

Developing a Customized Composite Drought Index for Pakistan

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Abstract

Pakistan map of Köppen climate classification

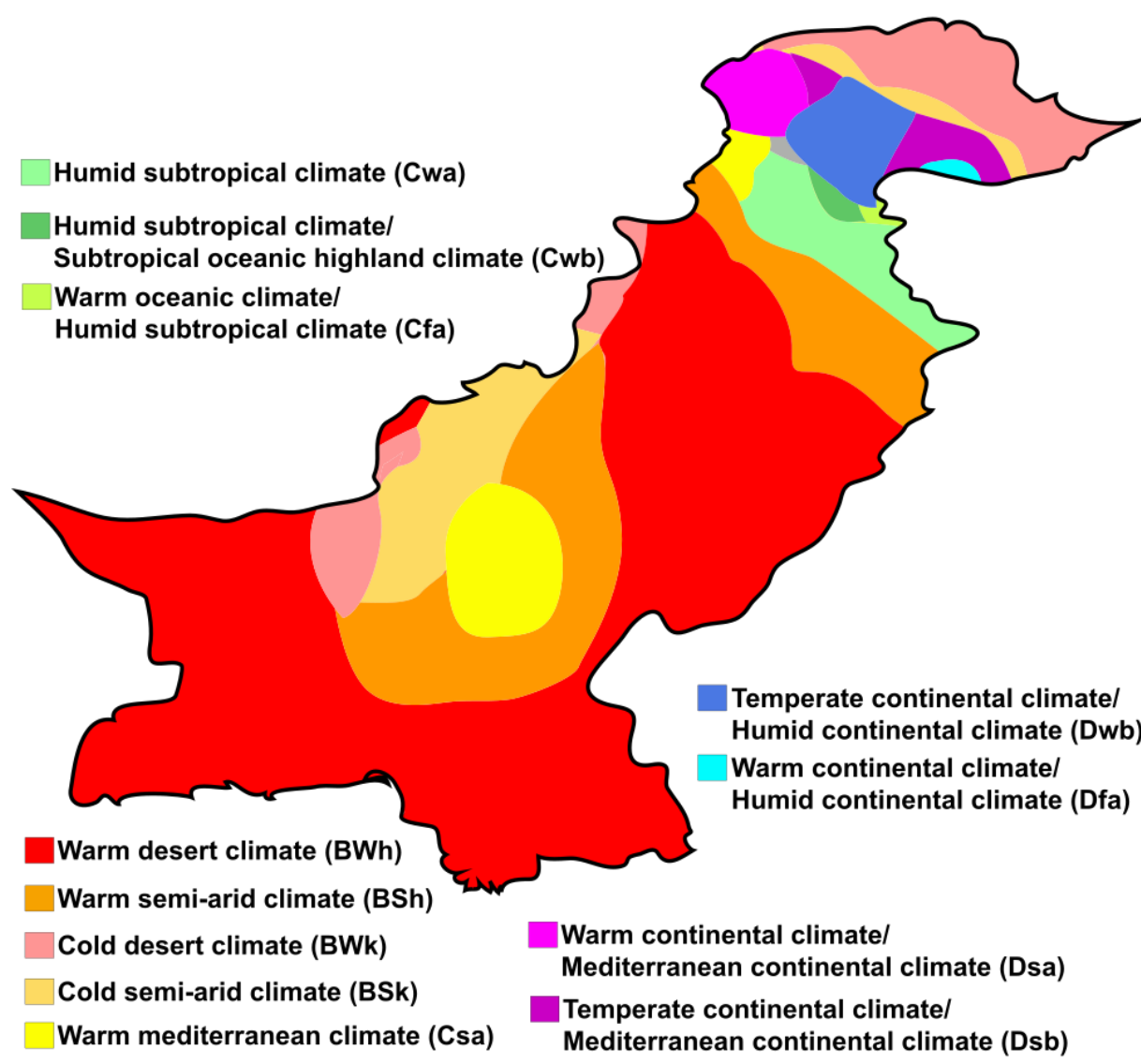
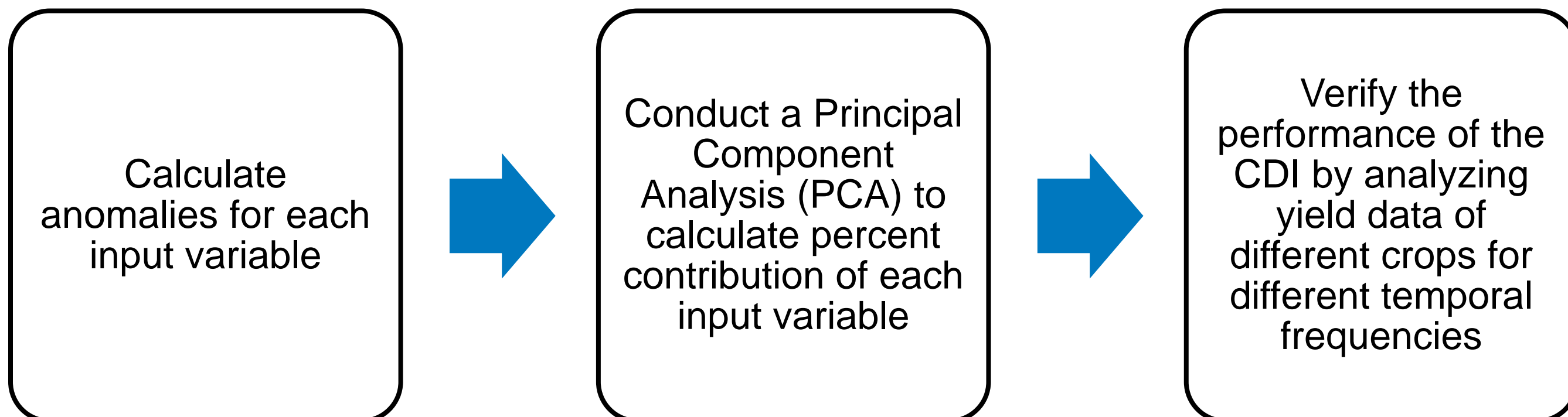


