



Deciding which organic nutrients to use and how much to apply.

Step A. Identify how much nitrogen and other nutrients the crop needs.

We strongly recommend conducting a soil test. Soil test results provide nutrient recommendations based on existing soil nutrient levels and crop needs. In the absence of a test the Penn State vegetable or agronomy guides include recommendations. My next crop requires ___ N ___ P ___ K in lbs/acre.

Step B. Did you apply manure or compost to this field during the past three years?

Yes - compost– Use **worksheet 1** to calculate how much nitrogen may be available from previous compost applications. = ___ lbs/acre

Yes - manure– Use **worksheet 6** to calculate how much nitrogen may be available from previous manure applications. = ___ lbs/acre

No – Proceed to step C.

I need to add ___ lbs N/acre for my next crop (N needs determined in step A minus any nitrogen available from previous manure or compost applications (step B).

Step C. Did you grow a nitrogen fixing legume cover crop on this field in the last three years?

Yes – Use worksheet 2 to calculate how much nitrogen may be provided by past cover crops. = _____ lbs/acre

No – Proceed to step D.

I need to add ___ lbs N/acre for my next crop (N needs determined in step B minus any nitrogen available from previous nitrogen fixing legume cover crops (step C).

Step D. Should I use compost/ manure to fulfill the remainder of my crop nutrient needs?

Yes – Use worksheet 4 to calculate how much compost to apply.

Yes – Use worksheet 7 to calculate how much manure to apply.

No – Use worksheet 5 to consider cover crop options to fulfill your nutrient needs.

Or use “Using Organic Nutrient Sources” to find other sources of nutrients.

And **worksheet 8** to calculate quantities.



Worksheet 1: Estimating Residual Nitrogen from Compost

(from pg 13 in “Using Organic Nutrient Sources” The Pennsylvania State University Code # UJ256

Not all the nitrogen in compost is available in the year it is applied to the soil and nitrogen will made available to plants in later years. Accounting for this left over nitrogen can decrease the amount of nitrogen that needs to be applied in later years, saving money and helping avoid over application.

START WITH STEP 1A OR 1B DEPENDING ON IF YOU APPLY BY WEIGHT OR VOLUME!

Step 1a: Determine the nitrogen (N) content of the compost in pounds per ton.

The two values you’ll need from your compost analysis report are organic nitrogen and the ammonium nitrogen (NH₄-N) from the “as is basis” column. If Penn State’s Agricultural Analytical Services Laboratory performed the analysis, organic N and ammonium N will be given as a percent (%). Convert organic nitrogen from % to pounds per ton by multiplying by 20.

Organic nitrogen (%) _____ = x 20 = _____ lbs N/ton of compost

Ammonium N (%) _____ = x 20 = _____ lbs NH₄-N/ton of compost

Example:

Organic nitrogen (%) = 1.1 (from compost analysis report) x 20 = 22 lbs N/ton of compost
 Ammonium N (%) = 0.16 (from compost analysis report) x 20 = 3.2 lbs NH₄-N/ton of compost

Step 1b: Determine the nitrogen (N) content of the compost in pounds per yd³.

If you have applied compost based on cubic yards instead of tons you need to convert your nitrogen content to lbs organic N/yd³. In order to do this you need to know your bulk density. Your bulk density is the weight per volume. The lab can make this determination for you. However, they use a very small amount of soil. For a more accurate method that you can do yourself, see the grey box below. If you provide bulk density or ask the lab measure it, they will add another column with N/yd³. **If you no longer have the compost available use the average bulk density for compost 1,200 lbs/ yd³.** Remember this is an average. Compost bulk density ranges from 1,000 to 1,400 lbs/yd³. It is much more accurate to determine the actual bulk density.

Organic nitrogen (%) _____ = x 20 = _____ lbs N/ton of compost ÷ 2000 lb/ton = _____ lbs/

ton of compost x _____ lbs/yd³ compost (bulk density) = _____ lbs organic N/ yd³



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compost.

