WSU Compost Outreach Project
Recommended Best Management Practices for Compost Use (Working Draft)
January 2016
WSU Snohomish County Extension

Incorporating Compost into Fertility Plan

1. Obtain Compost Analytical Data/Nutrient Analysis from compost producer.
2. Determine the amount of Nitrogen you desire to supply with your compost application.

   Use one of these methods to determine Nitrogen need:

   a. Soil lab recommendations: Conduct soil sampling in the field where you plan to add compost, provide information about previous crop and crop you will be growing in the amended soil. (The lab recommendation may not be as accurate if a cover crop is utilized or if organic matter has been applied regularly over previous seasons).
   b. Most reliable method: Determine Nitrogen required for a certain crop, taking into account N from soil OM and N from a cover crop.[3] (See Table 2, on page 5).
3. Upon delivery of compost, delivery driver should provide delivery ticket with weight and estimated volume of compost received along with the most recent compost testing data. If not provided upon delivery, this information can be provided by composter.
4. Determine NPK nutrient value of compost (using Compost Analytical Data sheet, provided upon request by the compost producer), by looking at the % values in the "As Rcvd" column and converting them to lb/ton through the following steps:

   a. Nitrogen
      i. Multiply the % total Nitrogen of the compost (provided in the compost analytical data) by 20 to get lb of N wet ton of compost.

   Ex: .94% total N x 20= 18.8 lb of N/wet ton of compost (enter into worksheet on line D).

   % total N

   Your value: _____ x 20 = _____ lb of N/wet ton of compost

   (Enter this ^ value into worksheet on line D).

   b. Phosphorus (P_2O_5)
      i. Multiply the % by 20 to get lb/wet ton (enter into worksheet on line E).

   c. Potassium (K_2O)
      i. Multiply the % by 20 to get lb/wet ton (enter into worksheet on line F).

5. Follow the steps in the worksheet to determine the compost application rate needed to meet the nitrogen needs of your crop.
    a. You may need to base rates on P to avoid excessive P in the soil, and supplement with other N sources to meet the total crop N requirement.

Table 1: Work sheet for Calculating Compost Application Rate

Worksheet for Calculating Compost Application Rate: **Example: I am growing sweet corn and the recommendation is 100 lbs/acre of Nitrogen. I have compost that contains 18.8 lbs of N, 6.4 lbs P, and 11.6 lbs K per wet ton of material.**				
#	Step	Units	Example	Your Value
A	Type of material		Food & Yard Waste Compost	
B	Crop		Brassicas	
C	Desired N application rate	lb N/acre	85	
D	Compost N concentration (from laboratory analysis).	lb N/ ton as-is	18.8	
E	Phosphorus concentration (from laboratory analysis).	lb P_2O_5/ton as-is	6.4	
F	Potassium concentration (from laboratory analysis).	lb K_2O/ton as-is	11.6	
G	Plant availability of N in compost	Percent	7	7
H	Calculate compost available N Line D x (line G/100)	lb N/ton as-is	1.3	
I	Calculate application rate Line C/line H	wet tons compost/acre	65	
J	Calculate the amount of phosphorus applied Line I x line E	lb P_2O_5/acre	416	
K	Calculate the amount of potassium applied Line I x line F	lb K_2O/acre	754	

Worksheet adapted from PNW0533 Fertilizing with Manure
http://cru.cahe.wsu.edu/CEPublications/pnw533/pnw533.pdf Andy Bary, Craig Cogger, Dan M. Sullivan, 2000.

