Table S1 List of vegetation indices using in the study.

Abbreviation	Index	Equation	Ref.
Water content indices			
WBI	Water band index	R_{970}/R_{900}	[1]
WI	Water index	R_{900}/R_{970}	[2]
fWBI	Floating position water band	$R_{900}/\min(R_{930\text{-}980})$	[3]
Green biomass and structural indices			
GI	Greenness	R_{554}/R_{677}	[4]
RGI	Red/Green index	R_{695}/R_{554}	[5]
RGI1	Red/Green index	R_{690}/R_{550}	[4]
BGI	Blue/Green index	R_{400}/R_{550}	[4]
BGI1	Blue/Green index	R_{420}/R_{554}	[4]
BRI	Blue/Red index	R_{400}/R_{690}	[4]
BRI1	Blue/Red index	R_{450}/R_{690}	[4]
BRI2	Blue/Red index	R_{440}/R_{690}	[6]
RVI	Ratio vegetation	R_{800}/R_{673}	[7]
GRR	Green/Red ratio	R_{554}/R_{673}	[8]
SR	Simple ratio	R_{845}/R_{665}	[6]
SR2	Simple ratio	R_{695}/R_{760}	[6]
SR3	Simple ratio	R_{678}/R_{880}	[6]
SR4	Simple ratio	R_{678}/R_{1070}	[6]
RBI	Red/Blue	R_{695}/R_{445}	[6]
DVI	Difference vegetation	$R_{880}\text{-}R_{673}$	[7]
SRPI	Simple ratio pigment	R_{430}/R_{680}	[9]
Crt1	Carter index	R_{695}/R_{420}	[10]
Crt2	Carter index	R_{695}/R_{760}	[11]
Crt3	Carter index	R_{700}/R_{420}	[6]
Lic1	Lichtenthaler index	R_{440}/R_{690}	[12]
Lic2	Lichtenthaler index	R_{440}/R_{740}	[12]
Vog	Vogelmann index	R_{740}/R_{720}	[13]
GMI1	Gitelson and Merzlyak index	R_{750}/R_{550}	[14]
GMI2	Gitelson and Merzlyak index	R_{750}/R_{700}	[14]
NGRR	Normalized green/rad ratio	$(R_{673}\text{-}R_{554})/(R_{673}+R_{554})$	[6]
NGRR1	Normalized green/red ration 1	$(R_{673}+R_{554})/(R_{673}\text{-}R_{554})$	[6]
NDVI	Normalized difference vegetation index	$(R_{845}\text{-}R_{665})/(R_{845}+R_{665})$	[15]
NDVI1	Normalized difference vegetation index	$(R_{880}\text{-}R_{673})/(R_{880}+R_{673})$	[16]
NDVI2	Normalized difference vegetation index	$(R_{859}\text{-}R_{645})/(R_{859}+R_{645})$	[6]
NDVI3	Normalized difference vegetation index	$(R_{870}\text{-}R_{673})/(R_{870}+R_{673})$	[6]
NDVI4	Normalized difference vegetation index	$(R_{884}\text{-}R_{680})/(R_{884}+R_{680})$	[6]