Ammonium N (%) _____ = x 20 = _____ lbs NH4-N/ton of compost ÷ 2000 lb/ ton =

_____ lbs N/ lb of compost x _____ lbs/yd³ compost (bulk density) = _____ lbs NH4-N/

yd³ of compost.

Example:

Organic nitrogen (%) = 1.1 (from compost analysis report) x 20 = 22 lbs N/ton of compost ÷ 2000 lb/ton = 0.011 lbs N/ lb compost x 1200 lbs/ yd compost (bulk density) = 13.2 lbs organic N/ yd³.

Ammonium N (%) = 0.16 (from compost analysis report) x 20 = 3.2 lbs NH4-N/ton of compost ÷ 2000 lbs/ ton = 0.0016 lbs N/ lb compost x 1200 lbs/ yd compost (bulk density) = 1.92 lbs NH4-N/ yd³ of compost.

Determine Bulk density:

Bulk density can also be determined before submitting the sample. This is more accurate than results from the lab because the lab uses less compost in its determination. The materials needed to determine the bulk density are a shovel, 5 gallon bucket and a scale (a bathroom scale will work). Fill the 5 gallon bucket half full, taking compost from various depths of the pile. Then drop the bucket 10 times from a height of about 6 inches. Fill the remaining portion of the bucket approximately half full and repeat the dropping process. Next, fill bucket to the brim and repeat the dropping process. Finally, fill bucket to the brim one more time and do not drop. Once that is done weigh the bucket with the compost in it and record the weight.

Weight of compost and bucket = ____ lbs

Example:

Weight of compost and bucket = 40 lbs

Subtract 2 pounds (the weight of a typical bucket) from the weight above to obtain the net sample weight.

Weight of compost and bucket = ____ lbs – 2 lbs = ____ net lbs

Example: Weight of compost and bucket = 40 lbs – 2 lbs = 38 net lbs

Next, multiply the net sample weight by 40 to convert to pounds per cubic yard.

____ net lbs x 40 = ____ lbs/yd³ (bulk density)

Example:

38 net lbs x 40 = 1520 lbs/yd³ (bulk density)



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Step 2: Estimate how much organic nitrogen was used in the year compost was applied.

Take the pounds of organic nitrogen in a ton or cubic yard of compost and multiply it by the total number of tons or cubic yards applied. Then, multiply the result by the mineralization rate used when originally calculating how much compost to apply. If you did not have an assumed mineralization rate use the average rate – 20%.

___ organic N lbs/ton or yd³ x ___ tons or yd³ of compost applied = ___ lbs organic N applied
 ___ lbs organic N applied x ___ mineralization rate = ___ lbs organic N available in the year the compost was applied

Example:

16.7 lbs organic N/yd³ x 21.2 yd³ of compost applied = 354 lbs organic N applied
 354 lbs organic N applied x 0.20 (or 20%) mineralization rate = 70.8 lbs organic N available in the year it was applied

Step 3: Determine how much organic nitrogen is left in the soil.

Take the pounds of organic nitrogen applied (determined in Step 1) and subtract the total pounds of organic nitrogen available in the year the compost was applied (determined in Step 1). The result is the amount of organic nitrogen left in the soil that can undergo mineralization and be available for plant uptake in the year after the compost was originally applied.

___ lbs organic N applied (determined in Step 2) – ___ lbs organic N available in the year it was applied (determined in Step 2) = ___ organic N left in the soil

Example:

354 lbs organic N applied – 70.8 lbs organic N available in the year it was applied = 283.2 lbs organic N left in the soil

Step 4: Finally, assume a mineralization rate for the organic nitrogen left in the soil.

For this step, take the result of Step 3 and multiply it by a 10 percent mineralization rate. This final result is the amount of residual nitrogen available the year after the compost was applied. This value can be subtracted from nitrogen application recommendations.

