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Remote Sensing of Crop Health for Food Security in Africa: Potentials and Constraints

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Abstract

Global food security, as determined by the balance of global food production and demand in the face of rapid increase in climate change effects, diseases and pests, has become a critical issue in recent years. From a global to local scale, food production is facing challenges from crop diseases and pests, which have the potential to affect a wide range of crops, and result in significant yield losses. Accurate and timely detection, mapping and monitoring of crop diseases and pests is critical for food security, particularly in sub-Saharan Africa where hunger and poverty have reached alarming stages. Recent developments in high resolution remotely sensed data has seen a great potential in mapping cropland areas infected by pests and diseases, as well as potential vulnerable areas over expansive areas. This paper provides a review on the developments in remote sensing and its potential to estimate and map pest and disease infestation. The review shows that large scale crop diseases and pests mapping and monitoring using remote sensing techniques remains a major challenge. Consequently, the inherent trade-offs between image resolution, spatial coverage, acquisition costs, optimal predictions and high classification accuracies in crop monitoring hinder effective remote sensing applications in monitoring crop diseases and pests, especially in poor economies.

Keywords: Crop pests; diseases mapping; precision farming; proximal sensing; infestation stages

1. Introduction

Anthropogenic activities and industrialization have altered the environment profoundly, leading to global change. The Intergovernmental Panel on Climate Change (IPCC) has reported that the most hazardous manifestation of climate change is through increased temperature, wetter and drier climates, heat waves and prolonged droughts, which in turn causes severe fluctuations in crop production (Landi and Giovanni 2016). One of the serious impacts of climate change on crop productivity, especially in sub-Saharan Africa is the shift in the occurrence of pests and diseases. Emerging pests, such as stock borers and

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