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

Volume 16Issue 1 Special Issue 2012

ANNOUNCEMENTS

This issue presents a summary of Caribbean weather and climate for the year 2012. CAMI comes to an end on 9 February 2013 The regional work in agrometeorology continues under the Caribbean Agrometeorological Network. (www.cimh.edu.bb)

A preliminary report from the National Climate Data Center suggests that 2012 was the tenth warmest on record since records began in 1880 (http://www.ncdc.noaa.gov/sotc/global/). The report went further to say that "12 years to date in the 21st century (2001–2012) rank among the 14 warmest in the 133-year period of record". NCDC also reports that following the two wettest years on record (2010 and 2011), the rainfall in 2012 was near normal.

REGIONAL OVERVIEW ON RAINFALL FOR 2012

Over the calendar year, rainfall totals reflected diverse conditions in the eastern Caribbean and Guyana. Trinidad was moderate to very wet; Tobago extremely wet; Grenada, Barbados, St. Vincent, and Antigua normal; St. Lucia abnormally wet; Dominica moderately dry; and Guyana abnormal to moderately wet. Conditions in Jamaica ranged from abnormally dry in the west to abnormally wet in the east. While in Belize they ranged from moderately dry in the south to moderately wet in the north.

For the three month period of January to March 2012, the region of the eastern Caribbean and Guyana was predominantly normal to above normal except for the vicinity of Dominica, itself moderately dry. Trinidad was very wet; Tobago extremely wet; Barbados and St. Vincent moderately wet; St. Lucia and Antigua normal; and Guyana very wet in the west and moderately wet in the east. In Jamaica conditions ranged from moderately dry in the west to abnormally wet in the east, while in Belize the range was from moderately wet in the west to normal in the east.

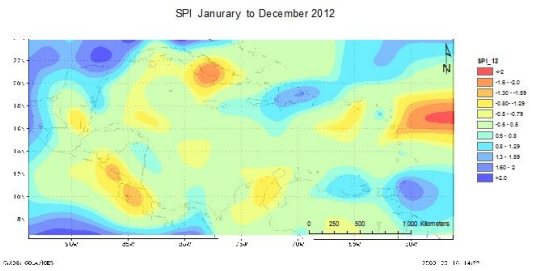


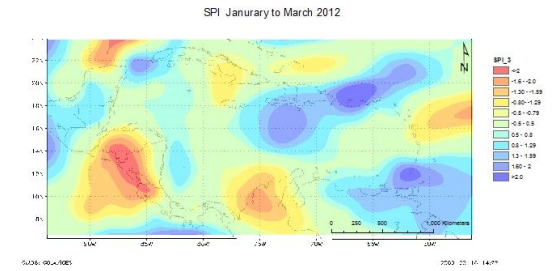
Figure 1. Standardised Precipitation Index (SPI) for the Caribbean for the 12 month period January to December, 2012. More information on the SPI can be viewed at http://63.175.159.26/~cdpmn/spimonitor.html.

For the second quarter of 2012, the eastern Caribbean islands were normal to above normal. Trinidad was extremely wet; Tobago very wet; Barbados moderately wet; and St. Vincent, St. Lucia and Antigua abnormally wet. Conditions in Guyana ranged from moderately wet in the northwest to normal in the east. Conditions in Jamaica ranged from moderately wet in the west to normal in the east, while in Belize the range was from normal in the west to exceptionally wet in the north.

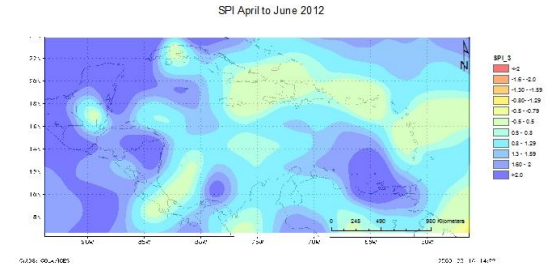
For the period July to September 2011, apart from Barbados that was abnormally wet, the eastern Caribbean and Guyana were normal to below normal for the three month period. Trinidad and Grenada

were moderately dry; Tobago and Dominica abnormally dry; St. Vincent extremely dry; Antigua severely dry; St. Lucia and Guyana normal. Conditions in Jamaica ranged from moderately dry in the west to moderately wet in the east; while those in Belize were extremely dry in the west and exceptionally dry in the east.

