

## Supplement 1 Agronomy Guide Tables

**Table 1.2-6. Nitrogen recommendations for agronomic crops.**

These are base recommendations and should be adjusted for previous crop, previous manure history, and planned manure applications (see “Manure Nutrient Management” section).

Crop	Recommendation (lb N/unit of expected yield)	Comments
Corn grain	1	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Corn silage	7	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is a major nutrient source.
Grain sorghum	0.75	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Forage sorghum	7	Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Oats	0.8	Apply the N with any other fertilizer before planting. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Wheat/Rye	1.0	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Barley	0.8	If plants did not tiller well, apply N by mid-March; otherwise, apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).
Small grain silage	17	Apply at greenup in the spring.
Grass hay	50	Split the nitrogen recommendation and apply it based on the expected yield for each cutting. For grass-legume mixtures, if the legume is more than 50% of the stand, the field should be managed as a legume; thus, no nitrogen is recommended. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 or 1.2-15).

**Table 1.2-7. Residual nitrogen contributions from legumes.**

Previous crop <sup>1</sup>	Percent stand	High-productivity fields (Soil productivity group 1) <sup>2</sup>	Moderate-productivity fields (Soil productivity groups 2 & 3) <sup>2</sup>	Low-productivity fields (Soil productivity groups 4 & 5) <sup>2</sup>
<b>Nitrogen credit (lbs/A)</b>				
<b>First year after alfalfa</b>	>50 stand	120	110	80
	25–49 stand	80	70	60
	<25 stand	40	40	40
<b>First year after clover or trefoil</b>	>50 stand	90	80	60
	25–49 stand	60	60	50
	<25 stand	40	40	40
<b>First year after soybeans harvested for grain</b>	1 lb N/bu soybeans			

1. When a previous legume crop is checked on the Penn State soil test information sheet, the residual nitrogen for the year following the legume is calculated and given on the report. This credit should be deducted from the N recommendation given on the soil test report.
2. See Agronomy Guide Table 1.1-1 in the basic soils section for information on soil productivity groups.

**Table 1.2-8. Nitrogen removal by legumes.**

Legume crop (no nitrogen application recommended)	Pounds of N removed/unit of yield	Pounds of N removed/A	Comments
Alfalfa (5 ton/A)	50	250	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Clover (3.5 ton/A)	40	140	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Trefoil (3.5 ton/A)	50	175	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Soybeans (40 bu/A)	3.2	130	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.

**Table 1.2-9. Typical crop nutrient removal for phosphorus and potassium.**

Crop (units)	Per unit of yield		Typical yield/A	Removal for given yield	
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Corn (bu)	0.4	0.3	125 (bu)	50	40
Corn silage (T) <sup>1</sup>	5.0	11.0	21 (T)	105	230
Grain sorghum (bu)	0.6	0.8	125 (bu)	75	100
Forage sorghum (T) <sup>1</sup>	3.0	10.0	15 (T)	45	150
Sorghum/sudangrass <sup>1</sup>	7.0	7.0	15 (T)	105	105
Alfalfa (T) <sup>2,3</sup>	15.0	50.0	5 (T)	75	250
Red Clover (T) <sup>2,3</sup>	15.0	40.0	3.5 (T)	55	140
Trefoil (T) <sup>2,3</sup>	15.0	40.0	3.5 (T)	55	140
Cool-season grass (T) <sup>2,3</sup>	15.0	50.0	4 (T)	60	200
Bluegrass (T) <sup>2,3</sup>	10.0	30.0	2.5 (T)	25	75
Wheat/rye (bu) <sup>4</sup>	1.0	1.8	60 (bu)	60	110
Oats (bu) <sup>4</sup>	0.9	1.5	80 (bu)	70	120
Barley (bu) <sup>4</sup>	0.6	1.5	75 (bu)	45	110
Soybeans (bu)	1.0	1.4	40 (bu)	40	55
Small grain silage (T) <sup>1</sup>	7.0	26.0	6 (T)	40	160

<sup>1</sup> 65 percent moisture.

