

## Supplementary Materials

**Table S1.** Characteristics of studied grasslands and observations.

Grassland Plot	Altitude (m a. s. l.)	Number of Plant Species	Total Yield in 2018 (kg DM ha <sup>-1</sup> )	First Cut	Last Observation
MT1	527	13	12670		
MT2	526	13	13860	11th April	13th September
MT3*	527	18	17140		
MB1	737	17	14410		
MB2	731	16	13810	16th April	9th October
MB3*	744	16	15510		
SB1	965	20	13720		
SB2*	963	21	13640	16th April	9th October
SB3	923	23	15320		
SI1	819	18	12360		
SI2	838	17	14660	23rd April	10th October
SI3*	846	16	15670		
BB1	552	24	9730		
BB2	548	27	13590	17th April	17th October
BB3*	548	27	10300		
BL1	520	22	13330		
BL2	526	22	13290	13th April	2nd October
BL3*	533	22	10240		

MT, MB, SB, SI, BB, and BL identify the six commercial farms; the highlighted grassland plots (\*) were selected for wet-chemical analysis

**Table S2.** Characteristics of the calibration model of the laboratory NIRS (Fourier-Transform NIR, N-500, Büchi, Flawil, Switzerland; all herbage parameters as g kg<sup>-1</sup> DM).

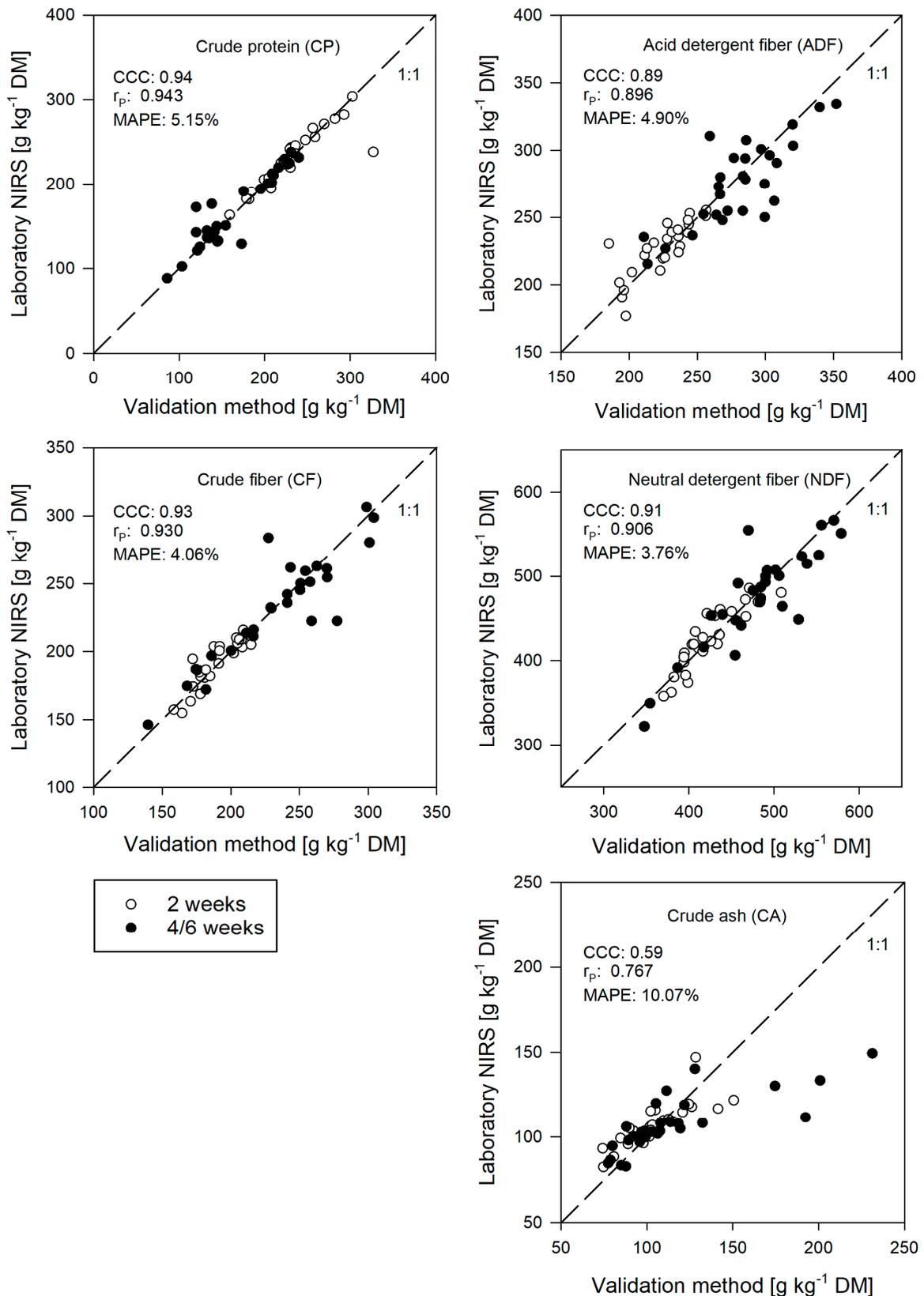
Laboratory NIRS	CP	CF	ADF	NDF	CA*
V-Set bias	0.08	0.10	0.85	-0.93	-0.39
SEC	5.42	8.02	10.66	15.07	6.22
SEP	5.36	8.03	10.27	15.15	6.24
C-Set regression coefficient	0.99	0.99	0.98	0.99	0.92
V-Set regression coefficient	0.99	0.99	0.99	0.99	0.91
C-Set regression slope	0.99	0.97	0.97	0.98	0.84
V-Set regression slope	0.98	0.97	0.96	0.98	0.85
RPD	52.6	45.8	38.9	40.0	20.0

