

CARIBBEAN DROUGHT AND PRECIPITATION MONITORING NETWORK (CDPMN): A PROPOSED APPROACH.

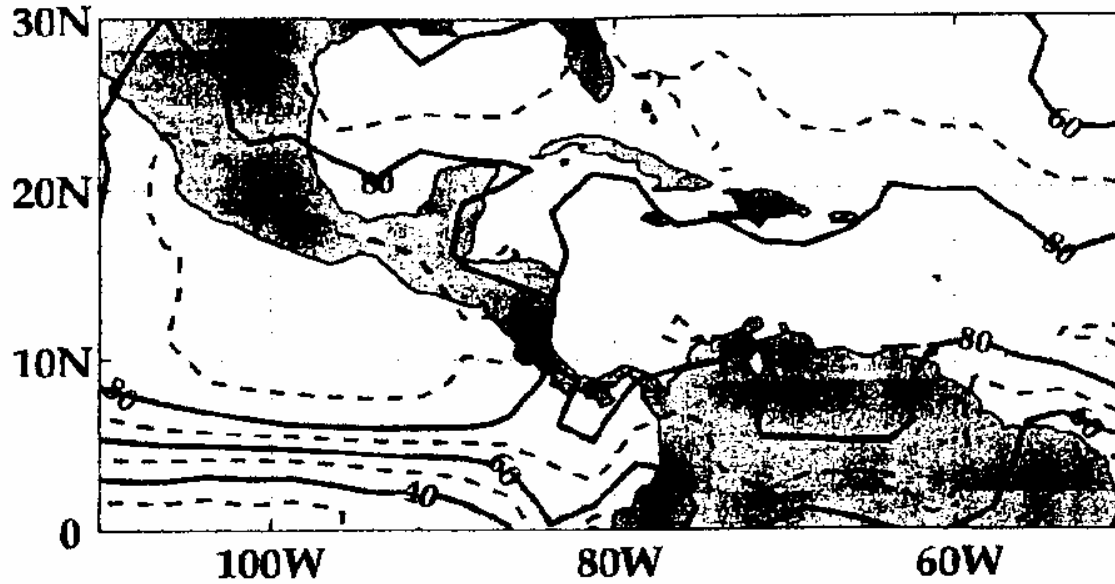
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Comprehensive Disaster Management
Conference
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Rainfall in the Caribbean

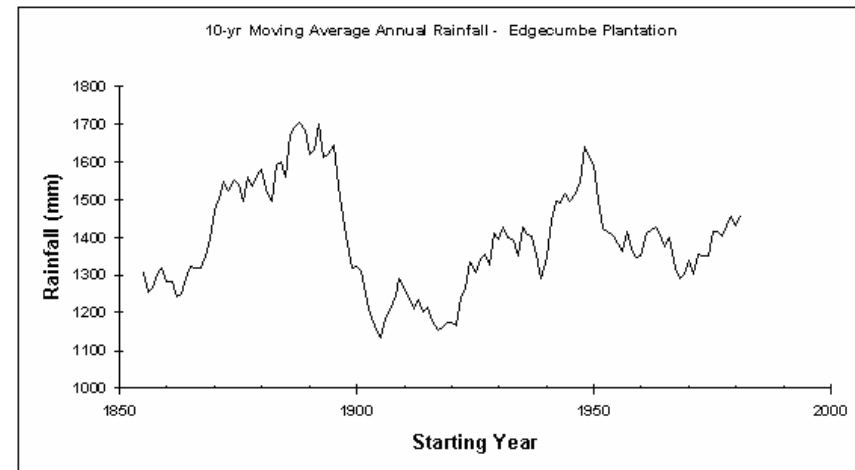
- Characterized by a wet and a dry season...
- ...except Guyana to the north with two wet and two dry seasons associated with ITCZ
- At least 70 to over 80 % of the rainfall occurs during the wet season
- Large seasonal, interannual and inter-decadal variability...
- ...associated with ENSO, SST anomalies and NAO
- Rainfall also cyclical – 50 to 60 years

Wet Season Rainfall (% of Annual Total)