<sup>2</sup> For legume-grass mixtures, use the predominant species in the mixture.

<sup>3</sup> 10 percent moisture.

<sup>4</sup> Includes straw.

**Table 1.2-13. Average daily production and total content of manure.**

Animal type	Daily production	Manure % dry matter	Analysis units	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Comments
<b>Dairy cattle</b>							
Lactating cows, liquid	13 gal/AU/day	<5	lb/1,000 gal	28	13	25	Production does not include dilution. Analysis includes dilution to approximately 5% solids.
Lactating cows, solid	106 lb/AU/day	12	lb/ton	10	4	8	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by dairy cows, dairy dry cattle, and dairy young cattle.
Dry cow	82 lb/AU/day		lb/ton	9	3	7	
Calf and heifer	87 lb/AU/day		lb/ton	7	2	7	
<b>Veal</b>	3.5 gal/AU/day	4	lb/1,000 gal	36	27	55	Production and analysis do not include dilution.
<b>Beef cattle</b>							
Cow and calf	60 lb/AU/day	12	lb/ton	11	7	10	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by a beef cow and calf, beef calves, and steers.
Calf	60 lb/AU/day	12	lb/ton	11	7	10	
Steer	75 lb/AU/day	8	lb/ton	14	5	8	
<b>Swine</b>							
Farrow to wean (includes sows)	11 gal/AU/day	2.5	lb/1,000 gal	18	18	11	Production includes a typical amount of in-barn dilution water but not rainfall for an outdoor storage, except for farrow to wean which also includes rainfall. Analysis includes dilution to approximately the % dry matter indicated.
Nursery	14 gal/AU/day	1.5	lb/1,000 gal	19	8	14	
Wean to finish	5.5 gal/AU/day	4	lb/1,000 gal	37	23	21	
Grow-finish	7 gal/AU/day	4	lb/1,000 gal	31	24	22	
<b>Swine, anaerobic lagoon</b>							
Supernatant	—	0.25	lb/1,000 gal	2.9	0.6	3.2	These figures apply only to a treatment lagoon.
Sludge	—	7.6	lb/1,000 gal	25	23	63	
<b>Sheep</b>	40 lb/AU/day	25	lb/ton	23	8	20	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by sheep.
<b>Horse</b>	45 lb/AU/day	20	lb/ton	12	5	9	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by horses.
<b>Poultry</b>							
Layer (364 d) <sup>1</sup>	26 lb/AU/day	41	lb/ton	37	55	31	
Pullet (126 d) <sup>1</sup>	48 lb/AU/day	35	lb/ton	43	46	26	
Light broiler (44 d) <sup>1</sup>	22 lb/AU/day	34	lb/ton	79	62	42	Production and analysis figures include litter.
Heavy broiler (57 d) <sup>1</sup>	20 lb/AU/day	25	lb/ton	66	63	47	Production and analysis figures include litter.
Turkey (tom) (123 d) <sup>1</sup>	13 lb/AU/day	60	lb/ton	52	76	42	Production and analysis figures include litter.
Turkey (hen) (88 d) <sup>1</sup>	11 lb/AU/day	65	lb/ton	73	88	46	Production and analysis figures include litter.

**Note:** When possible, have manure analyzed. Actual values may vary over 100 percent from averages in the table.

<sup>1</sup> Typical production days.

**Table 1.2-14A. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions.**

**A. Current Year**

To use this table find the *planned manure application season* in the left column, then move to the right in that row and select the *Target Crop Utilization*. Continue to the right in that row to find the *nitrogen availability factor* for the *planned manure application management*.

