

Supplementary Information

PRVSR: A Vegetation-Aware RGB-to-Hyperspectral Reconstruction Framework with PROSAIL-Based Reflectance Refinement for Rice LAI Estimation

Precision Agriculture

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Supplementary file description

This file provides the definitions and calculation formulas of the hyperspectral-image-derived vegetation indices used for rice leaf area index estimation.

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Table S1. Definitions and calculation formulas of HSI-derived spectral vegetation indices.

Table S1. Definitions and calculation formulas of hyperspectral-image-derived vegetation indices used for rice LAI estimation

Spectral index	Definition	Reference
<i>1. Broadband Greenness Vegetation Indices</i>		
NDVI	$\frac{R_{800}-R_{670}}{R_{800}+R_{670}}$	Rouse et al., 1974
GNDVI	$\frac{R_{800}-R_{550}}{R_{800}+R_{550}}$	Gitelson and Merzlyak, 1998
OSAVI	$\frac{R_{800}-R_{670}}{R_{800}+R_{670}+0.16}$	Rondeaux et al., 1996
DVI	$R_{800}-R_{670}$	Richardson and Wiegand, 1977
RVI	$\frac{R_{800}}{R_{670}}$	Jordan, 1969
IPVI	$\frac{R_{800}}{R_{800}+R_{670}}$	Crippen, 1990
NLI	$\frac{R_{800}^2-R_{670}}{R_{800}^2+R_{670}}$	Goel and Qin, 1994
RDVI	$\frac{R_{800}-R_{670}}{\sqrt{R_{800}+R_{670}}}$	Roujean and Breon, 1995
MSR	$\frac{SR-1}{\sqrt{SR+1}}, \quad SR=\frac{R_{800}}{R_{670}}$	Chen, 1996
TVI	$0.5(120(R_{750}-R_{550})-200(R_{670}-R_{550}))$	Broge and Leblanc, 2001
<i>2. Chlorophyll Indices</i>		
MCARI	$((R_{700}-R_{670})-0.2(R_{700}-R_{550}))\times\frac{R_{700}}{R_{670}}$	Daughtry et al., 2000

Spectral index	Definition	Reference
TCARI	$3 \left((R_{700}-R_{670})-0.2(R_{700}-R_{550}) \times \frac{R_{700}}{R_{670}} \right)$	Haboudane et al., 2002
CIgreen	$\frac{R_{800}}{R_{550}} - 1$	Gitelson et al., 2005
GM1	$\frac{R_{750}}{R_{550}}$	Gitelson and Merzlyak, 1998
3. Red-edge Indices		
NDRE	$\frac{R_{790}-R_{720}}{R_{790}+R_{720}}$	Barnes et al., 2000
CI_red edge	$\frac{R_{790}}{R_{720}} - 1$	Gitelson et al., 2005
MTCI	$\frac{R_{754}-R_{709}}{R_{709}-R_{681}}$	Dash and Curran, 2004
ND705	$\frac{R_{750}-R_{705}}{R_{750}+R_{705}}$	Sims and Gamon, 2002
mSR705	$\frac{R_{750}-R_{445}}{R_{705}-R_{445}}$	Sims and Gamon, 2002
mND705	$\frac{R_{750}-R_{705}}{R_{750}+R_{705}-2R_{445}}$	Sims and Gamon, 2002
Datt99	$\frac{R_{850}-R_{710}}{R_{850}-R_{680}}$	Datt, 1999
SR_750_700	$\frac{R_{750}}{R_{700}}$	Gitelson and Merzlyak, 1998
SR_750_710	$\frac{R_{750}}{R_{710}}$	Gitelson and Merzlyak, 1998; Zarco-Tejada and Miller, 1999

Spectral index	Definition	Reference
GM2	$\frac{R_{750}}{R_{700}}$	Gitelson and Merzlyak, 1998
<i>4. Senescence and Pigment-Ratio Indices</i>		
SIPI	$\frac{R_{800}-R_{445}}{R_{800}-R_{680}}$	Peñuelas et al., 1995
PSRI	$\frac{R_{680}-R_{500}}{R_{750}}$	Merzlyak et al., 1999
NPCI	$\frac{R_{680}-R_{430}}{R_{680}+R_{430}}$	Peñuelas et al., 1994
<i>5. Pigment-Specific Simple Ratio Indices</i>		
PSSRa	$\frac{R_{800}}{R_{675}}$	Blackburn, 1998
PSSRb	$\frac{R_{800}}{R_{650}}$	Blackburn, 1998
PSSRc	$\frac{R_{800}}{R_{500}}$	Blackburn, 1998

Note: R_λ denotes reflectance at wavelength λ (nm). All indices were calculated from the Savitzky–Golay-smoothed mean spectrum of the selected plot-level vegetation region of interest.