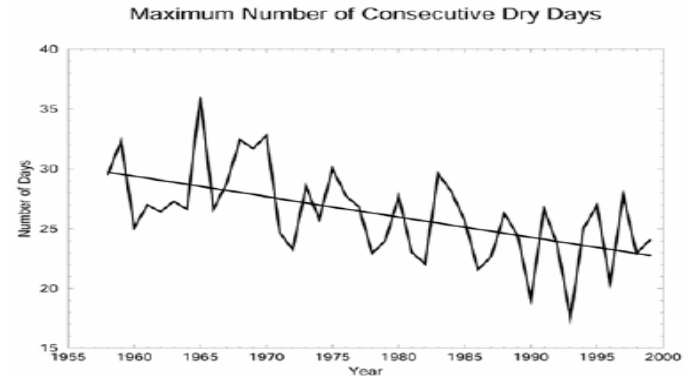
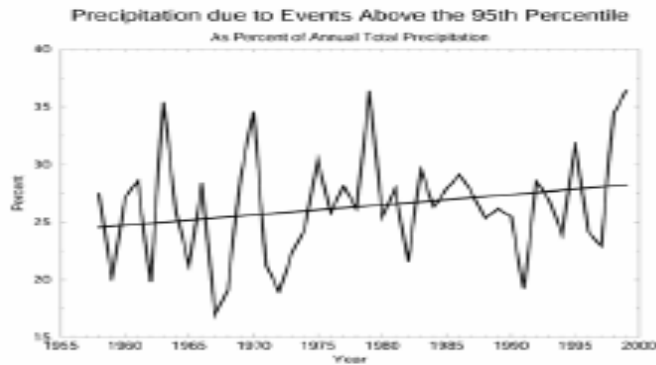


Wet season rainfall as a percentage of annual rainfall (Enfield and Alfaro, 1999).

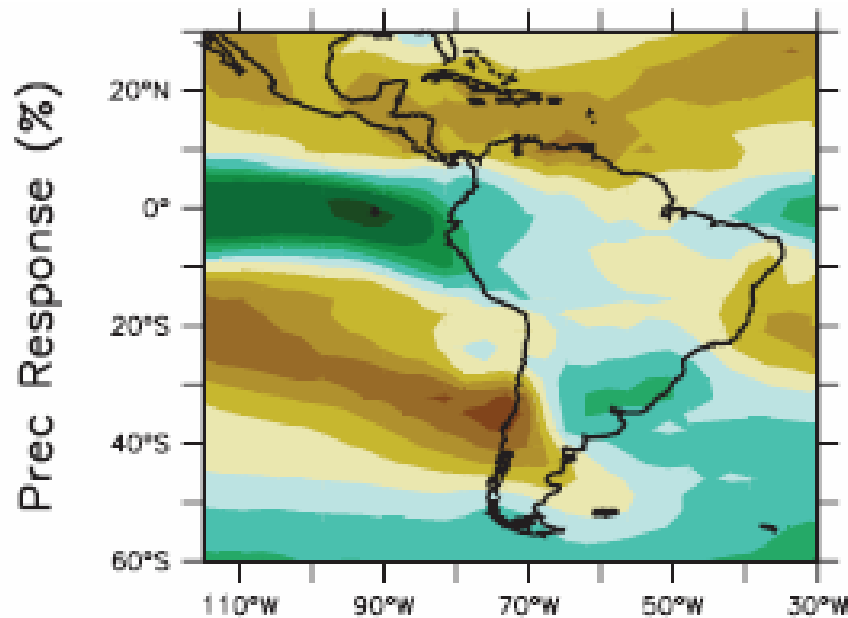
Moving 10 year averages of rainfall at Edgecumbe, Barbados (Burton 1995)



Climate Patterns and Climate Change



Pattern of precipitation events since 1950 (Peterson et al. 2001)



Precipitation change between 1980 to 1999 and 2080 to 2099, averaged over 21 models (IPCC AR4, WGII, Chapter 11)

