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

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ANNOUNCEMENTS

ENSO neutral conditions, or at best a weak La Niña, are likely during the October to December period. Should a La Niña develop, drought would continue to be suppressed, with the possibility for a later than usual start to the 2017 dry season, particularly in the eastern Caribbean. Heat stress, particularly during dry spells, may at times cause concerns over plant, animal and human health as temperatures are highly likely to continue to be normal to above normal. CIMH is set to launch the interactive portal of the Caribbean Society for Agro-Meteorology (CariSAM) at the Caribbean Week of Agriculture in Cayman Islands in late October 2016.

REGIONAL OVERVIEW ON WEATHER AND CLIMATE FOR SEPTEMBER 2016

Normal to above normal rainfall was experienced in the eastern Caribbean and Guyana for the month. Trinidad, Tobago, Grenada and Dominica, were normal; Barbados very wet; St. Vincent and Antigua moderately wet; St. Lucia extremely wet; and Guyana ranging from normal in the north west to exceptionally wet in the east. Central Jamaica was moderately dry becoming normal to the east and moderately wet to the west. Conditions in Belize ranged from normal in the south to moderately dry further north.

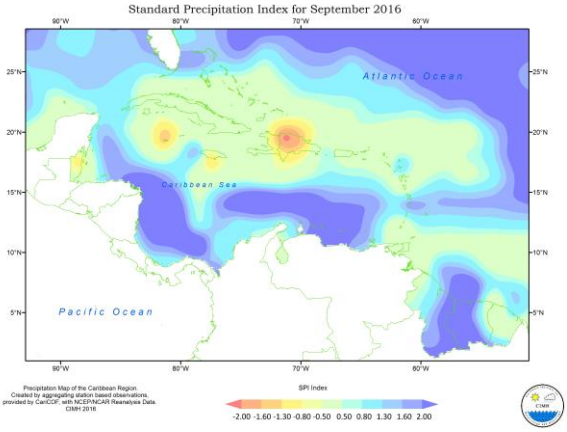

Figure 1. SPI for the Caribbean for September 2016. More information on the SPI can be viewed at http://rcc.cimh.edu.bb/climate-monitoring/spi-monitor/.

Most annual cropping takes place over a period of about three months. For the three month period, mixed conditions were experienced in the islands of the eastern Caribbean. Trinidad was slight to moderately dry; Tobago extremely dry; Grenada, Barbados and St Vincent normal; St. Lucia and Dominica slightly dry; and Antigua moderately wet. Conditions in Guyana ranged from normal to exceptionally wet. Jamaica was predominantly normal, but conditions in Belize ranged from normal in the south to moderately dry further north.

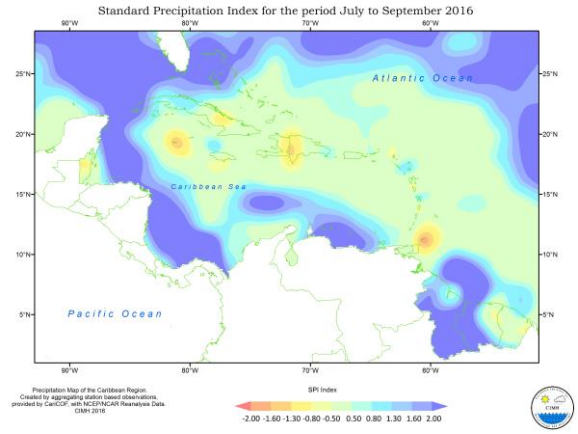

Figure 2. SPI for the Caribbean for July to September 2016. More information on the SPI can be viewed at http://rcc.cimh.edu.bb/climate-monitoring/spi-monitor/.

Tropical waves and Upper Level Troughs contributed to shower activity during September. There were five named tropical cyclones in the Atlantic basin during September, including Matthew.

The Bermuda Azores High peaked at 1035mb during the month of September.

