belize they ranged from extremely dry in the south to normal in the north.

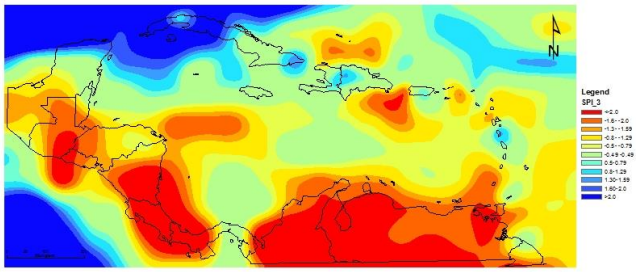

Figure 2. SPI for the Caribbean for January to March 2016. More information on the SPI can be viewed at http://rcc.cimh.edu.bb/climate-monitoring/spi-monitor/.

The Atlantic High Pressure system was the dominant feature over the Caribbean in March. Occasionally weak troughs contributed to rainfall.

Higher than average temperatures were experienced in parts of the Caribbean, particularly where drier conditions were experienced.

NATIONAL OVERVIEWS

Antigua and Barbuda

High night-time temperatures continue across Antigua, relative to this time of the year. At the V. C. Bird international Airport (VCBIA), the mean daily minimum temperature of 23.2 °C, was above normal and the eighth highest on record (1969-2016) for March. March 1996, 1993, 1978 and 1971 had similar mean minimums. Consistent with the high night-time temperatures, the month had six warm nights – two more than the long-term-average at the VCBIA. Overall, the mean daily temperature at the VCBIA for March was near normal – 25.7 °C. However, it is the warmest mean temperature for March since 2010.

Near normal rainfall for March has resulted in the drought easing to moderate levels. The island-average rainfall for the month was 47.0 mm, wetter than the March of 2014 and 2015 combined, and wetter than 10 of the last 14 months. The number of wet days (days with at least one mm) and heavy rainfall days (days with at least 10 mm) recorded at the VCBIA were above normal and near normal respectively.

Around 90% of potable water continues to come from desalination; the rest is from aquifers. The country remains out of surface water, which normally contributes 30%.

The Ministry of Agriculture has announced that land preparation activities have been completed, with farmers now awaiting farmer-friendly-showers, so as to proceed with their planting campaign. Notwithstanding, a few farmers have moved ahead with seeding crops. In adapting to the protracted dryness, farmers are planting drought-tolerant crops such as sweet potatoes and pumpkins. Additionally, they are seeding new varieties of tomatoes and sweet peppers that can withstand heat-stress.

The livestock division has indicated that feed for animals is available, however, water to maintain herds remains insufficient.

Belize

Only one cold front crossed the country in March; while rainfall was above normal at some stations in the south and one in the northwest.

The first two days of the month were mainly fair with only isolated showers. On the 3rd, skies became cloudy and a few showers affected inland areas during the day. Tower Hill and Melinda recorded just under 25mm of rain for that day. During the next day, Pomona received almost 75mm of rain, with all other stations well under 25mm. A few periods of light rain continued on the 5th, along with an isolated thunderstorm in the Belize City area in the afternoon. The rain gauge at St Johns College recorded just over 25mm of rain, while Baldi Beacon had about 12mm more. On the 6th, conditions continued to be relatively moist and a few showers affected mostly southern districts, with Punta Gorda getting about two and a half inches of rain. The rains spread to most areas the next day, though not as intense, and decreased by that evening.

On the 12th, isolated thunderstorms over the extreme southwest were experienced. However, dry conditions persisted from the 13th-19th, with conditions gradually warming up. An approaching cold front induced cloudy skies along with isolated showers and thunderstorms on the 20th, then produced some light rain along with strong gusty northerly winds as it crossed during the next day. Baldi Beacon reported over 50mm of rain for the 20th, while Middlesex had over 38mm of rain. Skies remained cloudy on the 22nd, with a few light showers/rain over the south and west, and only isolated showers/rain the next day as the front dissipated over our area. Moisture decreased further on the 24th, resulting in seasonally fair and warm weather to the end of the month.

Dominica

Normal to moderately wet conditions were experienced in Dominica for March 2016.

