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A Machine Learning-Based Early Warning System for Droughts in the Pangani Basin, East Africa

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Abstract

Droughts are among the most devastating and costly natural disasters, causing significant harm to agriculture. When soil moisture levels drop, crops face water stress and may not be able to grow, resulting in low productivity. An effective early warning system for droughts is crucial for mitigating their impact. This study introduces a machine learning-based drought early warning system (DEWS) for the Pangani basin. The DEWS combines meteorological, hydrological, soil moisture, and vegetation data from remote sensing and ground station sources to detect and predict drought conditions. Variability in rainfall in the Pangani basin has resulted in dry spells that can cause crop failures due to lack of water. The DEWS employs machine learning algorithms to analyze and test ground data from the Pangani basin, and is designed to detect and predict the onset of drought conditions, allowing for early intervention and mitigation measures to be put in place to reduce the impact of drought. This is particularly useful in African basins where continuous and high-quality data from ground stations may be limited. The DEWS has the potential to reduce the impact of droughts by providing information such as precipitation levels and soil moisture to help farmers, policymakers, and other stakeholders make informed decisions about water management and crop selection, and avoid crop failure. The study highlights the potential of machine learning-based DEWS as a tool for drought monitoring and early warning, and suggests that it could be applied to other regions with similar characteristics to the Pangani basin.

Keywords

Climate change, Agriculture, Farmers, Remote sensing,