**Optimizing Agricultural Insurance Assessments: A Remote Sensing Framework for Evaluating** **Flood-Induced Damage**

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***ABSTRACT***

Assessing crop damage from floods is vital for effective disaster recovery and agricultural insurance, yet current methods often lack a standardized scientific approach. This study proposes a framework that leverages remote sensing technologies to systematically evaluate flood-affected crop areas, enhancing the reliability of agricultural insurance assessments. The framework utilizes freely available satellite imagery from Landsat, Sentinel-1, and Sentinel-2 to provide a near real-time evaluation of crop damage. Landsat offers historical imagery necessary for understanding long-term impacts, while Sentinel-1’s radar imaging is crucial for detecting floods irrespective of cloud cover, which limits Sentinel-2’s optical imagery. To address this, the framework emphasizes radar data from Sentinel-1 for flood detection and integrates it with boundaries to precisely identify affected crop areas. Additionally, it employs the Normalized Difference Vegetation Index (NDVI) to analyze vegetation health and confirm flood-related damage by detecting deviations from expected patterns. The proposed framework uses Google Earth Engine (GEE) to automate data processing, significantly reducing manual effort and the need for specialized knowledge. By leveraging GEE’s cloud-based platform, the framework ensures a more efficient and consistent evaluation process. Evaluations based on historical flood events demonstrate that the framework identified 78% of flood-damaged crop areas. However, limitations include the lack of continuous imagery and the 30-meter resolution of remote sensing data, which may not capture smaller-scale damage. This study highlights the potential of integrating remote sensing with automated processing to enhance the precision and efficiency of crop damage assessments for agricultural insurance, providing a valuable tool for disaster response and insurance management.

**Keywords:** Agricultural Insurance, Flood Damage Assessment, Remote Sensing, Google Earth Engine