ONE PAGER SERIES

SAR Vegetation Indices

A quick reference to Synthetic Aperture Radar vegetation indices and their interpretations. For more information, check out the SAR Handbook: Comprehensive Methodologies for Forest Monitoring and Biomass Estimation and associated training materials at **SERVIRglobal.net**

Radar backscatter is impacted by forest type and structural forms (type and orientation), environmental conditions (e.g. moisture, and phenology), and radar imaging properties. Taking these into account can assist with the use of SAR for forest monitoring. SAR data can be used to calculate indices that help quickly interpret ground conditions.

RADAR VEGETATION INDEX (RVI):

$$RVI = \frac{8\gamma^0_{HV}}{(\gamma^0_{HH} + \gamma^0_{VV} + 2\gamma^0_{HV})}$$

γ^0 (gamma-nought) represents the radiometrically and geometrically corrected SAR backscattering coefficient for each polarization combination in linear units (m^2/m^2). RVI is a ratio of cross-polarization to ~total power from all polarization channels. It generally ranges between 0 and 1, and it is a measure of scattering randomness. As a ratio, RVI has less sensitivity to radar measurement geometry and topography, and remains insensitive to absolute calibration error in radar data.

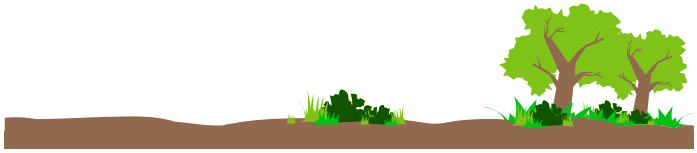
RADAR FOREST DEGRADATION INDEX (RFDI):

$$RFDI = \frac{\gamma^0_{HH} - \gamma^0_{HV}}{\gamma^0_{HH} + \gamma^0_{HV}}$$

Here, the terms are all radiometrically corrected imagery. The value of RFDI varies between 0 and 1. In general, RFDI can be used to detect both loss of forest cover and its recovery after a disturbance.

RADAR VEGETATION INDEX:

RVI is near zero for a smooth bare surface and increases with vegetation growth. It has an enhanced sensitivity to vegetation cover and biomass.



0 → 1

RADAR FOREST DEGRADATION INDEX:

RFDI values range from less than 0.3 for dense forests, between 0.4 and 0.6 for degraded forests, and greater than 0.6 for deforested landscapes.

<0.3 < 0.4–0.6 < >0.6

SOURCE: Saatchi, Sassan. "SAR Methods for Mapping and Monitoring Forest Biomass." SAR Handbook: Comprehensive Methodologies for Forest Monitoring and Biomass Estimation. Eds. Flores, A., Herndon, K., Thapa, R., Cherrington, E. NASA. DOI: 10.25966/hbm1-ej07

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