V-Set: validation set; C-Set: calibration set; SEC: standard error of calibration; SEP: standard error of prediction; RPD (ratio of performance deviation) = calibration range/SEP; DM: dry matter as g kg<sup>-1</sup> original matter; CP: crude protein; CF: crude fiber; ADF: acid detergent fiber; NDF: neutral detergent fiber; CA: crude ash; \* Reference method was the incineration of herbage samples to constant weight at 550 °C for three hours (ISO 5984:2002). Agreement with the validation method is shown in Figure S1

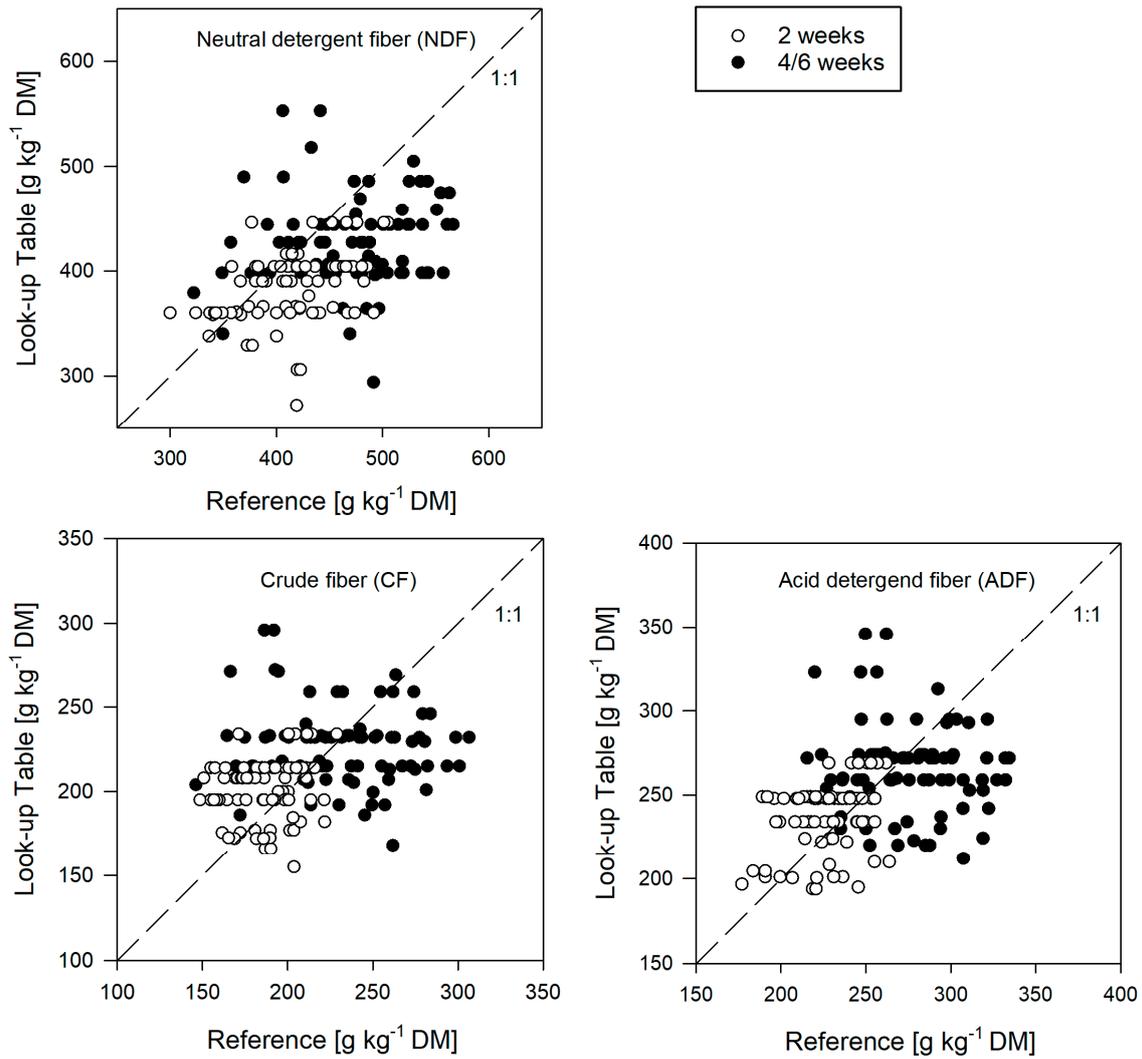
**Table S3.** Passing–Bablok regression result from fitting the full data set or fitting 5 of 6 farms (left-out farm indicated).

<b>Linear Model</b>	<b>Left-out Farm</b>	<b>Intercept</b>	<b>Slope</b>
