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Integrating Vegetation and Thermal Indices for Agricultural Drought Monitoring using Google Earth Engine: A Study from the Semi-Arid region of South India

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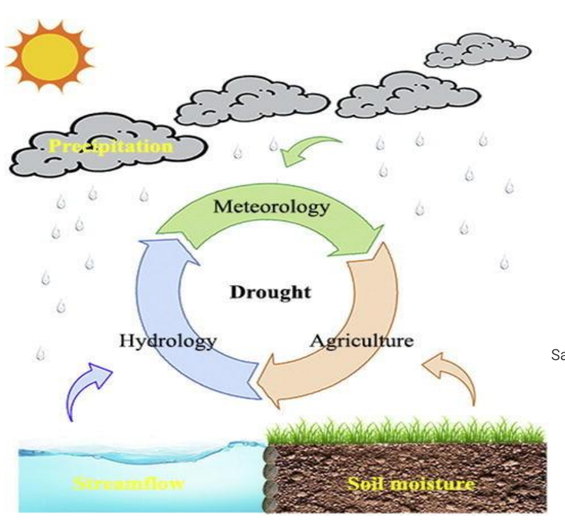
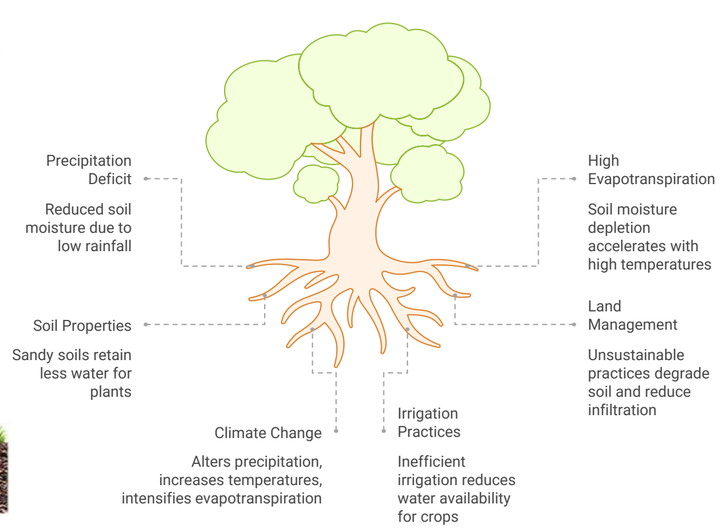
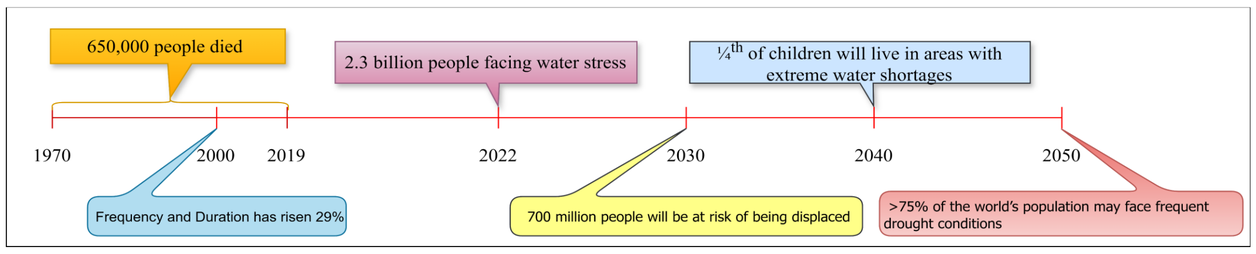
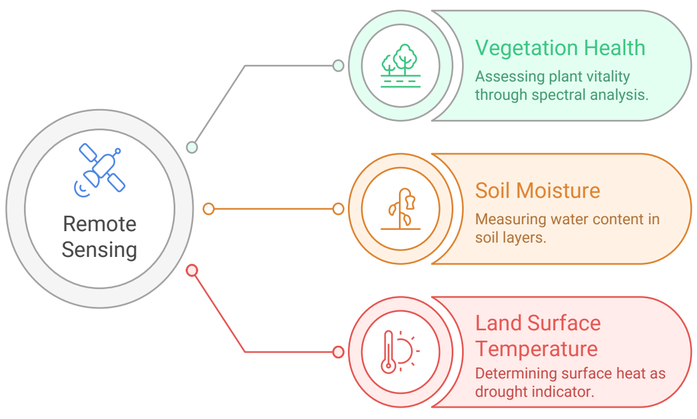
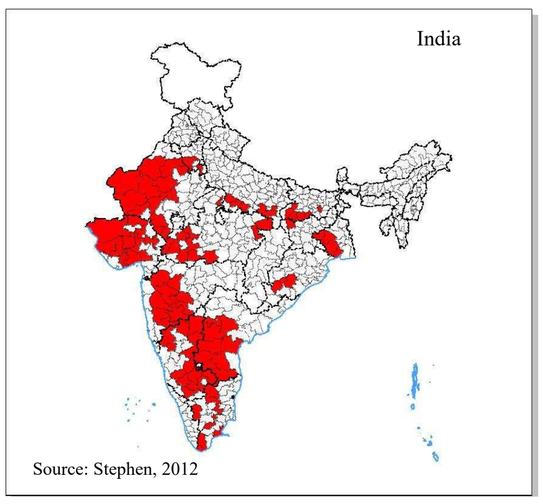
INTRODUCTION & AIM