NATIONAL OVERVIEWS

Barbados

There were several significant rainfall events during September with the first five days producing 65mm of rainfall at Charnocks, Christ Church (the new office location of the Barbados Meteorological Services) due to a tropical wave. This is similar to the total amount that was produced during the entire month of August 2016. Another 50mm was recorded between the 20th and 22nd as another tropical wave traversed the area. The most significant rainfall amount resulted with the passage of Tropical Storm Matthew between the 27th and 29th of the month when 68.2mm of rainfall was observed. The September rainfall total of 236mm occurred over a period of 15 rain-days (rain day ≥1.0 mm). This figure was 50% above the (1981-2010) average of 157.6mm, while the cumulative total of 735mm for the year up to the end of September was 89% of the long- term cumulative average of 826mm. Rainfall totals across the rest of the country ranged from 193.6mm at Retreat in St. Lucy to 328.9mm at Lears in St. Michael.

There was only one day on which the daily maximum temperature was less than the long-term average of 31°C. On all other occasions, the maximum temperature varied between 31.2°C and 32.7°C and on fifteen of these days, the maximum temperature equaled or exceeded 32°C. The highest maximum of 32.7°C was observed on the 14th and 15th, while the lowest minimum temperature of 23.0°C was recorded on both the 18th and 19th.

Dominica

Normal rainfall totals were recorded in Dominica for the month. Weak unstable conditions dominated the weather conditions in September. Tropical Storm Matthew affected the island on the 28th to 29th. Total accumulated rainfall associated with Mathew was 109.2mm at Canefield and 47.5mm at the Douglas – Charles Airport.

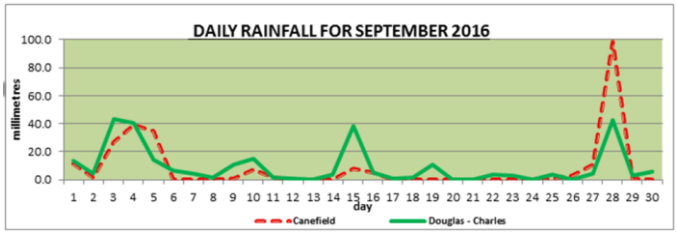

Figure 3 Daily rainfall at Canefield and Douglas-Charles Airports, Dominica during September 2016.

Canefield Airport recorded 248.9mm of rainfall, which represents 98% of the 30year average. Tropical Storm Matthew contributed to the month's highest 24 hour total of 98.6mm on the 28th. There were 12 rainfall days (5 days less than average). There was a 9-day dry spell during the second half of the month. The average air temperature was 29.1°C (near average). The highest temperature recorded was 34.4°C on the 27th and the lowest 22.5°C on the 7th. The average wind direction was south south east at 7km/h. Tropical Storm Matthew generated the highest gust of 93km/h on the 28th.

Douglas-Charles Airport recorded 280.1mm of rainfall, which is 88% of the 30year average. Overnight showers on the 3rd due to the passage of a tropical wave resulted in the month's highest 24 hour total of 43.0mm. There were 23 rainfall days (3 days above average). The average air temperature was 27.5°C (below average). The highest temperature recorded was 32.3°C on the 22nd and the lowest 22.4°C on the 4th. The average wind direction was east south east at 13km/h. The highest gust of 89km/h was recorded during the passage of a tropical wave on the 4th. The maximum gust generated by Tropical Storm Matthew was 85km/h.

While weather conditions favoured the growth of pasture and forages, it was also conducive for an increase in the infestation of gastro-intestinal nematodes in small ruminants like sheep and goats. Poultry and pork showed no significant impacts in their production. Plant health reports showed an increased incidence of fungal disease *(PowderyMildew, Cercospora Leafspot, and DownyMildew)* in vegetables. There was also an increase in the aphid, thrips and mite populations affecting crops. Surges and hot spots in the incidence of Black Sigatoka infestation were also evident. Crops established during the period include root crops (dasheen, sweet potato, tannias), vegetables and tree crops. Producers

experienced soil erosion, small landslides and crop damage, particularly of bananas and plantains due to high rainfall intensity with long durations along with extreme wind events.

