Developing a Customized Composite Drought Index for Pakistan

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Abstract

Pakistan experiences frequent and intense agricultural drought, varying spatially and temporally. Prolonged dry conditions often result in failed crop production. Using multiple variables, different components of drought can be captured across a multitude of climatic zones and throughout different seasons. Developing a composite drought index (CDI), specific for each district, will provide a more complete view of agricultural drought and enhance early warning systems.

Methods

Calculate standardized anomalies for each input variable for each month

Calculate eigenvectors from correlation matrix to find percent contribution of each input variable

Verify the performance of the CDI by analyzing yield data of different crops for different temporal frequencies

Inputs used to determine intensity of agricultural drought:

• Standard precipitation index for 1 month (CHIRPS), 3 months (SPI3) and 6 months (SPI6)
• Soil moisture (SLDAS)
• Vapor pressure deficit (VPD)
• Evaporative stress index (ESI)
• Total terrestrial water storage anomalies (GRACE)
• Normalized difference vegetation index (NDVI)

Results and Conclusions

From preliminary results, the visualized schematic representation of the CDI shows that different districts experienced drought during different years. Next steps include analyzing crop production data and determine if drought was captured with the CDI.

This framework can improve drought monitoring and forecasting systems that will have the ability to enhance mitigation methods.

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