On-site NIRS DM ~ reference DM [g kg <sup>-1</sup> FM]	none	107.6	0.45
	MT	107.7	0.46
	BL	104.9	0.46
	SB	105.8	0.45
	MB	107.3	0.45
	BB	112.7	0.43
	SI	104.8	0.46
On-site NIRS CP ~ reference CP [g kg <sup>-1</sup> DM]	none	109.8	0.24
	MT	106.5	0.25
	BL	110.3	0.23
	SB	110.7	0.23
	MB	113.2	0.22
	BB	110.4	0.23
	SI	106.6	0.25
On-site NIRS CF ~ reference CF [g kg <sup>-1</sup> DM]	none	132.8	0.43
	MT	135.4	0.43
	BL	134.1	0.43
	SB	134.1	0.43
	MB	130.6	0.44
	BB	133.3	0.43
	SI	131.1	0.44
On-site NIRS NDF ~ reference NDF [g kg <sup>-1</sup> DM]	none	229.8	0.50
	MT	246.7	0.47
	BL	236.0	0.48
	SB	213.3	0.52
	MB	214.1	0.52
	BB	232.8	0.48
	SI	218.8	0.53
On-site NIRS ADF ~ reference ADF [g kg <sup>-1</sup> DM]	none	168.4	0.38
	MT	168.5	0.38
	BL	168.8	0.38
	SB	161.7	0.40
	MB	170.3	0.37
	BB	169.2	0.38
	SI	169.1	0.38