___ lbs organic N left in the soil x 0.10 (or 10%) = ___ lbs residual nitrogen available this year

Example:

283.2 lbs organic N left in the soil x 0.10 (or 10%) = 28.3 lbs residual nitrogen

ENTER YOUR FINAL ANSWER ON PAGE ONE STEP B.



Worksheet 2: Calculating nitrogen availability from last season's cover crop

Example: Cynthia is an organic farmer and is using cover crops and compost to meet her cash crop nutrient needs. She grew a cover crop of clover over the winter, but the clover did not grow very well. She only got about 50% groundcover and the clover grew 8" tall. She thinks the amount of nitrogen she grew was not enough and will have to apply some compost to meet her crop nitrogen needs. First she wants to determine how much nitrogen her cover crop provided.

Lbs of cover crop:

Inches > 6: 8 inch – 6 inches = 2 inches cover crop > 6 inches tall.
2 inches x 150 lbs dry matter/ inch cover crop = 300 lbs/acre.

Add 2,000 lb/acre for first 6 inches:

2,000 lbs/acre + 300 lbs/acre = 2,300 lbs/acre cover crop dry matter at 100% cover

Multiply by percent cover:

2,300 lbs/acre x 50% = 1,150 lbs/ acre dry matter

Multiply by the cover crop percent nitrogen:

1,150 lbs/acre x 3.5% nitrogen = 40.25 lbs/acre

Assume 50 % of cover crop nitrogen available in year 1: 40.25 lbs N /acre_x 50% = 20.13 lbs nitrogen /acre

Calculate your cover crop nitrogen contribution:

Lbs of cover crop:

Inches > 6: _____ inch – 6 inches = _____ inches cover crop > 6 inches tall.
 _____ inches x 150 lbs dry matter/ inch cover crop = _____ lbs dry matter/acre

Add 2,000 lb for top 6 inches:

2,000 lbs/acre + _____ lbs/acre = _____ lbs/acre cover crop dry matter at 100% cover

Multiply by percent cover:



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_____ x _____ (%) = _____ lbs/ acre dry matter

Multiply by the cover crop percent nitrogen:

_____ lbs/acre x .035 (3.5%) nitrogen = _____ lbs/acre

Multiply by % of cover crop nitrogen available in year 1: _____ lbs N /acre x .5 (50%)
(general estimation) = _____ lbs nitrogen /acre

ENTER YOUR FINAL ANSWER ON PAGE 1 STEP C.



Worksheet 3: Is compost the best way to apply nutrients to my field?

Composts can be an important part of managing plant nutrients. In addition to adding nutrients to the soil, they can improve long-term soil quality. Composts are best when used along with other nutrient management strategies including green manures, other fertilizers and crop rotations. Composts do not contain nutrients in the same ratios as plants need. In particular, they may have more phosphorus and potassium relative to the plant's need for nitrogen. In soil these nutrients can build up to levels exceeding crop needs. This form contains yes-no questions to help determine if compost is the best option for supplying nutrients to field grown vegetable crops or if other nutrient sources would be better options. Soil test results are also needed to complete this form.

Does the soil level of phosphate (P_2O_5) exceed crop needs? _____

A level above 310 lbs P_2O_5 lbs/acre (140 lbs P/acre) exceeds crop needs. When soil test levels exceed crop needs, there is no economic benefit from adding phosphorus. Additionally, very high phosphorus levels in the soil may lead to deficiencies of other nutrients, especially iron and zinc. Environmental concerns also develop when phosphorus reaches bodies of water. If phosphorus levels exceed crop needs, minimize losses through erosion, runoff and leaching. Erosion, runoff and leaching can be minimized by planting cover crops, using reduced tillage practices or using grass waterways.