Grenada

A total of 85.9mm of rainfall was collected for September, which was only 64.1% of the 30-year average of 134.0mm. A tropical wave on the 13th produced a 24-hour rainfall amount of 11.5mm, while on the 27th, 28th and 29th, what eventually became Matthew produced rainfall amounts of 17.3mm, 14.3mm and 11.6mm respectively. There were five (5) days with a trace of rainfall and eight (8) days without rain.

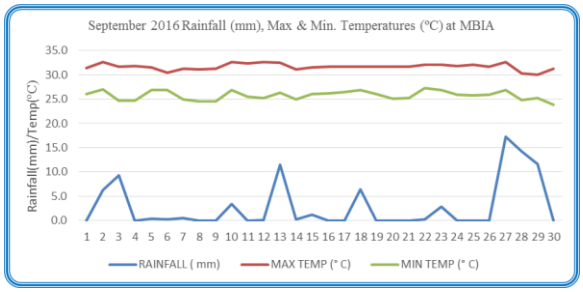

Figure 4 September 2016 daily rainfall, as well as daily maximum and minimum temperature at Maurice Bishop International Airport.

Although 43.2mm of rainfall was measured at the Airport during the passage of Matthew, most of the rainfall took place in the northern half of the mainland especially on the western side. This resulted in landslides along the coast causing damage to property.

Mean daily temperatures for the month were 0.1ºC lower than September 2015, reaching a mean of 28.7ºC, while the mean maximum and minimum temperatures were 31.6ºC and 25.8ºC respectively. The highest maximum temperature was 32.6ºC recorded on the 2nd, 10th, 12th and 27th compared with 33.0ºC for 2015 and an average of 32.5ºC. The lowest minimum temperature of 23.8ºC was recorded on the 30th compared with 23.7 ºC for 2015 and an average of 22.9ºC.

Wind speeds of 18.5 to 27.8km/h were generated for most of the month, and were from the east southeast most of the time. There were a few calm spells and a gust of 74km/h was recorded at 11:00am on the 29th.

Marine advisories were issued during the month, especially from the 26th – 30th when the seas were affected by what eventually became Matthew. Fishing was at a low level during the month and fishermen only had limited catches in yellow fin tuna, lobsters and some reef fish especially on the east coast.

Even though rainfall amounts fell by some 35.9% when compared with the 30-year average, the farming community still had reasonable crop production of pumpkins, pac choi, butternut squash and seasoning peppers.

Guyana

Guyana was moderately dry for the month, with an average rainfall of 127.8mm across the country over, on average, 9 rain days. The highest monthly rainfall total was recorded at Soesdyke Forestry station, Region 4 which recorded 339.6mm over 14 rain days, while the lowest monthly rainfall total was recorded at Bush Lot, Region 5 with a total of 8.4mm of rainfall with 2 rain days. The highest 24 hour rainfall was recorded at Capoey Compound, Region 2 with 121.9mm on the 7th. Most of the stations recorded near normal rainfall, but stations in Regions 2, 3, 7 and 10 recorded above average rainfalls.

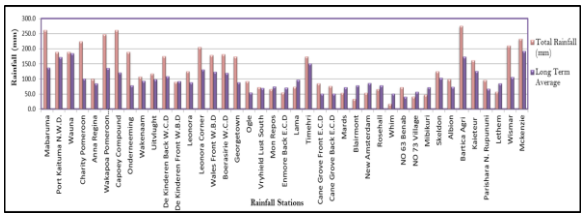

Figure 5 Rainfall totals for September 2016 compared with September averages at select stations in Guyana.