Why Precipitation Monitoring Drought

- A SLOW CREEPING PHENOMENON
- 1997/98 El Nino caused widespread drought and forest fires in Guyana and Trinidad – loss of animals, timber
- ...forced rice farmers to leave 35 % of their rice fields uncultivated and affected more than 1500 Amerindian families in Southern Guyana
- ...losses in the sugar sector, prompted in part by a severe drought in 1997, forced the Jamaican government to offer the sector a US\$100 million assistance package
- 1999-2000 drought, rainfall was less than 25 % of the average in some places, Jamaican authorities reported crop losses of approximately US\$6 million between October 1999 and March 2000
-

Why Precipitation Monitoring Flood

- Account for 70 % of all weather-related losses in the region's agriculture sector
- **Guyana** from January to February 2005 affected 37 % of the population, was blamed for the deaths of 34 people and caused approximately USD55 million in damage
- A similar flood event in 2006 resulted in total losses to the sector of USD22.5 million...
- ...which in 2004 accounted for 35.4 per cent of Guyana's gross domestic product (GDP)

Indices and Indicators

Standardised Precipitation Index (SPI)

- . Developed by T.B. Mckee, N.J. Doesken and J. Kleist of Colorado State University.
- . Rainfall data needs to be transformed to a normal distribution with mean 0 and standard deviation 1, by first fitting the data to a probability distribution. The necessary corrections are then applied and the best statistical fit to the data is determined.
- . SPI is basically a representation of rainfall in units of standard deviation. Positive values indicate greater than median rainfall; negative values indicate less than median rainfall.
- . SPI can be calculated for different time scales.

Standardised Precipitation Index (SPI)

SPI Values and precipitation intensity categories

SPI	Category	Probability (%)
2.0 +	Extremely wet	2.3
1.5 to 1.99	Very wet	4.4
1.0 to 1.49	Moderately wet	9.2
-0.99 to 0.99	Near normal	68.2
-1.0 to -1.49	Moderately dry	9.2
-1.5 to -1.99	Severely dry	4.4
-2.0 and less	Extremely dry	2.3

Standardised Precipitation Index (SPI)

- A one-month SPI analysis reflects short term soil moisture and crop stress especially during the growing season
- A three-month SPI analysis reflects short to medium term moisture and can give an indication of available moisture conditions at the beginning of the growing season.
- A six-month SPI analysis reflects medium term trends in rainfall and is effective in showing rainfall distribution over distinct seasons as well as being associated with anomalous stream flows and reservoir levels

