# Yield Estimation of Rice Using Multispectral Imagery from UAV in Nepal

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**Key words:** Capacity building; Cost management; Engineering survey; Geoinformation/GI; GNSS/GPS; Low cost technology; Photogrammetry; Positioning; Professional practice; Risk management; Digital Surface Model; Digital Terrain Model; Multi-Spectral sensor; Vegetation Index

**SUMMARY**

Agriculture plays a vital role in sustaining human life and providing food security for the global population. Sustainable development goals(SDGs) especially SDG 2: Zero hunger and SDG 12: Responsible consumption and production has stressed out that to optimize crop yield to meet the increasing demand for food security. Multispectral drones commonly known as UAVs, equipped with specialized sensors provides critical understanding into crop health, stress, and growth patterns, which are vital for optimizing crop management such as the early detection of diseases, pests, nutrient deficiencies, and other stress factors that can affect yield and quality.

Information to the farmer regarding irrigation, fertilizer dose estimation and pest control can lead to increased crop productivity and reduced input costs with optimum resources allocation. The primary focus of this study is to use the capabilities of multispectral imagery obtained through UAVs to precisely estimate rice yield by using sophisticated analysis techniques to open the way for more informed, sustainable, climate resilient and productive agricultural practices and implement smart climate practices. The article presented aims to estimate rice yield using regression models based on plant characteristics, including plant height, plant age, farm management data such as amount of DAP, zinc, Urea, Potash used and vegetation indices derived from unmanned aerial vehicle (UAV) data. The specific objectives are to analyze the correlation between indices, develop linear and multilinear relationships between yield and plant characteristics, and perform separate regression models based on the type of rice plant. The study was conducted in six different study areas during the month August and September. A total of 19 vegetation indices were calculated from multispectral and RGB imagery. Statistical measures such as mean, standard deviation, minimum, maximum, and sum were obtained from zonal statistics in ArcGIS software. Correlation analysis and regression models were developed using plant height, plant age, farm management and vegetation indices. The developed regression models showed good

accuracy in estimating rice yield, with R-squared values of around 74% with a predicted R-squared values of around 69%. The convergence of UAV-based multispectral imagery and data analysis techniques represents a pivotal step forward in revolutionizing rice yield estimation The study contributes to the field of precision agriculture by demonstrating the feasibility of using UAV-derived vegetation indices, farm management data, plant age and plant height for rice yield estimation for ensuring food security and economic resilient in the face of climate change.

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