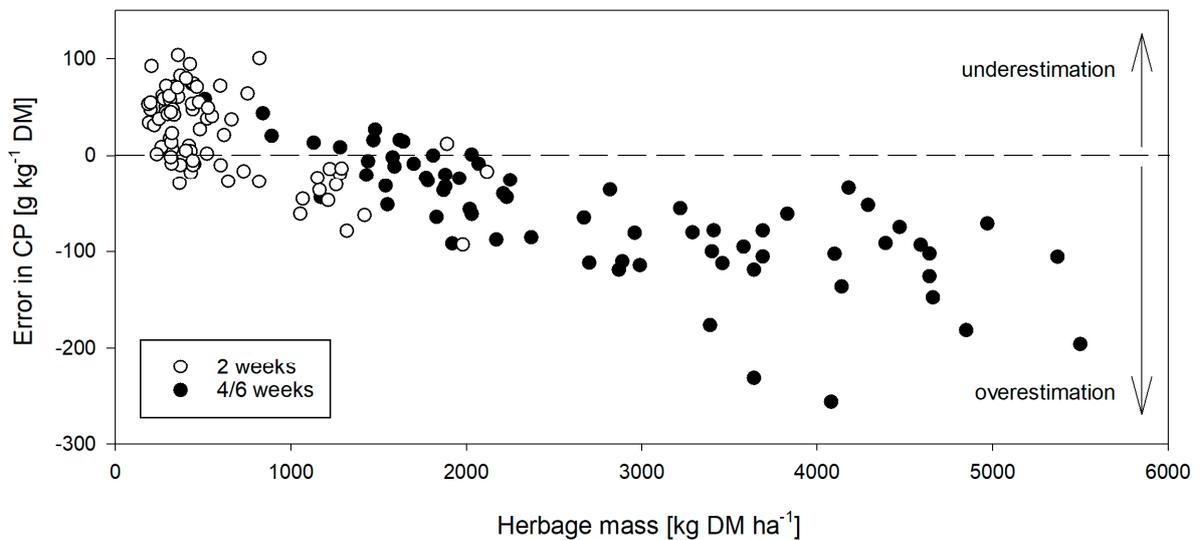
DM: dry matter; FM: fresh matter; CP: crude protein; CF: crude fiber; NDF: neutral detergent fiber; ADF: acid detergent fiber; MT, MB, SB, SI, BB, and BL identify the six commercial farms