Planned manure application season	Planned manure target crop utilization	Application management	Nitrogen availability factor <sup>1</sup>		
			Poultry manure	Swine manure	Other manure
Spring or Summer	Spring utilization by grass hay and small grains. Summer utilization by corn, other summer annuals, and grass hay.	Incorporation the same day	0.75	0.70	0.50
		Incorporation within 1 day	0.50	0.60	0.40
		Incorporation within 2–4 days	0.45	0.40	0.35
		Incorporation within 5–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
Early Fall <sup>2</sup>	Fall and spring utilization by grass hay and small grains.	Incorporation within 2 days	0.50	0.45	0.40
		Incorporation within 3–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
	Following summer utilization by corn and other summer annuals.	All situations	0.15	0.20	0.20
Late Fall or Winter <sup>3</sup>	Spring utilization by small grains and grass hay.	All situations	0.50	0.45	0.40
	Following summer utilization by corn or other summer annuals.	No cover crop	0.15	0.20	0.20
		Cover crop harvested for silage	0.15	0.20	0.20
		Cover crop used as green manure	0.50	0.45	0.40
Grazing	Late spring through early fall grazing	Manure deposited more or less continuously by grazing cattle	----	----	0.20
	Year-round grazing	Manure deposited more or less continuously by grazing cattle	----	----	0.30

<sup>1</sup> Multiply this factor times the manure N content to estimate the manure N available for the planning conditions.

<sup>2</sup> Early fall would be when it is still warm enough for plant growth and microbial activity to continue (soil temperature >50°F at 2").

<sup>3</sup> Late fall and winter is when it is so cold that there is no plant growth or microbial activity (soil temperature <50°F at 2").

**Table 1.2-14B. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions.**

**B. Historical Frequency of Manure Application on the Field**

To use this table, determine the frequency of manure application and go across to the amount of residual N that is available from past manure applications. Deduct this amount of residual N from the basic N recommendation before determining any additional fertilizer or manure application rates.

	<b>Residual N availability (lbs N/A)</b>
Rarely received manure in the past (< 2 out of 5 years)	0
Frequently received manure (2 - 3 out of 5 years)	20
Continuously received manure (4 - 5 out of 5 years)	35

**Table 1.2-15. Factors for calculating manure nitrogen availability based on time of application, incorporation, field history, and manure analysis with ammonium and organic N fractions. Recommended for all manures, but required for atypical or treated manures.**

**TOTAL MANURE N**

**AMMONIUM N ANALYSIS**

<b>Spring/summer</b>			
For spring utilization by small grains and grass hay and summer utilization by corn, other summer annuals, and grass hay			
Days to incorp. <sup>1</sup>	Poultry <sup>2</sup>	Other <sup>2</sup>	Compost
Immediately	0.90	0.80	0.80
1	0.80	0.60	0.60
2-4	0.60	0.40	0.40
5-7	0.40	0.20	0.20
>7	0.20	0.10	0.10
<b>Early fall</b>			
For fall and spring use by grass hay and small grains			
Days to incorp. <sup>1</sup>	Poultry <sup>2</sup>	Other <sup>2</sup>	Compost
0-2	0.50	0.40	0.40
3-7	0.25	0.20	0.20
>7	0	0	0
For following summer utilization by corn or other summer annuals			
All	0	0	0
<b>Late fall/winter</b>			
Days to incorp. <sup>1</sup>	Poultry <sup>2</sup>	Other <sup>2</sup>	Compost
For summer use by corn or summer annuals with no cover crop or cover crop harvested for silage			
All	0	0	0
For spring use by grass hay or small grains, or summer use by corn or summer annuals with green manure cover crop			
N/A	0.60	0.50	0.50

**ORGANIC N ANALYSIS (total N – ammonium N)**

<b>Organic N decomposed during year applied</b>				
Dry matter	Poultry	Swine	Other	Compost
<18%	0.60	0.50	0.35	0.10
>18%	0.60	0.50	0.25	0.10

<b>Organic N decomposed from past applications</b>		
Manure applied	Manure	Compost
1 yr ago	0.12	0.05
2 yrs ago	0.05	0.02
3 yrs ago	0.02	0.01
4 yrs ago	0.02	0.01
5 yrs ago	0.01	0.01

1. Mechanical incorporation or incorporation by 0.5 inch of rain.
2. Increase these factors by 0.2 after one day for very liquid manures (<5 percent solids) to account for soaking-in on application.