The highest 24 hour temperature was recorded at Lethem, Region 9 with a total of 35.5°C on the 24th, and 26th-29th. Lethem also would have experienced the hottest week so far for the year, with temperatures above 35°C for (9) consecutive days from the 20th, and 22nd-29th. Lethem also recorded the highest mean maximum temperature of 33.8°C. The highest mean minimum temperature was recorded at Timehri, Region 4 with a value of 29°C. Ogle, in Region 4, recorded the highest minimum temperature of 26.2°C on the 29th.

Georgetown recorded the highest average daily evapotranspiration of 3.9mm along with the highest 24 hour evapotranspiration of 4.7mm on the 22nd. Lethem recorded the lowest daily average evapotranspiration of 2.2mm and the lowest 24 hour evapotranspiration of 0.2 mm the 13th.

St. Lucia

The rainfall totals for September at both Hewanorra and GFL Charles were significantly above normal and this was largely due to the passage of the Tropical Storm Matthew. At Hewanorra Airport, the monthly rainfall total was 423.0mm, which is more than twice the average rainfall for this location. The month's rainfall at GFL Charles was 89.2mm above the average, with a total of 306.3mm. There were 15 rainy days with 3 dry spells at Hewanorra and at GFL Charles there were 19 rainy days with only one dry spell.

October is the wettest month in Saint Lucia. The mean rainfall for October is 210.9mm and 256.1mm for Hewanorra and GFL Charles respectively. Rainfall at this time of the year is mainly due to tropical waves and isolated convective activity.

Table 1 September 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)
5	90	11	28.7	187.3	423.0
RH (%)	Max Temp (°C)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)
80	31.8	26.1	8.5	7.5	28.5

Table 2 September 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)
5	90	6	29.0	217.1	306.3
RH (%)	Max Temp (°C)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)
78	31.6	24.6			

The extended precipitation outlook favours wetter than conditions in the early months of 2017 (January, February & March (JFM)). Rainfall in the Vieux-Fort area could range from 212 mm to 410 mm and in the Castries area to range from 282 mm to 641 mm.

Above normal maximum and minimum temperatures continued during the month of September in Saint Lucia. The highest daily maximum temperature for Hewanorra was recorded during this month with a high of 33.5°C.

There is no concern with regard to drought. However, due to the significantly above normal precipitation in September, the soil moisture content could be relatively high. Farmers should continue to take the necessary measures to reduce the chances of flooding as the country enters the wettest month of the year.

St. Vincent and the Grenadines

Rainfall in September was below average, until the 28th & 29th of the month when Tropical Storm Matthew affected the islands. Total recorded rainfall for those two days was 159mm and accounted for approximately 49 percent of the total recorded monthly rainfall at the E.T Joshua station. In addition, earlier in the month, shower activity and periods of rain resulted in flooding and landslides in both the Leeward and Windward areas of the country. Thunderstorms were reported on a few occasions. The highest September rainfall of 598mm was in the Dallaway area located in the leeward part of the island. The highest wind gust recorded at the E.T. Joshua Airport – Arnos Vale was 61km/h on the 28th. Sea swells were light to moderate in open waters. Advisories were issued for rough seas during the passing of Matthew

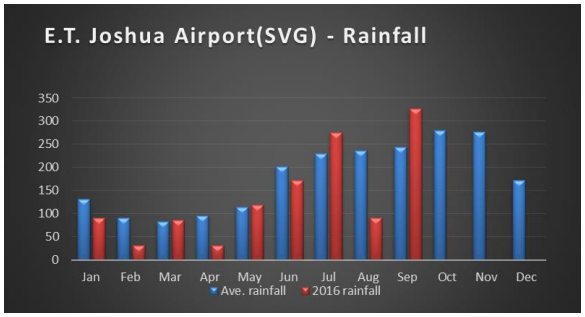

Figure 6 Average monthly rainfall compared with the January to September 2016 rainfall totals at E. T. Joshua Airport St. Vincent and the Grenadines.

