**In your own words describe what the CMI, PDSI and SPI are and how they are determined and how they are different.**

**Palmer Drought Severity Index PDSI**

PDSI is the measurement of dryness which is affected by precipitation and temperature. PDSI describes the current month's cumulative moisture conditions integrated over the last several months. PDSI shows long-term moisture conditions, it depicts meteorological drought. The PDSI is most effective in measuring impacts sensitive to soil moisture conditions, such as in agriculture production.

0 PDSI means normal and optimum conditions. Negative values shows drought and in contrast, positive values shows wet spells. The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. From the inputs, all the basic terms of the water balance equation can be determined, including evapotranspiration, soil recharge, runoff, and moisture loss from the surface layer.

**The Standardized Precipitation Index SPI**

SPI is a widely used index to illustrate meteorological drought on a range of timescales. SPI is closely related to soil moisture on short timescales, while at longer timescales, the SPI can be related to groundwater and reservoir storage. The SPI can be compared across regions with markedly different climates. It quantifies observed precipitation as a standardized departure from a selected probability distribution function that models the raw precipitation data.

To calculate SPI, a long-term precipitation record at the desired region is first fitted to a probability distribution (e.g. gamma distribution), which is then transformed into a normal distribution so that the mean SPI is zero. SPI may be computed with different time steps (e.g. 1 month, 3 months, 24 months). Positive SPI (Standard Precipitation Index) values indicate greater than mean precipitation and negative values indicate less than mean precipitation.

**Crop moisture index CMI**

CMI is Crop moisture index developed by Palmer (1968) to evaluate short-term crop water conditions and needs across major crop-producing regions.

CMI is centered on the conception of abnormal evapotranspiration deficit. It is calculated as the difference between computed actual evapotranspiration (ET) and computed potential evapotranspiration (i.e., expected or appropriate ET). Actual evapotranspiration is based on the temperature and precipitation that occurs during the week and computed soil moisture in both the topsoil and subsoil layers.