

INTISARI

Penelitian ini dilakukan dengan tujuan mengetahui hubungan pantulan spektral damar pada data digital multispektral Landsat ETM+ saluran tunggal (saluran ETM 1 – 5 dan 7) dan hasil transformasi matematis indeks vegetasi dengan umur damar, menentukan jenis transformasi matematis indeks vegetasi dan saluran tunggal yang paling baik dalam menggambarkan informasi umur damar, serta melakukan estimasi produksi kopal damar berdasarkan hasil pemrosesan informasi spektral data digital Landsat ETM+ yang dipadukan dengan data pengukuran lapangan menggunakan SIG. Penelitian ini dilaksanakan di BKPH Banjarnegara, Provinsi Jawa Tengah.

Sumber data utama penelitian ini adalah Citra Landsat ETM+ perekaman 20 Mei 2003, serta peta hutan dan peta RBI sebagai data bantu. Transformasi matematis indeks vegetasi yang dipergunakan untuk mempertajam kenampakan vegetasi adalah NDVI, RVI, GVI, SAVI, TVI, dan VIF. Metode pengolahan data meliputi pengolahan citra secara digital, pengecekan lapangan, dan analisis hasil secara statistik berdasarkan nilai korelasi dan persamaan regresi. Pendekatan utama penelitian ini adalah hubungan nilai spektral sebagai variabel terikat dan umur damar sebagai variabel bebas. Produksi kopal merupakan fungsi dari luas panen, jumlah hari kerja, kerapatan tegakan, dan produktivitas per pohon. Potensi produktivitas per pohon diperoleh untuk setiap kelas umur dengan kontrol keliling batang dan jumlah sadapan per pohon. Pengambilan sampel lapangan menggunakan metode pengambilan sampel terstratifikasi dan pengambilan sampel wilayah, dengan dasar pertimbangan umur dan homogenitas nilai spektral.

Hasil analisis statistik menunjukkan korelasi terbesar untuk saluran tunggal adalah pada saluran ETM 4 ($r = -0,737$ dan $r^2 = 0,544$ atau tingkat kepercayaannya 54,4%) dengan persamaan regresi $Y = 21,272 - 0,142 X$. Pada citra hasil transformasi matematis indeks vegetasi, korelasi terbesar diperoleh pada citra GVI ($r = -0,609$ dan $r^2 = 0,371$ atau tingkat kepercayaannya 37,1%) dengan persamaan regresi $Y = 51,882 - 0,176 X$. Taraf signifikansi kedua hubungan tersebut semua 0,000, sehingga hubungan yang terjadi sangat nyata. Hasil tersebut menjawab hipotesis satu, dua dan tiga, yang menyatakan ada korelasi yang kuat antara nilai spektral dengan umur damar, serta ada citra yang dapat dimanfaatkan dalam proses estimasi produksi, yaitu citra saluran ETM 4.

Potensi produksi kopal hasil estimasi sebesar 187,621 ton untuk tahun 2003, pada luas panen 586,134 ha. Data perhitungan Perum Perhutani tahun yang sama sebesar 324,872 ton, pada luas panen 743,231 ha. Perbandingan kedua hasil tanpa memperhitungkan perbedaan luas menghasilkan ketelitian 57,75%. Namun apabila perbedaan luas diperhitungkan, diperoleh ketelitian 73,23%. Data sadapan aktual tahun 2003 sebesar 140,715 ton. Perbandingan kedua hasil menghasilkan ketelitian 75%. Hipotesis empat dinyatakan tidak terbukti, karena ketelitian hasil masih kurang dari 95%. Perbedaan hasil dipengaruhi oleh perbedaan metode, terutama pendekatan yang digunakan. Metode ini masih mungkin dikembangkan dan diharapkan dapat diperoleh metode yang lebih baik.

ABSTRACT

This research is aimed to know the correlation between the spectral reflectance of damar on the single band digital multispectral Landsat ETM+ (band ETM 1-5 and 7) data, and the mathematical transformation of vegetation index result with the age of damar, to determine the best type of mathematical transformation of vegetation index and single band in depicting the age of damar information, and to estimate the copal damar production based on the result of spectral information processing from digital Landsat ETM+ data which is integrated with the data from field measurement using GIS. This research has been done in BKPH Banjarnegara, Central Java Province.

The main data source of this research was taken from Landsat ETM+ image, acquired on May 20th, 2003, and from forest map and RBI map as the branch source. Mathematical transformation of vegetation index which was used to sharpen the vegetation appearance were NDVI, RVI, GVI, SAVI, TVI, and VIF. The data processing methods were digital image processing, field checking, and statistical data analysis based on the correlation value and regression equivalent. The main approach of this research was the correlation between spectral value as the dependent variable and the age of damar as the independent variable. Copal production was the function of the harvest wide, the amount of working days, density of the trees, and productivity of each tree. The productivity potentation of each tree was gathered for each age class with the stalk circle control and the amount of sap tapped on each tree. The field sample had been taken using the stratified sampling method and areal sampling, based on the consideration of the age and spectral value homogeneity.

The statistic analysis result shows the biggest correlation for single band is in the ETM 4 band ($r = -0.737$ and $r^2 = 0.544$, or in the other words, the confidence level is 54.4%) with regression equivalent is $Y = 21.272 - 0.142 X$. On the image using mathematical transformation of vegetation index result, the biggest correlation is on the GVI image ($r = -0.609$ and $r^2 = 0.371$, or in the other words, the confidence level is 37.1%) with the regression equivalent is $Y = 51.882 - 0.176 X$. The significant level of those two correlation is 0.000, therefore the correlation which happenend is real. That result answers the first, second, and third hypothesis, which stated that there is a strong correlation between spectral value with the age of damar, and there is an image which can be used in the production estimation process, that is the single band ETM 4 image.

The result estimation of the copal production potency in 2003 is 187.621 ton for the 586.134 ha harvest wide. The measurement data from Perum Perhutani for the same year with the harvest wide 743.231 ha is 324.872 ton. The comparison of those two results, without considering the wide difference, shows the accuracy as much as 57.75%. However, when the wide difference is considered, the level of accuracy become 73.23%. The actual sap tapped data in 2003 is 140.715 ton. The comparison of those two results shows the accuracy as much as 75%. Based on it, the fourth hypothesis is stated unproffen, because the result of the accuracy is still under 95%. The difference on the result is influenced by the method difference, especially the approaches which is used. This method still can be developed, and hopefully can be found a better method.