

**KAJIAN *MULTIPLE ENDMEMBER SPECTRAL MIXTURE ANALYSIS*
(MESMA) UNTUK ANALISIS OBJEK PENUTUP LAHAN DI SEBAGIAN
KABUPATEN SLEMAN TAHUN 2025**

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INTISARI

Data penutup lahan memegang peranan yang penting bagi kehidupan manusia. Kepentingan tersebut mencakup manajemen sumber daya alam, konservasi lingkungan, dasar penentuan kebijakan tata ruang, dan lainnya. Sehingga, penelitian ini dilakukan untuk memperoleh inventarisasi data geospasial suatu wilayah. Lokasi kajian berada di sebagian Kabupaten Sleman agar dalam melakukan klasifikasi dapat memberikan keberagaman objek penutup lahan. Penelitian ini menggunakan citra *hyperspectral*, namun terdapat tantangan berupa kompleksitas wilayah kajian sehingga memberikan respon spektral yang mirip antar objek. Tujuan penelitian ini yaitu menyusun perpustakaan spektral objek penutup lahan, memetakan objek penutup lahan, dan mengetahui akurasi hasil MESMA untuk analisis fraksi penutup lahan di sebagian Kabupaten Sleman tahun 2025.

Pemrosesan MESMA dilakukan dengan data masukan berupa perpustakaan spektral yang berasal dari ekstraksi *endmember* hasil perekaman spektrometer dan ekstraksi citra. *Endmember* yang diperoleh dari ekstraksi citra berdasar pada pertimbangan nilai PPI, indeks NDVI, NDBI, dan NDWI. Kemudian, kombinasi MESMA yang digunakan yaitu dua *endmember* hingga lima *endmember*. Hasil pemrosesan MESMA melalui proses *hard classification* yang bertujuan mengelompokkan fraksi penutup lahan dalam satu kelas, kemudian hasil tersebut digunakan untuk uji akurasi dengan *confusion matrix*. Kombinasi dua *endmember* dengan keseluruhan *endmember* hasil ekstraksi citra. *Overall accuracy* tertinggi sebesar 62,79% dan terendah 42,96%.

Kata kunci: Fraksi penutup lahan, PRISMA *hyperspectral*, MESMA

***MULTIPLE ENDMEMBER SPECTRAL MIXTURE ANALYSIS (MESMA) FOR
LAND COVER OBJECT ANALYSIS IN A PORTION OF SLEMAN REGENCY,
2025***

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ABSTRACT

Land cover data play an important role in human life, particularly in natural resource management, environmental conservation, spatial planning policy development, and various other applications. Therefore, this study was conducted to generate a geospatial inventory of a study area. The research was carried out in part of Sleman Regency to provide a diverse range of land cover objects for classification purposes. Although hyperspectral imagery offers detailed spectral information, the complexity of the study area presents a challenge due to the similar spectral responses among different land cover objects. This study aims to develop a spectral library of land cover objects, map land cover classes, and evaluate the accuracy of MESMA for land cover fraction analysis in part of Sleman Regency in 2025.

The MESMA process used spectral libraries derived from endmember extraction based on both field spectrometer measurements and image extraction. Endmembers extracted from the imagery were selected based on Pixel Purity Index (PPI), Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), and Normalized Difference Water Index (NDWI) values. MESMA was then performed using combinations ranging from two to five endmembers. The resulting fraction images were converted into discrete land cover classes through a hard classification process, which assigned each pixel to a single dominant land cover class. The classification results were subsequently evaluated using a confusion matrix. The highest overall accuracy achieved was 62.79%, while the lowest overall accuracy was 42.96%, with the best performance obtained from the two-endmember combination using endmembers derived entirely from image extraction.

Keywords: Land Cover Fraction, Hyperspectral PRISMA, MESMA