

Supplementary Information

Adjusting Spectral Indices for Spectral Response Function Differences of Very High Spatial Resolution Sensors Simulated from Field Spectra. *Sensors* 2015, 15, 6221-6240

Sharon L. Cundill *, Harald M. A. van der Werff and Mark van der Meijde

Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands; E-Mails: harald.vanderwerff@utwente.nl (H.M.A.W.); m.vandermeijde@utwente.nl (M.M.)

* Author to whom correspondence should be addressed; E-Mail: s.l.cundill@utwente.nl; Tel.: +31-53-487-4444; Fax: +31-53-487-4336.

Table S1. Indices used in this study.

Index Name (Abbreviation)	Equation	Reference
Anthocyanin Reflectance Index (ARI)	$(1/R_{550}) - (1/R_{700})$	[1]
Atmospherically Resistant Vegetation Index (ARVI) ^a	$[R_{830} - (R_{660} - 1 * (R_{485} - R_{660}))]/[R_{830} + (R_{660} - 1 * (R_{485} - R_{660}))]$	[2]
Blue/Green Index 2 (BGL ₂)	R_{450}/R_{550}	[3]
Blue/Red Index 1 (BRI ₁)	R_{400}/R_{690}	[3]
Carotenoid Reflectance Index 2 (CRI ₇₀₀)	$(1/R_{510}) - (1/R_{700})$	[4]
Carter Index 1 (CTR ₁)	R_{695}/R_{420}	[5]
Carter Index 2 (CTR ₂)	R_{695}/R_{760}	[5]
Chlorophyll Absorption in Reflectance Index (CARI)	$CAR * (R_{700}/R_{670})$ where $CAR = [(a * 670 + R_{670} + b)/(a^2 + 1)]^{0.5}$, $a = (R_{700} - R_{550})/150$ and $b = R_{500} - (a * 550)$	[6,7]
Difference Vegetation Index (DVI) ^a	$R_{830} - R_{660}$	[8,9]
Enhanced Vegetation Index (EVI) ^a	$2.5 * (R_{830} - R_{660})/(R_{830} + 6 * R_{660} - 7.5 * R_{485} + 1)$	[10]
Gitelson and Merzlyak 1 (GM ₁)	R_{750}/R_{550}	[11]
Gitelson and Merzlyak 2 (GM ₂)	R_{750}/R_{700}	[11]
Global Environmental Monitoring Index (GEMI) ^a	$\eta * (1 - 0.25 * \eta) - [(R_{660} - 0.125)/(1 - R_{660})]$ where $\eta = [2 * ((R_{830})^2 - (R_{660})^2) + 1.5 * R_{830} + 0.5 * R_{660}] / (R_{830} + R_{660} + 0.5)$	[12]
Green Chlorophyll Index (CI _g) ^a	$(R_{830}/R_{560}) - 1$	[13]
Green Normalized Difference Vegetation Index (gNDVI) ^a	$(R_{830} - R_{560})/(R_{830} + R_{560})$	[14]
Green/Red Ratio (GRR)	R_{554}/R_{673}	[15,16]
Infrared Percentage Vegetation Index (IPVI) ^a	$R_{830}/(R_{830} + R_{660})$	[17]
Lichtenthaler Index 2 (LIC ₂)	R_{440}/R_{690}	[18]
Lichtenthaler Index 3 (LIC ₃)	R_{440}/R_{740}	[18]
Modified Anthocyanin Reflectance Index (mARI)	$[(1/R_{550}) - (1/R_{700})] * R_{800}$	[1,19]

Table S1. *Cont.*

Index Name (Abbreviation)	Equation	Reference
Modified Chlorophyll Absorption in Reflectance Index (MCARI)	$[(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550})] * (R_{700}/R_{670})$	[20]
Modified Chlorophyll Absorption in Reflectance Index 1 (MCARI ₁)	$1.2 * [2.5 * (R_{800} - R_{670}) - 1.3 * (R_{800} - R_{550})]$	[21]
Modified Chlorophyll Absorption in Reflectance Index 2 (MCARI ₂)	$[1.5 * [2.5 * (R_{800} - R_{670}) - 1.3 * (R_{800} - R_{550})]] / [((2 * R_{800} + 1)^2 - (6 * R_{800} - 5 * (R_{670})^{0.5}))^{0.5} - 0.5]$	[21]
Modified Red Edge Normalized Difference Vegetation Index (mNDVI ₇₀₅)	$(R_{750} - R_{705}) / (R_{750} + R_{705} - 2 * R_{445})$	[22]
Modified Simple Ratio (MSR) ^a	$(R_{800}/R_{670} - 1) / [(R_{800}/R_{670})^{0.5} + 1]$	[23]
Modified Simple Red Edge Ratio Index (mSR ₇₀₅)	$(R_{750} - R_{445}) / (R_{705} - R_{445})$	[22]
Modified Soil-Adjusted Vegetation Index (MSAVI ₂) ^a	$[2 * R_{800} + 1 - ((2 * R_{800} + 1)^2 - 8 * (R_{800} - R_{670}))^{0.5}] / 2$	[24]
Modified Triangular Vegetation Index 1 (MTVI ₁)	$1.2 * [1.2 * (R_{800} - R_{550}) - 2.5 * (R_{670} - R_{550})]$	[21]
Modified Triangular Vegetation Index 2 (MTVI ₂)	$[1.5 * [1.2 * (R_{800} - R_{550}) - 2.5 * (R_{670} - R_{550})]] / [((2 * R_{800} + 1)^2 - (6 * R_{800} - 5 * (R_{670})^{0.5}))^{0.5} - 0.5]$	[21]
Normalized Difference Vegetation Index (green-blue) (NDVIg-b)	$(R_{573} - R_{440}) / (R_{573} + R_{440})$	[25,26]
Normalized Difference Vegetation Index (NDVI) ^a	$(R_{830} - R_{660}) / (R_{830} + R_{660})$	[27,28]
Normalized Difference Water Index – McFeeters (NDWI _{Mc}) ^a	$(R_{560} - R_{830}) / (R_{560} + R_{830})$	[29]
Normalized Green/Red Ratio (NGRR)	$(R_{673} - R_{554}) / (R_{673} + R_{554})$	[16]
Normalized Pigment Chlorophyll Index (NPCl)	$(R_{680} - R_{430}) / (R_{680} + R_{430})$	[30]
Optimized Soil-Adjusted Vegetation Index (OSAVI) ^a	$(1 + 0.16) * (R_{800} - R_{670}) / (R_{800} + R_{670} + 0.16)$	[31]
Plant Senescence Reflectance Index (PSRI)	$(R_{680} - R_{500}) / R_{750}$	[32]
Ratio Vegetation Index (RVI) ^a	R_{800} / R_{673}	[16,33]
Red Edge Normalized Difference Vegetation Index (NDVI ₇₀₅)	$(R_{750} - R_{705}) / (R_{750} + R_{705})$	[22]
Red/Blue Index (RBI)	R_{695} / R_{445}	[16]
Red/Green Index (RGI)	R_{690} / R_{550}	[3]
Renormalized Difference Vegetation Index (RDVI) ^a	$(R_{800} - R_{670}) / [(R_{800} + R_{670})^{0.5}]$	[34]
Soil-adjusted Atmospherically Resistant Vegetation Index (SARVI) ^a	$[R_{800} - (R_{670} - 1 * (R_{445} - R_{670}))] / [R_{800} + (R_{670} - 1 * (R_{445} - R_{670})) + 0.5] * (1 + 0.5)$	[35]
Soil-Adjusted Vegetation Index (SAVI) ^a	$[(R_{800} - R_{670}) / (R_{800} + R_{670} + 0.5)] * (1 + 0.5)$	[36]
Structure Independent Pigment Index (SIPI)	$(R_{800} - R_{445}) / (R_{800} + R_{680})$	[37]
Transformed Chlorophyll Absorption in Reflectance Index (TCARI)	$3 * [(R_{700} - R_{670}) - 0.2 * (R_{700} - R_{550}) * (R_{700}/R_{670})]$	[21]
Transformed Normalized Difference Vegetation Index (TNDVI) ^a	$[(R_{830} - R_{660}) / (R_{830} + R_{660}) + 0.5]^{0.5}$	[27,28]
Triangular Vegetation Index (TVI)	$0.5 * [120 * (R_{750} - R_{550}) - 200 * (R_{670} - R_{550})]$	[6]
Visible Atmospherically Resistant Index (VARI) ^a	$(R_{560} - R_{660}) / (R_{560} + R_{660} - R_{485})$	[38]

^a Original index is was for a broadband sensor; R = Reflectance at specified wavelength in nm.

