

## Agronomy 354 Manure Worksheet

You are asked by a client to wisely manage the nutrients from a  $1 \times 10^6$  caged layer (4-lb bird) operation in NC Iowa. (For calculations, if a range of values is given, use the midway point.)

- a) An analysis indicates the manure contains 35+80+50 lbs/ton ( $N+P_2O_5+K_2O$ ). From a reference source, 1000 birds are estimated to produce 10.5 tons/yr of manure. (These are realistic estimates taken from an older 2003 publication ISU PM 1811.)
- b) Soil tests recommend 180 lbs N, 100 lbs  $P_2O_5$ , and 80 lbs  $K_2O$  per acre for corn production.
- 1) How many tons/acre of manure must be applied to meet the N requirement? (You must consider the 1<sup>st</sup>-yr availability and N volatilization factor--assume the manure is broadcast (solid) applied and not incorporated within 4 days.)
 
$$35 \cdot 0.55 \cdot 0.80 = 15.4 \text{ avail. N/T} \quad \frac{180 \text{ lbs}}{15.4 \text{ lbs/T}} = 11.69 \text{ T/acre}$$
  - 2) How many acres of corn can this manure be used to meet the N requirement at the rate calculated in question 1?
 
$$10.5 \text{ T/1000 birds/yr} \cdot 1,000,000 \text{ birds} = \frac{10500 \text{ T}}{11.69 \text{ T/acre}} = 898 \text{ acres}$$
  - 3) How many tons/acre of manure must be applied to meet the  $P_2O_5$  requirement?
 
$$80 \cdot 0.95 = 76 \text{ lbs avail. } P_2O_5/T \quad \frac{100 \text{ lbs}}{76 \text{ lbs/T}} = 1.32 \text{ T/acre}$$
  - 4) How many acres of corn can this manure be used to meet the  $P_2O_5$  requirement at the rate calculated in question 3?
 
$$\frac{10500 \text{ T}}{1.32 \text{ T/acre}} = 7955 \text{ acres}$$
  - 5) How many tons/acre of manure must be applied to the  $K_2O$  requirement?
 
$$50 \cdot 0.95 = 47.5 \text{ lbs avail. } K_2O/T \quad \frac{80 \text{ lbs}}{47.5 \text{ lbs/T}} = 1.68 \text{ T/acre}$$
  - 6) How many acres of corn can this manure be used to meet the  $K_2O$  requirement at the rate calculated in question 5?
 
$$\frac{10500 \text{ T}}{1.68 \text{ T/acre}} = 6250 \text{ acres}$$
  - 7) If the nutrient contents of this manure are to be fully utilized (i.e., no over-fertilization), what is the minimum number of acres that would you advise your client to rent?
 

If apply on less than 7955 acres, are over-applying  $P_2O_5$
  - 8) How much in pounds of additional N 1270260,  $P_2O_5$  0, and/or  $K_2O$  136400 must be purchased for these acres in question 7?
 
$$\frac{7955}{898} \text{ acres} \cdot 180 \text{ lbs N/acre} = 1270260 \text{ lbs N}$$

$$\frac{7955}{6250} \cdot 80 \text{ lbs } K_2O/\text{acre} = 136400 \text{ lbs } K_2O$$