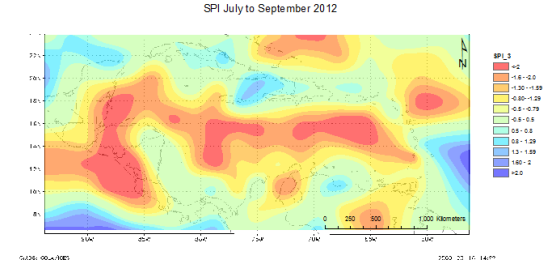
a)



b)



c)



d)

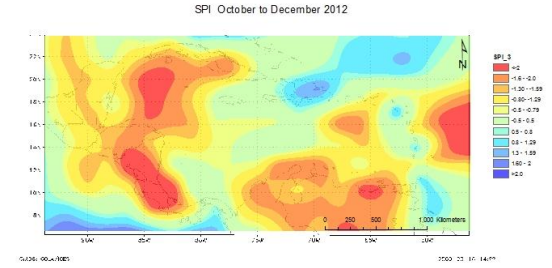


Figure 2. SPI maps for the Caribbean for the four quarters of 2012; a) January to March; b) April to June; c) July to September; and d) October to December. More information on the SPI can be viewed at http://63.175.159.26/~cdpmn/spimonitor.html

In the final quarter of the year, conditions in the eastern Caribbean and Guyana were diverse. Trinidad, St. Vincent, and Antigua were normal; Tobago and St. Lucia abnormally wet; Grenada, Barbados and Dominica moderately dry; and Guyana from moderately wet in the north to normal in the south. Jamaica was normal. Conditions in southern Belize were moderate and the northern areas abnormally dry.

NATIONAL OVERVIEWS OF WEATHER AND CLIMATE FOR 2012

Antigua and Barbuda

The year 2012 was a drought year for Antigua. There was a drought over the period February – September (Feb - Sep), which reached serious levels over the period July – September (JAS). Feb - Sep was the eighth driest such period on record, while JAS was the sixth, both dating back to 1928. Further, both periods were the driest since 2003. Actually, without the over 300 mm of flooding rainfall for October, which was the second wettest on record for the month, the year would have turned out much drier. Plans were already afoot by the water authority to ration water; however, the rainfall of October 'saved the day'. About half of the rainfall for October was due to Tropical Storm (TS) Rafael. Overall, the rainfall for 2012 of 1000.0 mm was below average and the lowest since 2009. Seven months of the year had below normal rainfall. The wettest month was October with 321.8 mm, and the driest was June with 13.5 mm. The average annual total rainfall for Antigua is 1187.5 mm (1981 – 2010).

This year, the V. C. Bird Airport, recorded the second highest temperature on record – 34.3°C. This was measured in September eclipsing the previous highest for the month of 33.5°C. However, the mean daily temperature of 26.7°C was below average. Half of the months had below normal temperature and none had above normal values. The coolest month was January with 25.1°C and September was the warmest with 28.2°C. The normal daily temperature is 26.9°C (1981 – 2010).

It was another frustrating year for many farmers: 2011 had too much rainfall, 2012 had insufficient. However, notwithstanding the drought for much of the year and the flooding rainfall of October, which caused notable crop loss, the Minister of Agriculture has reported a 5% increase in crop production for 2012.

Barbados

During the 'dry' season, February, April and May produced above-normal rainfall totals of 95.3mm and 93.0mm and 166.4mm respectively. The corresponding long-term averages are 41.3mm, 60.8mm and 79.0mm. As a result the cumulative rainfall between January and May, 2012 reached 461.4mm which was 59% above the thirty-year (1981 – 2010) cumulative average of 288.6mm for the same period.

In June, which marks the official start of the 'wet' season, the Grantley Adams Airport recorded only 20.6mm of rainfall which was just 20% of the 1981-2010 average; it was also the lowest monthly total for 2012 and the third lowest June total since 1942.

None of the nineteen tropical cyclones which developed over the Atlantic in 2012 directly impacted Barbados but the center of three of the eight systems which developed in August, namely TS 'Ernesto', T.D #7 and T.S 'Isaac', moved over the Lesser Antilles. These all made significant contributions to the Barbados rainfall total in August when we observed 237.0mm, the highest monthly total for 2012.

With the exception of August and December (128.8mm), the remaining months produced below normal rainfall totals. The final 2012 rainfall total reached 1213.7 mm. The long-term average is 1270.2 mm.