Table S2. Mean values for the statistical measures per index.

Index	Mean $1:r^2$	Mean Slope-1	Mean Intercept	Mean Normalized intercept	Mean ccR^2
ARI	-13.558	1.654	10.488	7.166	0.534
ARVI	0.874	0.093	0.054	0.077	0.997
BGI ₂	-3.353	0.161	0.199	0.430	0.979
BRI ₁	-4.090	0.284	0.257	0.529	0.876
CRI ₇₀₀	-0.463	0.435	2.424	0.130	0.652
CTR ₁	-22.910	0.558	4.341	1.702	0.221
CTR ₂	-3.203	0.307	0.240	1.005	0.918
CARI	-0.318	0.979	0.403	0.148	0.353
DVI	0.976	0.044	0.001	0.004	0.998
EVI	0.962	0.037	0.006	0.012	0.998
GM ₁	-0.155	0.304	0.503	0.117	0.994
GM ₂	-0.276	0.508	0.882	0.232	0.984
GEMI	0.978	0.023	0.008	0.012	0.999
CIg	0.825	0.138	0.229	0.058	0.995
gNDVI	0.876	0.048	0.038	0.058	0.993
GRR	0.363	0.424	0.372	0.172	0.976
IPVI	0.892	0.047	0.033	0.036	0.999
LIC ₂	0.205	0.261	0.180	0.273	0.968
LIC ₃	-1.273	0.070	0.039	0.342	0.973
mARI	-12.774	1.319	2.412	5.851	0.503
MCARI	-70.250	2.776	0.031	0.522	0.894
MCARI ₁	0.950	0.066	0.002	0.006	0.997
MCARI ₂	-2.669	0.539	0.050	0.166	0.953
mNDVI ₇₀₅	-1.445	0.370	0.100	0.174	0.928
MSR	0.417	0.305	0.154	0.054	0.996
mSR ₇₀₅	-0.706	0.641	1.101	0.291	0.969
MSAVI ₂	0.963	0.053	0.013	0.031	0.997
MTVI ₁	0.950	0.066	0.002	0.006	0.997
MTVI ₂	-0.073	0.231	0.040	0.133	0.953
NDVIg-b	-1.348	0.318	0.058	0.167	0.708
NDVI	0.892	0.047	0.033	0.043	0.999
NDWI _{Mc}	0.876	0.048	0.038	0.058	0.993
NGRR	0.428	0.228	0.050	0.159	0.994
NPCI	0.747	0.320	0.057	0.271	0.981
OSAVI	0.933	0.067	0.025	0.045	0.997
PSRI	0.909	0.138	0.014	0.343	0.991
RVI	0.748	0.290	1.241	0.114	0.989
NDVI ₇₀₅	-0.544	0.309	0.089	0.186	0.967
RBI	-0.730	0.333	0.281	0.142	0.903
RGI	0.795	0.152	0.184	0.222	0.996
RDVI	0.953	0.043	0.010	0.024	0.996
SARVI	0.948	0.069	0.013	0.035	0.996
SAVI	0.963	0.042	0.011	0.026	0.997
SIPI	0.823	0.055	0.036	0.044	0.998
TCARI	-2.619	0.134	0.009	0.119	0.646
TNDVI	0.894	0.042	0.045	0.038	0.999
TVI	0.939	0.066	0.181	0.014	0.990
VARI	-0.343	0.548	0.042	0.107	0.992

Table S3. Individual values for the statistical measures per index.

Index	1:1R ²									
	TC10	HyMap	TC05	RapidEye	IKONOS	GeoEye	WV3	WV2	Pléiades	QB
ARI	0.576	-3.853	-0.624	-14.216	NA	NA	-34.998	-28.234	NA	NA
ARVI	NA	0.685	0.971	0.989	0.537	0.998	0.854	0.995	0.959	0.876
BGI ₂	NA	0.944	0.646	-0.260	-8.842	-1.320	-3.378	-0.670	-10.049	-7.247
BRI ₁	NA	NA	-5.733	-3.849	-2.346	-5.785	-1.510	-3.714	-6.761	-3.022
CRI ₇₀₀	-2.806	0.985	-2.807	0.101	NA	NA	0.921	0.830	NA	NA
CTR ₁	NA	NA	0.378	-4.199	NA	NA	-47.760	-40.060	NA	NA
CTR ₂	0.784	0.985	0.604	-1.604	NA	NA	-10.568	-9.421	NA	NA
CARI	-0.376	-0.348	-0.377	-0.324	NA	NA	-0.244	-0.238	NA	NA
DVI	0.966	0.999	0.983	0.993	0.877	1.000	0.986	1.000	0.995	0.958
EVI	NA	0.999	0.972	0.989	0.806	0.999	0.954	0.999	0.998	0.939
GM ₁	0.352	0.998	0.247	-0.214	0.562	-0.748	-1.421	-0.664	0.324	-0.989
GM ₂	0.945	0.220	0.995	-0.091	NA	NA	-1.942	-1.784	NA	NA
GEMI	0.972	1.000	0.986	0.994	0.887	1.000	0.988	1.000	0.995	0.962
CIg	0.953	0.991	0.966	0.864	0.990	0.707	0.454	0.734	0.982	0.612
gNDVI	0.914	0.993	0.968	0.925	0.979	0.778	0.644	0.811	0.981	0.766
GRR	1.000	0.933	0.942	0.621	-0.577	0.715	-0.225	0.572	-0.054	-0.296
IPVI	0.969	0.999	0.986	0.989	0.407	0.999	0.884	0.996	0.852	0.839
LIC ₂	NA	0.565	-0.379	0.261	0.511	-0.370	0.742	0.901	-0.804	0.416
LIC ₃	NA	0.861	0.817	-9.158	NA	NA	0.655	0.458	NA	NA
mARI	0.534	-3.548	-0.624	-13.057	NA	NA	-32.601	-27.345	NA	NA
MCARI	0.724	-4.841	0.805	-15.919	NA	NA	-149.38	-252.88	NA	NA
MCARI ₁	0.942	0.999	0.987	0.989	0.776	0.998	0.941	0.995	0.976	0.898
MCARI ₂	-5.734	-3.837	-3.520	-2.942	0.049	-3.595	-1.333	-3.174	-1.671	-0.930
mNDVI ₇₀₅	NA	0.928	0.340	0.687	NA	NA	-4.973	-4.206	NA	NA
MSR	0.860	0.734	0.773	0.613	-0.450	0.716	0.177	0.625	0.039	0.085
mSR ₇₀₅	NA	0.866	-0.886	0.485	NA	NA	-2.108	-1.886	NA	NA
MSAVI ₂	0.941	1.000	0.997	0.997	0.809	0.995	0.974	0.998	0.978	0.943
MTVI ₁	0.942	0.999	0.987	0.989	0.776	0.998	0.941	0.995	0.976	0.898
MTVI ₂	-1.408	-0.545	-0.411	-0.142	0.913	-0.429	0.501	-0.240	0.384	0.644
NDVIg-b	NA	0.806	0.485	0.222	-4.923	-0.475	0.759	0.592	-5.693	-3.902
NDVI	0.969	0.999	0.986	0.989	0.407	0.999	0.884	0.996	0.852	0.839
NDWI _{Mc}	0.914	0.993	0.968	0.925	0.979	0.778	0.644	0.811	0.981	0.766
NGRR	1.000	0.968	0.940	0.777	-0.683	0.800	-0.177	0.722	0.175	-0.242
NPCI	NA	0.960	0.948	0.862	0.664	0.831	0.284	0.894	0.533	0.743
OSAVI	0.928	0.999	0.996	0.994	0.639	0.996	0.943	0.996	0.943	0.898
PSRI	NA	1.000	0.950	0.954	0.754	0.982	0.791	0.948	0.910	0.892
RVI	0.993	0.989	0.999	0.922	0.122	0.976	0.588	0.923	0.457	0.515
NDVI ₇₀₅	-0.016	0.940	0.523	0.798	NA	NA	-3.031	-2.480	NA	NA
RBI	NA	0.851	-0.962	-1.181	-1.170	-1.517	0.847	0.145	-2.314	-1.271
RGI	0.732	0.694	0.919	0.959	0.419	0.987	0.715	0.984	0.852	0.686
RDVI	0.926	1.000	0.996	0.997	0.751	0.995	0.968	0.997	0.972	0.931
SARVI	NA	0.999	0.998	0.995	0.759	0.986	0.889	0.993	0.977	0.935
SAVI	0.932	1.000	0.997	0.998	0.806	0.994	0.977	0.997	0.982	0.947
SIPI	NA	0.998	0.998	0.981	0.168	0.990	0.975	0.982	0.566	0.747
TCARI	0.959	0.646	0.995	0.309	NA	NA	-5.720	-12.903	NA	NA
TNDVI	0.968	0.999	0.983	0.989	0.409	0.999	0.889	0.996	0.861	0.844
TVI	0.724	0.994	0.973	0.962	0.959	0.915	0.984	0.933	0.959	0.991
VARI	NA	0.344	0.325	0.012	-1.267	0.044	-0.863	-0.048	-0.677	-0.952