Canefield Aiport recorded its second wettest March on record (from 1982). A total of 116.4mm of rainfall was recorded and this total is 60.4mm above the 66th percentile. The highest daily rainfall total of 20.0mm was recorded on the 12th. There were 20 rainfall days, 10 above the average. There were no

significant dry spells. The average air temperature was 26.8°C (about average). The highest temperature recorded was 32.0°C on the 17th and the lowest 20.0°C on the 12th. The average wind direction was southerly at 9km/hr. Gusty winds were recorded during the latter half of the month. The highest gust of 59km/hr, recorded on the 10th during the passage of a dissipating frontal boundary.

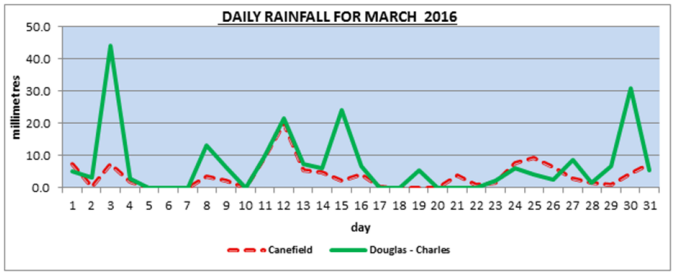

Figure 3 Daily rainfall at Canefield and Douglas-Charles Airports, Dominica during March 2016.

Above normal rainfall was also recorded at the Douglas-Charles Airport. A total of 224.1mm was recorded and that is 93.8mm above the 66th percentile. The highest daily total of 44.0mm was recorded on the 3rd. There were 22 rainfall days - 7 days above normal. There were no significant dry spells. The average air temperature was 26.3°C (slightly below average). The highest temperature recorded was 29.8°C on the 20th and the lowest was 20.0°C recorded on the 8th. The average wind direction was easterly at 17km/hr. Gusty winds were also recorded throughout the month. The highest wind gust recorded was 61km/hr on the 27th.

Vegetable production saw a slight increase for the past months. Farmers of root crops, banana and plantain also took advantage of the weather and production of these crops is on the increase. Tree and fruit crops production have been low for the period. Irish potato farmers have started harvesting their crops. There were different reviews on the performance of the crop. Some farmers have expressed their disappointment in the poor performance of the crop, the problems of pests and diseases, the low yields, die back of plants and different varietal characteristic of the crop. Other farmers expressed delight by the yield stating that, the sizes of potatoes were good. There was a strong incidence of wind during the month, which caused damage to young flowers and leaves of plants.

Guyana

Guyana experienced below normal rainfall during March, with a monthly average of 70.3mm with 6 rain days. Figure 4 shows that only three of the selected stations recorded rainfall totals above their long-term averages; Port Kaituma, Whim and Onderneeming. Comparing the regions, the highest rainfall total was recorded in Region 6 with an average of 80mm with 4 rain days

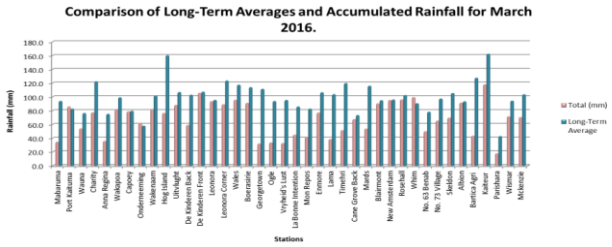

Figure 4. March 2016 rainfall compared with the long term averages at select stations in Guyana.

For the month of March, the highest mean maximum temperature of 34.8^{0}C was recorded at Lethem in Region 9, while the lowest mean maximum temperature was recorded at Kaieteur with a total of 28.4^{0}C. New Amsterdam, Region 5, recorded the highest mean minimum temperature of 24.5^{0}C, whereas the lowest average minimum temperature was recorded at Lethem with a value of 23.7^{0}C.

