ABSTRAK

ANALISIS KELEMBAPAN LAHAN GAMBUT TROPIS MENGGUNAKAN MODEL OPTRAM *(OPTICAL TRAPEZOID MODEL)* BERBASIS CITRA SENTINEL-2 (STUDI KASUS : DESA TABALA JAYA)

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Penelitian ini bertujuan memetakan distribusi spasial kelembapan lahan gambut tropis di Desa Tabala Jaya, Kabupaten Banyuasin menggunakan pendekatan *Optical Trapezoid Model (*OPTRAM) berbasis citra Sentinel-2. OPTRAM memanfaatkan hubungan antara *Normalized Difference Vegetation Index* (NDVI) dan *Shortwave Infrared Transformed Reflectance* (STR) dalam ruang *trapesoid* dua dimensi yang menunjukkan nilai kelembapan lahan setiap piksel dari kering hingga basah (Sadeghi et al., 2017). Hasil pemodelan menunjukkan nilai indeks kelembapan rata-rata sebesar 0,349 dengan median 0,267 pada rentang 0,003-0,999. Klasifikasi menggunakan metode *Natural Breaks (Jenks*) menghasilkan tiga kelas kelembapan: kelas Kering (0-0,392) mendominasi dengan luas 284,577 ha (62,0%), diikuti kelas Sedang 112,703 ha (24,6%), dan kelas Basah 61,462 ha (13,4%). Analisis deskriptif terhadap lima titik pengamatan lapangan menunjukkan bahwa titik pengamatan pada bekas tambak ikan menghasilkan estimasi paling representatif karena tutupan vegetasi yang lebih terbuka memungkinkan sinyal SWIR mencerminkan kondisi permukaan tanah gambut secara lebih langsung. Tutupan vegetasi yang mencapai 90% area penelitian menjadi faktor pembatas utama karena sinyal SWIR lebih mencerminkan kandungan air kanopi nipah dan mangrove daripada kelembapan lahan gambut, sehingga dominasi kelas Kering yang diperoleh merupakan hasil gabungan dari kondisi musiman akhir kemarau dan keterbatasan penetrasi sinyal SWIR menembus kanopi lebat (Burdun et al., 2023; Koupaei-Abyazani et al., 2024). Hasil penelitian menunjukkan bahwa OPTRAM berpotensi digunakan untuk menggambarkan variasi spasial kelembapan gambut tropis secara kontinu, namun penerapannya pada ekosistem bervegetasi lebat perlu mempertimbangkan batasan tutupan kanopi secara eksplisit.

Kata kunci: Kelembapan lahan gambut, OPTRAM, Sentinel-2, Penginderaan jauh, Hidrologi gambut

ABSTRACT

ANALYSIS OF TROPICAL PEATLAND MOISTURE USING THE OPTRAM (OPTICAL TRAPEZOID MODEL) BASED ON SENTINEL-2 IMAGERY (CASE STUDY: TABALA JAYA VILLAGE)

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This study aims to map the spatial distribution of moisture in tropical peatlands in Tabala Jaya Village, Banyuasin Regency, using the Optical Trapezoid Model (OPTRAM) approach based on Sentinel-2 imagery. OPTRAM utilises the relationship between the Normalised Difference Vegetation Index (NDVI) and Shortwave Infrared Transformed Reflectance (STR) within a two-dimensional trapezoidal space that indicates the moisture content of each pixel ranging from dry to wet (Sadeghi et al., 2017). Modelling results showed an average moisture index value of 0.349 with a median of 0.267 within the range of 0.003–0.999. Classification using the Natural Breaks (Jenks) method yielded three moisture classes: the Dry class (0–0.392) dominated with an area of 284,577 ha (62.0%), followed by the Moderate class at 112,703 ha (24.6%), and the Wet class at 61,462 ha (13.4%). Descriptive analysis of the five field observation points indicates that the observation point at the former fish pond site yields the most representative estimates, as the more open vegetation cover allows the SWIR signal to reflect the condition of the peatland surface more directly. Vegetation cover, which accounts for 90% of the study area, was the primary limiting factor, as the SWIR signal reflects the water content of the nipah and mangrove canopies rather than the moisture content of the peatland; consequently, the predominance of the 'Dry' class observed is a combined result of the seasonal conditions at the end of the dry season and the limited penetration of the SWIR signal through the dense canopy (Burdun et al., 2023; Koupaei-Abyazani et al., 2024). The results indicate that OPTRAM has the potential to be used to continuously characterise spatial variations in tropical peat moisture, but its application in heavily vegetated ecosystems must explicitly account for canopy cover limitations.

Keywords: Peatland moisture, OPTRAM, Sentinel-2, Remote sensing, Peatland hydrology