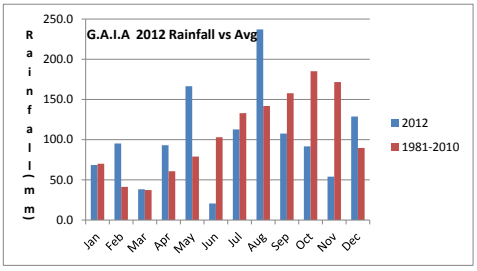


Figure 3 2012 relative to average rainfall at Grantley Adams Airport, Barbados

The lowest minimum temperature recorded at the Grantley Adams Airport for the year was 19.1°C and this occurred between 3rd and 4th August as the center of T.S 'Ernesto' passed just 30 miles to the north of Barbados. The highest maximum temperature for 2012 was 32.3°C which was recorded on 15th July.

The graph below shows extreme maximum temperatures for each month in 2012 exceeded its long term average. In addition, the smallest difference between the long-term average maximum temperature and the 2012 extreme maximum temperature of 0.1°C occurred in May while the greatest difference of 1.8°C was recorded in December.

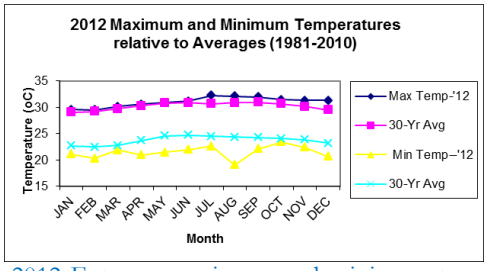


Figure 4 2012 Extreme maximum and minimum temperatures relative to the average (1981-2010)

Belize

A number of significant rainfall events occurred during 2012. On 21 May The International Airport recorded 101 mm and the Belize Zoo with 90.2mm. Events like these during the last ten days of May caused flooding in the Belize district that resulted in several farmers suffering crop losses. In early June, showers usually produced copious rainfall for central and northern Belize. Pomona and Melinda in southern Belize recorded 165mm and by the International Airport with 132mm. A low pressure system developed into tropical storm Debbie on the 23rd June, which produced showers mainly inland and over northern Belize. A tropical wave from the eastern Caribbean reached coastal Belize on 7th July that produced extensive rainfall with Libertad in the north and Barton Creek in the west sharing the highest rainfall amounts (75mm).

A tropical wave interacting with an upper level trough produced rains for two days beginning 3rd August mainly in southern Belizean resulting in totals greater than 100mm. Hurricane Ernesto

reached hurricane strength before making landfall on the southern coast of the Yucatan Peninsula on 7 August. The northern districts of Corozal and Orange Walk suffered the worst effects from Ernesto. Tropical storm force winds and intense rainfall produced flooding at several villages in the Corozal district. Libertad measured 112mm with Tower Hill recording 82mm.The agriculture industry suffered losses from the flooding. A strong tropical wave that produced intense rainfall resulted in more flooding in the Corozal district on 14th August. Libertad measured 131mm, with Tower Hill recording 59mm.

Dominica

2012 was the 3rd driest year on record at the Canefield Airport while it was the 4th driest at the Melville Hall Airport. A total of 1447.7mm of rainfall was recorded at Canefield which represents about 82% of the annual average while 1985.6mm of rainfall was recorded at Melville Hall which is approximately 77% of the annual average.

At Canefield, August produced the highest monthly rainfall total of 426.0mm which is about 74% above the monthly mean. Tropical Storm Ernesto contributed some 68.1mm on the 3rd, with Tropical Depression Seven producing the year's maximum daily total of 109.0mm on the 11th and tropical storm Isaac brought in 65.1mm on the 22nd. This was then immediately followed September, which was the driest month of 2012 and also the driest September on record. Rainfall total of 31.9mm was recorded and this is only about 13% of the monthly mean.

October was the wettest month at Melville Hall with 303.0mm of rainfall recorded which is about 95% of the monthly mean. Tropical storm Rafael contributed 78.5mm on the 12th. The driest month was June with a total of 59.5mm which is about 31% of the monthly mean. The maximum daily rainfall was 84.4mm recorded on 18th July as a result of instability associated with an upper level trough. A record low rainfall total was also set in September when 94.3mm was recorded.

