

Table 1 Hairy vetch and cereal rye seeding rates used in 2011-2012 and 2012-2013 cover crop studies.

Hairy vetch/cereal rye sown proportion	Hairy vetch seeding rate, kg/ha	Cereal rye seeding rate, kg/ha
0/1	0	168
0.2/0.8	7	134
0.4/0.6	14	101
0.6/0.4	20	67
0.8/0.2	27	34
1/0	34	0

Table 2 Selected soil properties of study sites at Beltsville Agricultural Research Center. Properties were measured on samples collected to 30 cm depth in the fall of 2011 and 2012. Standard errors are presented in parentheses.

	----- 2011-2012 -----		----- 2012-2013 -----	
	North Farm	South Farm	North Farm	South Farm
	Suf†	Suf†	Suf†	Suf†
Surface Texture	Loam	Loam	Loam	Loam
NO ₃ ⁻ -N+NH ₄ ⁺ -N, mg/kg	8.3(0.6)	9.4(1.1)	42.7 (3.4)	37.2 (2.1)
N, g/kg	0.6(0.1)	0.4(0.1)	0.6(0.1)	0.7(0.1)
C, g/kg	11.5(1.1)	6.7(0.6)	11.4(0.9)	10.0 (1.7)
P, mg/kg	56.7(23.8) O	67.3(3.3) O	46.0(9.7) O	76.7 (13) O
K, mg/kg	74.7(6.9) M	93.0(4.0) O	55.0(2.6) L/M	111.7 (5.2) O
Ca, mg/kg	975.0(33.1) O	760.7(60.1) O	931.7(33.4) O	899.0 (8.0) O
Mg, mg/kg	176.7(5.2) E	126.3(8.9) O	13.7(2.3) E	118.0 (5.5) O
Mn, mg/kg	31.0(2.6) A	142.0(5.0) A	43.7(3.4) A	111.3 (3.5) A
water pH	6.7(0.1)	6.2(0.2)	5.7(0.1)	5.7 (0.1)
CEC, meq/100 g	6.8(0.4)	5.9(0.3)	7.7(0.1)	7.4 (0.3)

†Sufficiency based on University of Maryland Soil Fertility Index Values and micronutrient requirements for most crops: L = low, M= moderate, O = optimal, E = excessive, A = adequate (micronutrient)

Table 3 Monthly growing degree days (gdd) and rainfall totals at Beltsville, MD North Farm and South Farm for two cover crop and corn growing seasons, 2011-2013. Thirty-year averages are based on 1980-2010.

	----- Rainfall, mm -----					----- Monthly cumulative gdd† -----				
	2011-2012		2012-2013		30-yr avg	2011-2012		2012-2013		30-yr avg
	NF	SF	NF	SF		NF	SF	NF	SF	
Cover crop growing season										
September	211	171	53	45	91	505	496	481	471	458
October	93	78	191	100	89	291	282	311	304	282
November	47	38	17	9	97	187	181	76	71	118
December	108	75	67	54	79	72	68	79	79	0
January	46	42	63	48	71	49	47	43	44	0
February	48	43	40	32	74	53	51	17	18	0
March	35	34	62	40	89	247	244	51	49	76
April	45	29	44	37	89	241	231	265	263	242
May	57	53	80	71	114	500	500	415	411	410
Corn growing season										
May‡	57	53	80	71	114	318	319	249	248	223
June	66	57	166	178	91	345	339	380	378	357
July	90	79	63	85	94	469	465	463	465	443
August	47	68	68	56	81	439	436	397	395	410
September	53	69	44	73	91	301	296	281	295	278
October	191	100	116	87	89	170	168	183	184	96

† Cover crop growing degree days were computed as the average daily temperature (calculated using daily maximum and minimum temperatures) minus 4° C. Days with average temperatures below 4° C were assigned a gdd of zero. Corn growing degree days were computed as the average daily temperature (calculated using daily maximum and minimum temperatures), minus 10° C. Constraints of 10° C and 30° C were placed in the minimum and maximum temperatures, respectively.

Table 4 Monoculture biomass yields, Relative Crowding Coefficients (RCCs) of hairy vetch and cereal rye, and de Wit model coefficients of determination for four site-years in Beltsville, MD. Values in parentheses are standard errors. Bolded values are significantly different than one at $p < 0.10$; asterisks indicate values are significantly different than one at $p < 0.05$.

Site-year	----- Hairy vetch -----			----- Cereal rye -----			
	Monoculture, kg/ha	RCC	R^2	Monoculture, kg/ha	RCC	R^2	RCC product
NF 2012	6426 (496)	0.73 (0.17)	0.71	10410 (790)	3.97 (1.04)*	0.74	2.88
SF 2012	6330 (373)	3.09 (0.67)*	0.77	10647 (733)	0.46 (0.13)*	0.75	1.42
NF 2013	7211 (299)	0.11 (0.02)*	0.92	12871 (801)	11.28 (4.28)*	0.80	1.20
SF 2013	5569 (301)	0.66 (0.08)*	0.77	10524 (590)	5.92 (1.29)*	0.76	3.89 *

Table 5 Profile soil inorganic nitrogen (IN) concentrations by growth stage, cover crop residue type, and pelletized poultry litter (PPL) treatment in 2012. Different lowercase letters indicate significant differences among PPL treatments within the same cover crop residue and growth stage ($p < 0.05$). Different uppercase letters indicate significant differences among residues within the same PPL treatment and growth stage ($p < 0.05$). Values in parentheses are soil IN amounts in units of kg N/ha to 30 cm depth.

