Nutrient Removal Values - Nitrogen

	Projected Nitrogen (N) removal, "wet" or "as is" basis				% Moisture, Dry matter			Number of samples in survey *
					Median*		Survey range*	
	lb N per yield unit	*	Survey range*		- moisture -	--------- dry matter ----------		
Grains, oilseeds, fiber, sugar crops								
Barley, grain	**0.83**	/ bu *(48 lb)*	1	0.76 - 0.89	11.1	*88.9*	*87.2 - 90.0*	*999*
Beans *(dry)*	**3.46**	/ cwt *(100 lb)*	2	---	10.0	*90.0*	---	---
Beans *(navy)*	**3.61**	/ cwt *(100 lb)*	3	---	10.0	*90.0*	---	---
Buckwheat, grain	**0.88**	/ bu *(52 lb)*	2	---	12.0	*88.0*	---	---
Canola, grain	**1.80**	/ bu *(60 lb)*	4	---	8.0	*92.0*	---	---
Corn, grain *(dry shelled)*	**0.66**	/ bu *(56 lb)*	1	0.64 - 0.70	14.2	*85.9*	*84.9 - 86.7*	*13,506*
	1.18	/ cwt *(100 lb)*		1.14 - 1.25	14.2	*85.9*	*84.9 - 86.7*	*13,506*
Corn, grain *(high moisture)*	**0.55**	/ bu *(56 lb)*	1	0.53 - 0.58	29.7	*70.3*	*67.4 - 72.9*	*8,346*
	0.98	/ cwt *(100 lb)*		0.94 - 1.03	29.7	*70.3*	*67.4 - 72.9*	*8,346*
Cotton *(seed, lint, trash)* *(≈1300 lb seed cotton yields 480 lb lint)*	**31.5**	/ 1300 lb *(bale)*	5	---	---	---	---	---
Cotton seeds	**3.35**	/ cwt *(100 lb)*	2		8.0	*92.0*		
Field pea, seeds	**2.06**	/ bu *(60 lb)*	1	1.61 - 2.19	11.5	*88.5*	*87.4 - 90.0*	*142*
Flax, grain	**2.17**	/ bu *(56 lb)*	1	1.95 - 2.90	8.7	*91.3*	*90.2 - 92.2*	*119*
Millet grain	**0.90**	/ bu *(50 lb)*	2	---	13.0	*87.0*	---	---
Oats, grain	**0.58**	/ bu *(32 lb)*	1	0.51 - 0.63	11.0	*89.0*	*87.8 - 90.6*	*235*
Peanuts, whole	**3.50**	/ cwt	6	---	10.0	*90.0*	---	---
Popcorn	**1.03**	/ bu *(56 lb)*	3	---	10.1	*89.9*	---	---
Potato tuber, fresh	**0.32**	/ cwt *(100 lb)*	6	---	77.0	*23.0*	---	---
Rice, grain	**0.51**	/ bu *(45 lb)*	2	---	11.0	*89.0*	---	---
Rye, grain	**1.12**	/ bu *(56 lb)*	2	---	11.0	*89.0*	---	---
Safflower seeds	**0.99**	/ bu *(38 lb)*	4	---	8.0	*92.0*	---	---
Sorghum, grain *(milo)*	**0.83**	/ bu *(56 lb)*	1	0.72 - 0.91	13.0	*87.0*	*85.8 - 88.2*	*1,380*
	1.48	/ cwt *(100 lb)*		1.29 - 1.63	13.0	*87.0*	*85.8 - 88.2*	*1,380*
Sorghum, grain *(high moisture)*	**0.66**	/ bu *(56 lb)*	1	0.57 - 0.73	30.5	*69.5*	*65.2 - 74.5*	*198*
	1.18	/ cwt *(100 lb)*		1.01 - 1.30	30.5	*69.5*	*65.2 - 74.5*	*198*
Soybeans, whole	**3.46**	/ bu *(60 lb)*	2	---	12.0	*88.0*	---	---
Spelt, grain	**0.73**	/ bu *(40 lb)*	2	---	12.0	*88.0*	---	---
Sugarbeet *(root)*	**3.70**	/ ton	6	---	80.0	*20.0*	---	---
Sugarcane	**2.00**	/ ton	6	---	74.0	*26.0*	---	---
Sunflower seeds	**2.50**	/ cwt *(100 lb)*	1	2.21 - 2.70	9.8	*90.3*	*88.3 - 92.2*	*60*
Triticale, grain	**1.20**	/ bu *(60 lb)*	2	---	11.0	*89.0*	---	---
Wheat, grain	**1.34**	/ bu *(60 lb)*	1	1.17 - 1.48	11.3	*88.7*	*87.5 - 89.9*	*1,127*
Hays, legume								
Alfalfa hay	**55.3**	/ ton	1	49.2 - 61.5	12.7	*87.3*	*85.0 - 89.1*	*33,530*
Clover hay, mixed	**40.5**	/ ton	1	35.6 - 47.7	14.4	*85.6*	*82.3 - 88.1*	*61*
Clover, hay alsike clover	**36.1**	/ ton	6	---	12.6	*87.4*	---	---
Clover hay, ladino clover	**60.5**	/ ton	2	---	10.0	*90.0*	---	---
Clover hay, red clover	**39.6**	/ ton	6	---	12.0	*88.0*	---	---