At the Canefield Airport, the average temperature was 28.1°C. Temperatures were slightly above average by 0.2°C. June had the highest monthly average temperature of 29.6°C while January recorded the lowest of 26.3°C. The highest daily temperature was 34.3ºC on 3rd September and the lowest temperature was 19.4ºC on 18th February. The average air temperature at Melville Hall was 27.5°C and does not deviate from the annual mean. The warmest month was June with an average of 29.3°C while the coolest month was March with 25.6°C. The highest temperature for the year was 34.3°C recorded on 2nd September, which was a record high for the month and the minimum temperature was 19.5°C recorded on 20th January.

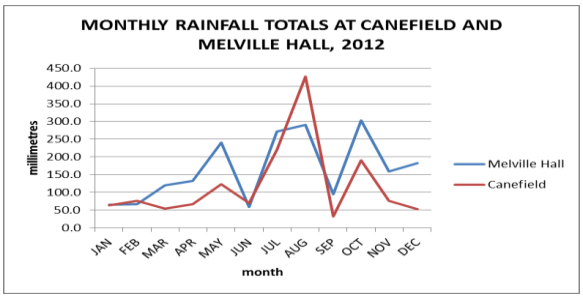
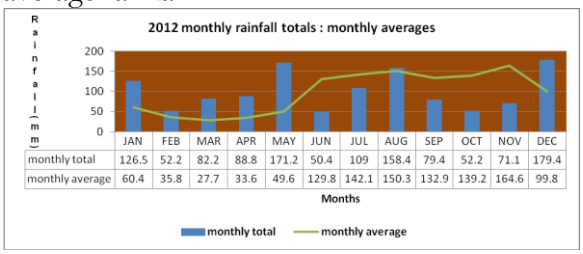


Figure 5 Monthly rainfall at the Canefield and Melville Hall Airports

Grenada

2012 was characterized by above average rainfall during the dry season (Jan- May) and mostly below average rainfall during the wet season (June – November) and the month of December had above average rainfall.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
monthly total	126.5	52.2	82.2	88.8	171.2	50.4	109	158.4	79.4	52.2	71.1	179.4
monthly average	60.4	35.8	27.7	33.6	49.6	129.8	142.1	150.3	132.9	139.2	164.6	99.8

Figure 6 2012 monthly rainfall compared with averages.

The highest monthly rainfall total for the 2012, recorded at the Maurice Bishop International Airport was 179.4mm during the month of December while the lowest of 50.4mm was measured during the month of June. The total wet season rainfall for 2012 amounted to 520.5 mm which is the lowest on record in the 27years of operation

As a result of the overabundance of rainfall in the dry season, farmers enjoyed reduced farming costs in the area of irrigation and use of farm machinery. The

longer sowing season afforded them the opportunity to plant tree crops throughout the season.

Another positive impact of the 'wetter dry season' was the significantly reduced presence of the pink mealy bug but unfortunately farmers were faced with the over infestation of mongoose and the resulting damages to root crops like sweet potatoes, yams and cassava.

Farmers traditionally use the drier months of February, March and April to produce the bulk of their tomatoes for the local market, but due to the increased rainfall received in those months, production of tomatoes was affected. However, the production of other vegetables such as cabbages, cauliflower, Water Melons, etc, were not affected. The prolonged period of dryness between the months of September, October and November led the rain fed farmers to incur additional farming costs for irrigation. This arid period also negatively impacted the production of crops grown within this time of year, such as cauliflower cabbages, peppers, lettuce, carrot, etc. However this was a very good period for tomato production.

Under the guidance of the Ministry of Agriculture, farmers were assisted in employing wiser crop selection options to deal with the unseasonal heavy rainfall and prolonged dry spells that were experienced throughout. In so doing, they were able to minimize their financial losses. There was increased production of tomatoes, cabbages, bell peppers, carrots, lettuce, watermelon, cantaloupe, and pumpkin, in periods when they would normally be scarce on the market. The variable weather in some instances resulted in an increase of pest and diseases affecting some crops, but the impacts were not significant.

The highest temperature for the year 2012 recorded at the Maurice Bishop International Airport was 33.5◦C read during the month of November and the lowest temperature was 20.7 registered during the months of January and February respectively

In general, 2012 was a very good year for the agricultural sector. Despite the variable weather that was experienced throughout the year, there were increases in the production of several major commodities when compared to 2011.