Are soil levels of potash (K_2O), calcium (CaO) and magnesium (MgO) high or out of balance? _____

Soil levels above 335 lbs K_2O /acre (280 lbs K/acre), 2505 lbs CaO/acre (1790 lbs Ca/acre) and 490 lbs MgO/acre (295 lbs Mg/acre) exceed crop needs. Soil levels that exceed crop needs can be as bad as deficient levels. High soil nutrient levels might not only result in an economic loss but may also lead to crop, animal or environmental problems.

If the answer to either or both of the above questions is "Yes" consider using sources of plant nutrients other than compost. For example, legume green manure crops contribute nitrogen without increasing phosphate, potash, calcium or magnesium levels.

RETURN TO PAGE 1 TO ANSWER STEP D.



Worksheet 4: Calculating How Much Compost to Apply

(from pg 10-12 in "Using Organic Nutrient Sources" The Pennsylvania State University Code # UJ256

Two basic methods for calculating compost application rates exist. Both methods require knowing the nitrogen content (the organic and ammonium nitrogen) of the compost. If the nitrogen content needs to be determined, compost analysis kits are available through your local Cooperative Extension office. The second piece of information needed is the nitrogen requirement of the crop to be grown. This information can be found on soil test results or in the Commercial Vegetable Production Recommendations guide for Pennsylvania.

Method 1

Step 1 – Determine the nitrogen (N) content of the compost in pounds per ton.

The two values you'll need from your compost analysis report are organic nitrogen and the ammonium nitrogen (NH₄-N) from the "as is basis" column. If Penn State's Agricultural Analytical Services Laboratory performed the analysis, organic N and ammonium N will be given as a percent (%). Convert organic nitrogen from % to pounds per ton by multiplying by 20.

Organic nitrogen (%) _____ = x 20 = _____ lbs N/ton of compost

Ammonium N (%) _____ = x 20 = _____ lbs NH₄-N/ton of compost

Example:

Organic nitrogen (%) = 1.1 (from compost analysis report) x 20 = 22 lbs N/ton of compost

Ammonium N (%) = 0.16 (from compost analysis report) x 20 = 3.2 lbs NH₄-N/ton of compost

Step 2 – Determine how much of the nitrogen that is in a ton of compost will be available to the plants.

Organic N is converted into inorganic nitrogen for plant uptake through a process called mineralization. Commonly, mineralization rates between 10 and 20% are assumed. However, if conditions favor mineralization, for example 1) if soil temperatures are high because of the use of black plastic, 2) soil moisture is high from irrigation and/or rainfall, 3) soil is frequently tilled and/or 4) the organic matter content of the soil is high, consider assuming higher rates of mineralization. For this step multiply the amount of organic nitrogen in lbs N/ton by an assumed mineralization rate. Add the amount of ammonium N in lbs/ton from step 1 to the result.



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Organic nitrogen _____ (lbs N/ton of compost) x _____ percent mineralization rate = _____
 lbs organic nitrogen estimated available per ton of compost

_____ lbs available N/ton of compost + _____ lbs NH₄-N/ton of compost = _____ lbs
 available N/ton of compost

Example:

Organic nitrogen (lbs N/ton of compost) 22 x 0.20 (or 20%) assumed percent mineralization rate
 = 4.4 lbs organic nitrogen estimated available per ton of compost

4.4 lbs organic nitrogen estimated available per ton of compost + 3.2 lbs NH₄-N/ton of compost
 = 7.6 lbs available N/ton of compost

Step 3 – Determine the amount of compost to apply

For this step, first determine the nitrogen needs of the crop in pounds per acre. This information can be found on soil test reports or in the Commercial Vegetable Production Recommendations guide for Pennsylvania. If you have residual nitrogen in the soil from previous nutrient applications or green manure crops, subtract that value from the recommended rate. Then, divide the remaining amount of nitrogen required by the pounds of available nitrogen per ton of compost determined in Step 2.