To estimate the equivalent hay or silage yield based on grain yield or hay yield based on stocking rates as animal units, see Crop File 1.02.022, Yield Goal Equivalents: Silage, Hay, and Pasture

	Projected Nitrogen (N) removal, "wet" or "as is" basis			% Moisture, Dry matter			Number of samples in survey *
				Median*		Survey range*	
	lb N per yield unit	*	Survey range*	- moisture -	--------- dry matter ---------		
Hays, legume *(continued)*							
Clover hay, sweetclover	**46.6** / ton	2	---	9.0	*91.0*	---	---
Cowpea hay	**53.6** / ton	3	---	9.6	*90.4*	---	---
Lespedeza hay	**41.2** / ton	2	---	8.0	*92.0*	---	---
Peanut hay	**23.7** / ton	1	20.3 - 27.7	10.8	*89.2*	*86.4 - 90.8*	*108*
Sanfoin hay	**39.4** / ton	2	---	12.0	*88.0*	---	---
Soybean hay	**37.7** / ton	1	20.1 - 47.9	13.0	*87.1*	*83.2 - 90.4*	*314*
Trefoil hay, birdsfoot trefoil	**45.6** / ton	2	---	11.0	*89.0*	---	---
Vetch hay	**51.3** / ton	2	---	11.0	*89.0*	---	---
Hays, grass							
Bahiagrass	**17.3** / ton	2	---	10.0	*90.0*	---	---
Bermudagrass hay	**30.7** / ton	1	24.8 - 37.7	10.0	*90.0*	*87.4 - 91.8*	*1,349*
Bluegrass hay	**26.7** / ton	6	---	11.0	*89.1*	---	---
Bluestem hay	**17.3** / ton	1	11.8 - 21.0	9.9	*90.1*	*87.0 - 92.4*	*182*
Bromegrass hay	**22.3** / ton	1	18.9 - 26.5	11.8	*88.2*	*86.3 - 89.9*	*931*
CRP hay	**15.9** / ton	1	11.9 - 21.0	11.4	*88.6*	*85.7 - 90.6*	*1,231*
Fescue hay	**24.0** / ton	1	20.9 - 29.4	12.2	*87.8*	*85.1 - 89.3*	*78*
Meadow hay	**22.6** / ton	1	20.6 - 27.5	10.6	*89.4*	*87.0 - 90.9*	*297*
Mixed grass hay	**23.7** / ton	1	18.3 - 31.4	10.7	*89.3*	*86.5 - 91.8*	*8,447*
Native grass hay	**18.7** / ton	1	14.5 - 24.5	12.9	*87.1*	*67.5 - 90.5*	*411*
Orchardgrass hay	**28.2** / ton	2	---	12.0	*88.0*	---	---
Prairie hay	**18.1** / ton	1	15.3 - 22.4	11.4	*88.6*	*86.6 - 90.2*	*1,176*