Jamaica

Norman Manley and Sangster International Airports both recorded below normal rainfall for six months of the year. Three of these months were January through March which represents the dry season for Jamaica. Jamaica's rainfall pattern consists of two peak rainfall periods. The primary peak occurs in October and the secondary in May. The lowest amounts are at a minimum during the period February to March and the month of July. This is based on a 30- year mean and deviations from this pattern do occur year to year. A comparison of rainfall figures for 2012 versus 2011 for Norman Manley shows that for six months in 2012 rainfall amounts exceeded that of 2011. For Sangster, 2012 figures were greater for only three months in comparison to 2011 (Figure 7). With the exception of June, rainfall amounts were below normal at Sangster for May through September period.

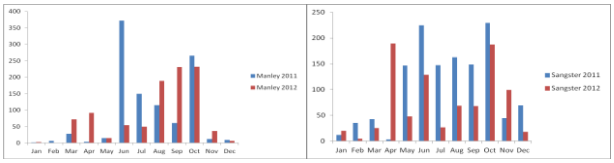


Figure 7 2012 rainfall compared with that of 2011 at Manley and Sangster Airports

For six months of 2012 mean maximum temperatures exceeded the 20 year mean (1992-2011) at Norman Manley Airport (January-March, May and November - December) while for Sangster Airport mean maximum temperatures exceeded the 20-year mean (1992-2011) for five consecutive months namely May through September. A closer look at the temperatures will reveal a contrast in the variation between both International Airports wherein Norman Manley experienced higher than normal temperature during the winters months or dry season and Sangster recorded higher than normal temperatures during summer or the wet season.

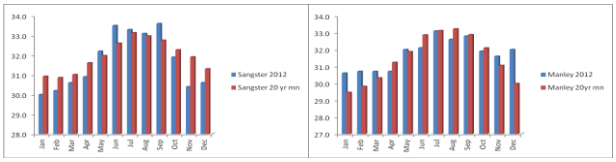


Figure 8 2012 temperatures compared with means at Manley and Sangster Airports, Jamaica,

Both International airports showed evidence of warmer than normal temperatures coupled with drier conditions in 2012. Hotter and drier conditions occurred at Norman Manley during the dry season January through March while hotter and drier conditions were experienced during the summer months or the dry season at Sangster Int'l.

St Lucia

Rainfall in Saint Lucia for 2012 was above the long term mean in the south of the island but below the mean in the north of the island. Hewanorra recorded a total of 1622.7 mm while George Charles recorded 1749.9 mm. There was significant variability particularly in the dry season.

The rainfall at George Charles remained significantly lower than the mean after August. In fact George Charles recorded its second lowest rainfall for September since 1967.

Vieux-Fort had 161 rainfall days and the highest daily rainfall was 78.4 mm on 12th November. The wettest month was October (237.8 mm) and the driest month was March (49.2 mm). The highest maximum temperature was 32.5° C and the lowest minimum was 20.0 ° C.

George Charles Meteorological Office had 160 rainy days and the highest daily rainfall was 71.8 mm on 24th May. The wettest month was May which produced 315.0 mm and the driest month was April which produced 63.0 mm. The highest maximum temperature was 32.5 ° C in September and the lowest minimum was 19.6 ° C in November.

Drought conditions began affecting the northern part of Saint Lucia in September and continued through December.

Table 1 2012 monthly averages at Hewanorra Airport

AVERAGE MONTHLY DATA FOR HEWANORRA					
Cloud Cover (oktas)	Wind Dir (o from N)	Wind Speed (kt)	Air Temp. (°C)	RH (%)	Rainfall (mm)
5	90	14	27.5	77	135.2
Temp (oC)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)	
30.3	23.8	3174.0	7.3	28.6	

Table 2 December monthly averages at George Charles Airport

AVERAGE MONTHLY DATA FOR HEWANORRA					
Cloud Cover (oktas)	Wind Dir (o from N)	Wind Speed (kt)	Air Temp. (°C)	RH (%)	Rainfall (mm)
5	90	08	27.7	76	154.8
Temp (oC)	Min Temp (°C)	Daily Sunshine (Hrs)	Daily Evap (mm)	Soil 20 (°C)	
30.2	24.3				

St. Vincent and the Grenadines

Some 194 rain-days, and a total of 2035.8 mm of rainfall was recorded at the E.T. Joshua Airport-Arnos Vale.

