ABSTRAK

Pemetaan batimetri merupakan aspek penting dalam pengelolaan sumber daya kelautan. Metode *In-situ* seperti survei sonar memiliki keterbatasan dalam hal biaya dan cakupan area, sehingga pendekatan alternatif melalui penginderaan jauh berbasis citra satelit menjadi solusi yang efisien. Penelitian ini bertujuan untuk meningkatkan akurasi estimasi batimetri menggunakan algoritma *machine learning*, yaitu *Random Forest* (RF) dan *Support Vector Machine* (SVM), berbasis citra Sentinel-2A. Lokasi penelitian berada di perairan Kepulauan Obi, Halmahera Selatan. Hasil prediksi kedalaman kemudian divalidasi menggunakan data in-situ dan diuji menggunakan metrik MAE, RMSE, dan R^2. Hasil menunjukkan bahwa algoritma *Random Forest* memberikan akurasi terbaik dengan nilai MAE 1.1704, RMSE 1.5976, dan R^2 sebesar 0.8092. Algoritma SVM juga menunjukkan performa yang baik namun masih berada di bawah RF. Dibandingkan dengan algoritma Lyzenga, metode *machine learning* terbukti lebih unggul dalam menangkap hubungan non-linear antara nilai reflektansi dan kedalaman perairan. Penelitian ini membuktikan bahwa integrasi citra satelit dengan *machine learning* mampu meningkatkan kualitas pemetaan batimetri secara signifikan dan efisien.

***Kata kunci**: Batimetri, Machine Learning, Citra Satelit, Random Forest, Support Vector Machine*

ABSTRACT

Bathymetric mapping is crucial for the management of marine resources. *In–situ* methods such as sonar surveys face limitations in cost and area coverage, making satellite remote sensing a more efficient alternative. This study aims to improve the accuracy of bathymetry estimation using machine learning algorithms, namely *Random Forest* (RF) and *Support Vector Machine* (SVM), based on Sentinel-2A satellite imagery. The study was conducted in the waters of Obi Islands, South Halmahera. Predicted depths were validated using in-situ measurements and evaluated using MAE, RMSE, and R^2 metrics. The results showed that the *Random Forest* algorithm achieved the highest accuracy with MAE of 1.1704, RMSE of 1.5976, and R^2 of 0.8092. While SVM also performed well, its accuracy was slightly lower than RF. Compared to the Lyzenga algorithm, *machine learning* methods proved more effective in capturing non-linear relationships between reflectance values and water depth. This study demonstrates that the integration of satellite imagery with *machine learning* significantly enhances the efficiency and accuracy of bathymetric mapping.

Keywords: *Bathymetry*, *Machine Learning*, *Satellite Imagery*, *Random Forest, Support Vector Machine*