**Table 1.1-1. Selected properties and typical capabilities of major Pennsylvania soils.**

Note: Ratings provide relative information for comparing soils and should not be used quantitatively.  
 Moisture contents: corn grain = 15.5%, corn silage = 65%, alfalfa and clover = dry matter, wheat, oats, and barley = 12%, sorghum/sudan = 65%, and soybeans = 13%

Soil series	Depth class <sup>1</sup>	Drain class <sup>2</sup>	Leaching potential	Crop prod. group	Corn grain (bu/A)	Corn silage (T/A)	Alfalfa (T/A)	Clover (T/A)	Wheat (bu/A)	Oats (bu/A)	Barley (bu/A)	Sorghum/sudan (T/A)	Soybeans (bu/A)
Abbotstown	D <sup>5</sup>	SWPD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Abtights	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Allegheny	D	WD	2	1	150	25	6	4	60	80	75	25	45
Allenwood	D	WD	2	1	150	25	6	4	60	80	75	25	45
Alton	D	WD <sup>5</sup>	3	3	125	21	4	3	50	60	50	21	30
Alvira	D <sup>5</sup>	SWPD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Andover	D <sup>5</sup>	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Armagh	D	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Atkins	D	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Barbour	D	WD	2 <sup>7</sup>	1	150	25	6	4	60	80	75	25	45
Basler	D	MWD	2 <sup>7</sup>	2	125	21	5	3.5	60	80	75	21	40
Bath	D <sup>5</sup>	WD	1 <sup>7</sup>	2	125	21	5	3.5	60	80	75	21	40
Bedington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Berks	M/D	WD	2	3	125	21	4	3	50	60	50	21	30
Birdsall	D	PD	1 <sup>7</sup>	5	100	17	3 <sup>8</sup>	2	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Birdsboro	D	MWD	2 <sup>7</sup>	1	150	25	6	4	60	80	75	25	45
Blairton	M/D	MWD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Bowmansville	D	SWPD	2 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Braceville	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Brecknock	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Brimerton	D	PD	2	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Brooke	M/D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Buchanan	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Bucks	D	WD	2	1	150	25	6	4	60	80	75	25	45
Calvin	M/D	WD	2	3	125	21	4	3	50	60	50	21	30
Cambridge	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Canfield	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Cavade	D	SWPD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Chenango	D	WD <sup>5</sup>	3	2	125	21	5	3.5	60	80	75	21	40
Chester	D	WD	2	1	150	25	6	4	60	80	75	25	45
Chippewa	D <sup>5</sup>	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Clarksburg	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Clymer	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Cornly	D	SWPD	1 <sup>7</sup>	3	125	21	4 <sup>8</sup>	3	50	60	50	21	40
Conestoga	D	WD	2	1	150	25	6	4	60	80	75	25	45
Conotton	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Cookport	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Croton	D <sup>5</sup>	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Cullboka	M/D	WD	2	3	125	21	4	3	50	60	50	21	30
Dekalb	M/D	WD	2	3	125	21	4	3	50	60	50	21	30
Dorment	D	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Durfield	D	WD	2	1	150	25	6	4	60	80	75	25	45
Durcannon	D	WD	2	1	150	25	6	4	60	80	75	25	45
Edgemont	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Edom	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Eliber	D	WD <sup>5</sup>	3	2	125	21	5	3.5	60	80	75	21	40
Etie	D <sup>4</sup>	SWPD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Ernest	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Fedest	D	SWPD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Frenchtown	D <sup>5</sup>	PD	1 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Gilpin	M/D	WD	2	3	125	21	4	3	50	60	50	21	30
Gleneld	D	WD	2	1	150	25	6	4	60	80	75	25	45
Glenville	D <sup>5</sup>	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Guernsey	D	MWD	1 <sup>7</sup>	3	125	21	4	3	50	60	50	21	30
Hagerstown	D	WD	1	1	150	25	6	4	60	80	75	25	45
Harover	D <sup>5</sup>	WD	1 <sup>7</sup>	2	125	21	5	3.5	60	80	75	21	40
Hartleton	D	WD	2	3	125	21	4	3	50	60	50	21	30
Hazleton	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Highfield	D	WD	2	1	150	25	6	4	60	80	75	25	45
Holly	D	PD	2 <sup>7</sup>	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30