mNDVI	Modified normalized difference vegetation index	$(R_{750}-R_{705})/(R_{750}+R_{705})$	[17]
MTVI1	Modified triangular vegetation index	$1.2\cdot[1.2\cdot(R_{800}-R_{550})-2.5\cdot(R_{670}-R_{550})]$	[18]
MTVI2	Modified triangular vegetation index	$1.5\cdot[1.2\cdot(R_{800}-R_{550})-2.5\cdot(R_{670}-R_{550})]/\sqrt{(2\cdot R_{800}+1)^2-(6\cdot R_{800}-5\cdot R_{670})-0.5}$	[18]
MTVI3	Modified triangular vegetation index	$1.2\cdot[1.2\cdot(R_{800}-R_{554})-2.5\cdot(R_{758}-R_{554})]$	[6]
RDVI	Renormalized difference vegetation index	$\sqrt{[(R_{880}-R_{673})^2/(R_{880}+R_{673})]}$	[19]
MSR	Modified simple ratio	$[(R_{845}/R_{651})-1]/[(R_{845}/R_{665})^{0.5}+1]$	[20]
TVI	Triangular vegetation index	$0.5\cdot[120\cdot(R_{750}-R_{550})-200\cdot(R_{670}-R_{550})]$	[21]
TVI1	Triangular vegetation index 1	$0.5\cdot[120\cdot(R_{758}-R_{554})-200\cdot(R_{674}-R_{554})]$	[6]
Vog1	Vogelmann index	$(R_{734}-R_{747})/(R_{715}+R_{726})$	[13]
Vog2	Vogelmann index	$(R_{734}-R_{747})/(R_{715}+R_{720})$	[13]
CUR	Curvature	$(R_{675}\cdot R690)/R_{683}^2$	[22]
EVI	Enhanced vegetation index	$2.5\cdot[(R_{859}-R_{645})/(R_{859}+6\cdot R_{645}-7.5\cdot R_{469}+1)]$	[23]
PSRI	Plant senescence reflectance index	$(R_{678}-R_{500})/R_{750}$	[24]
OSAVI	Optimized soil-adjusted vegetation index	$[(1+0.16)\cdot(R_{800}-R_{670})]/(R_{800}+R_{670}+0.16)$	[25]
Leaf chlorophyll content indices			
ZM	Zarco-Tajeda and Miller index	R_{750}/R_{710}	[26]
SIPI	Structure insensitive pigment index	$(R_{800}-R_{445})/(R_{800}+R_{680})$	[9]
SIPI1	Structure insensitive pigment index	$(R_{800}-R_{450})/(R_{800}+R_{650})$	[9]
TCARI	Transformed chlorophyll absorption in reflectance	$3\cdot[(R_{700}-R_{670})-0.2\cdot(R_{700}-R_{550})]\cdot(R_{700}/R_{670})$	[27]
MCARI	Modified chlorophyll absorption in reflectance	$[(R_{700}-R_{670})-0.2\cdot(R_{700}-R_{500})]\cdot(R_{700}/R_{670})$	[28]
MCARI1	Modified chlorophyll absorption in reflectance	$1.2\cdot[2.5\cdot(R_{800}-R_{670})-1.3\cdot(R_{800}-R_{550})]$	[18]
MCARI2	Modified chlorophyll absorption in reflectance	$1.5\cdot[2.5\cdot(R_{800}-R_{670})-1.3\cdot(R_{800}-R_{550})]/\sqrt{(2\cdot R_{800}+1)^2-(6\cdot R_{800}-5\cdot R_{670})-0.5}$	[18]
NPCI	Normalized pigments chlorophyll ratio	$(R_{680}-R_{430})/(R_{680}+R_{430})$	[29]
NPQI	Normalized phaeophytinization index	$(R_{415}-R_{435})/(R_{415}+R_{435})$	[9]
Leaf anthocyanin content indices			
ARI1	Anthocyanin reflectance index	$(1/R_{550})-(1/R_{700})$	[30]
ARI2	Anthocyanin reflectance index	$R_{800}\cdot[(1/R_{550})-(1/R_{700})]$	[30]
Leaf carotenoids content indices			
CRI1	Carotenoid reflectance index	$(1/R_{510})-(1/R_{550})$	[9]
CRI2	Carotenoid reflectance index	$(1/R_{510})-(1/R_{700})$	[9]
PRI	Photochemical reflectance index	$(R_{531}-R_{570})/(R_{531}+R_{570})$	[5]
PRI1	Photochemical reflectance index	$(R_{528}-R_{567})/(R_{528}+R_{567})$	[31]
PRI3	Photochemical reflectance index	$(R_{570}-R_{539})/(R_{570}+R_{539})$	[31]

References:

[1] Peñuelas, J.; Filella, I.; Biel, C.; Serrano, L.; Savé, R. The reflectance at the 950-970 nm region as an indicator of plant water status. *Int. J. Remote Sens.* **1993**, 14, 10, 1887–1905. DOI: 10.1080/01431169308954010

[2] Peñuelas, J.; Pinol, J.; Ogaya, R.; Filella, I. Estimation of plant water concentration by the reflectance water index WI (900/970). *Int. J. Remote Sens.* **1997**, 18, 2869–2875. DOI: 10.1080/014311697217396

[3] Strachan, I.B.; Pattey, E.; Boisvert, J.B. Impact of nitrogen and environmental conditions on as detected by hyperspectral reflectance. *Remote Sens. Environ.* **2002**, 80, 2, 213–224. DOI: 10.1016/S0034-4257(01)00299-1