Oddly in the middle of the dry season, February had occurrences of isolated thunderstorms, and rainfall was more than average for most of the traditional dry season. Strong breezes, agitating moderate to rough seas in open waters continued into February. During March, the Halo phenomenon around the sun due to the presence of cirrostratus clouds was visible. Between March and July, hazy conditions were experienced due to Sahara dust layer occasionally reducing visibility. Meanwhile, cloudiness, showers and thunderstorm activity associated with trough systems and frontal boundaries affected the islands during April. Trough systems continued in May, interacting with the ITCZ activity. This combination resulted in flooding and landslides on the northeastern side of mainland St. Vincent on 10th May. Also, tropical waves began affecting the islands, interacting with upper level troughs to produce moderate to isolated strong convection.

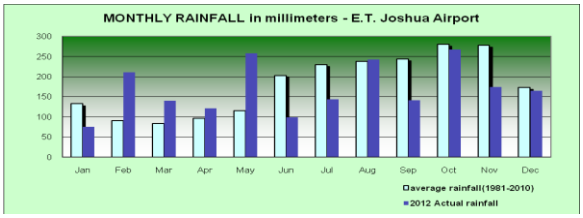


Figure 9 2012 rainfall compared with the average

High pressure ridges dominated the weather conditions during the month of June. However, there were a few days with light to moderate thunderstorm activity as tropical waves continued to

affect the islands. Tropical waves alternated with layers of Saharan dust during the month of July. On the 3rd August, tropical storm Ernesto passed north of St. Vincent and the Grenadines (SVG). On 22nd August, tropical storm Isaac passed North-North East of the SVG both produced cloudy skies, thunderstorms, occasional gusty winds and periods of continuous light showers. During September unusually dry air over the Atlantic and island chain resulted in hot dry days and warm nights. This changed on the night of the 18th, as lightning, heavy thunder, and heavy downpour ended the heat. Again during the period 22nd to 24th September, another heavy rainfall event resulted in a few landslips across the islands. Such occurrences prove that uneven distribution of rainfall can be more damaging than totals.

On 14th October, torrential rains associated with Tropical Storm Rafael triggered some landslides in the north of mainland St. Vincent. Then, unstable conditions from a trough system which was eventually named 'Sandy' resulted in 60.4mm of rainfall on the 18th, causing some localized flooding.

Average wind speeds increased slightly during the last week of November, and there was a general decrease in relative humidity. In December, occasionally, unstable conditions associated with troughs and shear-lines from cold fronts resulted in moderate scattered showers. Also, high pressure systems in the Atlantic Ocean generated brisk east-northeast winds which influenced the seas to be moderate to rough at times.

Table 3 Some weather extremes during 2012

	Pressure mb	Temperature °C	Relative Humidity %
High	1019.8 (Jun)	33.2 (Sep)	96% (Oct)
Low	1009.0 (Aug, Oct.)	21.0 (Mar, Oct)	48 % (Jan)

Trinidad and Tobago

Climatologically, in Trinidad and Tobago, the Dry Season is during the period January to May and Wet Season is during the period June to December. Rainfall for Dry Season 2012 was above normal in Trinidad and Tobago (Figure 10). Rainfall for Trinidad was mostly below normal for the 2012 Wet Season, with June and December being the exceptions. Rainfall in Tobago was mostly below normal for the 2012 Wet Season, with the exception of August and December. This variation in rainfall led to an Annual rainfall of below normal for Trinidad and above normal for Tobago.

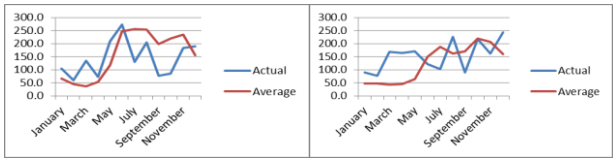


Figure 10 Actual 2012 compared with averages.

In Trinidad, average annual temperatures for 2012 were above normal (Figure 3). In Tobago, Dry Season temperatures were mostly below normal while the Wet Season temperatures were above normal.

There were reports of flooding and landslides during the dry and wet season, however the impacts which were made to agriculture was not reported. During the month of August 2012, there were severe flooding, infrastructural damages, landslides and damages to private and state property in parts of Trinidad. Damages were associated with Tropical Depression Seven and were estimated to be more than one hundred million Trinidad and Tobago Dollars (USD $16.7 million).

Prepared by
Caribbean Insititute 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