Table S3. *Cont.*

Index	Slope									
	TC10	HyMap	TC05	RapidEye	IKONOS	GeoEye	WV3	WV2	Pléiades	QB
ARI	0.616	−0.176	0.486	−1.135	NA	NA	−2.000	−1.715	NA	NA
ARVI	NA	0.692	1.158	1.031	0.926	1.043	0.938	0.997	0.895	0.944
BGI ₂	NA	1.019	1.012	0.953	0.594	0.967	0.848	0.984	0.544	0.693
BRI ₁	NA	NA	1.802	1.265	0.749	1.468	0.873	1.231	1.063	0.933
CRI ₇₀₀	−0.051	0.994	−0.051	0.626	NA	NA	1.035	0.907	NA	NA
CTR ₁	NA	NA	0.670	0.186	NA	NA	0.423	0.489	NA	NA
CTR ₂	0.703	0.964	0.928	0.752	NA	NA	0.368	0.440	NA	NA
CARI	0.022	0.023	0.022	0.024	NA	NA	0.020	0.013	NA	NA
DVI	1.058	1.012	0.959	0.971	0.859	1.009	0.953	0.999	0.974	0.920
EVI	NA	1.011	0.992	0.984	0.879	1.010	0.919	0.991	1.011	0.934
GM ₁	1.021	0.985	1.242	1.435	1.232	1.404	1.526	1.421	1.212	1.526
GM ₂	0.905	0.519	0.938	0.384	NA	NA	0.089	0.115	NA	NA
GEMI	1.004	1.005	1.001	0.994	0.909	0.998	0.961	0.998	0.965	0.956
CIg	0.859	1.035	1.036	1.202	1.030	1.176	1.278	1.190	1.014	1.276
gNDVI	0.804	0.998	0.998	1.086	1.078	0.978	1.009	1.005	0.988	1.071
GRR	0.989	0.833	0.902	0.600	0.217	0.691	0.327	0.591	0.316	0.293
IPVI	0.938	0.998	1.106	1.027	0.956	1.020	0.949	0.992	0.889	0.959
LIC ₂	NA	0.571	1.496	1.047	0.617	1.229	0.715	1.138	0.893	0.769
LIC ₃	NA	1.087	1.066	1.170	NA	NA	1.020	1.009	NA	NA
mARI	0.770	0.037	0.601	−0.766	NA	NA	−1.359	−1.197	NA	NA
MCARI	1.244	2.123	1.206	2.911	NA	NA	6.696	8.475	NA	NA
MCARI ₁	1.058	0.986	0.962	0.961	0.813	0.988	0.900	0.977	0.942	0.873
MCARI ₂	1.697	1.683	1.690	1.604	1.256	1.627	1.415	1.599	1.422	1.393
mNDVI ₇₀₅	NA	0.921	0.995	0.659	NA	NA	0.253	0.323	NA	NA
MSR	0.868	0.849	0.886	0.757	0.423	0.810	0.567	0.747	0.500	0.542
mSR ₇₀₅	NA	0.779	1.707	0.502	NA	NA	0.095	0.128	NA	NA
MSAVI ₂	0.994	0.989	0.998	0.975	0.832	0.985	0.912	0.978	0.909	0.900
MTVI ₁	1.058	0.986	0.962	0.961	0.813	0.988	0.900	0.977	0.942	0.873
MTVI ₂	1.358	1.346	1.352	1.283	1.005	1.302	1.132	1.279	1.138	1.114
NDVIg-b	NA	0.879	0.787	0.674	0.415	0.584	0.974	0.966	0.380	0.481
NDVI	0.938	0.998	1.106	1.027	0.956	1.020	0.949	0.992	0.889	0.959
NDWI _{Mc}	0.804	0.998	0.998	1.086	1.078	0.978	1.009	1.005	0.988	1.071
NGRR	0.999	0.941	1.029	0.816	0.474	0.914	0.630	0.831	0.566	0.576
NPCI	NA	0.868	0.921	0.674	0.427	0.748	0.611	0.826	0.527	0.513
OSAVI	0.906	0.994	1.019	0.971	0.879	0.957	0.901	0.950	0.881	0.910
PSRI	NA	1.001	1.088	0.881	0.851	0.890	0.835	0.842	0.733	0.814
RVI	1.003	0.925	0.984	0.784	0.329	0.875	0.516	0.778	0.435	0.479
NDVI ₇₀₅	0.843	0.937	1.030	0.738	NA	NA	0.297	0.364	NA	NA
RBI	NA	0.837	0.807	0.583	0.395	0.588	1.001	0.971	0.368	0.454
RGI	0.949	0.947	1.052	0.863	0.652	0.980	0.815	0.902	0.675	0.745
RDVI	0.974	0.995	1.004	0.981	0.879	0.986	0.931	0.980	0.930	0.923
SARVI	NA	0.992	1.010	0.961	0.843	0.970	0.876	0.952	0.904	0.890
SAVI	0.976	0.992	1.003	0.982	0.878	0.984	0.932	0.981	0.931	0.927
SIPI	NA	1.006	1.029	1.012	0.952	0.990	0.865	0.899	0.888	0.959
TCARI	1.080	1.221	0.979	1.219	NA	NA	0.954	0.785	NA	NA
TNDVI	0.928	0.997	1.114	1.034	0.992	1.021	0.961	0.994	0.902	0.977
TVI	1.159	0.969	1.063	1.064	0.916	1.096	1.012	1.085	1.049	0.981
VARI	NA	0.555	0.630	0.496	0.281	0.549	0.384	0.506	0.322	0.340