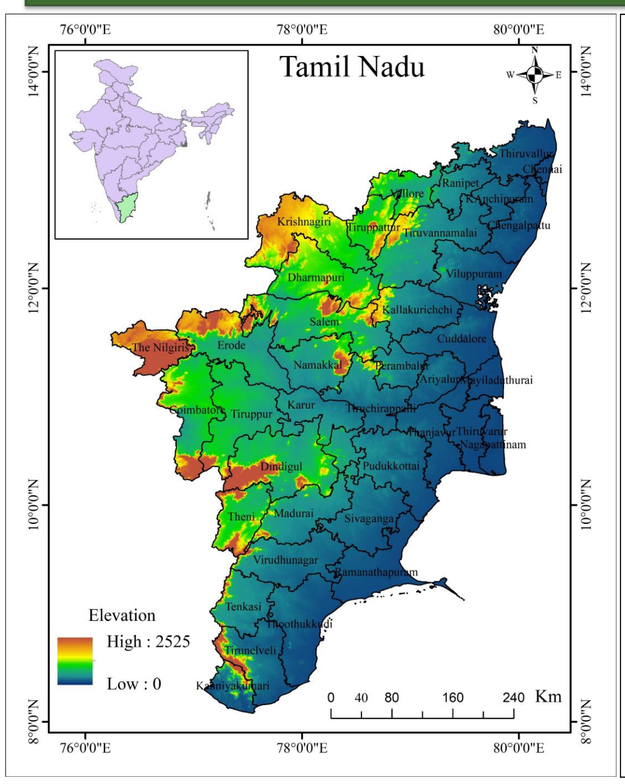


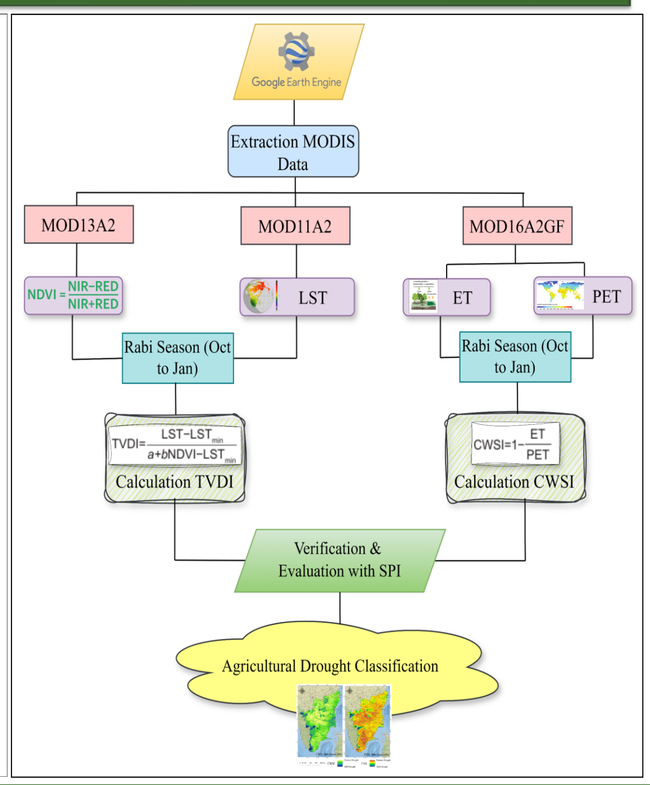


Objectives of the Study

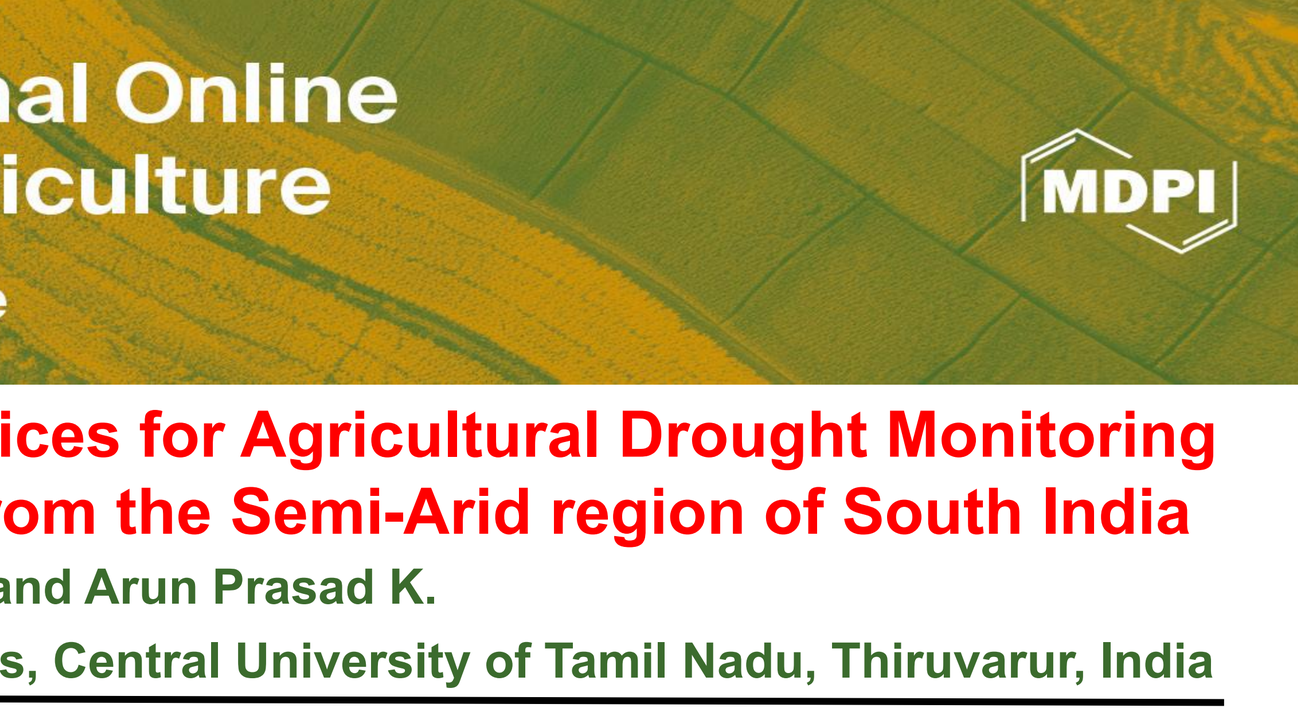
- To **evaluate and compare** the performance of **two remote sensing–based** drought indicators over **Tamil Nadu** during the Rabi season.
- To **explore the spatial and temporal dynamics of TVDI and CWSI** across the **Rabi season** to understand drought variation.
- To **demonstrate** the potential of **integrating vegetation and thermal-based indices** for enhanced and robust **agricultural drought monitoring** in semi-arid regions.