Image 1: Photo under Creative Commons license provided by Peel, M. C., Finlayson, B. L., and McMahon, T. A. and enhanced, modified, and vectorized by Ali Zifan.

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



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 relationship between the CDI and the production in tons, by district, shows that the years that were not in drought, also saw an increase in production of Maize. Next steps include analyzing other crop's 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.

Acknowledgements

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Means CDI2- 2004

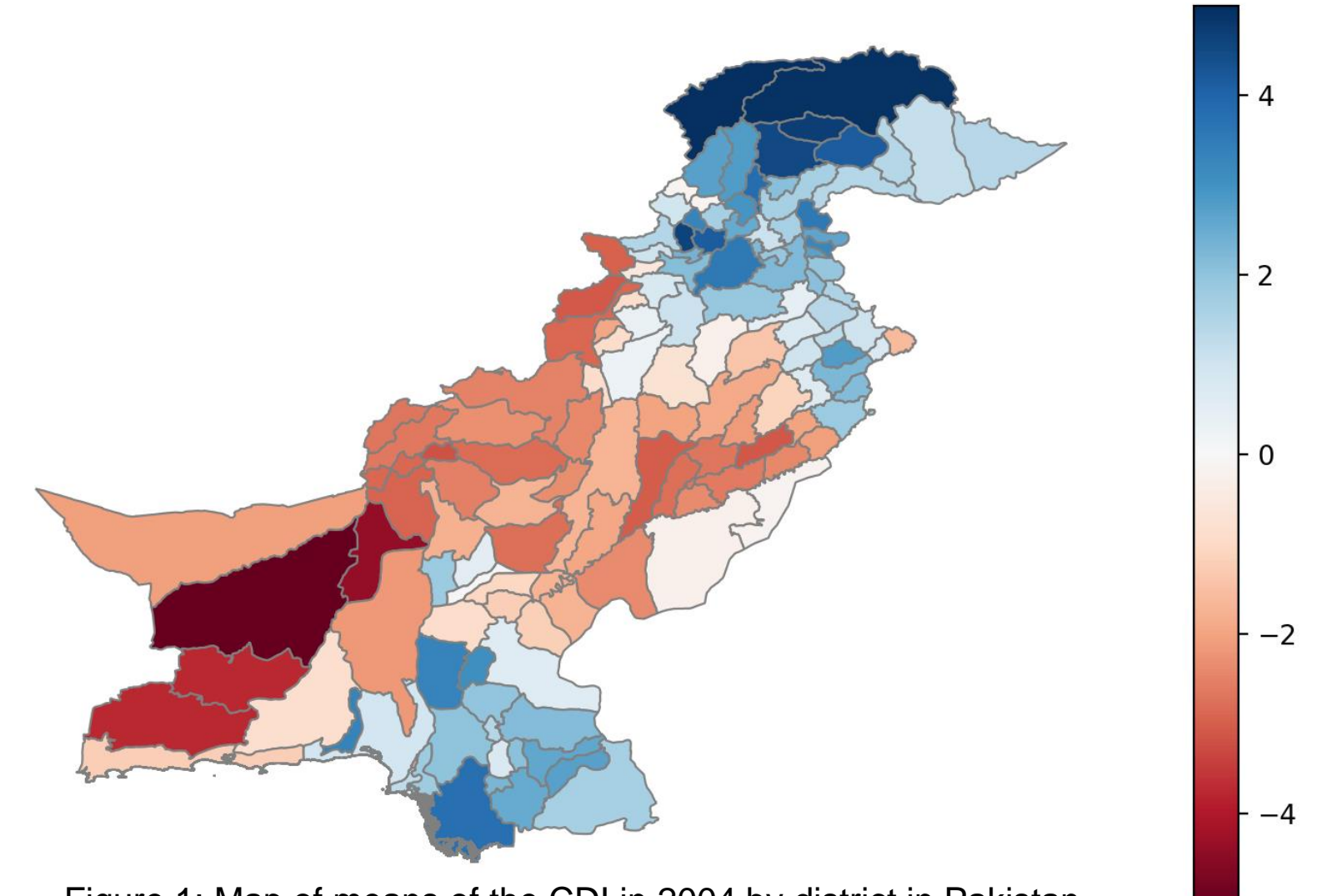