Table S3. *Cont.*

Index	Intercept									
	TC10	HyMap	TC05	RapidEye	IKONOS	GeoEye	WV3	WV2	Pléiades	QB
ARI	2.071	7.105	4.196	12.547	NA	NA	19.477	17.531	NA	NA
ARVI	NA	0.138	-0.120	-0.039	-0.064	-0.029	-0.021	-0.011	0.044	-0.020
BGI ₂	NA	0.008	0.039	0.103	0.406	0.126	0.220	0.102	0.441	0.344
BRI ₁	NA	NA	-0.004	0.212	0.399	0.172	0.303	0.224	0.401	0.342
CRI ₇₀₀	5.792	-0.236	5.794	-0.124	NA	NA	-1.654	-0.944	NA	NA
CTR ₁	NA	NA	1.312	3.520	NA	NA	6.547	5.983	NA	NA
CTR ₂	0.106	-0.005	0.086	0.236	NA	NA	0.522	0.486	NA	NA
CARI	0.178	0.264	0.176	0.336	NA	NA	0.676	0.785	NA	NA
DVI	0.003	-0.001	-0.001	-0.001	-0.001	0.000	0.000	-0.001	-0.001	-0.001
EVI	NA	0.000	-0.015	-0.007	-0.008	-0.001	0.007	-0.001	-0.007	-0.006
GM ₁	0.667	0.091	-0.205	-0.834	-0.372	-0.467	-0.775	-0.577	-0.118	-0.923
GM ₂	0.655	0.737	0.202	1.095	NA	NA	1.320	1.280	NA	NA
GEMI	0.019	-0.001	-0.015	-0.006	0.014	0.004	0.010	0.000	0.014	0.002
CIg	0.667	-0.032	0.039	-0.412	-0.144	-0.077	-0.262	-0.168	0.087	-0.405
gNDVI	0.137	0.007	0.011	-0.038	-0.054	0.046	0.034	0.026	0.016	-0.014
GRR	0.006	0.157	-0.002	0.388	0.693	0.230	0.566	0.366	0.692	0.622
IPVI	0.064	0.003	-0.095	-0.030	-0.008	-0.019	0.024	0.003	0.075	0.011
LIC ₂	NA	0.176	-0.110	0.139	0.358	0.079	0.102	-0.035	0.332	0.290
LIC ₃	NA	0.006	0.011	0.123	NA	NA	0.023	0.031	NA	NA
mARI	0.515	1.631	0.951	2.869	NA	NA	4.434	4.076	NA	NA
MCARI	-0.002	-0.011	-0.002	-0.018	NA	NA	-0.063	-0.093	NA	NA
MCARI ₁	0.011	0.000	-0.002	-0.001	-0.002	0.002	0.001	0.000	0.001	-0.001
MCARI ₂	0.090	0.041	0.028	0.043	0.034	0.055	0.050	0.053	0.063	0.040
mNDVI ₇₀₅	NA	0.013	0.098	0.135	NA	NA	0.136	0.115	NA	NA
MSR	-0.064	-0.179	-0.238	-0.038	0.251	-0.087	0.183	0.003	0.301	0.199
mSR ₇₀₅	NA	0.449	-1.107	1.187	NA	NA	1.407	1.356	NA	NA
MSAVI ₂	0.034	0.003	-0.006	0.004	0.008	0.014	0.016	0.012	0.021	0.009
MTVI ₁	0.011	0.000	-0.002	-0.001	-0.002	0.002	0.001	0.000	0.001	-0.001
MTVI ₂	0.072	0.033	0.023	0.034	0.027	0.044	0.040	0.042	0.050	0.032
NDVIg-b	NA	0.017	0.080	0.085	0.057	0.092	0.035	0.048	0.060	0.048
NDVI	0.066	0.005	-0.084	-0.033	-0.060	-0.017	-0.002	-0.001	0.039	-0.018
NDWI _{Mc}	-0.137	-0.007	-0.011	0.038	0.054	-0.046	-0.034	-0.026	-0.016	0.014
NGRR	0.003	0.016	0.055	0.032	0.080	0.061	0.093	0.049	0.031	0.079
NPCI	NA	-0.007	-0.028	0.018	0.083	-0.022	0.202	0.078	-0.020	0.053
OSAVI	0.079	0.000	-0.017	0.008	-0.002	0.028	0.030	0.027	0.043	0.014
PSRI	NA	-0.001	0.008	0.013	0.031	0.007	0.029	0.014	0.003	0.021
RVI	0.528	0.278	-0.022	0.990	2.259	0.671	1.992	1.134	2.453	2.083
NDVI ₇₀₅	0.189	0.002	0.067	0.080	NA	NA	0.107	0.091	NA	NA
RBI	NA	0.146	-0.385	0.072	0.518	-0.004	-0.221	-0.466	0.363	0.355
RGI	-0.098	0.184	-0.112	0.063	0.434	-0.014	0.267	0.054	0.292	0.318
RDVI	0.035	0.000	-0.007	0.003	-0.001	0.012	0.012	0.010	0.015	0.005
SARVI	NA	0.001	-0.009	0.011	0.003	0.023	0.010	0.011	0.035	0.015
SAVI	0.037	0.002	-0.007	0.003	0.000	0.014	0.013	0.011	0.017	0.004
SIPI	NA	-0.008	-0.026	-0.021	-0.043	0.000	0.100	0.087	0.031	-0.012
TCARI	-0.001	-0.001	0.001	-0.006	NA	NA	-0.019	-0.028	NA	NA
TNDVI	0.089	0.005	-0.130	-0.043	-0.033	-0.025	0.025	0.003	0.089	0.004
TVI	0.628	-0.003	0.044	0.124	0.059	0.237	0.212	0.182	0.214	0.111
VARI	NA	-0.003	-0.044	-0.026	-0.062	-0.048	-0.073	-0.039	-0.023	-0.061