Other Indices under Investigation

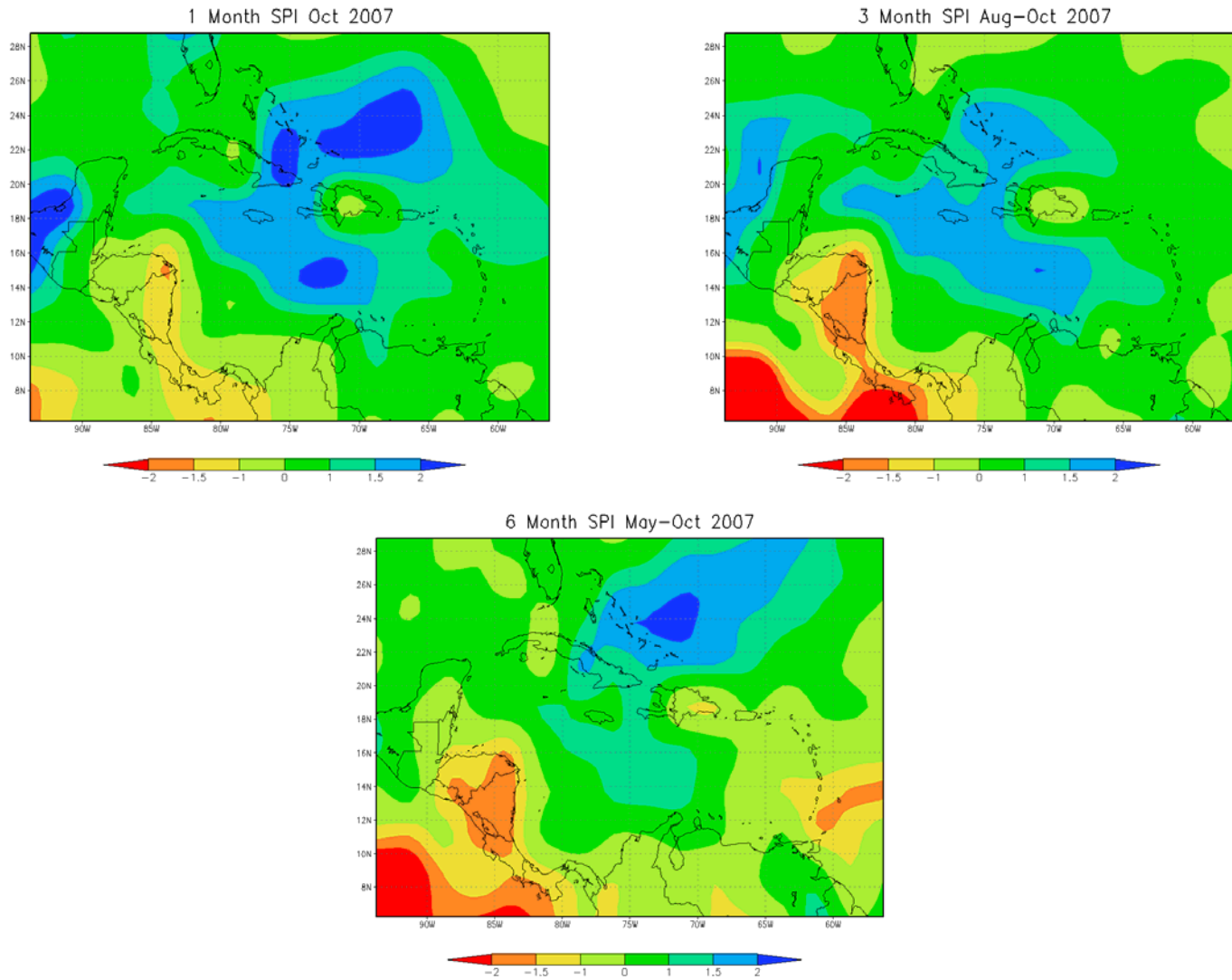
- Palmer Drought Severity Index (PDSI)...
- ...based on soil moisture budgeting over months
- Crop Moisture Index (CMI).
- ...A derivative of PDSI but good at determining soil moisture conditions at a smaller time (weekly) scale

4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

PDSI & CMI and intensity categories

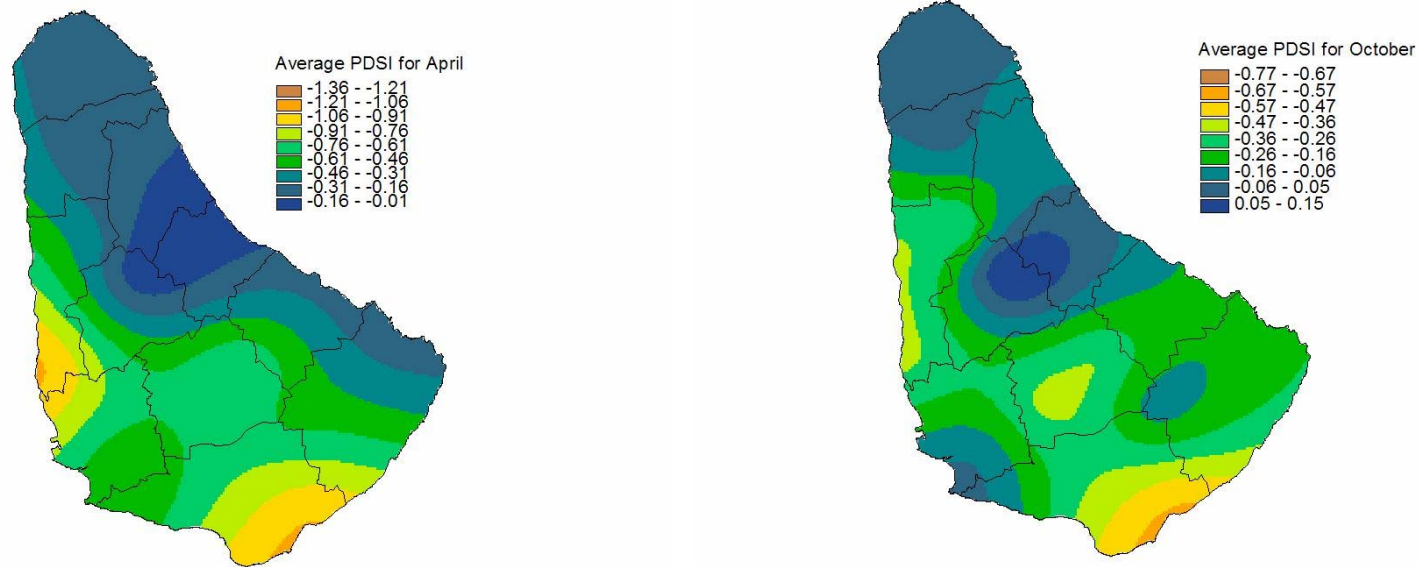
-3.0 or Less	Severely dry
-2.0 to -2.9	Excessively Dry
-1.0 to -1.9	Abnormally Dry
-0.9 to 0.9	Slightly Dry Favourably Moist
+1.0 to +1.9	Abnormally Moist
+2.0 to +2.9	Wet
+3.0 and above	Excessively Wet