_____ lbs N recommended/acre - _____ any residual nitrogen ÷ _____ lbs available N/ton
 of compost = _____ tons of compost to apply per acre

Example:

75 lbs N recommended/acre (from soil test recommendations or the Commercial Vegetable Production Recommendations guide and assuming no residual nitrogen) ÷ 7.6 lbs available N/ton of compost = 9.9 tons of compost to apply per acre

If using a front end loader or manure spreader with a scoop, figure out how many 5 gallon bucketfuls fit in the scoop, weigh a 5 gallon bucket of compost, and multiply to determine the weight of compost being applied per scoop.

The above method will have some built-in inaccuracy because it does not account for differences in weight due to how the compost is packed, or moisture level. A second, more accurate method requires that the bulk density of the compost be determined.



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**Method 2
Bulk Density**

This method is more accurate than the first method because it accounts for the changing moisture content of compost. This method can be easier to use if you are using manure spreaders or front end loaders because results are in pounds per cubic yard (lbs/yd³). It requires determining the bulk density of the compost. This can be done two ways. If using Penn State’s Agricultural Analytical Services Laboratory to analyze compost, the lab can determine bulk density as an optional test. This currently costs \$10.

Bulk density can also be determined before submitting the sample. This is more accurate than results from the lab because the lab uses less compost in its determination. The materials needed to determine the bulk density are a shovel, 5 gallon bucket and a scale (a bathroom scale will work). Fill the 5 gallon bucket half full, taking compost from various depths of the pile. Then drop the bucket 10 times from a height of 6 inches. Fill the remaining portion of the bucket approximately half full and repeat the dropping process. Next, fill bucket to the brim and repeat the dropping process. Finally, fill bucket to the brim one more time and do not drop. Once that is done weigh the bucket with the compost in it and record the weight.

Weight of compost and bucket = _____ lb

Example:

Weight of compost and bucket = 40 lb

Subtract 2 lbs (the weight of a typical bucket) from the weight above to obtain the net sample weight.

Weight of compost and bucket = __ lb – 2 lbs = _____ net lbs

Example:

Weight of compost and bucket = 40 lb – 2 lbs = 38 net lbs

Next, multiply the net sample weight by 40 to convert to pounds per cubic yard.

_____ net lbs x 40 = _____ lbs/yd³ (bulk density)

Example:

38 net lbs x 40 = 1520 lbs/yd³ (bulk density)

Lastly, insert the bulk density value on the compost submission form on the line that says *Producer-determined bulk density (lb/yd³)*.



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When bulk density is determined, the compost analysis report will have a third column for “volume basis”. This is the column to use for calculating how much compost to apply.

If you receive your compost test results from another source or otherwise do not receive nitrogen by volume measurements use the following calculations.

Organic nitrogen (%) _____ = x 20 = _____ lbs N/ton of compost ÷ 2000 = _____ lbs N/ lb of compost x _____ lbs/yd³ compost (bulk density) = _____ lbs organic N/ yd³ compost.

Ammonium N (%) _____ = x 20 = _____ lbs NH₄-N/ton of compost ÷ 2000 = _____ lbs N/ lb of compost x _____ lbs/yd³ compost (bulk density) = _____ lbs NH₄-N/ yd³ of compost

Example:

Organic nitrogen (%) 1.1 = x 20 = 22 lbs N/ton of compost ÷ 2000 = 0.011 lbs N/ lb of compost x 1520 lbs/yd³ compost (bulk density) = 16.7 lbs organic N/ yd³ compost.

Ammonium N (%) 0.6 = x 20 = 12 lbs NH₄-N/ton of compost ÷ 2000 = 0.006 lbs N/ lb of compost x 1520 lbs/yd³ compost (bulk density) = 9.12 lbs NH₄-N/ yd³ of compost

Step 1 - Determine how much available nitrogen is in a yard of compost

Multiply the amount of organic N by a mineralization rate. Then, add the amount of ammonium N.