Table S3. *Cont.*

Index	Normalized intercept									
	TC10	HyMap	TC05	RapidEye	IKONOS	GeoEye	WV3	WV2	Pléiades	QB
ARI	1.460	5.010	2.958	8.846	NA	NA	12.361	12.361	NA	NA
ARVI	NA	0.197	-0.171	-0.055	-0.091	-0.041	-0.029	-0.015	0.063	-0.029
BGI ₂	NA	0.018	0.090	0.239	0.942	0.292	0.236	0.236	1.023	0.798
BRI ₁	NA	NA	-0.009	0.454	0.853	0.367	0.480	0.480	0.859	0.732
CRI ₇₀₀	0.328	-0.013	0.328	-0.007	NA	NA	-0.053	-0.053	NA	NA
CTR ₁	NA	NA	0.532	1.426	NA	NA	2.425	2.425	NA	NA
CTR ₂	0.456	-0.020	0.369	1.012	NA	NA	2.086	2.086	NA	NA
CARI	0.063	0.093	0.062	0.118	NA	NA	0.275	0.275	NA	NA
DVI	0.012	-0.003	-0.004	-0.004	-0.004	-0.001	-0.004	-0.004	-0.004	-0.004
EVI	NA	-0.001	-0.034	-0.016	-0.019	-0.002	-0.001	-0.001	-0.017	-0.014
GM ₁	0.161	0.022	-0.049	-0.202	-0.090	-0.113	-0.139	-0.139	-0.029	-0.223
GM ₂	0.174	0.195	0.054	0.290	NA	NA	0.339	0.339	NA	NA
GEMI	0.029	-0.001	-0.024	-0.010	0.021	0.006	0.000	0.000	0.022	0.003
CIg	0.177	-0.008	0.010	-0.109	-0.038	-0.020	-0.045	-0.045	0.023	-0.108
gNDVI	0.214	0.010	0.017	-0.060	-0.084	0.071	0.040	0.040	0.025	-0.022
GRR	0.003	0.077	-0.001	0.190	0.339	0.112	0.179	0.179	0.338	0.304
IPVI	0.073	0.004	-0.109	-0.034	-0.009	-0.021	0.004	0.004	0.085	0.013
LIC ₂	NA	0.278	-0.173	0.220	0.565	0.124	-0.055	-0.055	0.525	0.459
LIC ₃	NA	0.050	0.095	1.038	NA	NA	0.262	0.262	NA	NA
mARI	1.280	4.055	2.364	7.135	NA	NA	10.135	10.135	NA	NA
MCARI	-0.030	-0.152	-0.029	-0.263	NA	NA	-1.329	-1.329	NA	NA
MCARI ₁	0.030	0.001	-0.006	-0.002	-0.006	0.004	0.001	0.001	0.003	-0.003
MCARI ₂	0.299	0.137	0.094	0.143	0.112	0.182	0.175	0.175	0.208	0.134
mNDVI ₇₀₅	NA	0.024	0.179	0.247	NA	NA	0.211	0.211	NA	NA
MSR	-0.026	-0.071	-0.095	-0.015	0.100	-0.035	0.001	0.001	0.120	0.079
mSR ₇₀₅	NA	0.120	-0.296	0.317	NA	NA	0.362	0.362	NA	NA
MSAVI ₂	0.087	0.006	-0.016	0.010	0.020	0.036	0.029	0.029	0.055	0.022
MTVI ₁	0.030	0.001	-0.006	-0.002	-0.006	0.004	0.001	0.001	0.003	-0.003
MTVI ₂	0.239	0.110	0.075	0.114	0.089	0.146	0.140	0.140	0.166	0.107
NDVIg-b	NA	0.048	0.225	0.238	0.161	0.259	0.134	0.134	0.168	0.135
NDVI	0.088	0.006	-0.112	-0.043	-0.080	-0.023	-0.002	-0.002	0.052	-0.024
NDWI _{Mc}	0.214	0.010	0.017	-0.060	-0.084	0.071	0.040	0.040	0.025	-0.022
NGRR	-0.010	-0.056	-0.192	-0.111	-0.281	-0.212	-0.170	-0.170	-0.110	-0.277
NPCI	NA	-0.045	-0.176	0.115	0.523	-0.137	0.493	0.493	-0.124	0.335
OSAVI	0.143	0.000	-0.031	0.015	-0.003	0.052	0.050	0.050	0.078	0.026
PSRI	NA	-0.029	0.216	0.369	0.859	0.184	0.380	0.380	0.094	0.573
RVI	0.052	0.028	-0.002	0.098	0.223	0.066	0.112	0.112	0.242	0.206
NDVI ₇₀₅	0.407	0.004	0.143	0.171	NA	NA	0.196	0.196	NA	NA
RBI	NA	0.067	-0.177	0.033	0.239	-0.002	-0.215	-0.215	0.167	0.163
RGI	-0.134	0.251	-0.152	0.086	0.593	-0.019	0.074	0.074	0.399	0.435
RDVI	0.086	0.001	-0.017	0.007	-0.003	0.029	0.025	0.025	0.037	0.013
SARVI	NA	0.001	-0.024	0.029	0.008	0.059	0.030	0.030	0.091	0.039
SAVI	0.091	0.004	-0.018	0.007	-0.001	0.034	0.027	0.027	0.042	0.010
SIPI	NA	-0.010	-0.033	-0.027	-0.054	0.000	0.110	0.110	0.040	-0.015
TCARI	-0.006	-0.016	0.010	-0.061	NA	NA	-0.310	-0.310	NA	NA
TNDVI	0.080	0.004	-0.116	-0.039	-0.030	-0.022	0.003	0.003	0.080	0.004
TVI	0.048	0.000	0.003	0.009	0.004	0.018	0.014	0.014	0.016	0.008
VARI	NA	-0.009	-0.123	-0.072	-0.171	-0.133	-0.109	-0.109	-0.065	-0.169

Table S3. *Cont.*

Index	ccR ²									
	TC10	HyMap	TC05	RapidEye	IKONOS	GeoEye	WV3	WV2	Pléiades	QB
ARI	0.910	0.067	0.654	0.489	NA	NA	0.556	0.528	NA	NA
ARVI	NA	0.976	0.999	1.000	0.998	1.000	0.998	1.000	0.999	0.999
BGI ₂	NA	0.991	0.997	0.984	0.978	0.946	0.990	0.962	0.972	0.989
BRI ₁	NA	NA	0.862	0.887	0.889	0.844	0.907	0.886	0.835	0.895
CRI ₇₀₀	0.046	0.987	0.047	0.944	NA	NA	0.946	0.939	NA	NA
CTR ₁	NA	NA	0.785	0.035	NA	NA	0.024	0.040	NA	NA
CTR ₂	0.963	1.000	0.989	0.956	NA	NA	0.789	0.808	NA	NA
CARI	0.660	0.425	0.664	0.298	NA	NA	0.054	0.017	NA	NA
DVI	0.994	1.000	0.995	0.999	0.998	1.000	1.000	1.000	1.000	1.000
EVI	NA	1.000	0.987	0.998	0.998	1.000	1.000	1.000	0.999	1.000
GM ₁	0.974	0.999	0.996	0.996	0.995	0.996	0.996	0.997	0.997	0.996
GM ₂	0.994	0.998	0.999	0.994	NA	NA	0.952	0.965	NA	NA
GEMI	0.995	1.000	0.997	0.999	0.998	1.000	1.000	1.000	1.000	1.000
CIg	0.983	1.000	0.991	0.997	0.992	0.998	0.997	0.998	0.997	0.995
gNDVI	0.975	1.000	0.991	0.995	0.990	0.998	0.996	0.997	0.997	0.991
GRR	1.000	0.999	0.999	0.994	0.916	0.997	0.960	0.993	0.953	0.953
IPVI	0.999	1.000	0.998	1.000	0.999	1.000	0.999	1.000	0.999	0.999
LIC ₂	NA	0.936	0.961	0.984	0.976	0.959	0.963	0.990	0.954	0.986
LIC ₃	NA	0.997	0.999	0.930	NA	NA	0.974	0.966	NA	NA
mARI	0.950	0.005	0.741	0.383	NA	NA	0.480	0.462	NA	NA
MCARI	0.995	0.943	0.994	0.910	NA	NA	0.781	0.740	NA	NA
MCARI ₁	0.985	1.000	0.998	0.999	0.999	0.998	0.998	0.998	0.994	0.999
MCARI ₂	0.956	0.928	0.918	0.950	0.969	0.943	0.965	0.953	0.980	0.969
mNDVI ₇₀₅	NA	1.000	0.999	0.988	NA	NA	0.806	0.848	NA	NA
MSR	0.998	0.999	0.999	0.999	0.989	0.999	0.996	0.999	0.992	0.995
mSR ₇₀₅	NA	0.999	0.998	0.994	NA	NA	0.913	0.943	NA	NA
MSAVI ₂	0.989	1.000	0.999	1.000	0.999	0.999	0.997	0.998	0.995	0.998
MTVI ₁	0.985	1.000	0.998	0.999	0.999	0.998	0.998	0.998	0.994	0.999
MTVI ₂	0.956	0.928	0.918	0.950	0.969	0.943	0.965	0.953	0.980	0.969
NDVIg-b	NA	0.978	0.571	0.509	0.709	0.384	0.918	0.901	0.727	0.674
NDVI	0.999	1.000	0.998	1.000	0.999	1.000	0.999	1.000	0.999	0.999
NDWI _{Mc}	0.975	1.000	0.991	0.995	0.990	0.998	0.996	0.997	0.997	0.991
NGRR	1.000	1.000	0.998	0.998	0.979	0.998	0.987	0.997	0.995	0.988
NPCI	NA	0.997	0.998	0.994	0.971	0.993	0.919	0.990	0.982	0.984
OSAVI	0.989	1.000	1.000	0.999	0.999	0.999	0.997	0.998	0.995	0.998
PSRI	NA	1.000	0.997	0.992	0.983	0.996	0.982	0.991	0.990	0.985
RVI	1.000	1.000	1.000	0.996	0.963	0.999	0.984	0.995	0.972	0.979
NDVI ₇₀₅	0.993	1.000	0.999	0.993	NA	NA	0.900	0.916	NA	NA
RBI	NA	0.997	0.875	0.885	0.911	0.839	0.983	0.938	0.797	0.900
RGI	0.994	0.995	0.998	0.997	0.993	0.998	0.994	0.998	0.999	0.995
RDVI	0.981	1.000	0.999	1.000	0.999	0.998	0.996	0.997	0.993	0.998
SARVI	NA	1.000	1.000	0.997	0.999	0.995	0.997	0.998	0.984	0.994
SAVI	0.985	1.000	0.999	1.000	1.000	0.998	0.997	0.998	0.996	0.999
SIPI	NA	1.000	1.000	0.999	0.996	0.998	0.998	0.999	0.995	0.997
TCARI	0.999	0.960	0.996	0.749	NA	NA	0.125	0.048	NA	NA
TNDVI	0.999	1.000	0.998	1.000	0.999	1.000	0.999	1.000	0.999	0.999
TVI	0.970	1.000	0.999	0.994	0.996	0.990	0.989	0.990	0.984	0.992
VARI	NA	0.991	0.993	0.993	0.984	0.994	0.991	0.994	0.995	0.991