Reed canarygrass hay	**26.2** / ton	2		9.0	*91.0*		
Ryegrass hay	**32.8** / ton	1	30.5 - 35.4	8.5	*91.5*	*89.6 - 92.7*	*339*
Switchgrass hay	**7.5** / ton	1	5.8 - 12.2	4.6	*95.4*	*93.7 - 96.0*	*136*
Teff hay	**30.2** / ton	1	19.6 - 39.7	11.5	*88.6*	*86.0 - 90.9*	*98*
Timothy hay	**22.5** / ton	2	---	12.0	*88.0*	---	---
Wheatgrass hay	**30.0** / ton	1	19.8 - 40.1	11.7	*88.4*	*80.4 - 92.0*	*116*
Hays, small grain							
Barley hay	**29.9** / ton	1	25.0 - 35.3	13.2	*86.8*	*84.1 - 88.7*	*1,002*
Millet hay	**25.6** / ton	1	19.7 - 32.5	13.1	*86.9*	*83.3 - 89.4*	*1,299*
Oat hay	**30.1** / ton	1	25.3 - 36.0	12.1	*87.9*	*84.9 - 90.1*	*2,280*
Pearl millet hay	**24.0** / ton	1	19.4 - 29.2	18.5	*81.5*	*74.8 - 87.1*	*67*
Rye hay	**27.5** / ton	1	22.1 - 36.4	12.4	*87.6*	*84.6 - 90.2*	*237*
Triticale hay	**32.4** / ton	1	25.2 - 42.4	10.4	*89.6*	*86.0 - 92.0*	*737*
Wheat hay	**30.9** / ton	1	24.6 - 38.2	11.5	*88.5*	*84.9 - 90.7*	*2,038*
Hay, annual sorghums							
Canex hay	**21.7** / ton	1	17.2 - 27.2	22.0	*78.0*	*38.2 - 86.1*	*77*
Forage sorghum hay	**23.4** / ton	1	18.5 - 30.6	16.1	*83.9*	*76.6 - 90.0*	*670*
Haygrazer hay	**24.4** / ton	1	17.5 - 31.8	17.2	*82.8*	*54.6 - 88.9*	*1,706*
Milo (grain sorghum) hay	**23.3** / ton	1	17.7 - 27.8	21.0	*79.0*	*61.3 - 85.9*	*994*
Sorghum hay	**22.0** / ton	1	16.2 - 28.4	17.1	*82.9*	*74.7 - 87.5*	*1,810*
Sorghum-sudan hay	**24.1** / ton	1	18.5 - 30.0	16.3	*83.7*	*74.7 - 88.0*	*793*
Sudan hay	**23.3** / ton	1	18.0 - 30.0	16.2	*83.8*	*77.3 - 87.8*	*2,285*
Sumac hay	**18.6** / ton	1	13.7 - 23.6	17.0	*83.0*	*76.0 - 87.7*	*328*

To estimate the equivalent hay or silage yield based on grain yield or hay yield based on stocking rates as animal units, see Crop File 1.02.022, Yield Goal Equivalents: Silage, Hay, and Pasture

