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Integrating Earth Observation and Agronomic Diagnostics for Enhanced Crop Monitoring in North Africa

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ABSTRACT

Background: Crop monitoring in semi-arid regions remains challenging due to sparse ground data and variable agro-climatic conditions. Existing remote sensing methods often lack integration with in-situ agronomic diagnostics, limiting their operational utility for smallholder systems.

Purpose and objectives: This paper develops and validates an integrated framework combining satellite-derived indices with diagnostic agronomic modelling to improve the accuracy and actionable insight of crop monitoring for staple cereals in a North African context.

Keywords: *Earth observation, precision agriculture, agronomic diagnostics, crop monitoring, North Africa, remote sensing, semi-arid regions*

Article Highlights

- Integrated model explained over 70% of yield variance
- 25-percentage-point improvement over remote-sensing-only baseline
- Hierarchical Bayesian approach with field-specific random effects
- Positive effect of nutrient status index confirmed with credible intervals

Methodological Innovation

Hierarchical Bayesian model fuses Sentinel-2 time-series data with field-level agronomic diagnostics to estimate crop performance in semi-arid North Africa.

This study demonstrates how integrated monitoring can bridge the gap between remote sensing detection and actionable agricultural insights.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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