(continued)

**Table 1.1-1. Selected properties and typical capabilities of major Pennsylvania soils (continued).**

Soil series	Depth class <sup>1</sup>	Drain class <sup>2</sup>	Leaching potential	Crop prod. group	Corn grain (bu/A)	Corn silage (T/A)	Alfalfa (T/A)	Clover (T/A)	Wheat (bu/A)	Oats (bu/A)	Barley (T/A)	Sorghum/sudan (T/A)	Soybeans (bu/A)
Hubertburg	D	WD	2	1	150	25	6	4	60	80	75	25	45
Huntington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Klinesville	S	WD	2	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Kreamer	D	MWD	17	3	125	21	4	3	50	60	50	21	30
Lackawanna	D <sup>5</sup>	WD	17	2	125	21	5	3.5	60	80	75	21	40
Ladig	D <sup>5</sup>	WD	17	2	125	21	5	3.5	60	80	75	21	40
Langford	D <sup>5</sup>	WD	17	3	125	21	4	3	50	60	50	21	30
Lansdale	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Leck Kill	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Lehigh	D	MWD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Lehrt	D	WD	2	1	150	25	6	4	60	80	75	25	45
Lewisberry	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Lordstown	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Manor	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Marcliff	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
McKeesville	D <sup>5</sup>	WD	17	2	125	21	5	3.5	60	80	75	21	40
Melvin	D	PD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Mertz	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Monongahela	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
Morris	D <sup>4</sup>	SWPD	2	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Morriston	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Murrill	D	WD	2	1	150	25	6	4	60	80	75	25	45
Neshaminy	D	WD	2	1	150	25	6	4	60	80	75	25	45
Oregon	S	WD	2	4	100	17	4 <sup>8</sup>	2.5	40	60	40	17	30
Oruaga	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Penn	MD	WD	2	3	125	21	4	3	50	60	50	21	30
Philo	D	MWD	27	2	125	21	5	3.5	60	80	75	21	40
Plataea	D <sup>5</sup>	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Pope	D	WD	2	1	150	25	6	4	60	80	75	25	45
Rainboro	D	MWD	17	3	125	21	4	3	50	60	50	21	30
Ravenna	D <sup>5</sup>	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Rayne	D	WD	2	1	150	25	6	4	60	80	75	25	45
Readington	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
Reaville	D	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Red Hook	D	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Sheffield	D <sup>5</sup>	PD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Shelmadinge	D <sup>5</sup>	PD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Swartswood	D <sup>5</sup>	MWD	17	2	125	21	5	3.5	60	80	75	21	40
Tunkhannock	D	WD <sup>8</sup>	3	2	125	21	5	3.5	60	80	75	21	40
Tyler	D	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Upshur	D	WD	1	2	125	21	5	3.5	60	80	75	21	40
Venango	D <sup>5</sup>	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Volusia	D	SWPD	17	4	100	17	4 <sup>8</sup>	2.5	40 <sup>8</sup>	60	40 <sup>8</sup>	17	30
Washington	D	WD	2	1	150	25	6	4	60	80	75	25	45
Watson	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
Weikert	S	WD <sup>8</sup>	2	4	100	17	4 <sup>8</sup>	2.5	40	60	40	17	30
Weisboro	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
Westmoreland	D	WD	2	2	125	21	5	3.5	60	80	75	21	40
Wharton	D	MWD	17	3	125	21	4	3	50	60	50	21	30
Whitling	D	WD	2	1	150	25	6	4	60	80	75	25	45
Wurtsboro	D <sup>5</sup>	MWD	17	3	125	21	4	3	50	60	50	21	30
Wyoming	D	WD <sup>8</sup>	3	3	125	21	4	3	50	60	50	21	30

