Table S1. Nutrient analyses of the harvested biomass, influenced by the year and cropping system interaction (Y x CS) from 2017 to 2019. The superscript lowercase letters indicate the mean separation (α=0.05) of the forage crops collected from 2017-2019. The subscript uppercase letters indicate the mean separation of both forage and bioenergy crops collected from 2018 and 2019 (no mean separations were applied if the variable effect was not significant).

Year	Cropping systems	N	P	K	S	Ca	Mg	Cu	Zn	Mn	Fe	Ca:P	N:S
		---------- Macronutrient (g kg^{-1}) ----------						------- Micronutrient (g kg^{-1}) -------					
2017	F (2-cut; Sum.)	17.4^{a}	3.2^{bcd}	21.9^{bc}	2.3^{ab}	6.4^{a}	2.4^{ab}	6.3	23.3	84.0	251.3^{ab}	2.0^{a}	7.6^{ab}
	F (2-cut; Fall)	16.8^{ab}	3.1^{bcd}	20.4^{c}	2.1^{b}	5.9^{ab}	2.3^{abc}	6.7	29.7	80.7	447.3^{ab}	1.9^{ab}	7.9^{ab}
	F (1-cut; Fall)	17.0^{ab}	3.8^{a}	30.1^{a}	2.7^{a}	5.2^{abc}	2.5^{a}	5.8	25.2	119.7	588.8^{ab}	1.4^{bcd}	6.3^{abc}
2018	F (2-cut; Sum.)	$16.7^{ab}{}_{A}$	$3.3^{abc}{}_{AB}$	$27.8^{ab}{}_{A}$	$2.0^{b}{}_{AB}$	4.4^{bcd}	$1.9^{cd}{}_{ABC}$	6.0	23.0_{AB}	75.3	$325.0^{ab}{}_{ABC}$	$1.3^{bcd}{}_{ABC}$	$8.2^{a}{}_{A}$
	F (2-cut; Fall)	$13.1^{bcd}{}_{AB}$	$2.8^{cde}{}_{BC}$	$21.4^{c}{}_{B}$	$2.0^{b}{}_{AB}$	4.6^{bcd}	$2.1^{bcd}{}_{ABC}$	5.3	24.7_{AB}	98.0	$263.0^{ab}{}_{BC}$	$1.7^{abc}{}_{ABC}$	$6.4^{abc}{}_{AB}$
	F (1-cut; Fall)	$12.5^{cd}{}_{AB}$	$2.6^{e}{}_{C}$	$20.3^{c}{}_{B}$	$1.9^{b}{}_{B}$	5.0^{abc}	$1.9^{d}{}_{BC}$	5.0	22.3_{AB}	112.0	$167.3^{b}{}_{BC}$	$2.0^{a}{}_{A}$	$6.7^{ab}{}_{AB}$
	†B (1-cut; Fall)	6.8_{CD}	1.5_{D}	7.0_{C}	0.9_{C}	2.5	1.4_{D}	3.7	33.7_{A}	26.7	149.0_{BC}	1.6_{ABC}	7.5_{B}
2019	F (2-cut; Sum.)	$10.4^{d}{}_{BC}$	$3.4^{ab}{}_{AB}$	$21.9^{bc}{}_{B}$	$2.3^{ab}{}_{AB}$	3.4^{d}	$1.8^{d}{}_{C}$	4.0	20.3_{AB}	123.7	$713.3^{ab}{}_{AB}$	$1.0^{d}{}_{C}$	$4.5^{c}{}_{B}$
	F (2-cut; Fall)	$14.8^{abc}{}_{AB}$	$3.4^{ab}{}_{AB}$	$20.4^{c}{}_{B}$	$2.4^{ab}{}_{A}$	3.9^{cd}	$2.1^{bcd}{}_{AB}$	5.3	26_{AB}	86.7	$302.3^{ab}{}_{ABC}$	$1.2^{cd}{}_{C}$	$6.2^{bc}{}_{AB}$
	F (1-cut; Fall)	$13.8^{abcd}{}_{AB}$	$2.7^{de}{}_{C}$	$17.2^{c}{}_{B}$	$2.1^{ab}{}_{AB}$	4.8^{abcd}	$2.1^{bcd}{}_{A}$	5.3	24.3_{AB}	147.7	$928.0^{a}{}_{A}$	$1.8^{abc}{}_{AB}$	$6.5^{abc}{}_{AB}$
	†B (1-cut; Fall)	3.8_{D}	1.2_{D}	6.2_{C}	0.6_{C}	2.1	1.4_{D}	3.3	21.0_{B}	29.0	30.7_{C}	1.9_{AB}	7.0_{AB}

F (2-cut; Sum.): forage crop with two harvest management (1st harvest in Summer)
F (2-cut; Fall): forage crop with two harvest management (2nd harvest in Fall)
F (1-cut; Fall): forage crop with one harvest management in Fall
B (1-cut; Fall): bioenergy crop with one harvest management in Fall
†Bioenergy crops were not harvested in 2017 for biomass nutrient analysis due to insufficient biomass production.