Figure 1: Map of means of the CDI in 2004 by district in Pakistan

Means CDI2- 2010

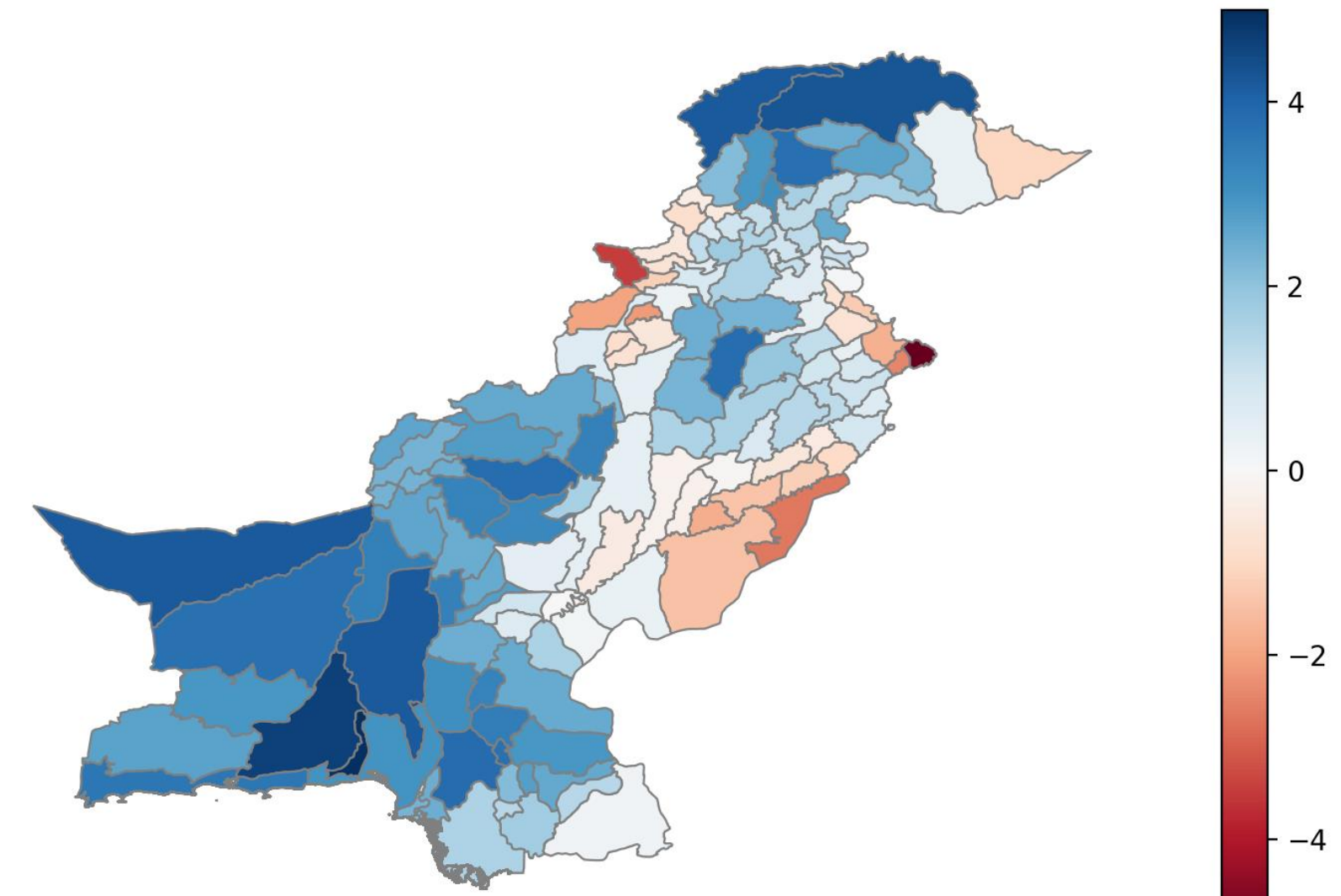


Figure 2: Map of means of the CDI in 2010 by district in Pakistan

Percent Contribution of each Input for ['Kohlu']

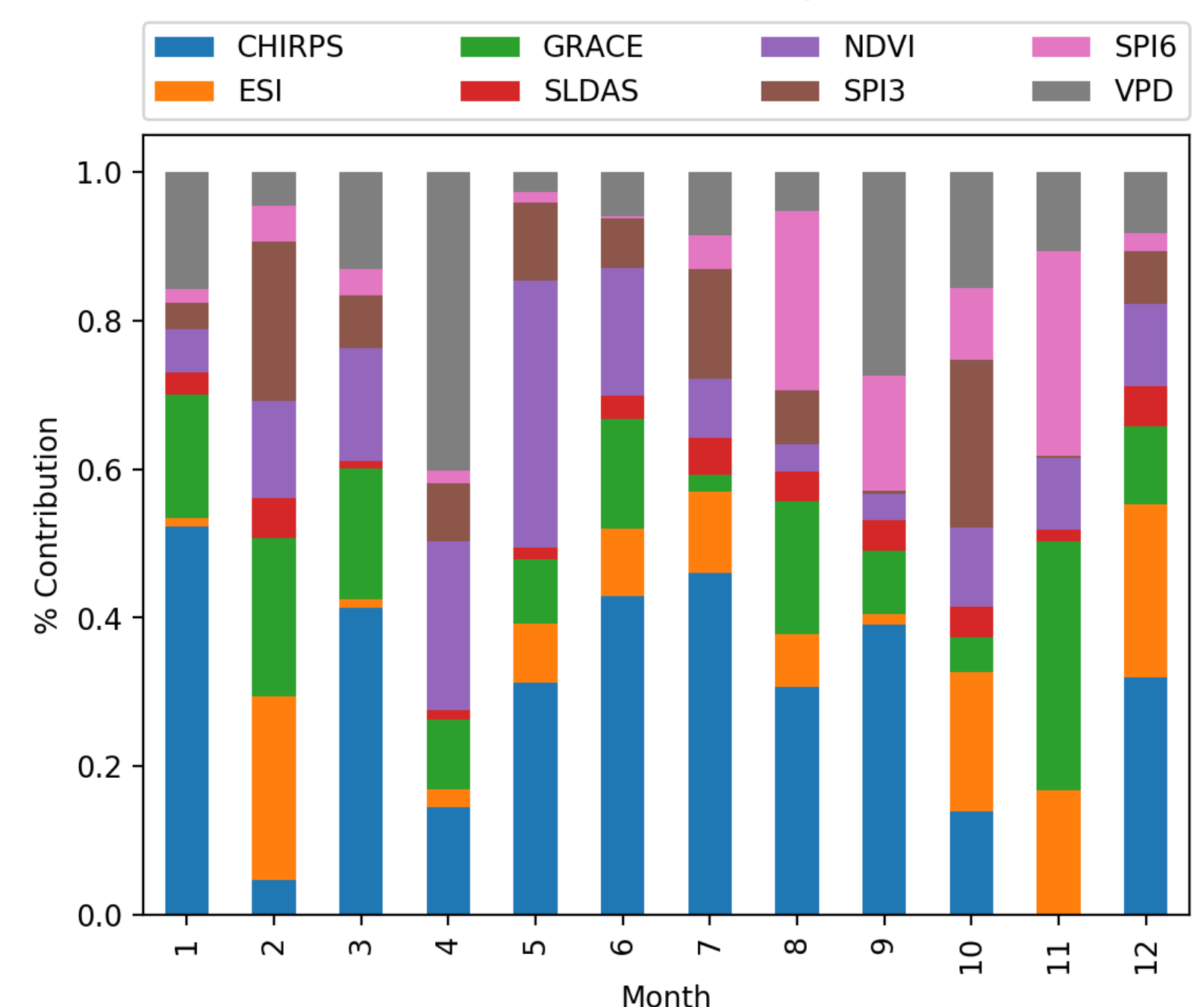


Figure 3: Percent contribution aggregated by month of each input for the district Kohlu