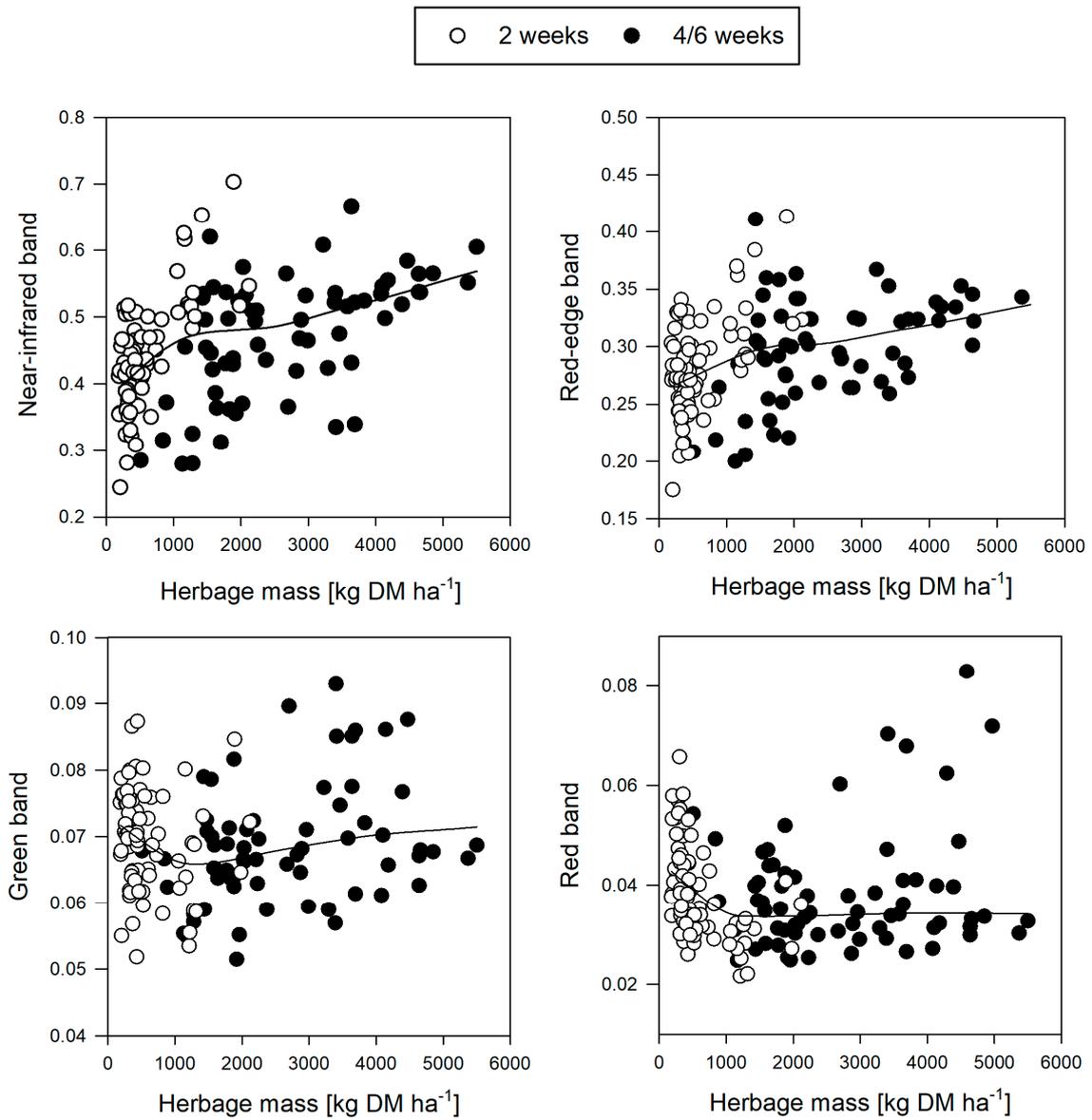
**Figure S1.** Laboratory NIRS measurements versus the validation methods ( $n = 54$ , Table 2) for quality parameters in dried herbage. Dashed line is the line of identity (1:1). The open and filled dots represent the two growth stages of the plants: “2 weeks” of growth and “4/6 weeks” of growth. The values of Pearson’s correlation coefficient ( $r_p$ ), Lin’s concordance correlation coefficient (CCC), and the mean absolute percentage error (MAPE) are given. CA was not further used to evaluate smart farming tools in the study, because sampling was prone to soil contamination. Data points far from the line of identity were confirmed to not explain measurement errors of other parameters.