Calibrating your rear discharge manure spreader to achieve desired application rate:

6. (Manure spreader calibration can be done using this method or the method defined in step 7). Use Tarp Method to determine actual compost application rate:
    a. Measure tarp to determine square footage (area), record the tarp area
        i. use a tarp that is no wider than the spreader spray pattern
    b. Record original weight of tarp or container you will utilize for weighing
    c. Place tarp on ground in the pathway of the tractor and manure spreader
    d. Drive over the tarp in a single pass and spread compost evenly over the tarp
    e. Gather tarp and take care to contain all compost in the tarp
    f. Weigh the compost, subtract the weight of the tarp or bucket, and record the weight
    g. Divide the weight of the compost by the tarp area to get lbs. of compost per sq.ft.
       Ex: 75 lb of compost / 144 ft^2 = 0.5 lb of compost per sq. foot

    Your Value: _____(lb of compost) / _____ (size of tarp in sq ft) = _____ (lb of compost per sq ft)

    h. Convert to lb per acre. There are 43,560 sq. ft. per acre.
       Ex.: 0.5 x 43560 = 21,780 lbs of compost per acre (or 11 wet tons/acre)

    Your Value: _____(lb of compost per sq ft) x 43560 = _____ (lb of compost per acre) (Divide by 2000 to get wet ton per acre)

    i. Adjust your application equipment settings, or make multiple passes with the spreader to achieve desired compost application rate
    j. Use actual compost application rate to determine actual quantity of nutrients applied. (see worksheet in table 1)
       **To convert cubic yards of compost to tons or tons to cubic yards, utilize this conversion rate: 1150lb/cu yd <u>or</u> find actual bulk density by following step 7a (below).

7. Use compost Bulk Density and spreader capacity to determine application rate (Bulk Density of compost can be calculated from Compost Analytical Data or you can use the assumed Bulk Density of 1150 lb/cu yd):
    a. Find the "As Rcvd" Bulk Density of the compost by referencing the Compost Analytical Data sheet. Bulk Density is provided in lb/cu ft. (Ex: 39 lb/cu ft)
    b. To convert the Bulk Density to lb/cu yd multiple the provided number by 27. (Ex: 39 lb/ cu ft x 27= 1053 lb/ cu yd)
    c. Determine the capacity of the manure spreader. If capacity is provided in bushels, divide the bushels by 21.7 to find capacity in cubic yards.

d. Multiply the spreader capacity by the Bulk Density of the compost to determine the weight of a full load of compost. (Ex: if spreader capacity is 2 cu yds x 1053 lb/ cu yd= 2106 lb of compost in one full manure spreader load)
e. Spread a load on the field in a rectangular pattern and measure the length and width covered by one full load. Multiply the length and width to determine sq footage of the covered area. (Ex: 100ft length x 6ft width= 600ft^2)
f. Divide the weight of the compost in the spreader by the square footage of the covered area to determine lb/sq ft of actual compost applied. (Ex: 2106lbs / 600ft^2= 3.51 wet lb/sq ft)
g. Convert to tons/acre by multiplying the wet lb/sq ft of actual compost applied by 21.78. (Ex: 3.51 lb/sq ft x 21.78 = 76.45 wet tons/acre)
h. Modify the application rate through tractor or manure spreader adjustments.
i. To convert wet tons/acre to dry tons/acre assume a compost moisture content of 50% and divide by two (Ex: 76.45 wet tons/acre ÷ 2= 38.2 dry tons/acre). [5]

8. Once compost is applied, it's recommended to incorporate the compost into the soil within twelve hours. If top-dressing a pasture or hay field, use a harrow.
9. After incorporating compost, wait at least 10 days before planting for annual crops. This allows compost to stabilize in the soil and nutrients from compost to become available to plants.