Dry conditions were experienced for the month of March 2016 in most regions of Guyana. The issue of insufficient water for irrigation purposes continues to be a problem due to below normal rainfall recorded in most areas. Farming communities throughout Guyana are being affected by the prolonged dry spell. On a recent visit to Region 9, it has been revealed that the region has seen a decrease in agricultural production as most water sources (wells, creeks, rivers etc.,) within the region currently range between dry and extremely low. Crops are reported to be suffering from water stress. The livestock sector of the region has been exposed to a massive deterioration of pasture and range conditions, and the cattle industry has lost a great amount of cattle to dehydration and starvation. Further, farmers within the Essequibo area are in distress as crops are continually being affected by saline intrusion, and as a direct result there has been a drop in crop production and failure.

Figure 5 In Guyana, (left) A dry lake in the Manari area, Region 9 and (right) Flash fire witnessed about 25 miles into the trail en route to Region 9.

Jamaica

During the month, Sangster in the northwest recorded 5.4mm of rainfall, while Norman Manley in the southeast recorded 19.3mm. Sangster received only 10% of its 30-year mean rainfall. There were two (2) rainfall days reported for both Sangster Airport and Manley Airport.

The highest maximum temperature recorded for Norman Manley Airport was 33.1°C (26th March) meanwhile Sangster Airport reported 33.9°C (25th March).

Table 1 Rainfall Statistics for Manley and Sangster Airports, Jamaica, for December 2015.

Monthly Averages	Norman Manley	Sangster
Extreme Maximum Temperature	33.1°C (32.7 °C)	33.9°C (32.5 °C)
Lowest Minimum Temperature	22.6°C (21.1 °C)	21.0°C (20.1 °C)
Rainfall Total	19.3mm (24 mm)	5.4mm (53 mm)
Rainfall days (≥1mm)	2 days (4.5)	2 days (10.5)

Values in red indicate the 1992-2011 (20–year) averages.
Values in orange represent 1971-2000 (30-year) mean.

St. Lucia

Saint Lucia experienced average to above average rainfall for the month of March. At Hewanorra Airport, the rainfall amount was 98.9 mm which is the sixth wettest March over the last 44 years (1973-2016). At George Charles Airport, the rainfall was slightly below average with a total of 64.0mm, which is only 12% short of the expected amount for this time of year. There were 19 rainy days at Hewanorra and at GFL Charles 14 rainy days. Only one short dry spell was observed at Hewanorra lasting only 3 days in the middle of the month and at GFL Charles there were 3 dry spells, with the longest one lasting 5 days.

Historically in April, precipitation totals begin to slowly increase after the peak of the dry season (February-March). The mean rainfall for April at Hewanorra is 78.2 mm and 91.7 mm for GFL Charles Airport. The seasonal precipitation outlook for the April, May & June (AMJ) period indicate the greatest likelihood for rainfall to be above normal, or to range from 304 mm to 670 mm at Hewanorra and from 452 mm to 920 mm at George Charles.

Table 2 March 2016 monthly averages at Hewanorra Airport, St. Lucia.

Cloud Cover (oktas)	Wind Dir (o from N)	Wind Speed (kt)	Air Temp. (°C)	Rainfall Mean (mm)	Rainfall Total (mm)
4	90	14	26.9	57.0	98.9
RH (%)	Max Temp (°C)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)
75	30.0	24.3	9.1	7.8	26.6

Table 3 March 2016 monthly averages at George Charles Airport, St. Lucia.

Cloud Cover (oktas)	Wind Dir (o from N)	Wind Speed (kt)	Air Temp. (°C)	Rainfall Mean (mm)	Rainfall Total (mm)
4	90	8	27.4	72.5	64.0
RH (%)	Max Temp (°C)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)
72	30.3	23.4			

St. Vincent and the Grenadines

Total rainfall at the E.T. Joshua Airport was 86.7mm, 3.9mm higher than the thirty year average (1981-2010) with the highest daily rainfall being recorded as 20.1mm on the 16th. Thunderstorms were reported in the Stubbs area, (South Windward part of the island) on the 29th. There were sixteen days with rainfall less than 1mm.

Hazy and breezy conditions were also experienced across the islands. Strong winds pushed across the area agitating seas to moderate to rough in open

waters. Maximum gusts in the Arnos Vale area were recorded on the 28th as 57km/hr.

