

**IDENTIFIKASI PENYAKIT JAMUR AKAR PADA TANAMAN TEH
(*Camellia sinensis*) DENGAN CITRA PLANETSCOPE SUPERDOVE
MENGUNAKAN TRANSFORMASI INDEKS VEGETASI DAN
LINEAR SPECTRAL MIXTURE ANALYSIS (LSMA)**

INTISARI

Tanaman teh (*Camellia sinensis*) merupakan komoditas perkebunan bernilai ekonomi tinggi di Indonesia, namun produktivitasnya terus tertekan oleh penurunan luas lahan dan serangan penyakit, khususnya jamur akar. Penyakit jamur akar menimbulkan perubahan fisiologis yang berpengaruh pada respons spektral tajuk, sehingga pendekatan penginderaan jauh berpotensi digunakan untuk memetakan serangan secara objektif pada skala kebun yang luas. Penelitian ini memanfaatkan citra PlanetScope SuperDove untuk membangun model identifikasi tanaman teh yang terserang penyakit jamur akar menggunakan regresi *Random Forest* (RF) dengan input: (1) integrasi transformasi indeks vegetasi dengan *Linear Spectral Mixture Analysis* (LSMA) dan (2) kombinasi delapan *band* citra PlanetScope SuperDove. Selain itu, penelitian ini juga bertujuan untuk mengetahui hubungan hasil model dengan faktor vegetatif dan lingkungan melalui analisis korelasi *Pearson*. Penerapan LSMA untuk mengekstraksi piksel campuran menjadi fraksi tutupan lahan menunjukkan nilai SEE sebesar 30,5%. Hasil penelitian ini menunjukkan bahwa integrasi indeks vegetasi dengan LSMA mampu meningkatkan akurasi pada model identifikasi tanaman teh yang terserang penyakit jamur akar. Model *Simple Ratio* (SR) tanaman teh menghasilkan nilai R^2 sebesar 0,22, korelasi (r) sebesar 0,47, dan SEE sebesar 31,65%, sedangkan model regresi RF dengan kombinasi 8 *band* menunjukkan performa yang lebih baik dengan R^2 sebesar 0,32, korelasi (r) sebesar 0,56, dan SEE sebesar 31,74%. Analisis variabel *importance* pada model regresi RF dengan kombinasi 8 *band* mengindikasikan bahwa *band* kuning dan *red-edge* memiliki kontribusi paling besar. Kemudian analisis korelasi *Pearson* antara model regresi RF 8 *band* dengan faktor vegetatif dan lingkungan menunjukkan hubungan sangat lemah ($r < 0,2$). Namun, keterbatasan penelitian ini meliputi distribusi titik sampel lapangan yang tidak merata dan keterbatasan saluran spektral citra PlanetScope dalam menangkap variasi reflektansi tanaman teh.

Kata kunci: Indeks vegetasi; *Linear Spectral Mixture Analysis* (LSMA); PlanetScope SuperDove; *Random Forest* (RF); Tanaman teh terserang penyakit jamur akar

***IDENTIFICATION OF ROOT FUNGUS DISEASE IN TEA PLANTS
(Camellia sinensis) USING PLANETSCOPE SUPERDOVE IMAGERY WITH
VEGETATION INDEX TRANSFORMATION AND
LINEAR SPECTRAL MIXTURE ANALYSIS (LSMA)***

ABSTRACT

*Tea plants (*Camellia sinensis*) are a high value agricultural commodity in Indonesia, but their productivity continues to be suppressed by declining land area and disease outbreaks, particularly root fungus. Root fungus disease causes physiological changes that affect canopy spectral response, so remote sensing approaches have the potential to be used to map outbreaks objectively on a large plantation scale. This study utilizes PlanetScope SuperDove imagery to build a model for identifying tea plants affected by root fungus disease using Random Forest (RF) regression with the following inputs: (1) integration of vegetation index transformation with Linear Spectral Mixture Analysis (LSMA) and (2) a combination of eight bands of PlanetScope SuperDove imagery. In addition, this study also aims to determine the relationship between the model results and vegetative and environmental factors through Pearson correlation analysis. The application of LSMA to extract mixed pixels into land cover fractions showed an SEE value of 30.5%. The results of this study indicate that the integration of vegetation indices with LSMA can improve the accuracy of the identification model for tea plants infected with root fungus disease. The Simple Ratio (SR) model for tea plants produced an R^2 value of 0.22, a correlation (r) of 0.47, and an SEE of 31.65%, while the RF regression model with a combination of 8 bands showed better performance with an R^2 of 0.32, a correlation (r) of 0.56, and an SEE of 31.74%. Variable importance analysis on the RF regression model with a combination of 8 bands indicated that the yellow and red-edge bands had the greatest contribution. Furthermore, Pearson's correlation analysis between the 8 band RF regression model and vegetative and environmental factors showed a very weak relationship ($r < 0.2$). However, the limitations of this study include the uneven distribution of field sample points and the limitations of PlanetScope image spectral channels in capturing the reflectance variation of tea plants.*

Keywords: *Vegetation index; Linear Spectral Mixture Analysis (LSMA); PlanetScope SuperDove; Random Forest (RF); Tea plants affected by root fungus disease*