<u>General Compost Use Recommendations:</u>

1. Know the needs of your crops and the current soil nutrient content.
2. Compost application rate can be determined based on your **goals** (listed in order of lowest to highest compost application rate)*:
   *Compost can be assumed to have 50% moisture content.
   a. -**improve health/microbial life**, 7 - 70yds^3/acre (2 - 20 dry tons/acre*) **<u>(lowest rate)</u>**
   b. -**nutrients: N,P,K, micros**, determine rate using compost nutrient content and crop needs (steps 4-8 above)
   c. -**increase organic matter**
   d. -**nursery and planting bed establishment**, ½ - 3 inch layer or 30 – 200 yds^3/acre (9-60 dry tons/acre*)
   e. -**reclamation:** increase productivity of crop land, 1 - 2" layer or 200+ yds^3/acre (60+ dry tons/acre*)
   f. -**mulch**, 1-2 inch layer or 200+ yds^3/acre (60+ dry tons/acre*) **<u>(highest application rate)</u>** [1]
   *Assumptions: 1 yd^3 weighs approx. 1150lbs and has 50% moisture content
3. For annual crops, apply and incorporate compost 10 days prior to crop planting to ensure the compost is stabilized and nutrients are available to the crop(s).
4. Rear discharge manure spreaders are a common tool for field application of compost.
5. Incorporation of the compost is recommended whenever possible. Incorporating compost within 12 hours of application is important to reduce Ammonium-N volatilization losses. [2]
6. Establishing new planting beds:
   a. New planting beds can benefit from one to three inches of compost incorporation to improve the soil's physical properties. [3]
7. Yearly compost application:
   a. Smaller amounts are needed to maintain organic matter and soil fertility (ie, ¼–½ inch). [3]
8. Compost will provide approximately 1.3 lb Total N /wet ton compost, 6.4 lb P_2O_5/wet ton of compost, and 11.6 lb K_2O/wet ton of compost in the first season after application (calculate nutrient values from Compost Analytical Data, see worksheet in Table 1 above), additional nutrients may need to be supplied using other fertilizer sources with plant available nutrients.

Table 2: Calculating the amount of nitrogen (N) fertilizer needed (lb/A) for a vegetable crop when taking into account soil reserves and cover crop contributions.

Fertilizer N needed	=	Crop demand (lb N/A)	- [	N from soil organic matter (lb /A)	+	N from cover crop (lbs N/A)	]	
Example:								
Fertilizer N needed	=	85 lb N/acre						
Fertilizer N needed	=	225 lb N/acre (Nitrogen needed for brassicas crop)	- [	70 lb N/acre (moderate organics applications over recent seasons)	+	70 lb N/acre (legume cover crop, dense stand)	]	
Solving for this number indicates how much N application is needed for this growing season.		Obtain recommended fertilizer application rates from production guides. Ex: *The Pacific Northwest Vegetable Production Guides* (Oregon State University 2012)		Depends on soil management. Range of N yielded by soil OM: 50 to 200lb N/acre Regular organic matter inputs lead to higher end of the range= 200, moderate applications of organics lead to lower N mineralization= 70 lb N/acre. [3]		Did you plant a cover crop? If no, use a 0 in this category. Typical values for PAN are 30 to 70 lb N/a for winter cereal/legume cover crops killed in mid-April. [6]		

1. USCC Field Guide to Compost Use. http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/1330/Field_Guide_to_Compost_Use.pdf
2. Using Manure and Compost as Nutrient Sources for Vegetable Crops. University of Minnesota Extension Service. http://www1.extension.umn.edu/garden/fruit-vegetable/using-manure-and-compost/docs/manure-and-compost.pdf
3. Soil Fertility in Organic Systems: A Guide for Gardeners and Small Acreage Farmers. http://cru.cahe.wsu.edu/CEPublications/PNW646/PNW646.pdf
4. THE ORGANIC WAY- USE OF COMPOST AND MANURE IN SMALL FRUIT PRODUCTION, Small Fruits Penn State University. Vegetable and Small Fruit Gazette, Vol. 8 No. 10, October 2004. http://www.fruit.cornell.edu/berry/production/pdfs/owcompostmanuresmallfru.pdf
5. Fertilizing with Manure PNW0533 http://cru.cahe.wsu.edu/CEPublications/pnw533/pnw533.pdf Andy Bary, Craig Cogger, Dan M. Sullivan, 2000.
6. Estimating Plant Available N Release from Cover Crops PNW636. https://catalog.extension.oregonstate.edu/files/project/pdf/pnw636.pdf D.M. Sullivan and N.D. Andrews, 2012.