

Assimilating Remote Sensing Data into Crop Models: A Global Systematic Review

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Abstract : Accurately estimating crop growth and yield is pivotal for timely sustainable agricultural management and ensuring food security. Crop models and remote sensing can complement each other and form a robust analysis tool to improve crop growth and yield estimations when combined. This study thus aims to systematically evaluate how research that exclusively focuses on assimilating RS data into crop models varies among countries, crops, data assimilation methods, and farming conditions. A strict search string was applied in the Scopus and Web of Science databases, and 497 potential publications were obtained. After screening for relevance with predefined inclusion/exclusion criteria, 123 publications were considered in the final review. Results indicate that over 81% of the studies were conducted in countries associated with high socio-economic and technological advancement, mainly China, the United States of America, France, Germany, and Italy. Many of these studies integrated MODIS or Landsat data into WOFOST to improve crop growth and yield estimation of staple crops at the field and regional scales. Most studies use recalibration or updating methods alongside various algorithms to assimilate remotely sensed leaf area index into crop models. However, these methods cannot account for the uncertainties in remote sensing observations and the crop model itself. 1. Over 85% of the studies were based on commercial and irrigated farming systems. Despite a great global interest in data assimilation into crop models, limited research has been conducted in resource- and data-limited regions like Africa. We foresee a great potential for such application in those conditions. Hence facilitating and expanding the use of such an approach, from which developing farming communities could benefit.

Keywords : crop models, remote sensing, data assimilation, crop yield estimation

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