SPI for the Caribbean



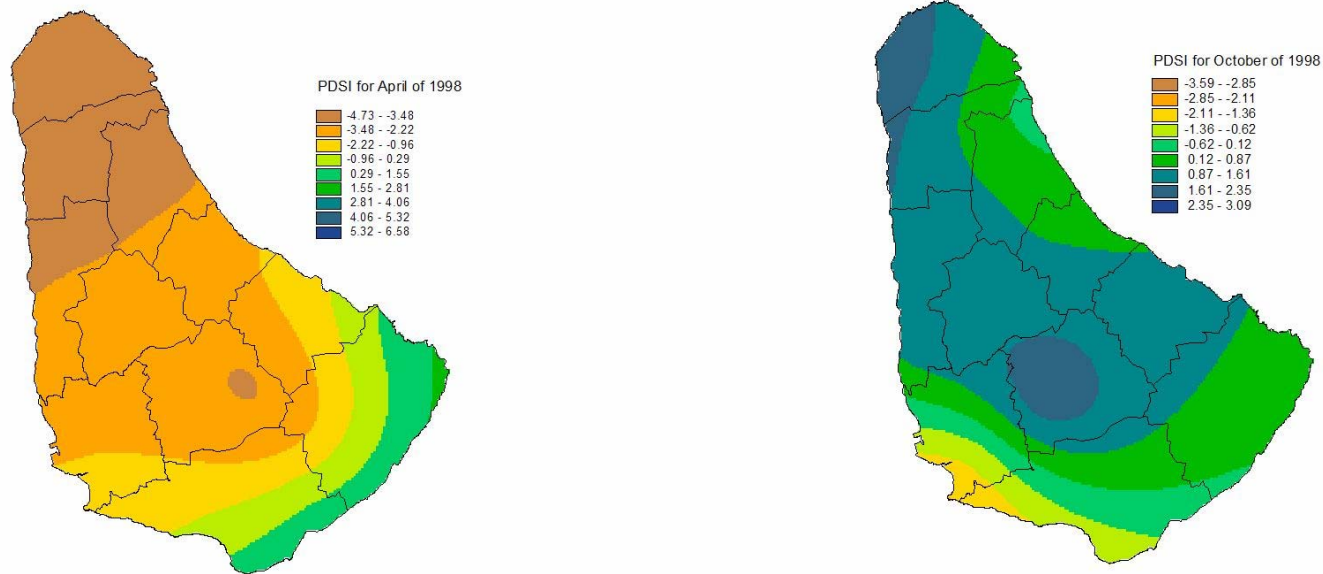
1-, 3- and 6 - month SPI for the Caribbean for October 2007