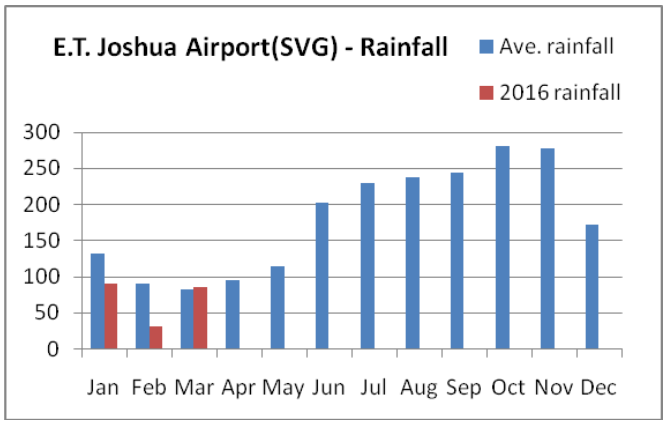

Figure 6 Average monthly rainfall, along with the 2016 January to March rainfall totals at E. T. Joshua Airport St. Vincent and the Grenadines.

The highest 24-hour day rainfall was 20.1mm, which was approximately 23% of total rainfall. The first dekad (ten-day period) had 11.7% of the total rainfall; the second 34.4% and the third 53.9%l. There were 15 days with rainfall ≥ 1mm, this was equal to the average for this station and there were 4 consecutive days with < 1mm.

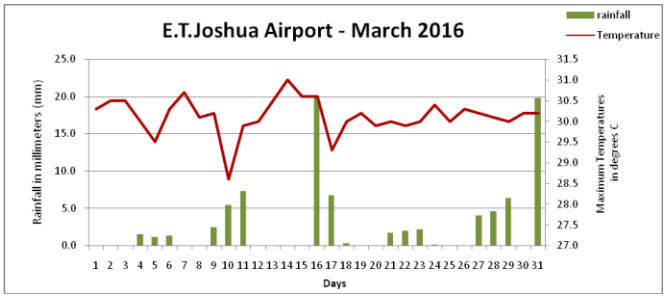

Figure 7 Daily rainfall and minimum temperature for March 2016 at E. T, Joshua St. Vincent.

The average maximum temperature recorded at this station was 31.0°C, and the average minimum temperature was 22.4°C. Mean relative humidity was 70.0%, 3.1 % lower than the 30 year average.

Trinidad and Tobago

Rainfall total for March 2016 at Piarco, Trinidad was 8.4mm or 26.7% of the 1981-2010 average. At Crown Point, Tobago, the rainfall total was 28.4mm or 77.0% of the 1981-2010 average.

Following on from a dry end to February, hot and dry weather continued to be of concern to rain-fed agricultural farmers and livestock owners, as the first ten days of March brought little or no relief with scanty rainfall and very high temperatures observed in Trinidad and Tobago. Even though Tobago enjoyed more favourable conditions, dry weather still dominated the island overall. Of the ten days, only the 6th produced any significant rainfall, with 2.1mm measured at Piarco, which was also the ten-day total. Rainfall amounts were similar in other locations, remaining below 10.0mm during the dekad. Welcomed rainfall occurred in Tobago on four of the ten days, with the 6th and 9th producing satisfactory rainfall for agriculture, with 5.0mm and 4.0mm respectively measured at Crown Point, accounting for ten-day rainfall totals near 10.0mm across the island. Maximum temperatures for the dekad peaked at 34.5^{0}C at Piarco and 30.2^{0}C at Crown Point.

During the second ten days of March, hot dry weather continued to dominate conditions across Trinidad and Tobago. At Piarco, no measurable rainfall was recorded during the period while a meager 2.0mm was recorded at Crown Point. The temperatures were the highest and driest for the year so far, as the ten-day maximum temperatures averaged 34.2^{0}C and climbed to a high of 35.5^{0}C in Trinidad. In Tobago, maximum temperatures averaged 30.5^{0}C and peaked at 31.5^{0}C during the period.