On average, September receives 243.9mm of rainfall. Rainfall totals at the E. T. Joshua Airport for this

September was 326.5mm. There were 22 rain-days; with the highest 24 hour rainfall (149.2mm) being recorded on the 28th. There were 8 days with rainfall < 1mm. The first dekad (ten-day period) had ~25.0% of the rainfall, the second dekad 12.5%, and the third 62.5%.

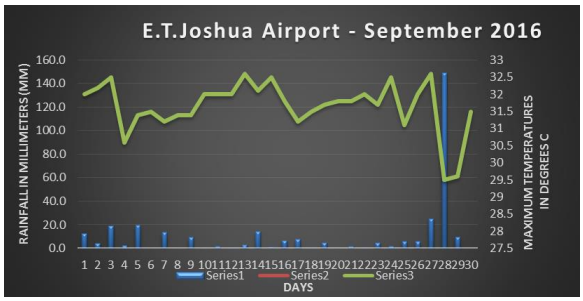

Figure 7 Daily rainfall and minimum temperature for September 2016 at E. T, Joshua St. Vincent.

The average maximum temperature was 31.8°C, and the average minimum temperature was 26.1°C. The extreme maximum temperature recorded was 32.6°C, 0.3 °C higher than the 30-year average. The extreme minimum was 23.0 °C, 0.3°C higher than the 30-year average. The mean relative humidity was 77%.

Trinidad and Tobago

September's rainfall total at Piarco, Trinidad was 158.4mm or 84.0% of the 1981-2010 average. At Crown Point, Tobago, the rainfall total was 152.0mm or 97.6% of the 1981-2010 average.

In the first ten days in Trinidad, wet conditions dominated most areas, with measurable rainfall recorded on all but one day of the period. At Piarco, the two wettest days (3rd and 6th) produced 24.9mm and 28.9mm respectively. The heavy rainfall resulted in flooding in parts of northwest and southwest Trinidad. The ten-day rainfall total at Piarco amounted to 79.6mm. In Tobago, eight of the 10 days produced measurable rainfall. The wettest 24 hour period was on the 3rd with 24.1mm, followed by 16.1mm on the 4th at Crown Point. The ten-day rainfall totaled 51.4mm. Daily maximum temperatures climbed above 33.0 °C on eight days in Trinidad. Temperature averaged 33.5°C during the dekad and peaked at 34.8 °C at Piarco. In Tobago, maximum temperatures averaged 31.6°C, climbed above 31.5°C on six days, and peaked at 33.2°C. At the same time, nights remained much cooler at Piarco, with minimum temperatures dipping below 24.5°C on seven of the ten nights while averaging 24.4°C. At Crown Point warmer nights persisted as minimum temperatures remained above 25.5 °C on seven nights to average 25.9 °C.

During the second ten day period, following more limited rainfall than in the previous period, heavy rainfall was experienced in most areas of Trinidad on the 18th with 15.3 mm of rain recorded at Piarco. Ten-day rainfall totals reached 28.1mm and 22.4mm at Crown Point and Piarco respectively. Hot conditions accompanying the drier weather also prevailed with maximum temperatures rising above 33.0°C on all but two days in Trinidad to peak at 34.4°C, while in Tobago temperatures averaged 31.9°C and peaked at 32.8°C. In Tobago, minimum temperature remained above 25.5°C on all nights. In contrast, nights were cooler in Trinidad, where minimum temperatures remained below 24.5°C on most nights.