Table S4. Pearson correlation coefficients between soil moisture and index values for simulated data sets used in this study.

Index	ASD	TC10	HyMap	TC05	Rapid-Eye	IKONOS	Geo-Eye	WV3	WV2	Pléiades	QB	Mean r
ARI	-0.461	-0.399	0.233	-0.293	0.409	NA	NA	0.421	0.412	NA	NA	0.375
ARVI	0.460	NA	0.485	0.452	0.460	0.471	0.457	0.473	0.461	0.464	0.468	0.465
BGI ₂	-0.240	NA	-0.282	-0.266	-0.300	-0.182	-0.347	-0.287	-0.332	-0.162	-0.220	0.262
BRI ₁	0.460	NA	NA	0.548	0.541	0.504	0.551	0.498	0.539	0.550	0.524	0.524
CRI ₇₀₀	0.459	-0.293	0.439	-0.293	0.409	NA	NA	0.421	0.412	NA	NA	0.389
CTR ₁	-0.428	NA	NA	-0.219	0.301	NA	NA	0.324	0.294	NA	NA	0.313
CTR ₂	-0.402	-0.469	-0.398	-0.443	-0.480	NA	NA	-0.520	-0.526	NA	NA	0.463
CARI	-0.479	-0.263	-0.132	-0.265	-0.045	NA	NA	0.170	0.245	NA	NA	0.228
DVI	-0.051	-0.092	-0.056	-0.017	-0.034	-0.030	-0.054	-0.054	-0.050	-0.056	-0.042	0.049
EVI	0.070	NA	0.065	0.125	0.092	0.095	0.075	0.078	0.077	0.054	0.078	0.081
GM ₁	0.500	0.471	0.494	0.491	0.522	0.522	0.506	0.513	0.509	0.513	0.522	0.506
GM ₂	0.574	0.565	0.564	0.572	0.557	NA	NA	0.536	0.545	NA	NA	0.559
GEMI	-0.046	-0.080	-0.049	-0.020	-0.032	-0.028	-0.047	-0.048	-0.044	-0.047	-0.040	0.044
CIg	0.511	0.471	0.511	0.491	0.522	0.522	0.506	0.513	0.509	0.513	0.522	0.508
gNDVI	0.440	0.418	0.438	0.407	0.433	0.432	0.425	0.424	0.425	0.431	0.425	0.427
GRR	0.585	0.586	0.582	0.586	0.584	0.543	0.582	0.568	0.584	0.562	0.565	0.575
IPVI	0.438	0.440	0.436	0.427	0.437	0.450	0.438	0.450	0.439	0.445	0.445	0.440
LIC ₂	0.508	NA	0.433	0.548	0.541	0.504	0.551	0.462	0.525	0.550	0.524	0.515
LIC ₃	-0.258	NA	-0.281	-0.266	-0.244	NA	NA	-0.224	-0.211	NA	NA	0.247
mARI	-0.576	-0.517	0.118	-0.412	0.483	NA	NA	0.509	0.502	NA	NA	0.445
MCARI	0.131	0.172	0.273	0.179	0.299	NA	NA	0.385	0.426	NA	NA	0.266
MCARI ₁	0.004	-0.057	0.010	0.027	-0.001	0.018	-0.013	-0.008	-0.012	-0.024	0.000	0.016
MCARI ₂	0.131	0.241	0.283	0.294	0.260	0.229	0.265	0.236	0.254	0.205	0.231	0.239
mNDVI ₇₀₅	0.487	NA	0.489	0.477	0.513	NA	NA	0.543	0.551	NA	NA	0.510
MSR	0.573	0.577	0.578	0.579	0.576	0.555	0.576	0.566	0.575	0.560	0.564	0.571
mSR ₇₀₅	0.554	NA	0.553	0.553	0.552	NA	NA	0.544	0.554	NA	NA	0.552
MSAVI ₂	0.102	0.048	0.104	0.112	0.096	0.091	0.084	0.075	0.083	0.068	0.080	0.086
MTVI ₁	0.004	-0.057	0.010	0.027	-0.001	0.018	-0.013	-0.008	-0.012	-0.024	0.000	0.016
MTVI ₂	0.131	0.241	0.283	0.294	0.260	0.229	0.265	0.236	0.254	0.205	0.231	0.239
NDVIg-b	-0.083	NA	-0.001	0.285	0.320	0.187	0.372	0.046	0.069	0.166	0.227	0.176
NDVI	0.438	0.440	0.436	0.427	0.437	0.450	0.438	0.450	0.439	0.445	0.445	0.440
NDWI _{Mc}	-0.440	-0.418	-0.438	-0.407	-0.433	-0.432	-0.425	-0.424	-0.425	-0.431	-0.425	0.427
NGRR	-0.531	-0.532	-0.534	-0.539	-0.544	-0.519	-0.542	-0.539	-0.544	-0.528	-0.537	0.535
NPCI	-0.539	NA	-0.539	-0.544	-0.535	-0.497	-0.543	-0.467	-0.527	-0.535	-0.516	0.524
OSAVI	0.226	0.186	0.233	0.234	0.226	0.242	0.219	0.222	0.216	0.210	0.223	0.222
PSRI	-0.362	NA	-0.366	-0.380	-0.395	-0.414	-0.389	-0.417	-0.400	-0.405	-0.410	0.394
RVI	0.590	0.585	0.589	0.591	0.591	0.580	0.588	0.585	0.590	0.584	0.586	0.587
NDVI ₇₀₅	0.497	0.501	0.499	0.489	0.510	NA	NA	0.527	0.535	NA	NA	0.508
RBI	-0.422	NA	-0.429	-0.505	-0.509	-0.481	-0.513	-0.448	-0.491	-0.510	-0.496	0.480
RGI	-0.484	-0.472	-0.493	-0.480	-0.497	-0.492	-0.491	-0.505	-0.497	-0.493	-0.505	0.492
RDVI	0.130	0.064	0.133	0.143	0.126	0.140	0.109	0.110	0.110	0.098	0.120	0.117
SARVI	0.219	NA	0.222	0.227	0.203	0.224	0.188	0.232	0.217	0.170	0.197	0.210
SAVI	0.088	0.029	0.092	0.100	0.085	0.096	0.070	0.070	0.071	0.063	0.078	0.077
SIPI	0.411	NA	0.416	0.410	0.421	0.432	0.426	0.417	0.410	0.429	0.427	0.420
TCARI	-0.154	-0.178	-0.282	-0.192	-0.457	NA	NA	-0.665	-0.671	NA	NA	0.371
TNDVI	0.421	0.425	0.419	0.407	0.419	0.433	0.421	0.434	0.423	0.429	0.429	0.424
TVI	0.007	-0.070	0.011	0.011	-0.013	0.000	-0.029	-0.026	-0.026	-0.036	-0.017	0.022
VARI	0.527	NA	0.541	0.542	0.546	0.518	0.544	0.542	0.547	0.525	0.537	0.537

Table S5. Spearman correlation coefficients between cover quality and index values for simulated data sets used in this study.

