

Table S1. Mean and cumulative soil NO₃-N mineralization over six incubation periods and five free-thaw cycles with overall mean for corn, flax, pea, forage radish, soybean, spring wheat, and winter wheat crop residues and cycle means showing significant differences for the Foreman soil series in North Dakota.

Cycle	Crop Residue Treatment	Nitrogen mineralization, mg NO ₃ kg ⁻¹ soil							Overall Average [±]	Cycle Average [‡]
		1 st (14 d.)	2 nd (28 d.)	3 rd (42 d.)	4 th (56 d.)	5 th (70 d.)	6 th (84 d.)	Cumulative		
1 st	Soil only	1.99b [†]	0.08a	0.97ab	2.92b	2.29b	2.39b	10.6b	1.74b ± 2.21	4.95b
	Corn	3.67b	0.02a	0.01b	0.07b	0.00b	0.02b	3.77b	0.53b ± 1.40	
	Pea	2.29b	0.10a	1.51ab	2.84b	2.25b	2.55b	11.5b	1.88b ± 1.67	
	Radish	55.2a	1.53a	26.0a	37.6a	37.7a	14.9a	173a	28.3a ± 23.3	
	Soybean	2.30b	0.06a	0.01b	0.22b	0.22b	0.15b	2.96b	0.43b ± 0.85	
	Spring Wheat	3.20b	0.02a	0.01b	0.10b	0.10b	0.08b	3.50b	0.50b ± 1.21	
	Winter Wheat	2.28b	0.01a	0.01b	0.09b	0.00b	0.06b	2.43b	0.35b ± 0.87	
2 nd	Soil only	0.95ab	4.23bc	3.60b	1.81b	4.05b	4.66bc	19.3b	3.21b ± 1.78	9.03b
	Corn	0.00b	0.19c	0.02b	0.01b	0.00b	0.03c	0.19b	0.03b ± 0.09	
	Pea	0.36b	11.4b	9.65b	7.77ab	16.0ab	13.7ab	58.9b	9.79b ± 8.99	
	Radish	14.1a	143a	68.5a	26.8a	25.8a	21.4a	300a	49.7a ± 47.9	
	Soybean	0.00b	0.00c	0.09b	0.00b	0.10b	0.15c	0.35b	0.06b ± 0.13	
	Spring Wheat	0.00b	0.00c	0.01b	0.01b	0.00b	0.05c	0.06b	0.01b ± 0.04	
	Winter Wheat	0.00b	0.04c	0.01b	0.01a	0.00b	0.02c	0.05b	0.01b ± 0.03	
3 rd	Soil only	2.58b	3.13b	3.13b	3.26b	3.44b	3.19b	18.7b	2.99b ± 0.89	10.22b
	Corn	0.00b	0.00b	0.00b	0.00b	0.01b	0.01b	0.01b	0.01b ± 0.01	
	Pea	21.7b	18.9b	18.9b	14.6b	19.2a	22.0a	115ab	20.7ab ± 8.70	
	Radish	110a	52.5a	52.5a	33.7a	23.3a	21.9a	295a	59.0a ± 36.1	
	Soybean	0.00b	0.00b	0.00b	0.03b	0.00b	0.01b	0.04b	0.00b ± 0.02	
	Spring Wheat	0.07b	0.00b	0.00b	0.00b	0.01b	0.02b	0.09b	0.03b ± 0.04	
	Winter Wheat	0.00b	0.00b	0.00b	0.00b	0.00b	0.11b	0.12b	0.04b ± 0.05	
4 th	Soil only	6.55a	17.5ab	33.3ab	24.1b	32.6b	32.8ab	147ab	22.7ab ± 11.8	17.84a
	Corn	0.19b	0.35b	5.32b	1.83b	0.48c	0.49b	8.66b	1.03b ± 2.87	
	Pea	4.19ab	19.8ab	28.3ab	46.1ab	54.7ab	45.6a	198ab	30.1ab ± 21.7	
	Radish	8.42a	60.4a	78.4a	88.6a	76.3a	65.2a	377a	53.2a ± 40.9	
	Soybean	0.00b	0.93b	2.12b	1.19b	0.87c	0.70b	5.80b	0.74b ± 1.05	
	Spring Wheat	0.43b	0.57b	0.83b	2.39b	0.59c	0.33b	5.15b	0.68b ± 1.39	
	Winter Wheat	0.00b	0.72b	1.49b	3.06b	0.62c	1.00b	6.89b	0.91b ± 1.46	
5 th	Soil only	26.5a	31.0a	28.5b	27.5bc	8.19bc	0.00b	121ab	18.4ab ± 12.9	16.03a
	Corn	0.79b	0.87a	7.51b	5.31c	1.04cd	0.00b	15.5b	2.02b ± 3.32	
	Pea	40.7a	56.5a	51.1ab	53.3ab	9.69b	0.00b	211ab	31.4ab ± 25.1	
	Radish	26.2a	44.8a	98.0a	86.8a	25.4a	7.31a	288a	39.9a ± 45.5	
	Soybean	0.00b	1.53a	6.14b	2.84c	0.06d	0.00b	10.6b	1.30b ± 2.38	
	Spring Wheat	0.78b	0.81a	4.59b	5.54c	0.47cd	0.00b	12.2b	1.61b ± 3.52	
	Winter Wheat	0.01a	1.00a	6.30b	5.43c	0.73cd	0.00b	13.5b	1.66b ± 3.07	

[†]Different letters within a column for each incubation cycle are significantly different at the 0.05 level using Tukey's HSD test.

[±]Nitrogen mineralization mean over all incubation periods for each crop residue treatment.

[‡]Nitrogen mineralization mean over all incubation periods including all crop residue treatments illustrating system changes over time.