# PERBANDINGAN TRANSFORMASI INDEKS VEGETASI DAN *FOREST CANOPY DENSITY* (FCD) UNTUK PEMETAAN KERAPATAN KANOPI DI SEBAGIAN KAWASAN GUNUNG ARJUNO-WELIRANG

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## ABSTRAK

Informasi kerapatan kanopi dapat digunakan untuk mengetahui sebaran objek vegetasi pada suatu penutup lahan. Kawasan Gunung Arjuno-Welirang memiliki masih mengalami alih fungsi lahan. Metode penginderaan jauh untuk pemetaan kerapatan kanopi dapat menggunakan indeks vegetasi dan *forest canopy density* (FCD). Penelitian ini bertujuan 1) membandingkan kapabilitas hasil pemodelan dan nilai akurasi indeks vegetasi dan FCD untuk memetakan kerapatan kanopi, 2) mengidentifikasi karakteristik kerapatan kanopi pada setiap kondisi topografi berdasarkan analisis indeks vegetasi dan FCD. Transformasi indeks vegetasi yang digunakan *Normalized Difference Index* (NDVI), *Soil Adjusted Vegetation Index* (SAVI), *Atmospheric Resistant Vegetation Index* (ARVI), *Enhanced Vegetation Index* (EVI), dan *Modified Soil and Atmospheric Resistant Vegetation Index* (MSARVI). Seluruh model index vegetasi dan FCD diterapkan pada citra yang terkoreksi atmosferik dan terkoreksi topografi *Sun-Canopy-Sensor+C* (SCS+C). Model FCD menggunakan indeks biofisik *Advanced Vegetation Index* (AVI), *Bare Soil Index* (BI), *Shadow Index* (SI), dan *Thermal Index* (TI). Estimasi kerapatan kanopi dari model indeks vegetasi dibangun menggunakan persamaan regresi linear sederhana dari data kerapatan kanopi lapangan.

Berdasarkan uji akurasi *standard error of estimate* (SEE) nilai akurasi yang diperoleh yaitu NDVI atmosferik 43, 61%, ARVI atmosferik 43,20%, ARVI topografi 40,10%, NDVI topografi 39,99%, FCD topografi, 32,53%, SAVI topografi, 31,52%, SAVI atmosferik 31,03%, FCD atmosferik 29,92%, MSARVI topografi 27,97%, MSARVI atmosferik 27,1%, EVI topografi 24,67%, dan EVI topografi 23,53%. SAVI, EVI, MSARVI, dan FCD terkoreksi topografi memiliki akurasi lebih tinggi dibandingkan koreksi atmosferik. Berdasarkan akurasi *confusion matrix* klasifikasi FCD akurasi yang diperoleh yaitu 23,8% untuk topografi dan 18,1% untuk atmosferik. Analisis karakteristik kanopi di Kawasan Gunung Arjuno-Welirang yaitu, kaki gunung api didominasi vegetasi kerapatan rendah hingga tinggi. Lereng gunung api memiliki kawasan hutan, dengan kerapatan kanopi sedang hingga tinggi. Serta, kerucut gunung api berupa sabana dan hutan. Berdasarkan hasil klasifikasi FCD, kawasan Arjuno-Welirang memiliki komposisi struktur mulai dari herba hingga tajuk pohon dengan nilai kerapatan 0%-99%. Dominasi komposisi struktur adalah tajuk pohon dengan selingan herba dan semak dengan rata-rata kerapatan kanopi 54,02%.

**Kata kunci** : Kerapatan kanopi, indeks vegetasi, FCD

# COMPARISON OF VEGETATION INDEX TRANSFORMATION AND FOREST CANOPY DENSITY (FCD) FOR CANOPY DENSITY MAPPING IN A PART OF ARJUNO-WELIRANG MOUNTAIN

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## *ABSTRACT*

Canopy density information can be used to determine the distribution of vegetation objects on a land cover. Arjuno-Welirang Mountain is still experiencing land conversion. Remote sensing methods for canopy density mapping can use vegetation index and forest canopy density (FCD). This study aims to 1) compare the modeling capabilities and the accuracy of vegetation index and FCD for canopy density mapping, 2) identify the characteristics of the canopy density in each topographical condition based on the analysis of vegetation index and FCD. The vegetation index transformation used is Normalized Difference Index (NDVI), Soil Adjusted Vegetation Index (SAVI), Atmospheric Resistant Vegetation Index (ARVI), Enhanced Vegetation Index (EVI), and Modified Soil and Atmospheric Resistant Vegetation Index (MSARVI). All vegetation index and FCD models were applied to atmospheric corrected and topographically corrected Sun-Canopy-Sensor+C (SCS+C) images. FCD model uses Advanced Vegetation Index (AVI), Bare Soil Index (BI), Shadow Index (SI), and Thermal Index (TI). Canopy density estimate from the vegetation index model was constructed using a simple linear regression equation from the field canopy density data.

Based on the standard error of estimate (SEE) accuracy test, the accuracy values obtained are atmospheric NDVI 43.61%, atmospheric ARVI 43.20%, topographic ARVI 40.10%, topographic NDVI 39.99%, topographic FCD, 32.53%, topographic SAVI, 31.52%, atmospheric SAVI 31.03%, atmospheric FCD 29.92%, topographic MSARVI 27.97%, atmospheric MSARVI 27.1%, topographic EVI 24.67%, and topographic EVI 23.53 %. Topographically corrected SAVI, EVI, MSARVI, and FCD have higher accuracy than atmospheric correction. Based on the confusion matrix FCD classification, the accuracy obtained is 23.8% for topographic and 18.1% for atmospheric. Analysis of canopy characteristics in Arjuno-Welirang Mountain is volcanic foothills are dominated by low to high canopy density. The slopes of the volcano have forest areas, with medium to high canopy density. As well as, volcanic cones in the form of savanna and forest. Based on the results of the FCD classification, the Arjuno-Welirang area has a structural composition ranging from herbs to tree crowns with a density value of 0%-99%. The dominance of the structure composition was tree canopy interspersed with herbs and shrubs with an average canopy density of 54.02%.

**Keyword** : Canopy density, vegetation index, FCD