Very hot and dry conditions continued throughout the last dekad, accompanied by moderate to strong winds and low relative humidity. At both Piarco and Crown Point, no measurable rainfall was observed during the period with eight of the ten days having their lowest relative humidity values being less than 50% and as low as 32% on the 25th. At the same time, seven of the ten days had maximum temperatures above 34.0^{0}C in Trinidad and five of the ten days above 31.0^{0}C in Tobago. These conditions resulted in high pan evaporation rates, which tend to correlate with high water loss from crops.

The very hot conditions and lack of rainfall meant top soil in crop root zone would have been hotter than usual, and when taken together with the windy conditions and low humidity values, there would have been significant increase in the water needs of crops, especially in more mature crops. These

conditions also meant that top soil moisture content, ponds and rain-harvesting container water levels would have decreased. Heat and water stress would have affected young and newly planted seedlings and crops in critical stages of development, in the absence of sufficient watering.

REGIONAL OVERVIEW ON SEASONAL CLIMATE FORECASTS

The **El Niño has weakened to** border-line strong. Sea-Surface Temperatures (SSTs) are 1.5 °C above average in equatorial eastern Pacific. The El Niño event is highly likely to last throughout the dry season, i.e. at least until May/June 2016, and then become neutral, with some chance of converting to La Niña later in the year. The El Niño is expected to continue to limit rainfall in the eastern Caribbean and the Guianas, at least until April/May 2016. For the longer term, any shift to a La Niña later is likely to enhance rainfall activity.

Caribbean Sea Surface Temperatures (SST) are currently about 0-1°C above-average in the vicinity of the Caribbean. **Trade and upper level winds** speeds are stronger than average. SST anomalies are expected to increase towards the east; but the strength of trade winds are hardly predictable. High SST anomalies are linked with enhanced rainfall, but strong upper level winds would be expected to reduce convective cloud development.

April to September 2016

For the period April to June, normal to above normal rainfall is expected over most of the Caribbean, except for Cuba and Jamaica where there is much uncertainty. The highest certainty for above normal rainfall is over the Windward Islands. It is expected that most of the abnormality in rainfall will occur over the latter part of the three month period, likely accompanied by more intense rainfall events than normal, particularly in the southern portion of the eastern Caribbean. However, rainfall for the period July to September is expected to be normal to below normal over the eastern Caribbean, Puerto Rico, southern Hispaniola and Belize. The northwest Caribbean in the vicinity of The Bahamas and Cuba are expected to be normal to above normal as was the trend in recent months. There is greater uncertainty over the Guianas and the remaining islands.

Concern over drought is expected to abate for most of the Caribbean by the end of June 2016. Exceptions to this include the southern Caribbean (Trinidad and Tobago and the ABC Islands), Antigua, the Guianas and western Belize. Drought watches are still recommended for these countries except the ABC Islands where drought impacts are expected to continue.