Index	ASD	TC10	HyMap	TC05	Rapid-Eye	IKONOS	Geo-Eye	WV3	WV2	Pléiades	QB	Mean r
ARI	0.570	0.529	-0.361	0.364	-0.555	NA	NA	-0.584	-0.573	NA	NA	0.505
ARVI	-0.577	NA	-0.575	-0.577	-0.577	-0.584	-0.581	-0.586	-0.579	-0.582	-0.579	0.580
BGI ₂	0.433	NA	0.484	0.451	0.496	0.391	0.529	0.476	0.523	0.369	0.412	0.456
BRI ₁	-0.473	NA	NA	-0.555	-0.546	-0.528	-0.551	-0.516	-0.543	-0.561	-0.530	0.534
CRI ₇₀₀	-0.611	0.362	-0.590	0.364	-0.555	NA	NA	-0.584	-0.573	NA	NA	0.520
CTR ₁	0.465	NA	NA	0.070	-0.447	NA	NA	-0.484	-0.460	NA	NA	0.385
CTR ₂	0.570	0.584	0.570	0.572	0.588	NA	NA	0.598	0.603	NA	NA	0.584
CARI	0.579	0.324	0.173	0.329	0.056	NA	NA	-0.159	-0.224	NA	NA	0.264
DVI	0.040	0.094	0.047	0.015	0.027	0.025	0.048	0.047	0.042	0.047	0.041	0.043
EVI	-0.039	NA	-0.036	-0.085	-0.058	-0.069	-0.041	-0.053	-0.049	-0.017	-0.051	0.050
GM ₁	-0.574	-0.548	-0.574	-0.564	-0.582	-0.582	-0.577	-0.576	-0.577	-0.582	-0.587	0.575
GM ₂	-0.567	-0.584	-0.574	-0.572	-0.588	NA	NA	-0.598	-0.603	NA	NA	0.584
GEMI	0.088	0.131	0.091	0.064	0.074	0.078	0.091	0.091	0.088	0.090	0.088	0.089
CIg	-0.571	-0.548	-0.573	-0.564	-0.582	-0.582	-0.577	-0.576	-0.577	-0.582	-0.587	0.574
gNDVI	-0.571	-0.548	-0.573	-0.564	-0.582	-0.582	-0.577	-0.576	-0.577	-0.582	-0.587	0.574
GRR	-0.579	-0.580	-0.581	-0.578	-0.578	-0.588	-0.579	-0.585	-0.579	-0.583	-0.585	0.581
IPVI	-0.583	-0.581	-0.585	-0.579	-0.580	-0.573	-0.585	-0.573	-0.582	-0.577	-0.573	0.579
LIC ₂	-0.517	NA	-0.450	-0.555	-0.546	-0.528	-0.551	-0.482	-0.536	-0.561	-0.530	0.526
LIC ₃	0.525	NA	0.540	0.519	0.447	NA	NA	0.484	0.460	NA	NA	0.496
mARI	0.535	0.506	-0.246	0.363	-0.546	NA	NA	-0.569	-0.561	NA	NA	0.475
MCARI	-0.149	-0.177	-0.266	-0.178	-0.288	NA	NA	-0.355	-0.383	NA	NA	0.256
MCARI ₁	-0.004	0.066	-0.008	-0.029	0.003	-0.016	0.020	0.012	0.020	0.027	-0.001	0.019
MCARI ₂	-0.120	-0.192	-0.254	-0.262	-0.227	-0.207	-0.221	-0.206	-0.218	-0.189	-0.206	0.209
mNDVI ₇₀₅	-0.579	NA	-0.579	-0.579	-0.589	NA	NA	-0.574	-0.585	NA	NA	0.581
MSR	-0.579	-0.581	-0.579	-0.579	-0.580	-0.573	-0.585	-0.573	-0.582	-0.577	-0.573	0.578
mSR ₇₀₅	-0.579	NA	-0.579	-0.579	-0.589	NA	NA	-0.574	-0.585	NA	NA	0.581
MSAVI ₂	-0.077	-0.002	-0.081	-0.086	-0.068	-0.075	-0.055	-0.053	-0.057	-0.050	-0.062	0.060
MTVI ₁	-0.004	0.066	-0.008	-0.029	0.003	-0.016	0.020	0.012	0.020	0.027	-0.001	0.019
MTVI ₂	-0.120	-0.192	-0.254	-0.262	-0.227	-0.207	-0.221	-0.206	-0.218	-0.189	-0.206	0.209
NDVIg-b	-0.083	NA	-0.173	-0.451	-0.496	-0.391	-0.529	-0.233	-0.244	-0.369	-0.412	0.338
NDVI	-0.583	-0.581	-0.585	-0.579	-0.580	-0.573	-0.585	-0.573	-0.582	-0.577	-0.573	0.579
NDWI _{Mc}	0.571	0.548	0.573	0.564	0.582	0.582	0.577	0.576	0.577	0.582	0.587	0.574
NGRR	0.579	0.580	0.581	0.578	0.578	0.588	0.579	0.585	0.579	0.583	0.585	0.581
NPCI	0.551	NA	0.556	0.555	0.546	0.528	0.551	0.482	0.536	0.561	0.530	0.540
OSAVI	-0.252	-0.197	-0.261	-0.262	-0.250	-0.270	-0.244	-0.235	-0.233	-0.222	-0.235	0.242
PSRI	0.575	NA	0.575	0.571	0.574	0.565	0.579	0.568	0.572	0.571	0.567	0.572
RVI	-0.581	-0.581	-0.579	-0.579	-0.580	-0.573	-0.585	-0.573	-0.582	-0.577	-0.573	0.578
NDVI ₇₀₅	-0.573	-0.584	-0.574	-0.572	-0.588	NA	NA	-0.598	-0.603	NA	NA	0.585
RBI	0.434	NA	0.450	0.555	0.546	0.528	0.551	0.482	0.536	0.561	0.530	0.517
RGI	0.580	0.580	0.581	0.578	0.578	0.588	0.579	0.585	0.579	0.583	0.585	0.581
RDVI	-0.161	-0.087	-0.171	-0.176	-0.166	-0.180	-0.155	-0.161	-0.158	-0.144	-0.170	0.157
SARVI	-0.215	NA	-0.219	-0.229	-0.186	-0.231	-0.167	-0.226	-0.207	-0.151	-0.184	0.201
SAVI	-0.087	-0.009	-0.091	-0.108	-0.087	-0.093	-0.065	-0.065	-0.069	-0.063	-0.077	0.074
SIPI	-0.585	NA	-0.587	-0.582	-0.580	-0.577	-0.585	-0.576	-0.578	-0.571	-0.573	0.579
TCARI	0.169	0.181	0.256	0.205	0.449	NA	NA	0.547	0.516	NA	NA	0.332
TNDVI	-0.583	-0.581	-0.585	-0.579	-0.580	-0.573	-0.585	-0.573	-0.582	-0.577	-0.573	0.579
TVI	-0.012	0.076	-0.020	-0.017	0.015	0.003	0.029	0.025	0.027	0.028	0.012	0.024
VARI	-0.584	NA	-0.566	-0.574	-0.573	-0.590	-0.578	-0.583	-0.576	-0.585	-0.583	0.579