PDSI on Agricultural Drought in Barbados



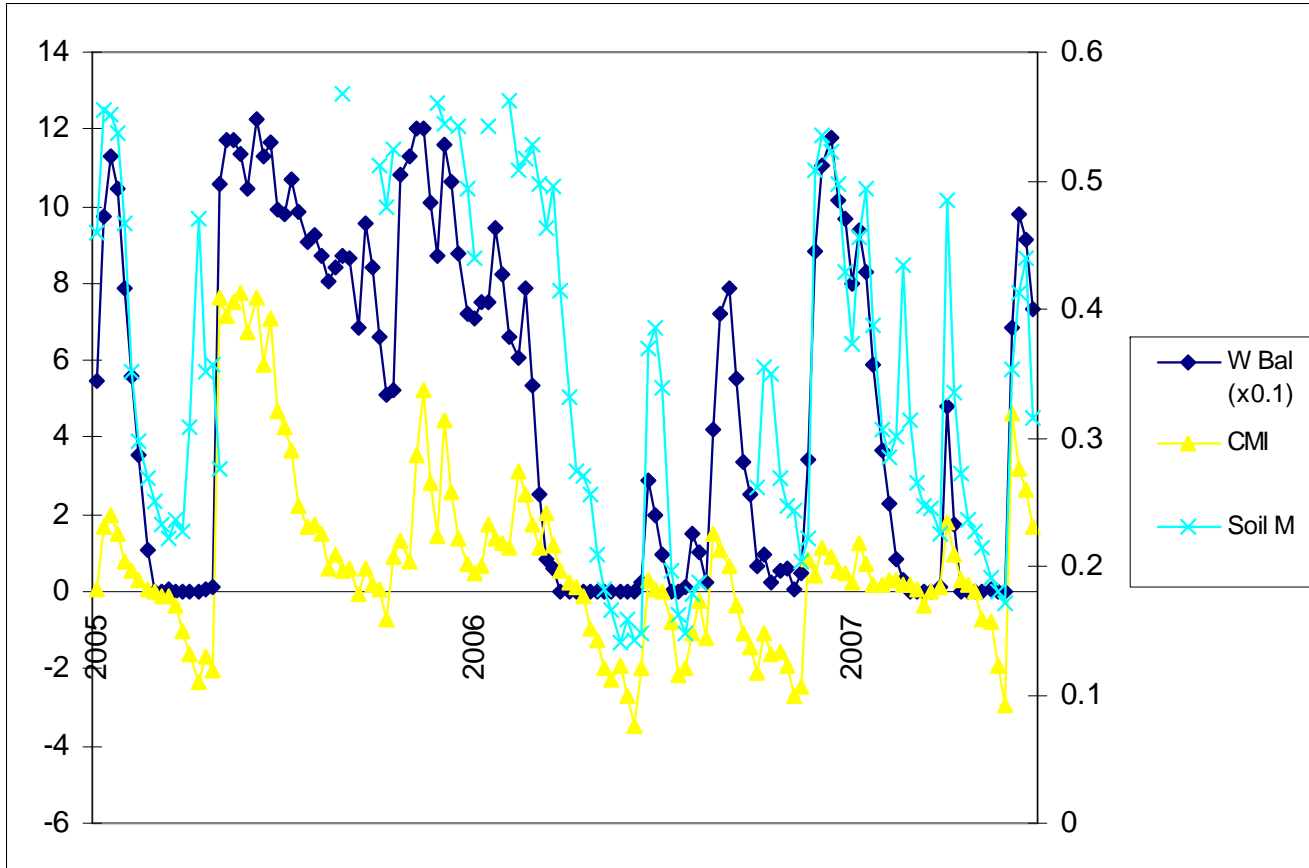
Mean PDSI values for April and October 1998 (an El Niño year)

PDSI on Agricultural Drought in Barbados



PDSI values for April and October 1998 (an El Niño year)

CMI Appropriate for Agricultural Drought?



Time series of agricultural drought indicators from January 2005 to June 2007.

Network Approach

- Drought can affect different sectors with different intensities and in different ways
- Network of climatologists and users to determine the status of drought (extreme precipitation by consensus)
- Decide which indices and other indicators
- One final product or different products for different sectors?
- Used successfully in US Drought Monitor
- CARIWIN project to possibly form pilot network

Importance of Drought/Precipitation Monitor

- Supporting mitigation and preparedness planning and policies.
- In combination with other products (e.g. seasonal forecasts) will be a major component in a drought/flood early warning system
- **FINANCING NECESSARY**