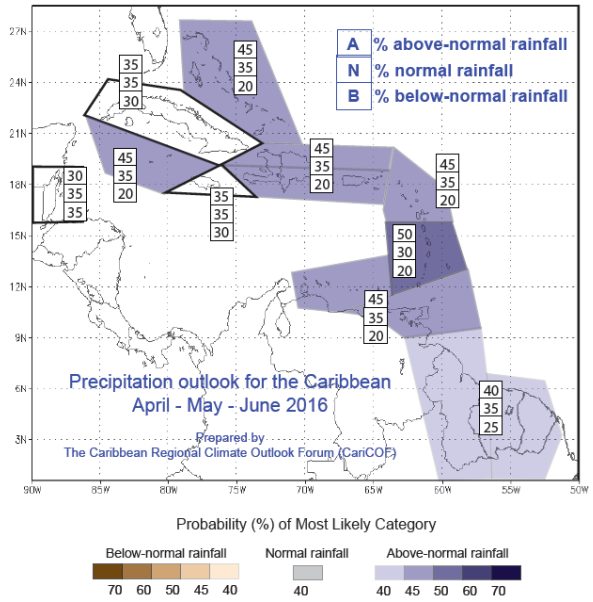

Figure 8 The April to June 2016 rainfall forecast

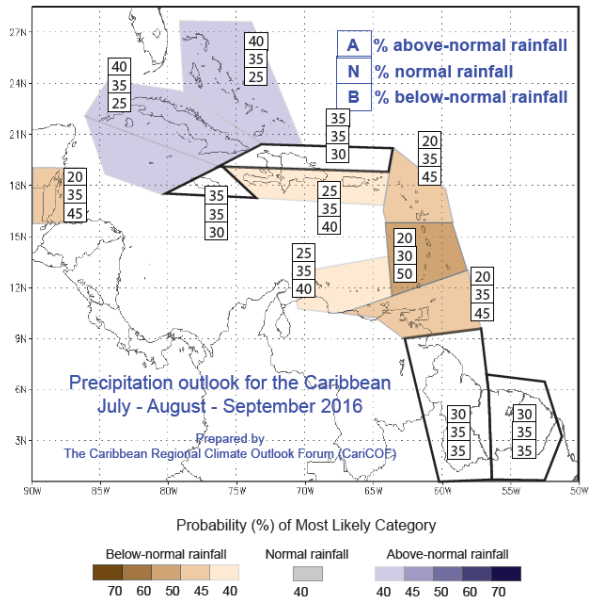

Figure 9 The July to September 2016 rainfall forecast

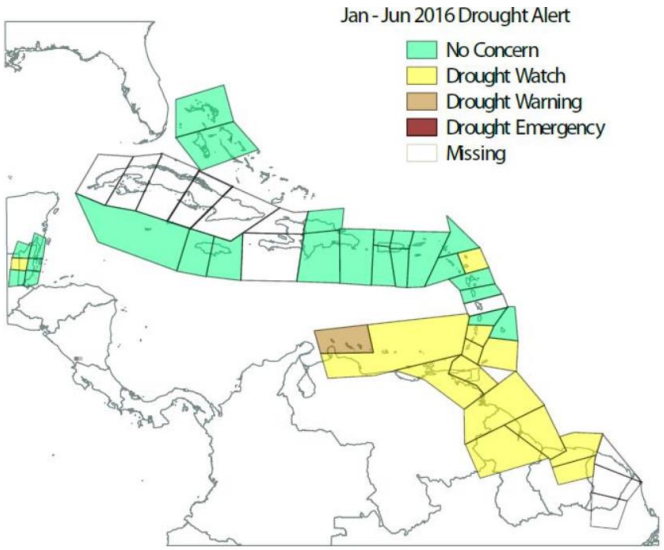

Figure 10 Drought Alert map (based on the SPI forecast) for the end of June 2016, based on actual and forecasted rainfall for the period January to June 2016.

Forecast Implications for Agriculture

Farmers in the eastern Caribbean, including the Guianas should continue to plan for below normal rainfall until the end of April, and into May. These conditions are quite likely to be accompanied by higher than normal temperatures, enhancing evaporative loss and low water availability. This would make irrigation necessary at least until April 2016, if not into May, as the rains are highly unlikely to satisfy crop demand. In cases where there is some irrigation, farmers would have to decide on the area to be farmed, such that the more limiting water can satisfy some cropping. Rainwater Harvesting and storage of water, where feasible, would enhance irrigation supplies. Other soil water conservation methods such as mulching and flat beds (instead of raised ones) would help in such conditions. It is however increasingly possible that rainfall would begin to increase to satisfactory levels into May. This is particularly so in most of the northern islands. Certainly, planting for rainfed farmers would then be recommended, noting that as the region enters the wet season, flood impacts may well increase as the season progresses.

Apart from Belize that is likely to experience drought impacts into April/May, the western Caribbean should have very little impacts due to dry conditions, as rainfall levels have been normal to above normal and are expected to continue in this manner into the wet season. The impacts for the wet season in western areas, is likely to be associated with excessive rainfall, and farmers should consider measures for such eventuality.

The likelihood for below normal rainfall in the eastern half of the Caribbean during July to September suggests the possibility for period of plant water stress.

Certainly, if a La Niña does develop later in the wet season, as is increasingly possible, the entire Caribbean may have to brace for an above normal second half to the wet season.

As the wet season approaches farmers will be kept up to date on the seasonal outlooks and implications.

Prepared by
Caribbean Institute for Meteorology and Hydrology (CIMH) and the National Meteorological Services of Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St Lucia, St Vincent and the Grenadines and Trinidad and Tobago
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