



Bulletin

Extension

Worksheet

Step 1

Convert analyzed sludge values to lb/ton.

$$\text{ppm} = \text{mg/kg} \times 0.002 = \text{lb/ton dry basis}$$

ex. _____ mg/kg x 0.002 = _____ lb/ton

Step 2

Determine fertilizer recommendations based on yield goals and soil test values.

Crop to be grown _____

Yield goal _____

Fertilizer recommendations based on soil test.

pH _____

N _____ lb

P₂O₅ _____ lb

K₂O _____ lb

It may be necessary to convert sludge phosphorus levels from phosphate P₂O₅ to elemental form or K₂O to elemental K.

$$\text{P}_2\text{O}_5 \times 0.44 = \text{Elemental P}$$

$$\text{K}_2\text{O} \times 0.83 = \text{Elemental K}$$

Step 3

A. Determine application rate by nitrogen balance.

ammonium nitrogen _____ lb/ton from analysis
T.K. nitrogen _____ lb/ton from analysis
(if analyzed) nitrate nitrogen _____ lb/ton from analysis

B. Calculate the amount of organic nitrogen in sludge.

lb/ton organic nitrogen = total N _____ lb/ton - (ammonium nitrogen _____ lb/ton + nitrate nitrogen _____ lb/ton)
(from analysis, (from analysis) (from analysis)
Total Kjeldahl nitrogen * if available

C. Determine PAN (plant available nitrogen).

The amount of ammonium nitrogen available to plants will vary greatly based on application method and time of year, Table 3.

PAN = (_____ lb/ton organic nitrogen x _____ efficiency factor) + (_____ lb/ton ammonium nitrogen x _____
(3. B) (Table 3, manure) (from analysis) (Based on
(Table 4, sludge) application
method and
time of
year, Table 3).

efficiency factor + _____) nitrate nitrogen if available.

* Use 15% for compost and advanced alkaline stabilized sludge.

Step 4

If sludge has been previously applied, determine residual nitrogen.

	A	B	C
	1 year ago application rate of organic nitrogen	X mineralization rate	= mineralized organic nitrogen
Year 0	_____ lb/acre	X _____ Kmin Table 4 based on sludge digestion process	= _____ lb/acre
Year 1	_____ lb/acre (A-C)	X _____ Kmin year (1-2)	= _____ lb/acre available N
	(lb/acre) starting available organic nitrogen (A)-(lb/acre) mineralized organic nitrogen (C) -remaining organic nitrogen (lb/acre)		
	2 years ago application rate of organic nitrogen	X mineralization rate	= mineralized organic nitrogen
Year 0	_____ lb/acre	X _____ Kmin	= _____ lb/acre
Year 1	_____ starting O.N.-mineralized O.N.	X _____ Kmin (1-2)	= _____ lb/acre available N (year 1)
Year 2	_____ starting O.N (year 1)- available N (year 1)	X _____ Kmin (2-3)	= _____ lb/acre available N (year 2)
	(lb/acre) Starting available organic nitrogen-(lb/acre) mineralized organic nitrogen=remaining organic nitrogen year 2 (year 2, column A) (year 2, column C) (lb/acre)		

*Continue calculations for previous applications until the mineralization rate becomes less than 3% (0.03).

Adjust nitrogen requirement of crop based on residual nitrogen.

Year 1 residual nitrogen + year 2 residual nitrogen + year 3 residual nitrogen.

(Year 1) (Year 2) (Year 3)
_____ lb/acre + _____ lb/acre + _____ lb/acre = total lb PAN residual organic nitrogen/acre _____

lb nitrogen needed by the crop _____ - total residual nitrogen _____ = lb nitrogen required/acre

Step 5

Determine tons of biosolids to apply to meet nitrogen needs.

Crop needs _____ N/acre – _____ (lb/acre total residual nitrogen, Step 4.) ÷ _____ lb available
nitrogen per ton in biosolids (Step 3) = _____ tons/acre of biosolids to meet nitrogen needs

*The maximum application rate of biosolids will be specified in the permit issued by the Ohio EPA.
On agricultural land this is usually 5 tons/acres dry.

Based on your application rate determine the amount of phosphorus being applied.

_____ biosolid application rate X _____ lb phosphorus/ton (from analysis) = _____ lb P applied per acre
(tons/acre)

Do the same calculations for potassium.

_____ biosolid application rate X _____ lb potassium/ton (from analysis) = _____ lb K applied per acre
(tons/acre)

Determine supplemental fertilizer needed.

1. Nitrogen needed = _____
(crop needs) (lb/acre
from soil test adjusted for
residual nitrogen in Step 4) – (application rate of _____ tons/acre X _____ lb
available nitrogen per ton)
2. Phosphorus needed = _____ lb/acre
(From soil test needed) – _____ lb/acre applied, Step 5.
3. Potassium needed = _____ lb/acre
(From soil test needed) – _____ lb/acre applied, Step 5.

Step 6

Calculate biosolids pollutant loadings.

Pollutant Loading

As: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Cd: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Cu: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Pb: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Hg: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Mo: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Ni: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Se: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

Zn: _____ T/acre application X _____ lbs/ton concentration (from analysis = _____ lbs/acre

*Refer to OEPA Class restrictions for Pollutant Loading Rates.

Step 7

Convert dry basis to wet basis.

Dry tons to wet tons

$$\text{wet tons/acre} = \frac{\text{dry tons/acre application} \times 100}{\text{(\% dry solids) use value, i.e., 10 for 10\%}}$$

Conversion to gallons/acre =

$$\frac{\text{wet tons/acre} \times 2000}{\text{weight of one gallon of the biosolid (approx. 8.3 lbs/gal)}}$$