	Projected Nitrogen (N) removal, "wet" or "as is" basis				% Moisture, Dry matter			Number of samples in survey *
					Median*		Survey range*	
	lb N per yield unit	*		Survey range*	- moisture -	--------- dry matter ---------		
Hays, miscellaneous								
Cane hay	**20.2** / ton	1		15.4 - 25.8	17.0	*83.0*	*77.4 - 86.8*	*3,415*
Corn hay	**24.7** / ton	1		18.9 - 30.4	14.3	*85.7*	*77.9 - 89.7*	*719*
Kochia hay	**37.8** / ton	1		28.8 - 48.1	12.6	*87.4*	*78.0 - 90.5*	*119*
Johnsongrass hay	**19.3** / ton	1		15.9 - 25.4	13.9	*86.1*	*66.9 - 90.4*	*64*
Weed hay	**30.6** / ton	1		24.2 - 38.6	12.2	*87.9*	*84.4 - 90.3*	*252*
Silages, annual crop								
Barley silage	**12.4** / ton	1		10.9 - 13.7	66.3	*33.7*	*30.8 - 38.3*	*441*
Cane silage	**6.7** / ton	1		5.7 - 8.1	71.4	*28.6*	*24.9 - 33.3*	*457*
Corn silage	**8.7** / ton	1		7.9 - 9.8	66.3	*33.7*	*30.2 - 37.8*	*23,321*
Corn silage (sweet corn)	**8.4** / ton	2		---	76.0	*24.0*	---	---
Forage sorghum silage	**7.4** / ton	1		6.4 - 8.4	70.2	*29.8*	*25.7 - 34.8*	*78*
Milo silage (grain sorghum)	**10.4** / ton	1		9.1 - 12.2	64.9	*35.1*	*28.9 - 41.4*	*248*
Oat silage	**11.8** / ton	1		10.3 - 13.8	64.8	*35.3*	*29.1 - 42.8*	*205*
Oatlage	**11.8** / ton	1		10.1 - 13.7	66.3	*33.7*	*28.9 - 43.0*	*263*
Rye silage	**12.5** / ton	1		10.3 - 14.7	68.9	*31.1*	*26.0 - 38.6*	*369*
Small grain silage	**12.8** / ton	1		11.6 - 14.4	65.1	*34.9*	*30.7 - 38.7*	*609*
Sorghum silage	**7.3** / ton	1		6.1 - 8.6	70.5	*29.5*	*26.2 - 33.1*	*4,679*
Sorghum-sudan silage	**8.7** / ton	1		6.9 - 10.6	68.5	*31.5*	*28.2 - 40.3*	*71*
Sudangrass silage	**8.5** / ton	1		6.5 - 11.7	71.0	*29.1*	*24.5 - 36.3*	*171*
Triticale silage	**13.2** / ton	1		10.8 - 16.2	67.3	*32.7*	*28.1 - 38.8*	*1,360*
Wheatlage	**14.3** / ton	1		11.8 - 17.3	63.9	*36.1*	*31.5 - 41.7*	*1,763*
Wheat silage	13.8 / ton	1		11.8 - 16.1	65.5	*34.5*	*30.3 - 39.9*	*1,467*
Silages, perennial crop								
Alfalfa haylage	**26.6** / ton	1		24.5 - 28.5	59.1	*40.9*	*34.1 - 48.1*	*1,604*
Alfalfa silage	**22.8** / ton	1		19.5 - 25.6	64.0	*36.0*	*31.3 - 43.2*	*254*
Bermudagrass silage	**8.3** / ton	2		---	74.0	*26.0*	---	---
Bromegrass silage	**12.3** / ton	2		---	65.0	*35.0*	---	---
Mixed grass silage	**10.6** / ton	2		---	70.0	*30.0*	---	---
Ryegrass silage	**14.3** / ton	2		---	68.0	*32.0*	---	---
Timothy silage	**10.9** / ton	2		---	66.0	*34.0*	---	---
Crop residues								
Barley straw	**12.5** / ton	3		---	10.0	*90.0*	---	---
(72 lb straw/bu)	**0.40** / bu harvested			---	---	---	---	---
Buckwheat straw	**14.0** / ton	3		---	11.3	*88.7*	---	---
Canola straw *(236 lb straw/cwt)*	**1.05** / cwt harvested	3		---	20.3	*79.7*	---	---
Corn cobs	**11.1** / ton	1		8.0 - 14.7	6.4	*93.6*	*91.1 95.2*	*356*
Corn stalks	**14.7** / ton	1		11.7 - 19.3	15.0	*85.0*	*79.9 88.1*	*2,316*
Corn stover	**15.3** / ton	1		12.2 - 20.7	11.3	*88.7*	*83.3 92.1*	*340*
(70 lb stover/bu)	**0.60** / bu harvested			---	---	---	---	---
Cotton stover *(1300 lb seed cotton yields 480 lb lint)*	**39.5** / bale	3		---	7.7	*92.3*	---	---
Flax straw *(80 lb straw/bu)*	**0.83** / bu harvested	3			7.7	*93.0*		
Grain sorghum (milo) stalks	**12.3** / ton	1		8.9 - 17.1	46.6	*53.5*	*34.8 77.8*	*626*
Millet straw	**12.2** / ton	3			10.0	*90.0*		
(84 lb straw/bu)	**0.51** / bu harvested			---	---	---	---	---