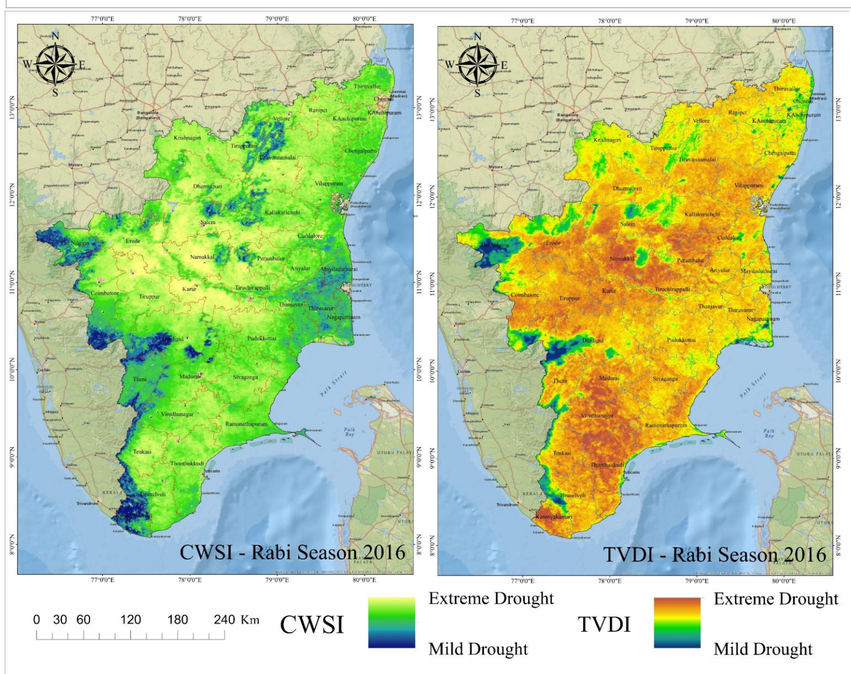
METHOD





RESULTS & DISCUSSION

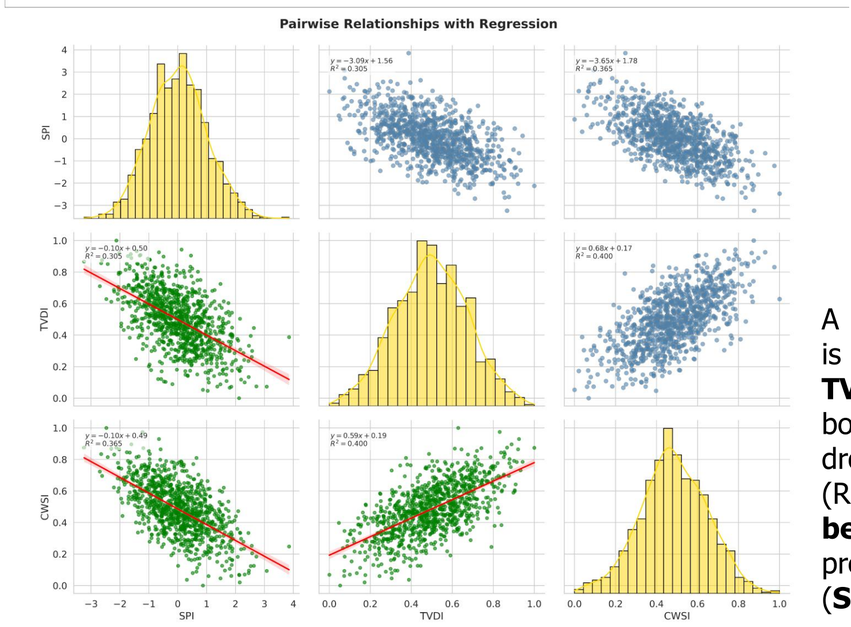




The results indicated that agricultural drought in Tamil Nadu was overall relatively **severe to extreme**, and drought was especially severe in some strip areas, characterized by high values for both indices during the **Rabi season of 2016**.

Tirunelveli, Tenkasi, Virudhunagar, Tiruchirappalli, Karur, Tiruppur, Erode, Namakkal, Perambalur, Villupuram, and Salem districts **experienced extremely dry** conditions.

The **high CWSI and TVDI** values may be attributed to **irregular rainfall**, **limited groundwater availability,** and a **low percentage of irrigated farmland**, indicating greater crop water stress in those areas.



A **strong positive correlation** is evident between **CWSI and TVDI** (R^2 = 0.40), indicating that both indices effectively capture drought severity. However, **CWSI** (R^2 = 0.365) shows **slightly better** alignment with precipitation-based drought (**SPI**).

CONCLUSION and SUGGESTIONS

This study demonstrates that both **TVDI** and **CWSI** effectively capture the spatial and temporal dynamics of agricultural drought in Tamil Nadu during the Rabi season. A strong correlation between the two indices indicates consistent drought detection, with **CWSI showing slightly higher sensitivity** to crop water stress. Overall, **integrating vegetation and thermal indices** enhances the accuracy and robustness of drought monitoring in semi-arid regions. However, this study used only one year of data from Tamil Nadu in the analysis. In the future, the study will be conducted on a longer time series.

REFERENCES

- Chen, A., Jiang, J., Luo, Y., Zhang, G., Hu, B., Wang, X., & Zhang, S. (2023). Temperature vegetation dryness index (TVDI) for drought monitoring in the Guangdong Province from 2000 to 2019. *PeerJ*, *11*, e16337. https://doi.org/10.7717/peerj.16337
- Ma, Z.-C., Sun, P., Zhang, Q., Hu, Y.-Q., & Jiang, W. (2021). Characterization and Evaluation of MODIS-Derived Crop Water Stress Index (CWSI) for Monitoring Drought from 2001 to 2017 over Inner Mongolia. *Sustainability*, *13*(2), 916. https://doi.org/10.3390/su13020916