**Maturity Determination of Plant and Ratoon Crops of Sugarcane (*Saccharum officinarum*) Plantations Based on UAV Images**

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**Abstract**

Determination of the maturity of sugarcane is mainly influenced by Agronomic, visual observation, and weather conditions. Conventional maturity determination indices are time and labor-consuming. Hence, with the advanced technology of the world, Unmanned Aerial Vehicle (UAV)-based Multispectral Imagery is widely used for plant monitoring. This study focuses on determining the maturity state of the sugarcane fields in order to optimize the yield by timely harvesting. NDVI (Normalized Difference Vegetation Index), GNDVI (Green Normalized Difference Vegetation Index), and NDRE (Normalized Difference Red Edge) Vegetative Indices which are derived from the UAV images were used and they mainly represent the greenness or chlorophyll activity of the crop. Recovery Cane Sugar (RCS) (%) amount was obtained from the milling section of the Pelwatte Lanka Sugar Company (Pvt) Limited and related NDVI, GNDVI, and NDR indexes were acquired from 9–12 month age ratoon crops in the intermediate zone at the Pelwatte. According to the results NDVI, GNDVI, and NDRE are not much significantly different from the crop age. RCS (%) shows a positive correlation with the NDVI, GNDVI, and NDRE values. The correlation coefficient values are respectively 0.33, 0.35, and 0.73. According to the results, RCS (%) has a strong positive correlation with the NDRE. The data which gathered earlier using the same methodology was used as secondary data which derived from the sugarcane plant crops in the intermediate zone and the results indicate that RCS (%) shows a strong negative correlation with the NDVI, GNDVI, and NDRE. The correlation coefficient values are respectively -0.92, -0.98, and -0.90.Though the relationship between RCS (%) with the Vegetative Indices show a positive relationship in ratoon crops, plant crops showed negative relationship. Further study is required to confirm the relationships between VIs and sugar recovery.This study requires more data to identify the most fitted VI for the estimation of the maturity of sugarcane cultivations

**Keywords:** Unmanned Aerial Vehicle, Multispectral Imagery, Normalized Difference Vegetation Index, Green Normalized Difference Vegetation Index, Normalized Difference Red Edge.