# Seagrass Mapping Using ALOS AVNIR-2 Data in Lap An Lagoon, Vietnam: A Comparison of Depth Invariant Index and Bottom Reflectance Index Methods

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**Abstract**: Seagrass canopy plays a critical role in the ecological function of coastal zones. They supply nursery and juvenile habitats for fisheries, stabilize sediment and provide direct food for dugongs and green turtles. Lap An is a semi-enclosed lagoon in the South of Thua Thien Hue province with a large area of mangrove and seagrass. This lagoon supports significant local aquaculture, and is a highly important nursery for economic fisheries. However, the reclamation activities of local farmers have disturbed aquatic habitats, and diminished the seagrass canopy (more than 88% has disappeared from the lagoon). To facilitate seagrass protection, monitoring is an important step for better understanding spatial changes and their mechanisms within Lap An lagoon. With its unique advantages, remote sensing supports effective tools for detecting and assessing these changes.

The objective of this research is to detect the distribution of the seagrass community in Lap An lagoon. ALOS AVNIR 2 data was utilized to detect scattered small patches of seagrass under conditions of high turbidity. Sun glint correction was applied by using NIR band of the image. Water column correction, involving DII (Depth Invariant Index) and BRI (Bottom Reflectance Index) methods, were compared in terms of seagrass detection ability in Lap An lagoon.

The results confirm that there are 3 seagrass species, *Halodule pinifolia* (Miki) Hartog (small leaf seagrass), *Halophyla ovalis* (R.Br) Hook.f and *Thalassia hemprichii* (Ehrenberg) Ascherson respectively. According to a 2010 classification, the seagrass area comprises approximately 60.49 ha, mainly distributed in the East, Southwest, and South of Lap An lagoon. Almost all canopies are healthy with coverage of 58 - 86.7% on average and fresh weight gains of 650 – 1,820 $g/m^2$. The bottom reflectance index showed strong correlation with the spectral reflectance of seagrass. Both indexes were adequately calibrated without IOPs (Inherent Optical Properties of water) data. They are also applicable for water column correction under various conditions of turbidity in water bodies as well as bottom habitats. The BRI detects seagrass distribution better than the DII method. The overall accuracy of the DII method is 68.32%; the overall accuracy of BRI method is 83.49%. BRI can deal with higher turbidity in the water body than the DII method as well as more precisely transfer the reflectance from the bottom of the lagoon.

This research contributes a new approach for detecting seagrass meadows in Lap An lagoon. More importantly, the seagrass database was updated in comparison with available data in 2004. The use of the BRI method signifies its original application not only in Lap An lagoon but in Vietnam. The results of this research facilitate a better understanding and monitoring of seagrass changes in Lap An lagoon.

**Keywords:** *ALOS AVNIR 2, seagrass, Lap An, BRI, DII*