----- Soil inorganic N, mg/kg -----				
PPL	----- Cereal rye -----	----- Mixture -----	----- Hairy vetch -----	
----- Emergence -----				
No PPL	3.26 cB (12.3)	7.74 cA (29.3)	9.31 cA (35.2)	
Broadcast	5.08 bB (19.2)	12.05 bA (45.6)	14.50 bA (54.8)	
Band	3.40 cB (12.8)	8.06 cA (30.5)	9.70 cA (36.6)	
Incorporated	10.83 aB (38.3)	25.71 aA (91.0)	30.91 aA (109.4)	
----- Fifth-leaf -----				
No PPL	5.28 bB (20.0)	11.27 bA (42.6)	19.43 bA (73.4)	
Broadcast	12.06 aB (45.6)	21.82 aAB (82.5)	24.80 abA (93.7)	
Band	15.61 aB (59.0)	22.64 aA (85.6)	26.66 abA (100.8)	
Incorporated	9.51 abB (33.7)	25.51 aA (79.7)	35.95 aA (127.3)	
----- Silking -----				
No PPL	2.99 aA (11.3)	3.42 bA (12.9)	3.99 bA (15.1)	
Broadcast	4.16 aA (15.7)	4.58 bA (17.3)	7.96 bA (30.1)	
Band	4.34 aA (16.4)	6.69 abA (25.3)	9.56 bA (36.1)	
Incorporated	3.66 aB (13.0)	15.41 aA (54.6)	28.59 aA (101.2)	
----- Milk -----				
No PPL	2.72 bA (10.3)	3.13 bA (11.8)	3.30 bA (12.5)	
Band	4.36 aA (16.5)	5.01 aA (18.9)	5.29 aA (20.0)	
----- Maturity -----				
No PPL	2.97 aA (11.0)	2.73 aA (10.3)	6.91 bA (26.1)	
Broadcast	4.73 aA (17.9)	2.67 aA (10.1)	6.79 bA (25.7)	
Band	4.43 aA (16.7)	7.44 aA (28.1)	8.92 abA (33.7)	
Incorporated	2.21 aB (7.8)	7.81 aAB (27.6)	28.90 aA (102.3)	

Table 6 Profile soil inorganic nitrogen (IN) concentrations by growth stage, cover crop residue type, and pelletized poultry litter (PPL) treatment in 2013. Different lowercase letters indicate significant differences among PPL treatments within the same cover crop residue and growth stage ($p < 0.05$). Different uppercase letters indicate significant differences among residues within the same PPL treatment and growth stage ($p < 0.05$). Values in parentheses are soil IN amounts in units of kg N/ha to 30 cm depth.

----- Soil inorganic N, mg/kg -----			
PPL	----- Cereal rye -----	----- Mixture -----	----- Hairy vetch -----
----- Emergence -----			
No PPL	3.53 cB (14.0)	4.22 cB (16.7)	12.66 cA (50.1)
Broadcast	5.16 bB (20.4)	6.27 bB (24.8)	18.51 bA (73.3)
Band	3.60 cB (14.3)	4.31 cB (17.1)	12.92 cA (51.2)
Incorporated	7.57 aB (29.1)	9.05 aB (34.8)	27.13 aA (104.2)
----- Fifth-leaf -----			
No PPL	4.39 bA (17.4)	4.48 bA (17.7)	6.75 cA (26.7)
Broadcast	4.73 bB (18.7)	6.46 abAB (25.6)	8.33 bcA (33.0)
Band	12.05 aA (47.7)	9.56 aA (37.9)	14.38 aA (56.9)
Incorporated	4.56 bB (17.5)	4.87 bB (18.7)	11.11 abA (42.7)
----- Silking -----			
No PPL	2.90 bA (11.5)	2.29 bA (9.1)	3.13 bA (12.4)
Broadcast	3.16 bA (12.5)	2.48 bA (9.8)	3.40 bA (13.5)
Band	5.57 aA (22.1)	5.10 aA (20.2)	6.98 aA (27.6)
Incorporated	3.81 bA (14.6)	3.00 bA (11.5)	4.11 aA (15.8)
----- Milk -----			
No PPL	3.22 aA (12.8)	3.60 aA (14.3)	2.89 bA (11.4)
Band	4.48 aA (17.7)	3.85 aA (15.2)	5.28 aA (20.9)
----- Maturity -----			
No PPL	5.66 aA (22.4)	5.59 aA (22.1)	5.92 aA (23.4)
Broadcast	5.18 aA (20.5)	5.11 aA (20.2)	5.41 aA (21.4)
Band	6.18 aA (24.5)	6.10 aA (24.2)	6.46 aA (25.6)
Incorporated	5.11 aA (19.6)	5.05 aA (19.4)	5.34 aA (20.5)