1. Depth classes: D = deep (>40 inches); MD = moderately deep (20 to 40 inches); S = shallow (<20 inches)  
 2. Drainage classes: WD = well drained; MWD = moderately well drained; SWPD = somewhat poorly drained; PD = poorly drained  
 3. Leaching ratings—these are only a relative rating of leaching potential. The higher the number, the greater the relative leaching potential.  
 4. A fragipan is present at 10 to 16 inches (0.25 to 0.40 meters) below the surface of the soil.  
 5. A fragipan is present at 16 to 40 inches (0.40 to 1 meter) below the surface.  
 6. These soils are well drained to excessively well drained.  
 7. These soils have a seasonal high water table that is less than 6 feet from the surface. Leaching potential may be a consideration of water resource use and water table following pesticide application.  
 8. Crop is not well suited for the soil.

### Typical Manure Only

This example illustrates calculating the maximum rate of manure required to meet the nitrogen needs of a crop and the net recommendation for the field based on total analysis for N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O and can only be used for typical, non-treated dairy, swine, other livestock, and poultry manures.

- Situation**
- Recommendations for 150 bu/A corn crop from the soil test report were 150-50-100 pounds of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, respectively.
  - The liquid dairy manure analysis is 20 pounds total N, 11 pounds P<sub>2</sub>O<sub>5</sub> and 21 pounds K<sub>2</sub>O per 1,000 gallons.
  - Manure is to be applied in the spring for this corn crop and incorporated the day after application.
  - Similar manure has been applied to this field frequently in the past (two or three out of the last five years).
  - The starter fertilizer program is 150 pounds per acre of 10-20-10.
  - Last year, the crop in this field was soybeans, which yielded 50 bu/A.

### Net Crop Nutrient Requirement

First, all sources of nutrients must be accounted for before a manure rate is calculated by starting with the soil test recommendations and then deducting any other sources of nutrients applied or already available in the field.

Net nutrients required = soil test recommendation – residual N from past manure – residual N from a previous legume crop in the rotation – starter nutrients

### Residual N from Past Applications (Table 1.2-14, Part B)

Residual N = 20 lb N/A for a history of frequent manure applications  
 Residual N from a Previous Legume Crop in the Rotation (Table 1.2-8)

Soybeans @ 50 bu/A x 1 lb residual N/bu = 50 lb N/A from the soybeans the previous year

### Starter Fertilizer Nutrients That Will Be Applied Regardless of the Planned Manure Application

150 lb/A of a 10-20-10 starter fertilizer will be used on this field. The N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O applied in this fertilizer is calculated as follows:

150 lbs fertilizer/A x 10% N = 15 lb N/A  
 150 lbs fertilizer/A x 20% P<sub>2</sub>O<sub>5</sub> = 30 lb P<sub>2</sub>O<sub>5</sub>/A  
 150 lbs fertilizer/A x 10% K<sub>2</sub>O = 15 lb K<sub>2</sub>O/A

### Net nutrients required

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Soil test recommendation	150	50	100
-Residual manure N	20	—	—
-Residual legume N	50	—	—
-Starter nutrients	15	30	15
Net requirement (lbs/A)	65	20	85

### N Balance Manure Application Rate

The N balanced manure application rate is determined by dividing the available N in the manure into the net crop N requirement calculated above.

Available N in the manure = total manure N x N availability factor (Table 1.2-14, Part A)

N availability factor = 0.4 from Table 1.2-14 (based on the time until incorporation or 1 day in this example).

Available N = 20 lb N/1,000 gal x 0.4 = 8 lb N/1,000 gal

Maximum rate per acre to meet N need = net N requirement + available manure N

Rate per acre to meet N need = 65 lbs N/A + 8 lbs N/1,000 gal = 8.125 gal/A

(Note: Any rate less than or equal to this rate is acceptable.)