Organic nitrogen _____ (lbs N/yd³ of compost) x _____ percent mineralization rate = _____ lbs organic nitrogen estimated available per yd³ of compost

_____ lbs available N/yd³ of compost + _____ lbs NH₄-N/yd³ of compost = _____ lbs organic nitrogen estimated available per yd³ of compost



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Example:

Organic nitrogen (lbs N/yd³ of compost) 16.7×0.20 (20%) assumed percent mineralization rate
 = 3.34 lbs organic nitrogen estimated available per yd³ of compost

3.34 lbs available N/yd³ of compost + 0.19 lbs NH₄-N/yd³ of compost = 3.53 lbs organic
 nitrogen estimated available per yd³ of compost

Step 2 - Determine the amount of compost to apply

To do this, take the nitrogen recommendation and divide it by the amount of available nitrogen in a ton of compost. Nitrogen recommendations can be found on soil test results or in the Commercial Vegetable Production Recommendations guide for Pennsylvania. If you have residual nitrogen in the soil from previous nutrient applications or green manure crops, subtract that value from the recommended rate. Then, divide the remaining amount of nitrogen required by the pounds of available nitrogen per ton of compost.

_____ lbs N recommended/acre ÷ _____ lbs available N/yd³ of compost = _____ yd³
 of compost to apply per acre

Example:

75 lbs N recommended/acre (from soil test recommendations or the Commercial Vegetable Production Recommendations guide for Pennsylvania, assuming no residual nitrogen) ÷ 3.53 lbs available N/yd³ of compost = 21.2 yd³ of compost to apply per acre



Worksheet 5: Adding Nitrogen with Leguminous Green Manures

(from pg 8 in "Using Organic Nutrient Sources" The Pennsylvania State University Code # UJ256)

Green manures are crops that are turned into the soil while they are young and succulent, rather than harvested. Legume crops add nitrogen to the soil. They are able to establish relationships with soilborne bacteria that are capable of extracting nitrogen gas from the atmosphere and converting it into a form that the plant can use. Seed of legumes may need to be inoculated with these bacteria; inoculants are commercially available. Inoculants are specific to the legume species grown, so chose a compatible inoculant. Also, not all brands of inoculants are allowable in organic production. Check with your certifying agency before using.

Approximate nitrogen credit from the use of nitrogen-fixing legumes

Nitrogen-fixing Legume	N (lbs/acre) ^a
Alfalfa sod	50-100 ^b
Clovers	
Alsike	60-119 ^c
Berseem	50-95
Crimson clover sod	50
Ladino clover sod	60
Red	100-110
White	≤130
Cowpeas	130
Fava beans	71-220
Field peas	172-190
Hairy vetch	50-100 ^b
Sweetclovers	
Annual white	70-90
Biennial	90-170
Birdsfoot trefoil	40
Lespedeza	20
Soybeans	
Tops and roots	40
Grain harvest residue	15

Adapted from Commercial Vegetables Recommendations guide for Pennsylvania (Penn State Cooperative Extension publication AGRS-28) and the Northeast Cover Crop Handbook (by Sarrantonio, Rodale Institute) Footnotes:

^aNitrogen contributed to the soil varies depending on the plant biomass (volume of above ground growth) produced. Biomass production is related to percent stand, the length of the growing season for the nitrogen-fixing legume and management practices, table values are approximate.

^b75% stand = 100-0-0, 50% stand = 75-0-0 and 25% stand = 50-0-0.

^cUse values on the lower end of the range when biomass is low and values on the higher end of the range when biomass is high.



Worksheet 6: Estimating Residual Nutrients from Manure

Adapted from Penn State Agronomy Facts 55: Estimating Manure Application Rates

Table 3. Average total nutrient content of manure.

Animal type		N (lb/ton)
Dairy cattle	Solid	10
	Liquid (lb/1,000 gal)	28
Veal		8
Beef cattle		11
Swine	Pigs	14
	Gestating sow	14
	Sow and 8 pigs	14
	Boar	14
	Liquid (lb/1,000 gal)	35
Sheep		23
Horse		12
Poultry	Layer	37
	Pullet	43
	Broiler	73
	Turkey (tom)	52
	Turkey (hen)	73

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

Table 4. Residual manure N availability factors.