The last ten days of September produced beneficial rainfall for agriculture in both Trinidad and Tobago. Rainfall on the 21st, 23rd and 25th accounted for 17.5 mm at Piarco before hot and dry conditions dominated over the 26th and 27th. Moderate rainfall on the 28th and heavy rainfall on the 29th associated with tropical Storm Matthew produced 26.2mm of rain at Piarco over 24 hours. Ten-day rainfall total was 56.4mm at Piarco. With little or no rainfall after the first four days in Tobago, moderate to heavy rainfall was experienced over the last six days. The 27th and 28th produced the largest daily amounts with 20.5mm and 43.4mm respectively. Ten-day rainfall totals reached 71.8mm at Crown Point. Maximum temperatures peaked at 35.3°C in Trinidad and at 33.5°C in Tobago, on dry days. Overall, maximum temperatures averaged 33.9°C in Trinidad and 32.1°C in Tobago. Night minimum temperatures in Trinidad remained below 25.0 °C on most nights while minimum temperatures remained above 25.0°C in Tobago.

While conditions in Tobago were mostly beneficial for agriculture, farmlands in Trinidad would have been negatively affected by the floods and saturated soil in some locations.

REGIONAL OVERVIEW ON SEASONAL CLIMATE FORECASTS

The **ENSO** is currently in **neutral phase,** but in recent months, sea-surface temperatures (SSTs) in the equatorial eastern Pacific (NINO3.4) have decreased to 0.5°C below-average, bordering a La Niña. Should a La Niña develop, and this is still very possible, a slight shift towards above- to normal rainfall is possible for much of the Caribbean due to slightly reduced winds in the upper atmosphere, which allows for stronger, local showers to develop. Greater convection and a higher frequency of tropical cyclones may also be more likely. La Niña is also likely to enhance rainfall activity into the 2017 dry season.

Caribbean Sea Surface Temperatures (SST) SSTs are presently 0.5°C above-average within the Caribbean and north Atlantic. These positive anomalies are expected to continue into the early months of 2017 slowly approaching normal. Above average SSTs can result in rainfall increases across the Caribbean.

October 2016 to March 2017

There is great uncertainty in the islands of the eastern Caribbean as to the rainfall during October to December, but October is typically the wettest month of the year in this part of the Caribbean. However in the Greater Antilles and Guyana, normal to above normal rainfall (with greater likelihood of above normal) is more likely in these locations. Normal to below normal rainfall is more likely in the rest of the Guianas.

For the period January to March 2017, the eastern Caribbean, ABC islands and the Guianas are most likely to experience normal to above normal rainfall. Apart from Cuba and The Bahamas that are likely to have normal to below normal rainfall, the uncertainty of rainfall during this period is high in the remainder of the Caribbean.