References

1. Gitelson, A.A.; Merzlyak, M.N.; Chivkunova, O.B. Optical properties and nondestructive estimation of anthocyanin content in plant leaves. *Photochem. Photobiol.* **2001**, *74*, 38–45.
2. Kaufman, Y.J.; Tanré, D. Atmospherically resistant vegetation index (ARVI) for EOS-MODIS. *IEEE Trans. Geosci. Remote Sens.* **1992**, *30*, 261–270.
3. Zarco-Tejada, P.J.; Berjón, A.; López-Lozano, R.; Miller, J.R.; Martín, P.; Cachorro, V.; González, 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*, 271–287.
4. Gitelson, A.A.; Zur, Y.; Chivkunova, O.B.; Merzlyak, M.N. Assessing carotenoid content in plant leaves with reflectance spectroscopy. *Photochem. Photobiol.* **2002**, *75*, 272–281.
5. Carter, G.A. Ratios of leaf reflectances in narrow wavebands as indicators of plant stress. *Int. J. Remote Sens.* **1994**, *15*, 697–703.
6. 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.* **2000**, *76*, 156–172.
7. Kim, M.S.; Daughtry, C.S.T.; Chappelle, E.W.; McMurtrey, J.E.; Walthall, C.L. The use of high spectral resolution bands for estimating absorbed photosynthetically active radiation (APAR). In Proceedings of the ISPRS 6th Symposium on Physical Measurements and Signatures in Remote Sensing, Val d'Isère, France, 17–21 January 1994; pp. 299–306.
8. Lillesand, T.M.; Kiefer, R.W.; Chipman, J.W. *Remote sensing and image interpretation*, 6th ed.; Wiley & Sons: New York, NY, USA, 2008; p. 756.
9. Richardson, A.J.; Everitt, J.H. Using spectral vegetation indices to estimate rangeland productivity. *Geocarto Int.* **1992**, *7*, 63–69.
10. Huete, A.R.; Liu, H.; van Leeuwen, W.J.D. The use of vegetation indices in forested regions: Issues of linearity and saturation. In Proceedings of the 1997 IEEE International Geoscience and Remote Sensing. Remote Sensing—A Scientific Vision for Sustainable Development (IGARSS'97), Singapore, 3–8 August 1997; pp. 1966–1968.
11. Gitelson, A.A.; Merzlyak, M.N. Remote estimation of chlorophyll content in higher plant leaves. *Int. J. Remote Sens.* **1997**, *18*, 2691–2697.
12. Pinty, B.; Verstraete, M.M. GEMI: A non-linear index to monitor global vegetation from satellites. *Vegetatio* **1992**, *101*, 15–20.
13. Gitelson, A.A.; Vina, A.; Ciganda, V.; Rundquist, D.C.; Arkebauer, T.J. Remote estimation of canopy chlorophyll content in crops. *Geophys. Res. Lett.* **2005**, *32*, doi: 10.1029/2005GL022688.
14. Gitelson, A.A.; Merzlyak, M.N. Remote sensing of chlorophyll concentration in higher plant leaves. *Adv. Space Res.* **1998**, *22*, 689–692.
15. Kanemasu, E.T. Seasonal canopy reflectance patterns of wheat, sorghum, and soybean. *Remote Sens. Environ.* **1974**, *3*, 43–47.
16. Rodríguez-Pérez, J.R.; Riaño, D.; Carlisle, E.; Ustin, S.L.; Smart, D.R. Evaluation of hyperspectral reflectance indexes to detect grapevine water status in vineyards. *Am. J. Enol. Viticult.* **2007**, *58*, 302–317.

17. Crippen, R.E. Calculating the vegetation index faster. *Remote Sens. Environ.* **1990**, *34*, 71–73.
18. Lichtenthaler, H.K. Vegetation stress: An introduction to the stress concept in plants. *J. Plant Physiol.* **1996**, *148*, 4–14.
19. Gitelson, A.A.; Chivkunova, O.B.; Merzlyak, M.N. Nondestructive estimation of anthocyanons and chlorophylls in anthocyanic leaves. *Am. J. Bot.* **2009**, *96*, 1861–1868.
20. Daughtry, C.S.T.; Walthall, C.L.; Kim, M.S.; de Colstoun, E.B.; McMurtrey, J.E. Estimating corn leaf chlorophyll concentration from leaf and canopy reflectance. *Remote Sens. Environ.* **2000**, *74*, 229–239.
21. 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*, 416–426.
22. Sims, D.A.; Gamon, J.A. Relationships between leaf pigment content and spectral reflectance across a wide range of species, leaf structures and developmental stages. *Remote Sens. Environ.* **2002**, *81*, 337–354.
23. Chen, J.M. Evaluation of vegetation indices and a modified simple ratio for boreal applications. *Can. J. Remote Sens.* **1996**, *22*, 229–242.
24. Qi, J.; Chehbouni, A.; Huete, A.R.; Kerr, Y.H.; Sorooshian, S. A modified soil adjusted vegetation index. *Remote Sens. Environ.* **1994**, *48*, 119–126.
25. Chen, P.F.; Haboudane, D.; Tremblay, N.; Wang, J.H.; Vigneault, P.; Li, B.G. New spectral indicator assessing the efficiency of crop nitrogen treatment in corn and wheat. *Remote Sens. Environ.* **2010**, *114*, 1987–1997.
26. Hansen, P.M.; Schjoerring, J.K. Reflectance measurement of canopy biomass and nitrogen status in wheat crops using normalized difference vegetation indices and partial least squares regression. *Remote Sens. Environ.* **2003**, *86*, 542–553.
27. Rouse, J.W., Jr.; Haas, R.H.; Deering, D.W.; Schell, J.A.; Harlan, J.C. *Monitoring the Vernal Advancement and Retrogradation (Green Wave Effect) of Natural Vegetation*; Technical Report; Texas A&M University: College Station, TX, USA, November 1974.
28. Rouse, J.W., Jr.; Haas, R.H.; Schell, J.A.; Deering, D.W. Monitoring vegetation systems in the great plains with ERTS. In *Third Earth Resources Technology Satellite—1 Symposium*; Freden, S.C., Mercanti, E.P., Becker, M.A., Eds.; Goddard Space Flight Center, NASA: Washington, DC, USA, 1974.
29. McFeeters, S.K. The use of the normalized difference water index (NDWI) in the delineation of open water features. *Int. J. Remote Sens.* **1996**, *17*, 1425–1432.
30. 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*, 135–146.
31. Rondeaux, G.; Steven, M.; Baret, F. Optimization of soil-adjusted vegetation indices. *Remote Sens. Environ.* **1996**, *55*, 95–107.
32. Merzlyak, M.N.; Gitelson, A.A.; Chivkunova, O.B.; Rakitin, V.Y. Non-destructive optical detection of pigment changes during leaf senescence and fruit ripening. *Physiol. Plantarum* **1999**, *106*, 135–141.

33. Jordan, C.F. Derivation of leaf-area index from quality of light on the forest floor. *Ecology* **1969**, *50*, 663–666.
34. Roujean, J.L.; Breon, F.M. Estimating PAR absorbed by vegetation from bidirectional reflectance measurements. *Remote Sens. Environ.* **1995**, *51*, 375–384.
35. Huete, A.; Justice, C.; Liu, H. Development of vegetation and soil indices for MODIS-EOS. *Remote Sens. Environ.* **1994**, *49*, 224–234.
36. Huete, A.R. A soil-adjusted vegetation index (SAVI). *Remote Sens. Environ.* **1988**, *25*, 295–309.
37. Peñuelas, J.; Baret, F.; Filella, I. Semi-empirical indices to assess carotenoids/chlorophyll *a* ratio from leaf spectral reflectance. *Photosynthetica* **1995**, *31*, 221–230.
38. Gitelson, A.A.; Kaufman, Y.J.; Stark, R.; Rundquist, D. Novel algorithms for remote estimation of vegetation fraction. *Remote Sens. Environ.* **2002**, *80*, 76–87.

© 2015 by the authors; licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).