### Nutrients Applied at the Planned Rate

Based on the calculation, the farmer decided to apply 8,000 gal/A. At this application rate the following amounts of nutrients would be applied:

Nitrogen: 8,000 gal/A x 8 lb available N/1,000 gal = 64 lb available N/A  
 Phosphorus: 8,000 gal/A x 11 lb P<sub>2</sub>O<sub>5</sub>/1,000 gal = 88 lb P<sub>2</sub>O<sub>5</sub>/A  
 Potassium: 8,000 gal/A x 21 lb K<sub>2</sub>O/1,000 gal = 168 lb K<sub>2</sub>O/A

**Final Nutrient Balance on the Field after Manure Application**  
 The nutrient balance is simply the difference between the net crop nutrient requirement and the nutrients applied at the planned rate.

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Net crop nutrient requirement	65	20	85
Nutrients applied at planned rate (8,000 gal/acre)	64	88	168
Balance after manure application	1 short	68 excess	83 excess

As discussed earlier, this excess P should be evaluated with the Phosphorus Index to see if it represents a potential risk to the environment. If the P index indicates that the risk is high, manure management may have to be changed to address this concern. The excess K could result in high K levels in crops, which can, under certain circumstances, cause problems in animal feeding programs and animal health.

### All Manure Including Atypical or Treated Manure

This example illustrates calculating the maximum rate of manure required to meet the nitrogen needs of a crop and the net recommendation for the field based on analysis for dry matter, total N, NH<sub>4</sub>-N, total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. This calculation can be used for all manure, but it is required for atypical and/or treated manures.

### Situation

- Recommendations from the soil test report were 180-50-40 lbs of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, respectively.
- The poultry manure was composted and has an analysis of 50 lbs total N, 10 lbs NH<sub>4</sub>-N, 40 lbs P<sub>2</sub>O<sub>5</sub> and 30 lbs K<sub>2</sub>O/ton; and 40 percent moisture.
- Manure is to be incorporated three days after application.
- Manure with the same analysis has been applied to this field at the rate of 10 ton/A each of the last three years.
- The starter fertilizer program is 5 gal/A of 10-34-0 (Note: 10-34-0 weighs 11.85 lb/gal).

### Net Crop Nutrient Requirement

First all sources of nutrients must be accounted for before a manure rate is calculated by starting with the soil test recommendations and then deducting any other sources of nutrients applied or already available in the field.

Net nutrients required = soil test recommendation – residual N from past manure – residual N from a previous legume crop in the rotation – starter nutrients

### Residual N from Past Applications (Table 1.2-15)

Residual N from past manure applications is estimated as follows: For each year in the last five when manure was applied, multiply the rate applied x organic N analysis x the appropriate factor from the section of Table 1.2-15 labeled "Organic N decomposed from past applications." Note that if the organic N is not given on the manure analysis report it can be calculated by subtracting the ammonium N from the total N on the report.

In this example the manure is composted and has 50 lbs total N/ton and 10 lbs of NH<sub>4</sub>-N/ton  
 Organic N = total N – ammonium N = 50 lb/ton – 10 lb/ton = 40 lbs/ton organic N

Residual N from last year: 10 tons/A x 40 lbs organic N/ton x 0.05 = 20 lbs N/A

Residual N from 2 years ago: 10 tons/A x 40 lbs organic N/ton x 0.02 = 8 lbs N/A

Residual N from 3 years ago: 10 tons/A x 40 lbs organic N/ton x 0.01 = 4 lbs N/A

Total residual N from past applications: 32 lbs N/A

### Residual N from a Previous Legume Crop in the Rotation (Table 1.2-8)

None in this example.