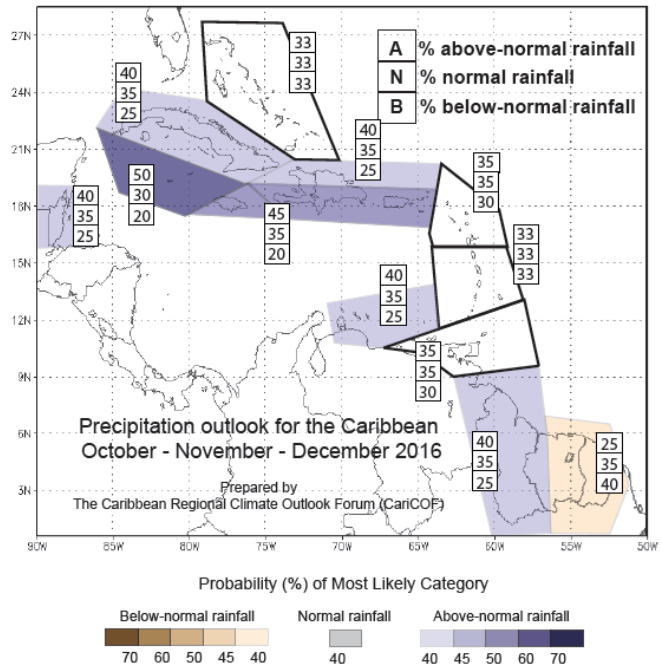

Figure 8 The October to December 2016 rainfall forecast

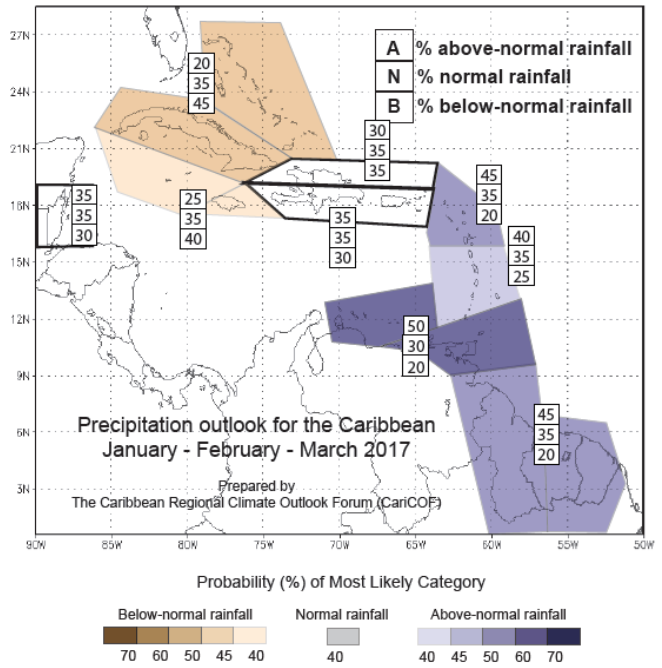

Figure 9 The January to March 2017 rainfall forecast

Apart from in central parts of The Bahamas, there are no concerns over short term drought by end of the year. There are likely to be more wet days and wet spells during the period October to December over most of the Caribbean. There is also likely to be normal to more frequent occurrences of extreme wet spells over most the Caribbean during the three month period.

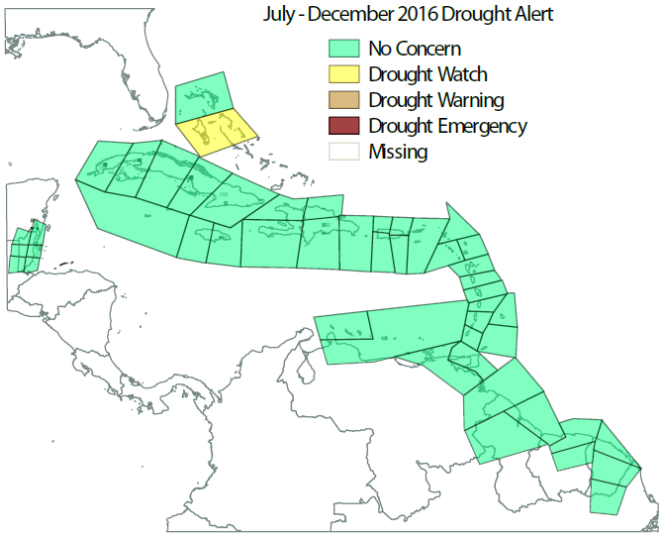

Figure 10 Drought Alert map (based on the SPI) for the end of December 2016, based on actual and forecasted rainfall for the period July to December 2016.

Forecast Implications for Agriculture

Drought concerns continue to be alleviated across the Caribbean during September. The only concern for short term drought (impactful to agriculture) by the end of the calendar year is in central parts of The Bahamas. So rainfed agriculture and irrigation from ponds and streams should not be heavily impacted up until the end of the year. There are some concerns over long term drought in the southern islands of the eastern Caribbean where aquifers and large rivers would still be recuperating from the recent drought. So these sources should be continually monitored over the next two to three months.

It is highly likely that the eastern Caribbean dry season would have a late start, particularly if a La Niña develops, though likely to be weak. In the case of northern Guyana, there should be some concerns over flooding as that region prepares to enter one of its two annual wet seasons.

Temperatures are still likely to be above normal over much of the Caribbean during October to December. During dry spells in particular, heat stress could be a concern for plant, animal and farmer health.

Prepared by
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