Table S2. Analysis of variance (ANOVA) showed the effects of main factors, including year (Y), cropping system (CS), and interactions on methane (CH_4) productions based on different models with a significance level of 0.05.

Model	2017-2019			2018-2019			Predictor variables
	Y	*CS	Y × *CS	Y	†CS	Y × †CS	
1	**	*ns*	*ns*	*	**	*ns*	dDMI, ADLi
2	*	*ns*	*ns*	*ns*	*ns*	*ns*	ADFi
3	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	ADFi, ADLi
4	****	*ns*	*ns*	****	*	*ns*	dDMI, FA, NDF, CP
5	****	*	**	***	**	**	dDMI, FA, NDF
6	*	*ns*	*ns*	*ns*	*ns*	*ns*	ADFi
7	****	*	**	***	***	**	dDMI
8	***	*	**	**	**	**	dDMI, NDFi, ADFi
9	**	*ns*	*ns*	*ns*	**	*ns*	dDMI, NDFi, ADLi

Level-1 (*): $0.05 < p < 0.01$; Level-2 (**): $0.01 < p < 0.001$; Level-3 (***): $0.001 < p < 0.0001$; Level-4 (****): $p < 0.0001$; ns: not significant.

*: forages only

†: forage and bioenergy crops

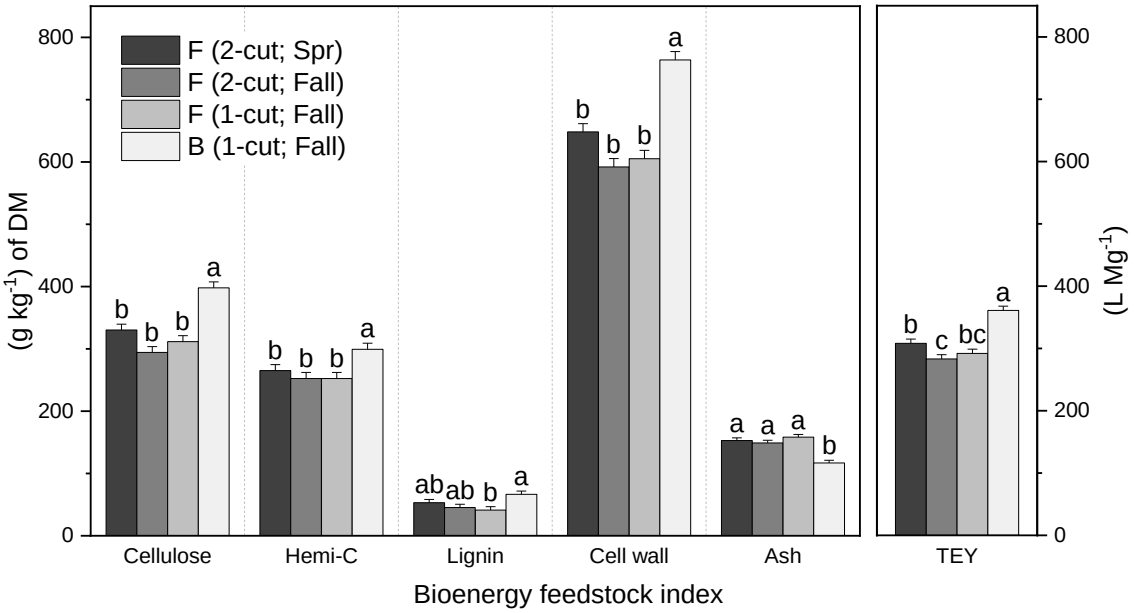

Figure S1. The effect of the cropping system on feedstock quality of the harvested forage and bioenergy crops from 2018 and 2019. The lowercase letters indicate mean separation (α=0.05) (no mean separations were applied if the variable effect was not significant)