

**Application of Multispectral Drone for Quantitative Assessment of the Fertilizer Requirement for the Up-country Tea Plantation in Sri Lanka**

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**Abstract**

The amount of chlorophyll content and structure would differ between diseased and healthy plants, affecting the NDVI values, which strongly correlated with fertilizer applications. The primary goal of this research is to use a multispectral drone to quantify the fertilizer requirements for the sample tea plantations in Nuwara Eliya, Sri Lanka. In contrast, a drone with multispectral imaging camera sensors was used to gather images covering blue, green, red, red-edge, and near-infrared bands. The collected images were analyzed, and geographic outputs were generated. The processed geospatial data were used to determine the NDVI values for each tea field, and the general health of the tea was estimated. Finally, NDVI readings and geospatial products from each tea field related to soil analytical data. Based on the NDVI values, 25 selected soil samples were collected using sampling plots. The concentrations of pH, electrical conductivity (EC), nitrogen (N), phosphorus (P) and potassium (K) were then determined using standard soil testing procedures. Finally, soil analysis results were combined with the geospatial data. In addition, the amount of Dolomite for each tea field was calculated based on the pH values, and the amount of nitrogen, phosphorus, and potassium was calculated as yield and area and based on the number of tea bushes. The tea plantations show an NDVI range of 0.76-0.81 for low healthy tea, 0.81-0.86 for medium healthy tea and 0.86-0.97 for healthy tea. The healthiness percentages of one of the tea plantation show 18% healthy tea, 54% medium healthy tea, and 22% low healthy tea. Conversely, the healthiness percentages of the other tea plantation show 44% healthy tea, 39% medium healthy tea and 17% low healthy tea based on the NDVI value. The average value of pH, EC, N, P, and K are 4.84, 41.58, 0.29, 0.11, 0.04 in tea plantations, respectively, and in other planation, average values of pH, EC, N%, P%, and K% are 4.83, 40.96, 0.36, 0.25, 0.04 respectively. The amounts of Dolomite for each tea field are 2685.32 Kg/ha and 977.34 Kg/ha. In one tea field, an average annual NPK fertilizer need is 685 kg per hectare, 94 kg per hectare, and 269 kg per hectare, respectively. Additionally, calculations based on tea bushes indicate that the average annual NPK fertilizer requirements are 685 kg, 89 kg, and 254 kg, respectively. Other tea filed average annual NPK fertilizer need is 88 kg per hectare, 24 kg per hectare, and 68 kg per hectare, respectively. Additionally, calculations based on tea bushes indicate that the average annual NPK fertilizer requirements are 90 kg, 25 kg, and 70 kg, respectively. However, these values have several limitations, such as climate, soil, plant, and cultural practices. This study mainly focuses on and creates Insights into Plant Health by assessing precise plant-level data using a multispectral imaging system. It had not been correlated with other factors except soil conditions.

**Keywords:** Unmanned aerial vehicles, Multispectral, NDVI, Tea, Fertilizer