[4] Zarco-Tejada, P.J.; Berjón, A.; López-Lozano, R.; Miller, J.R.; Matín, P.; Cachorro, V.; Gonzáles, M.R.; de Frutos, A. Assessing vineyard condition with hyperspectral indices: Leaf and canopy reflectance simulation in a row-structured discontinuous canopy. *Remote Sens. Environ.* **2005**, 99, 3, 271–287. DOI: 10.1016/j.rse.2005.09.002

[5] Gamon, J.A.; Surfus, J. Assessing leaf pigment content and activity with a reflectometer. *New Phytol.* **1999**, 143, 1, 105–117. DOI: 10.1046/j.1469-8137.1999.00424.x

[6] Rodríguez-Pérez, J.R.; Riaño, D.; Carlisle, E.; Ustin, S.; Smart, D.R. Evaluation of hyperspectral indexes to detect grapevine water status in vineyards. Am. J. Enol. Vitic. **2007**, 58, 302–317.

[7] Broge, N.H.; Mortensen, J.V. Deriving green crop area index and canopy chlorophyll density of winter wheat from spectral reflectance data. *Remote Sens. Environ.* **2002**, 81, 1, 45–57. DOI: 10.1016/S0034-4257(01)00332-7

[8] Fuentes, D.A.; Gamon, J.A.; Qiu, H.-L.; Sims, D.A.; Roberts, D.A. Mapping Canadian boreal forest vegetation using pigment and water absorption features derived from the AVIRIS sensor. *J. Geophys. Res.* **2001**, 106, D24, 565–577. DOI: 10.1029/2001JD900110

[9] Peñuelas, J.; Filella, I.; Biel, C.; Serrano, L.; Save, R. The reflectance at the 950-970 region as an indicator of plant water status. *Int. J. Remote Sens.* **1995**, 14, 1887–1905. DOI: 10.1080/01431169308954010

[10] Carter, G.A. Ratios of leaf reflectance in narrow wavebands as indicators of plant stress. *Int. J. Remote Sens.* **1994**, 15, 697–703. DOI: 10.1080/01431169408954109

[11] Carter, G.A.; Cibula, W.G.; Miller, R.L. Narrow-band reflectance imagery compared with thermal imagery of early detection of plant stress. J. Plant Physiol. **1996**, 184, 5, 515–522. DOI: 10.1016/S0176-1617(96)80070-8

[12] Lichtenthaler, H.K.; Lang, M.; Sowinska, M.; Heisel, F.; Mieh, J.A. Detection of vegetation stress via a new high resolution fluorescence imaging system. *J. Plant Physiol.* **1996**, 148, 599–612. DOI: 10.1016/S0176-1617(96)80081-2

[13] Vogelmann, J.E.; Rock, B.N.; Moss, D.M. Red edge spectral measurements from sugar maple leaves. *Int. J. Remote Sens.* **1993**, 14, 1563–1575. DOI: 10.1080/01431169308953986

[14] Gitelson, A.A.; Merzlyak, M.N. Remote estimation of chlorophyll content in higher plant leaves. *Int. J. Remote Sens.* **1997**, 18, 12, 2691–2697. DOI: 10.1080/014311697217558

[15] Rouse, J.W.; Haas, R.H.; Schell, J.A.; Deering, D.W.; Harlan, J.C. Monitoring the vernal advancements and retrogradation of natural vegetation. NASA/GSFC final report. MD, USA, Greenbelt, **1974**, 371 pp.

[16] Zhao, D.; Reddy, K.R.; Kakani, V.G.; Reddy, V.R. Nitrogen deficiency effects on plant growth, leaf photosynthesis, and hyperspectral reflectance properties of sorghum. *Eur. J. Agron.* **2005**, 22, 4, 391–403. DOI: 10.1016/j.eja.2004.06.005

[17] Gitelson, A. A.; Kaufman, Y.J.; Merzlyak, M.M. Use of a green channel in remote sensing of global vegetation from EOS-MODIS. *Remote Sens. Environ.* **1996**, 58, 3, 289–298. DOI: 10.1016/S0034-4257(96)00072-7