Historical frequency of manure application on the field	N availability factor	
	Poultry manure	Other manure
Rarely received manure in the past	0	0
Frequently received manure (4-8 out of 10 yrs)	0.07	0.15
Continuously received manure (>8 out of 10 yrs)	0.12	0.25

Typical application rate for your farm _____ Ton/A

x Typical Manure Analysis (Table 3 or from manure analysis) _____ lb N/ ton

x Residual N factor (Table 4) _____

= _____ lb/ A Residual N from Manure.

ENTER YOUR ANSWER ON PG 1 STEP B.



Worksheet 7: How much manure do I apply?

Adapted from Penn State Agronomy Facts 55: Estimating Manure Application Rates

Table 3. Average total nutrient content of manure.

Animal type		N (lb/ton)
Dairy cattle	Solid	10
	Liquid (lb/1,000 gal)	28
Veal		8
Beef cattle		11
Swine	Pigs	14
	Gestating sow	14
	Sow and 8 pigs	14
	Boar	14
	Liquid (lb/1,000 gal)	35
Sheep		23
Horse		12
Poultry	Layer	37
	Pullet	43
	Broiler	73
	Turkey (tom)	52
	Turkey (hen)	73

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

Table 4. Residual manure N availability factors.

Historical frequency of manure application on the field	N availability factor	
	Poultry manure	Other manure
Rarely received manure in the past	0	0
Frequently received manure (4-8 out of 10 yrs)	0.07	0.15
Continuously received manure (>8 out of 10 yrs)	0.12	0.25

Step 1.

Typical Manure Analysis (Table 3 or from manure analysis) _____ lb N/ ton

x N Availability Factor (Table 4) _____

= _____ lb/ A Available N from Manure.

Step 2.

Net N requirement (from pg 1) _____ lb/ Acre ÷ _____ lb N/ton Available N

from Manure(from step 1) = _____ ton/ Acre balanced manure rate.



Worksheet 8: How much fertilizer do I apply?

Step 1: Find a nutrient source using Table 3 in 'Using Organic Nutrient Sources' if you are an organic farmer/gardener or chose a synthetic fertilizer from the Agronomy Guide Table 1.2 (Appendix A).

_____ is a nutrient source which is high in N but low in P & K. The composition of the nutrient source is ___ N ___ P ___ K.

Step 2. Calculate lbs of fertilizer to apply.

I need _____ lb/A of N (from step C) x _____ acres** I am applying to = _____ lb N to apply to my parcel ÷ _____ % N of fertilizer = _____ lb of fertilizer/ parcel to apply.

** Area conversions

50 row feet of 4' beds = .0046 acres

50 row feet of 5' beds = .0057 acres

75 row feet on 5' beds = .0086 acres

75 row feet on 4' beds = .0046 acres

200 square feet = .0046 acres

500 square feet = .011 acres

*** It is always a good idea to price compare your nutrient sources. Convert each source to \$/lb of N (or P or K).

ie a 50 lb bag of Blue N (5-1-1) contains 2.5 lbs of N. At \$19.75/ bag. $\$19.75 / 2.5 \text{ lbs N} = \$8/\text{lb N}$.



Appendix A: Agronomy Guide - Table 1.2-11. Description of fertilizer materials.