### Starter Fertilizer Nutrients That Will Be Applied Regardless of the Planned Manure Application

5 gal/A of a 10-34-0 starter fertilizer will be used on this field. First, since this is a liquid fertilizer the gal/A must be converted to ton/A to do this multiply the number of gal/A x the weight/gal. 5 gal/A x 11.85 lb/gal = 59.3 lbs/A

Then the N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O applied in this fertilizer are calculated as follows:

59.3 lbs fertilizer/A x 10% N = 6 lbs N/A  
 59.3 lbs fertilizer/A x 20% P<sub>2</sub>O<sub>5</sub> = 20 lbs P<sub>2</sub>O<sub>5</sub>/A  
 There is no K<sub>2</sub>O in this fertilizer.

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Net nutrients required	65	20	85
Soil test recommendation	180	50	40
-Residual manure N	32	0	—
-Residual legume N	0	—	—
-Starter nutrients	6	20	0
Net requirement (lbs/A)	122	30	40

### N Balance Manure Application Rate

The N balanced manure application rate is determined by dividing the available N in the manure into the net crop N requirement calculated above. For treated manures the available N is the sum of the N available from both the ammonium and organic N.

Available NH<sub>4</sub>-N in the manure = NH<sub>4</sub>-N x NH<sub>4</sub>-N availability factor (Table 1.2-15)

NH<sub>4</sub>-N availability factor = 0.4 from Table 1.2-15 (based on the time until incorporation or 3 days in this example):  
 NH<sub>4</sub>-N x NH<sub>4</sub>-N availability factor = 10 x 0.40 = 4 lbs N/ton

Available organic N in the manure = organic N x organic N availability factor (Table 1.2-15)

In this example, the manure is composted and has 50 lbs total N/ton and 10 lbs NH<sub>4</sub>-N/ton  
 Organic N = total N – ammonium N = 50 lb/ton – 10 lb/ton = 40 lbs/ton organic N  
 Organic N availability factor = 0.1 from Table 1.2-15 (composted manure in this example):  
 Organic N x Organic N availability factor = 40 x 0.10 = 4 lbs N/ton

Total available N in the manure = available NH<sub>4</sub>-N + available organic N  
 Total available N = 4 lbs NH<sub>4</sub>-N/ton + 4 lbs organic N/ton = 8 lbs available N/ton  
 Maximum rate per acre to meet N need = net N requirement + available manure N

Rate per acre to meet N need = 138 lbs N/A + 8 lb N/ton = 15.25 ton/A  
 (Note: Any rate less than or equal to this rate is acceptable.)  
 (Note: This may seem to be a very high rate for poultry manure, but because it was composted, the N availability is very low compared to raw poultry manure; thus, a larger amount is required to supply adequate available N for the crop.)

### Nutrients Applied at the Planned Rate

Based on this calculation, which determined that up to 15.25 tons/A could be applied, the farmer decided to apply 10 ton/A. At this application rate the following amounts of nutrients would be applied:

Nitrogen: 10 tons/A x 8 lbs available N/ton = 80 lbs available N/A  
 Phosphorus: 10 tons/A x 40 lbs P<sub>2</sub>O<sub>5</sub>/ton = 400 lbs P<sub>2</sub>O<sub>5</sub>/A  
 Potassium: 10 tons/A x 30 lbs K<sub>2</sub>O/ton = 300 lbs K<sub>2</sub>O/A

**Final Nutrient Balance on the Field after Manure Application**  
 The nutrient balance is simply the difference between the net crop nutrient requirement and the nutrients applied at the planned rate.

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Net crop nutrient requirement	122	30	40
Nutrients applied at planned rate	80	400	300
Balance after manure application	42 short	370 excess	260 excess

Note that one of the consequences of applying a low N availability material like compost at a rate that comes close to matching the N needs of the crop will usually apply a large excess of P and K. This is very clear in this example even though the rate the farm chose was much lower than the rate required to supply the available N needs.

### Supplemental Fertilizer Needs

In this example the N applied by the farmers planned rate will not be adequate to meet the needs of the crop. Therefore, a supplemental N fertilizer application will be needed to supply the 42 lbs N/A that is short.