INTISARI

PERBANDINGAN ALGORITMA *MAXIMUM LIKELIHOOD CLASSIFICATION*, *SUPPORT VECTOR MACHINE,* DAN *RANDOM FOREST* UNTUK PEMETAAN MANGROVE DI TELUK LUMPUR, GILIMANUK MENGGUNAKAN CITRA SENTINEL-2A

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Indonesia dengan garis pantai yang luas, memiliki ekosistem mangrove yang penting untuk kestabilan garis pantai dan mitigasi perubahan iklim. Namun, luas hutan mangrove terus berkurang akibat alih fungsi lahan. Pemetaan mangrove yang akurat sangat diperlukan, dan *Google Earth Engine* (GEE) menawarkan solusi efisien untuk pemrosesan data, dengan menggunakan algoritma machine learning seperti MLC, SVM, dan RF untuk mengklasifikasikan hutan mangrove di Teluk Lempur, Bali.

Penelitian ini bertujuan (1) menentukan saluran input citra Sentinel-2A yang tepat untuk mendeteksi mangrove menggunakan algoritma MLC, SVM, dan RF, (2) memetakan dan menganalisis karakteristik perbedaan hasil pemetaan mangrove menggunakan algoritma MLC, SVM, dan RF, (3) melakukan uji akurasi untuk menentukan algoritma paling baik dalam memetakan mangrove di antara MLC, SVM, dan RF. Penelitian ini menggunakan Citra Satelit Sentinel-2A *Level Surface Reflectance* sebagai sumber data klasifikasi. Uji akurasi dilakukan *area-based accuracy assessment* yang terdiri dari matriks *Overall Quality, Producer Accuracy, User Accuracy, dan Overall Accuracy.*

Formasi saluran input terbaik untuk pemetaan mangrove adalah integrasi saluran Sentinel-2A dan indeks vegetasi, termasuk B8, B8A, B11 B12, CMRI, SR, NDVI, dan MFI. Ketiga algoritma, SVM, RF, dan MLC, mampu memetakan mangrove dengan baik meskipun menunjukkan perbedaan dalam batas delineasi dan kemampuan memisahkan kelas. Uji akurasi menunjukkan bahwa *Random Forest* memiliki *Overall Accuracy* tertinggi sebesar 87,2%, diikuti oleh SVM (86%) dan MLC (84,7%).

Kata Kunci: Mangrove, SVM, RF, MLC, GEE, Sentinel-2A, pemetaan, klasifikasi

ABSTRACT

COMPARISON OF MAXIMUM LIKELIHOOD CLASSIFICATION, SUPPORT VECTOR MACHINE, AND RANDOM FOREST ALGORITHMS FOR MANGROVE MAPPING IN TELUK LEMPUR, GILIMANUK USING SENTINEL-2A IMAGERY

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Indonesia, with its extensive coastline, harbors a significant mangrove ecosystem that plays a crucial role in coastal stability and climate change mitigation. However, the area covered by mangroves has been steadily decreasing due to land-use conversion. Accurate mangrove mapping is essential, and remote sensing technology through Google Earth Engine (GEE) offers an efficient solution for data processing. This study employs machine learning algorithms such as Maximum Likelihood Classification (MLC), Support Vector Machine (SVM), and Random Forest (RF) to classify mangrove forests in Teluk Lempur, Gilimanuk, Bali, aiming to compare the performance of these algorithms in mangrove mapping.

The objectives of this study are to (1) determine the appropriate Sentinel-2A image bands for detecting mangrove using MLC, SVM, and RF, (2) map and analyze the characteristic differences in mangrove mapping results using these algorithms, and (3) perform an accuracy assessment to identify the most suitable algorithm for mangrove mapping. The study utilizes Sentinel-2A Level Surface Reflectance imagery and maps four land cover classes: mangrove, non-mangrove vegetation, non-vegetation, and water bodies. Accuracy assessment is based on an area-based accuracy approach, using matrices of Overall Quality, Producer Accuracy, User Accuracy, and Overall Accuracy.

The optimal input band combination for mangrove mapping is the integration of Sentinel-2A original bands and vegetation indices, namely B8, B8A, B11, B12, CMRI, SR, NDVI, and MFI. All three algorithms, SVM, RF, and MLC, effectively mapped mangroves, although they showed differences in delineation boundaries, class separation abilities, and the mapped area extent. The accuracy results indicated that Random Forest achieved the highest Overall Accuracy at 87,2%, followed by Support Vector Machine with 86%, and Maximum Likelihood Classification at 84,2%.

Keywords: Mangrove, SVM, RF, MLC, GEE, Sentinel-2A, mapping, classification