Fertilizer	Total N, %	Available phosphoric acid, %	Soluble potash, %	Equivalent acidity ¹	Salt index ²	Comments
Anhydrous ammonia— NH ₃	82	0	0	148	47	A high-pressure liquid that turns into a gas when released. Must be injected 6–8 inches deep on friable, moist soil. N loss by volatilization can occur if not properly injected, or if soil is too wet or too dry at application.
Urea—NH ₂ -CO-NH ₂	46	0	0	84	75	A dry material in granular or prilled form, urea-N rapidly hydrolyzes to NH ₄ ⁺ . Can be used for direct application, in mixed fertilizers, and in liquid nitrogen. N at application is present as urea-N. Within 1 day after application, about 66% of urea-N is hydrolyzed to ammonia-N; all within 1 week. When not incorporated, significant N loss by volatilization can occur until approximately 0.5 inch of rain has fallen. Not recommended for starter use. Broadcast (incorporated) or sidedress.
Ammonium nitrate— NH ₄ NO ₃	33–34	0	0	63	105	A dry material in granular or prilled form, in which half of the N is as nitrate and half is as ammonium. Used for direct application and in the production of nitrogen solutions (see below). Broadcast or sidedress. Can be left on surface or incorporated into soil. Ammonium nitrate is a good fertilizer but it can be very difficult to get because it is used as an explosive.
Nitrogen solutions (UAN)—	28–32 (mostly	0	0	54	74	A mixture of ammonium nitrate, urea, and water. Urea supplies about half of the N that



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Urea+NH ₄ NO ₃ +Water	30 in					may be subject to volatilization loss—read comments above for urea. The other half of N is supplied by ammonium nitrate—read comments above for ammonium nitrate. Once applied, nitrogen solution behaves exactly like dry urea and ammonium nitrate. To minimize N loss, incorporate into soil as soon as possible after application. Use caution when spraying, as leaf burn can occur. To minimize injury, do not spray on vegetation. For postemergence application, use a directed spray or dribble between the rows.
Ammonium sulfate— (NH ₄) ₂ SO ₄	21	0	0	112	69	A dry crystalline material in which the nitrogen is all in the ammonium form. Produced by two methods—by-product and synthetic. Used for direct application and blended complete fertilizers. Broadcast or sidedress. Can be left on surface or incorporated into soil. Contains 24% sulfur. Good starter N source.
Diammonium phosphate (DAP)— (NH ₄) ₂ HPO ₄	18	46	0	74	34	A dry granular or crystalline material. Common analysis is 18-46-0. Used for direct application and in blended fertilizers. Starter fertilizers containing DAP should be used with caution; be sure to band at least 2 inches to the side and 2 inches below seed.
Monoammonium phosphate (MAP)— NH ₄ H ₂ PO ₄	11	52	0	65	30	A dry granular material. Common analysis 11-52-0. Used for direct application and in blended fertilizers. Makes an excellent starter fertilizer, either alone or with a small amount of potash.
Ammonium polyphosphate	10	34	0	53	-	A liquid solution (10-34-0). The agronomic effectiveness of APP is similar to that of MAP. Sequesters some micronutrients and impurities



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						in fluid fertilizers, keeping them in solution.
Triple superphosphate— $\text{Ca}(\text{H}_2\text{PO}_4)_2$	0	46	0	0	10	Dry granular material. Used for direct application and in blended fertilizers.
Muriate of potash—KCl	0	0	60–62	0	116	Dry granular material. Used for direct application and in blended fertilizers.
Potassium sulfate— K_2SO_4	0	0	50	0	46	Dry crystalline material. A specialty fertilizer used for direct application and in blended fertilizers.
Potassium nitrate— KNO_3	13	0	45	-26	74	Dry crystalline material. A specialty fertilizer used for direct application and in blended fertilizers.
Potassium hydroxide— KOH	0	0	70	-89	-	Crystalline material usually used in liquid fertilizers. Basic nature of this material allows production of neutral liquid fertilizers. Primarily used in liquid starter fertilizers.
Sulfate of potash magnesia— Sul-Po- Mag or K-Mag	0	0	22	-	-	Crystalline material made from langbeinite. Contains 22% sulfur and 11% magnesium.
Fertilizer	Total N, %	Available phosphoric acid, %	Soluble potash, %	Equivalent acidity ¹	Salt index ²	Comments