Yield vs. CDI Mean for Maize in Thatta

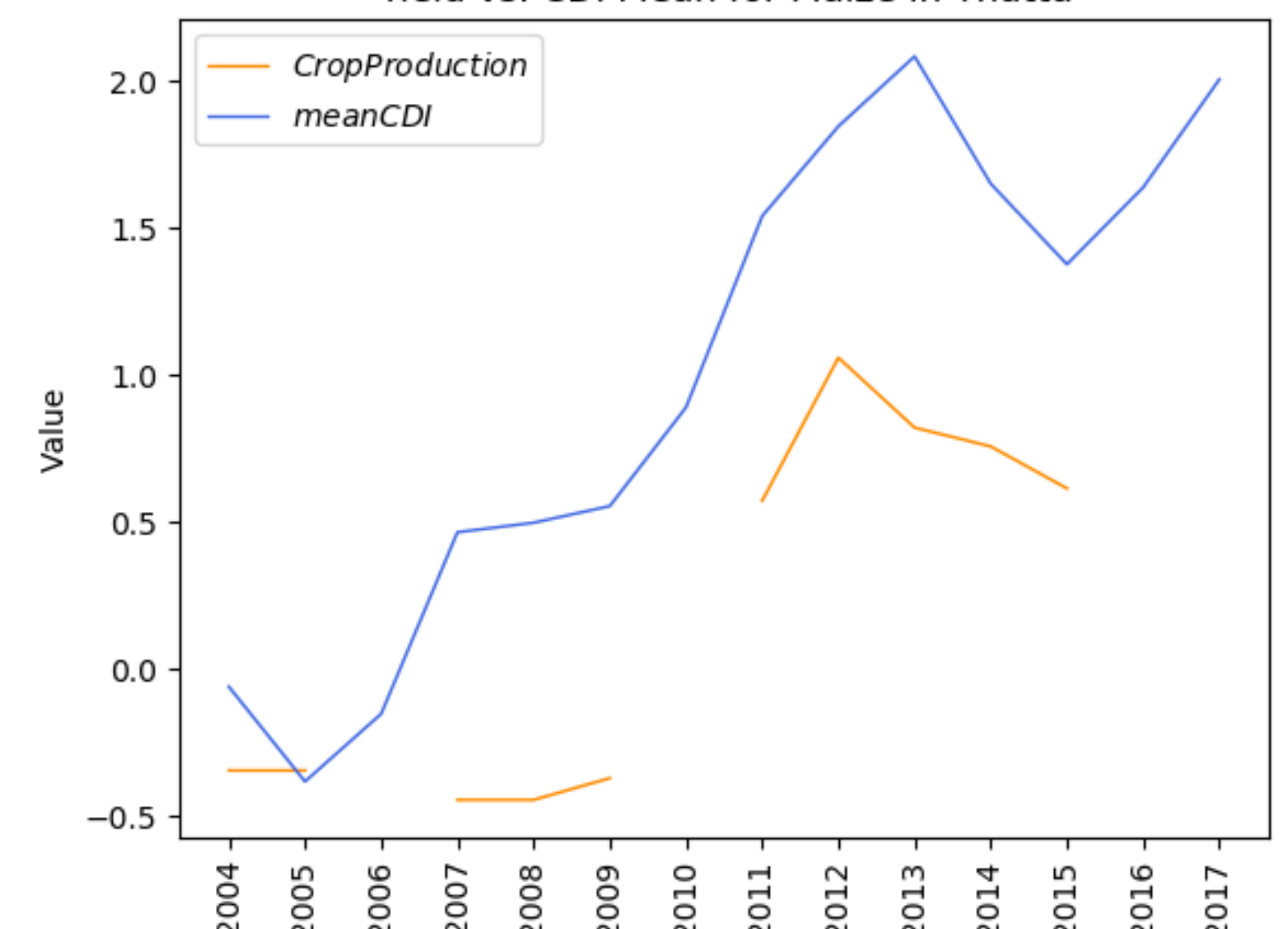


Figure 4: Relationship between production of crop and CDI mean for the district Thatta