To estimate the equivalent hay or silage yield based on grain yield or hay yield based on stocking rates as animal units, see Crop File 1.02.022, Yield Goal Equivalents: Silage, Hay, and Pasture	**Projected Nitrogen (N) removal, "wet" or "as is" basis**				**% Moisture, Dry matter**			***Number of samples in survey **
					Median*		Survey range*	
	lb N per yield unit	*		Survey range*	- moisture -	--------- dry matter ---------		
Crop residues								
Oat straw	**11.6**	/ ton	2	---	9.0	*90.3*	---	---
(44 lb straw/bu)	**0.26**	/ bu harvested		---	---	---	---	---
Peanut stover	**33.0**	/ ton	6	---	---	---	---	---
Popcorn stover	**16.9**	/ ton	3		12.7	*87.3*		
(56 lb stover/bu)	**0.47**	/ bu harvested		---	---	---	---	---
Potato vines	**7.2**	/ ton	2	---	85.0	*15.0*	---	---
Rice straw	**12.9**	/ ton	3	---	9.2	*90.8*	---	---
(100 lb straw/cwt)	**0.64**	/ cwt harvested		---	---	---	---	---
Rye straw	**9.2**	/ ton	3	---	9.1	*90.9*	---	---
(87 lb straw/bu)	**0.40**	/ bu harvested		---	---	---	---	---
Sorghum stover	**12.3**	/ ton	3	---	8.1	*91.9*	---	---
(56 lb stover/bu)	**0.35**	/ bu harvested		---	---	---	---	---
Soybean stover	**14.8**	/ ton	3	12.4 - 16.8	13.9	*86.2*	*83.1 88.2*	*69*
(96 lb stover/bu)	**0.71**	/ bu harvested		---	---	---	---	---
Sugarbeet top	**7.4**	/ ton	6	---	81.0	*19.0*	---	---
Sunflower stover	**14.9**	/ ton	3	---	13.3	*86.7*	---	---
(150 lb stover/cwt)	**1.12**	/ cwt harvested		---	---	---	---	---
Wheat straw	**11.6**	/ ton	1	10.1 - 21.6	9.8	*90.3*	*86.5 94.0*	*378*
(92 lb straw/bu)	**0.53**	/ bu harvested		---	---		---	---
Fresh forages, pasture - annuals								
Cane plants, fresh	**9.4**	/ ton	1	7.1 - 11.5	73.7	*26.4*	*21.3 - 34.5*	*106*
Corn plants, fresh	**10.2**	/ ton	1	8.4 - 12.2	74.0	*26.1*	*21.3 - 33.8*	*607*
Forage sorghum plants, fresh	**10.2**	/ ton	1	7.6 - 13.0	71.5	*28.5*	*22.7 - 35.9*	*156*
Millet plants, fresh	**12.6**	/ ton	1	10.0 - 16.1	70.0	*30.1*	*22.2 - 40.2*	*130*
Milo plants, fresh *(grain sorghum)*	**12.6**	/ ton	1	10.3 - 14.9	66.6	*33.4*	*28.7 - 40.3*	*536*
Oat plants, fresh	**14.4**	/ ton	1	11.5 - 19.7	70.4	*29.6*	*21.6 - 39.6*	*79*
Rye plants, fresh	**16.2**	/ ton	1	14.9 - 18.2	68.9	*31.2*	*24.5 - 35.0*	*103*
Sorghum plants, fresh	**8.9**	/ ton	1	6.6 - 11.3	71.9	*28.1*	*23.3 - 34.1*	*441*
Sorghum-sudan plants, fresh	**10.2**	/ ton	1	7.6 - 12.7	72.4	*27.6*	*21.2 - 39.2*	*283*
Sudangrass plants, fresh	**9.3**	/ ton	1	6.7 - 11.8	75.1	*24.9*	*19.9 - 33.2*	*267*
Triticale plants, fresh	**14.9**	/ ton	1	11.7 - 19.3	68.0	*32.0*	*25.1 - 37.9*	*210*
Weeds, fresh	**14.3**	/ ton	1	11.4 - 16.9	74.7	*25.3*	*20.7 - 34.9*	*69*
Wheat plants, fresh	**19.3**	/ ton	1	15.8 - 22.3	63.2	*36.9*	*27.5 - 47.3*	*429*
Fresh forages, pasture - grasses								
Bermudagrass, fresh	**14.1**	/ ton	1	11.0 - 18.8	64.8	*35.2*	*31.8 - 40.3*	*156*
Bluestem, fresh	**11.7**	/ ton	2	---	60.4	*39.6*	---	---
Bromegrass, fresh	**14.4**	/ ton	2	---	70.0	*30.0*	---	---
Fescue, fresh	**13.9**	/ ton	2	---	71.0	*29.0*	---	---
Mixed grass, fresh	**16.7**	/ ton	1	12.0 - 24.0	30.5	*69.6*	*46.2 - 86.9*	*3,408*
Native grass, fresh	**12.4**	/ ton	1	9.0 - 18.1	58.5	*41.6*	*33.5 - 52.1*	*178*
Orchardgrass, fresh	**10.8**	/ ton	2	---	76.0	*24.0*	---	---
Timothy, fresh	**9.2**	/ ton	2	---	74.0	*26.0*	---	---
Wheatgrass (crested), fresh	**13.0**	/ ton	2	---	63.0	*37.0*	---	---