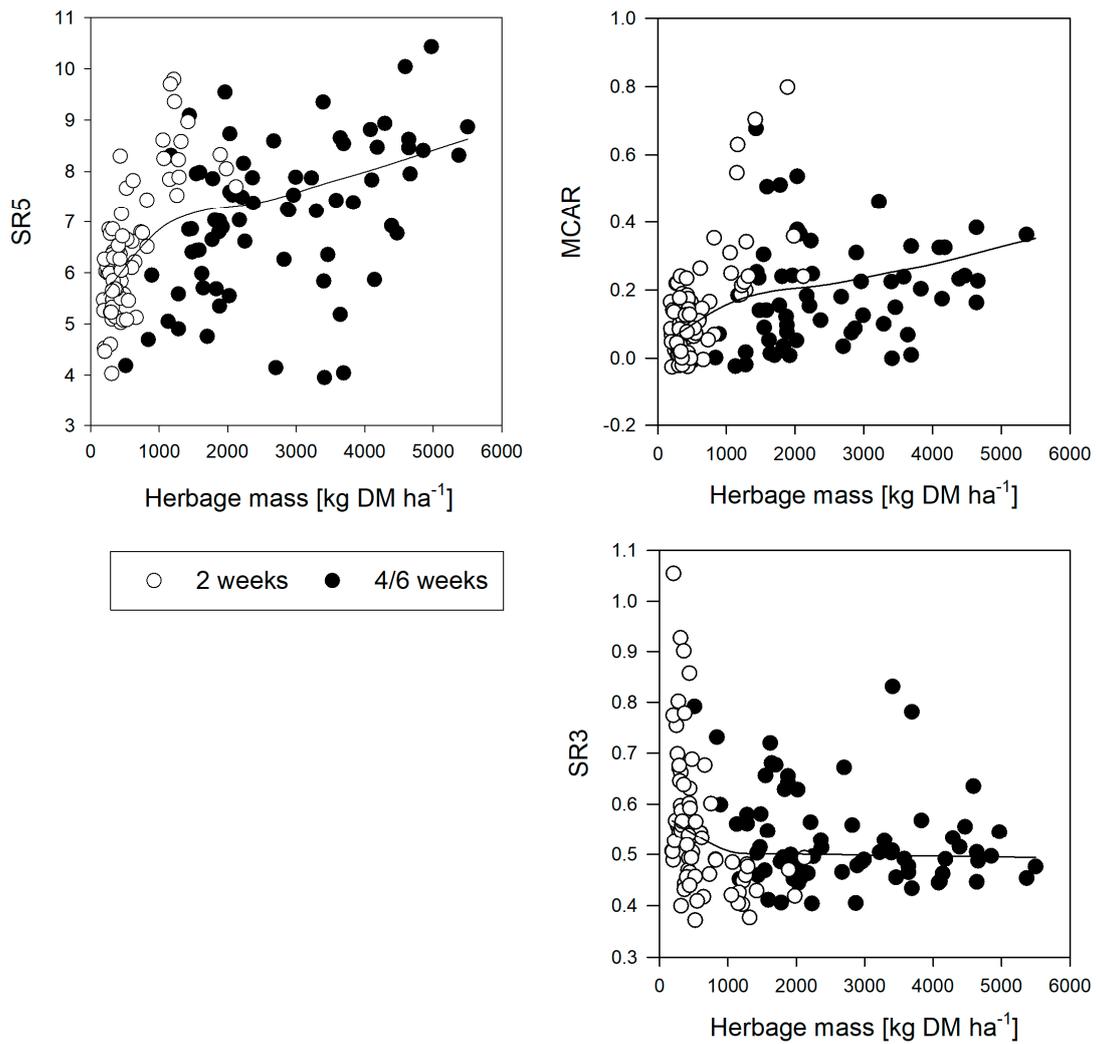
**Figure S2.** Herbage quality parameters determined with the Look-up Tables by Daccord et al. [10] versus the reference methods ( $n = 162$ ). The dashed line is the line of identity (1:1). The open and filled dots represent the two growth stages of the plants: “2 weeks” of growth and “4/6 weeks” of growth.



**Figure S3.** The error of the MSI-model (reference – MSI-model) in determining crude protein (CP) versus the herbage mass ( $n = 147$ ). The open and filled dots represent the two growth stages of the plants: “2 weeks” of growth and “4/6 weeks” of growth.



**Figure S4.** Reflectance in four spectral bands determined by UAV multispectral imagery versus the herbage mass ( $n = 147$ ). Values are plot-area means of the corresponding pixel values. Solid line is a smooth LOESS trend line. The open and filled dots represent the two growth stages of the plants: "2 weeks" of growth and "4/6 weeks" of growth. Nine and one far outlying data points are not shown for red-edge and red, respectively.



**Figure S5.** Vegetation indices determined by UAV multispectral imagery versus the herbage mass ( $n = 147$ ). Values are plot-area means of pixel-wise calculate indices. The solid line is a smooth LOESS trend line. The open and filled dots represent the two growth stages of the plants: “2 weeks” of growth and “4/6 weeks” of growth. The plot for MCAR does not show nine far outlying data points. Abbreviation of indices: SR5: Single Ratio 5, MCAR: Modified Chlorophyll Absorption Ratio, SR3: Single Ratio 3. Definition of indices according to Askari et al. [31].