[18] Haboudane, D.; Miller, J.R.; Pattey, E.; Zarco-Tejada, P.J.; Strachan, I. Hyperspectral vegetation indices and novel algorithms for predicting green LAI of crop canopies: Modeling and validation in the context of precision agriculture. *Remote Sens. Environ.* **2004**, 90, 3, 337–352. DOI: 10.1016/j.rse.2003.12.013

[19] Rougean, J.-L.; Breon, F.M. Estimation PAR absorbed by vegetation from bidirectional reflectance measurements. *Remote Sens. Environ.* **1995**, 51, 375–384. DOI: 10.1016/0034-4257(94)00114-3

[20] Chen, J. Evaluation of vegetation indices and modified simple ratio for boreal applications. *Can. J. Remote Sens.* **1996**, 22, 229–242. DOI: 10.1080/07038992.1996.10855178

[21] Broge, N.H.; Leblanc, E. Comparing prediction power and stability of broadband and hyperspectral vegetation indices for estimation of green leaf area index and canopy chlorophyll density. *Remote Sens. Environ.* **2001**, 76, 156–72. DOI: 10.1016/S0034-4257(00)00197-8

[22] Zarco-Tejada, P.J.; Miller, J.R.; Mohammed, G.H.; Noland, T.L. Chlorophyll fluorescence effects on vegetation apparent reflectance: I. Leaf-level measurements and model simulation. *Remote Sens. Environ.* **2000**, 74, 3, 582–595. DOI: 10.1016/S0034-4257(00)00148-6

[23] Huete, A.; Didan, K.; Miura, T.; Rodriguez, E.P.; Gao, X.; Ferreira, L.G. Overview of the radiometric and biophysical performance of the MODIS vegetation indices. *Remote Sens. Environ.* **2002**, 83, 1-2, 195–213. DOI: 10.1016/S0034-4257(02)00096-2

[24] Merzlyak M.N.; Gitelson A.A.; Chivkunova, O.B.; Rakitin, V.Y.U. Non-destructive optical detection of pigment changes during leaf senescence and fruit ripening. *Physiol. Plant.* **1999**, 106, 135–41. DOI: 10.1034/j.1399-3054.1999.106119.x

[25] Rondeaux, G.; Steven, M.; Baret, F. Optimization of soil-adjusted vegetation indices. *Remote Sens. Environ.* **1996**, 55, 95–107. DOI: 10.1016/0034-4257(95)00186-7

[26] Zarco-Tejada, P.J.; Ustin, S.L. Modeling canopy water content for carbon estimates from MODIS data at land EOS validation sites. *International Geoscience and Remote Sensing Symposium*, **2001**. IGARSS 01, 1, 342–344. DOI: 10.1109/IGARSS.2001.976152

[27] Haboudane, D.; Miller, J.R.; Tremblay, N.; Zarco-Tejada; P.J.; Dextraze, L. Integrated narrow-band vegetation indices for prediction of crop chlorophyll content for application to precision agriculture. *Remote Sens. Environ.* **2002**, 81, 416–26. DOI: 10.1016/S0034-4257(02)00018-4

[28] Daughtry, C.S.T.; Walthall, C.L.; Kim, M.S.; Brown de Colstoun, E.; McMurtrey III, J.E. Estimating corn leaf chlorophyll concentration from leaf and canopy reflectance. *Remote Sens. Environ.* **2000**, 74, 2, 229–239. DOI: 10.1016/S0034-4257(00)00113-9

[29] Peñuelas, J.; Gamon, J. A.; Fredeen, A.L.; Merino, J.; Field, C.B. Reflectance indices associated with physiological changes in nitrogen and water-limited sunflower leaves. *Remote Sens. Environ.* **1994**, 48, 135–46. DOI: 10.1016/0034-4257(94)90136-8

[30] Gitelson, A.A.; Merzlyak, M.N.; Chivkunova, O.B. Optical properties and nondestructive estimation of anthocyanin content in plant leaves. *Photochem. Photobiol.* **2001**, 71, 38–45. DOI: 10.1562/0031-8655(2001)0740038OPANEO2.0.CO2

[31] Gamon, J.A.; Penuelas, J.; Field, C.B. A narrow-waveband spectral index that tracks diurnal changes in photosynthetic efficiency. *Remote Sens. Environ.* **1992**, 41, 35–44. DOI: 10.1016/0034-4257(92)90059-S