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	Projected Nitrogen (N) removal, "wet" or "as is" basis				% Moisture, Dry matter			
					Median*		Survey range*	Number of samples in survey *
	lb N per yield unit	*	Survey range*		- moisture -	--------- dry matter ----------		
Fresh forages, pasture - legumes								
Alfalfa, fresh	**20.0** / ton	[1]	18.0 - 22.6		72.4	*27.6*	*20.8 - 39.5*	*277*
Clover (ladino), fresh	**15.2** / ton	[2]	---		81.0	*19.0*	---	---
Clover (red), fresh	**13.8** / ton	[2]	---		76.0	*24.0*	---	---
Lespedeza, fresh	**12.8** / ton	[2]	---		75.0	*25.0*	---	---
Trefoil (birdsfoot) fresh	**14.8** / ton	[2]	---		78.0	*22.0*	---	---

Removal by animal type [7]

Beef cattle	0.032 lb N per pound of weight gain *(based on average 20% protein in meat, bones, offal, etc.)*
Poultry	0.134 lb N per 5 lb market-weight broiler
Dairy cows	0.588 lb N per cwt (100 lb) of milk

* References and Resources

*(Certain references for feedstuffs list "crude protein" values on a "dry matter" basis. Removal values were calculated as follows: lb N per yield unit = [yield unit weight * % dry matter] * [(% crude protein / 100) / 6.25]. Crop residue weights per unit of yield harvested were derived from NRCS PLANTS database (reference #3).*

1 Servi-Tech Laboratories. 2014. In-house data survey of feed analysis results, 2006-2013. Results reported as "Median" or 50th percentile. "Typical range" includes the middle 50% of all samples, so 25% of samples are above range and 25% below. Statistical calculations based on listed number of samples of particular feedsuff that was included in data survey.

2 BEEF. 2014 Feed Composition Table. BEEF magazine, Minneapolis MN *(http://beefmagazine.com/datasheet/2014-feed-composition-table, 25 June 2014)*

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