

Supplementary Material

Table S1 Spearman rank correlation (r) between canopy nitrogen concentration (CNC) and aboveground biomass (AGB) across the measurement stages

	CC-1/GS25-30	CC-2/GS38	CC-3/GS47	CC-4/GS61-65	GS80
Winter Ryegrass	0.13*	0.49***	0.49***	0.02*	-
Summer Ryegrass	0.51***	0.87***	0.90***	0.67***	-
Barley	0.42*	0.82***	0.48**	0.47**	0.43**

*** p value <0.01, **p value<0.05, * p value > 0.05

Table S2 Following Table 6, regression attributes of spectral indices against aboveground biomass (AGB, g/m²). Each spectral index is fitted individually with the respective crop group data

Index	Winter Ryegrass (n =160)		Summer Ryegrass (n =160)		Ryegrass (n =320)		Barley (n =129)	
	R ²	NRMSE	R ²	NRMSE	R ²	NRMSE	R ²	NRMSE
NDVI	0.23	0.52	0.47	0.43	0.27	0.52	0.27	0.52
PRI	0.44	0.47	0.04	0.57	0.05	0.59	0.51	0.42
MTCI	0.38	0.49	0.36	0.47	0.28	0.51	0.23	0.53
NDRE	0.40	0.48	0.49	0.42	0.36	0.48	0.15	0.56
CCCI	0.41	0.48	0.46	0.43	0.37	0.48	0.05	0.59
mSR	0.38	0.49	0.39	0.45	0.29	0.51	0.34	0.49
AIVI	0.41	0.48	0.33	0.48	0.30	0.51	0.34	0.49
ND2_winter	0.00	0.62	0.06	0.57	0.00	0.60	0.41	0.46
ND2_summer	0.48	0.45	0.02	0.58	0.11	0.57	0.52	0.42
ND2_ryegrass	0.01	0.62	0.04	0.57	0.01	0.60	0.39	0.47
ND2_barley	0.39	0.48	0.17	0.53	0.16	0.55	0.53	0.41
ND2	0.10	0.59	0.11	0.55	0.00	0.60	0.50	0.43
ND4_winter	0.05	0.60	0.25	0.51	0.08	0.58	0.25	0.52
ND4_summer	0.30	0.52	0.03	0.57	0.03	0.59	0.47	0.44
ND4_ryegrass	0.01	0.62	0.07	0.56	0.02	0.60	0.44	0.45
ND4_barley	0.18	0.56	0.03	0.58	0.03	0.59	0.46	0.44
ND4	0.32	0.51	0.08	0.56	0.01	0.60	0.50	0.43

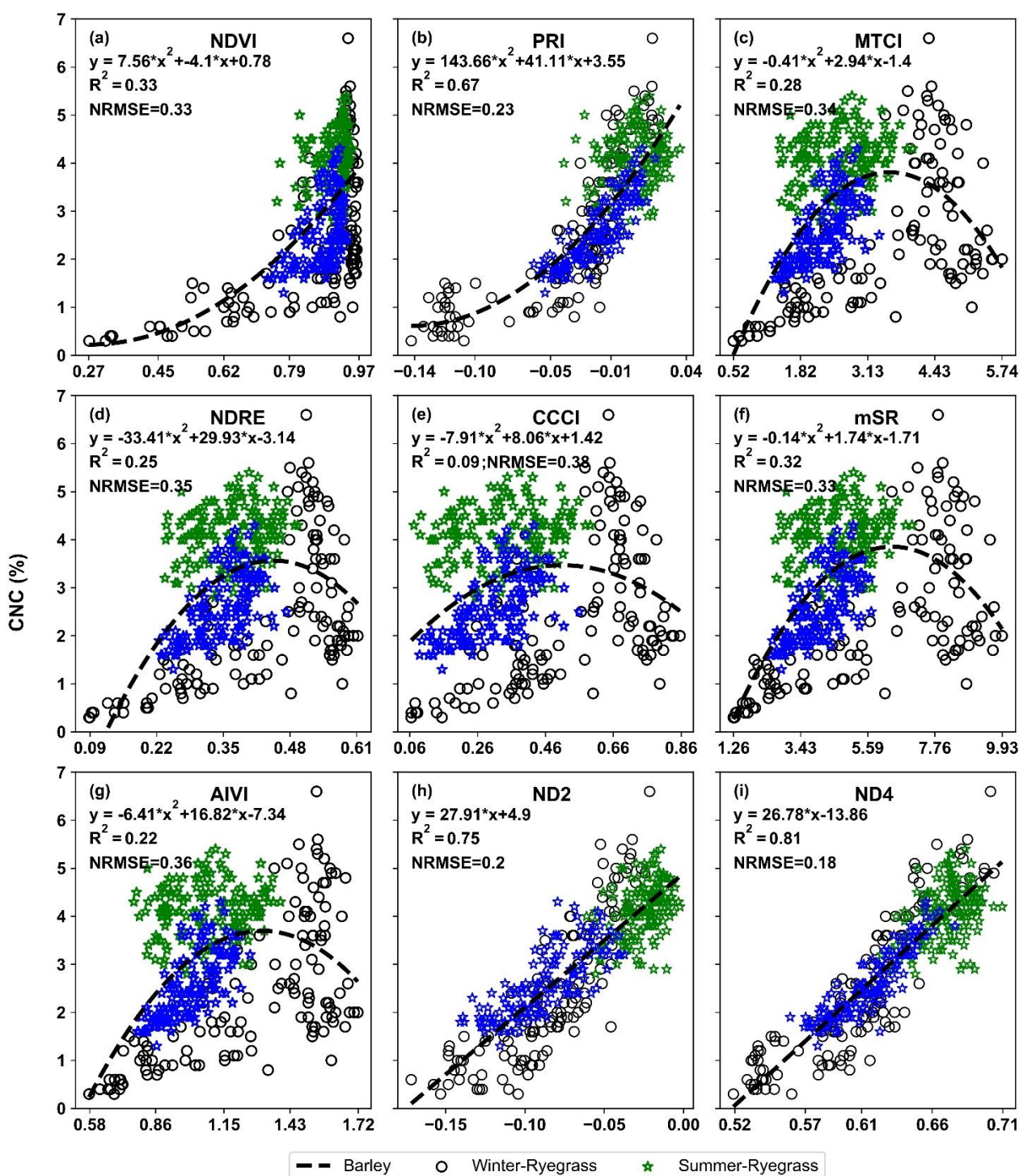


Fig. S1 Relationship of newly developed (ND2, ND4) and published indices with CNC in ryegrass winter ($n=160$), summer ($n=160$) and barley ($n=129$) crops in the calibration data. Relationships shown for indices are from the error metrics for the fitted relationships. The X-axis has the values of the index indicated inside the respective plot