

Fertilizer Calculations



LET'S SEE IF WE CAN FIGURE THIS OUT

Four “Finds” in Fertilizer Calculations



- Find the area
- Find the rate (per area)
- Find the amount of nutrient (area * rate)
- Find the amount of fertilizer (nutrient / concentration)

Two Basic Types of Calculations



- You have a given amount of fertilizer and you need to calculate how much nutrient is in it
- You have a given amount of a nutrient to apply and you need to calculate how much fertilizer to use

Memorize and Understand This!



- # of fertilizer * % of nutrient = # of nutrient
 - # of urea * 0.46 #N/#urea = # of N
- # of nutrient / % of nutrient = # of fertilizer
 - # of urea = # of N / 0.46 #N/#urea
- There are **43,560** ft² in 1 acre (ac)
- There are **10,000** m² in 1 hectare (ha)
- **1 ac = 0.4047 ha; thus, 1 ha = 2.471 ac**

Memorize and Understand This!



- **N** = % elemental **Nitrogen**
- **P** = % **P₂O₅** (phosphate) equivalent
 - Elemental **P** = 0.437 * P₂O₅
- **K** = % **K₂O** (potash) equivalent
 - Elemental **K** = 0.83 * K₂O

Converting From Fertilizer to Nutrient :



- How many pounds of N are in a 50# bag of ammonium nitrate (35-0-0)?

$$50 \text{ \#} 35\text{-}0\text{-}0 * 0.35 \text{ \#N} / \text{\#} 35\text{-}0\text{-}0 = \mathbf{17.5 \text{ \#N}}$$

Converting From Nutrient to Fertilizer :



- How many pounds of ammonium nitrate (35-0-0) do you need to give you 5# of N?

$$x \text{ \#35-0-0} = 5 \text{ \#N} / 0.35 \text{ \#N/\#35-0-0} =$$

14.3 # fertilizer

Example #1



- The area of a home lawn is 15,000 ft²
- You want to apply 1#N per 1000 ft² using ammonium sulfate (21-0-0)
- Total amount of N = 1 #N/1000 ft² * 15,000 ft² =
15 #N
- Total fertilizer = 15 #N / 0.21 #N/#21-0-0 =
71# ammonium sulfate

Example 1, more difficult



- You want to apply 1#N per 1000 ft² to the same lawn, using 75% isobutylenediurea (IBDU) and 25% urea
 - $15\text{#N} * 75\% = 11.25\text{#N}$ from IBDU (31 %N)
 - $x \text{#IBDU} = 11.25 \text{#N} / 0.31 \text{#N/#IBDU} =$
36.3 #IBDU
 - $15 \text{#N} * 25\% = 3.75 \text{#N}$ from urea (46 %N)
 - $y \text{#urea} = 3.75 \text{#N} / 0.46 \text{#N/#urea} =$
8.2 #urea

Example 2, Acres



- How much ammonium nitrate (AN) (33-0-0) would you buy for 75 acres if you want to apply a total of 4#N/1000 ft² during the next year, in 4 separate applications? It comes in 50 # bags. How many bags would you order?

Continued



- $4 \text{ \#N/1000 ft}^2 * 43,560 \text{ ft}^2/\text{ac} = \mathbf{174.2 \text{ \#N/ac}}$
- $174.2 \text{ \#N/ac} * 75 \text{ ac} = \mathbf{13,065 \text{ \#N}}$
- $x \text{ \#AN} = 13,065 \text{ \#N} / 0.33 \text{ \#N/\#AN} =$
 $\mathbf{39591 \text{ \#AN}}$
- $39591 \text{ \#AN} / 50 \text{ \#AN/bag} = \mathbf{792 \text{ bags}}$
- $792 \text{ bags} / 4 \text{ applications} = \mathbf{198 \text{ bags/appl.}}$

Example 3



- You are growing 25 acres of tall fescue and plan on applying a total of 160 #N/ac on the following schedule:
 - 80 #N/ac as methylene urea (MU) (39-0-0) on Mar 1
 - 40 #N/ac as 26-4-8 on May 1
 - 40 #N/ac as 26-4-8 on Oct. 1
- Question 1: How much of each fertilizer do you need to order?

Question 1 Calculations:



- First, you apply 80 #N/ac using each fertilizer
- $80 \text{ #N/ac} * 25 \text{ ac} = 2,000 \text{ #N}$
- $2,000 \text{ #N} / 0.39 \text{ #N/#MU} = \mathbf{5,128 \text{ #MU}}$
- $2,000 \text{ #N} / 0.26 \text{ #N/#26-4-8} = \mathbf{7,692 \text{ #26-4-8}}$

Example 3 continued



- You also want to apply 60 #elemental P/ac and 120 #actual K/ac.
- Question 2: How much actual P and K are applied per acre in the 26-4-8 applications?

Question 2 calculations



- There are a couple ways to approach this.
- Figure out how much fertilizer is applied per acre:
 - $7,692 \text{ \#26-4-8} / 25 \text{ ac} = 307.7 \text{ \#26-4-8/ac}$
- Now calculate how much elemental P and K are applied in $307.7 \text{ \#26-4-8/ac}$.

Continued...



- For P: $307.7 \text{ \#26-4-8/ac} * .04 \text{ \#P}_2\text{O}_5/\text{\#26-4-8} =$
 $12.3 \text{ \# P}_2\text{O}_5/\text{ac}$
- $12.3 \text{ \# P}_2\text{O}_5/\text{ac} * 0.437 \text{ \#P}/\text{\#P}_2\text{O}_5 =$ **5.38 \#P/ac**
- To apply a total of 60 #elemental P/ac, need additional 44.62 #P/ac (60 – 5.38) from some other source.
 - Let's use super phosphate (0-20-0).

Continued...



- Need 44.62 #P/ac from 0-20-0 for 25 acres
- How much total P?
 - $44.62 \text{ #P/ac} * 25 \text{ acres} = 1,115.5 \text{ #P}$
- How much 0-20-0 is needed?
 - First calculate the amount of P_2O_5 equal to 1462 #P:
 $1115.5 \text{ #P} / 0.437 \text{ #P}_2\text{O}_5/\text{#P} = 2,553 \text{ #P}_2\text{O}_5$
 - $2,553 \text{ #P}_2\text{O}_5 / 0.20 \text{ #P}_2\text{O}_5/\text{#0-20-0} = 12,765 \text{ #0-20-0}$

Continued...



- Now figure out how much K must be applied:
- Remember we applied 307.7 #26-4-8/ac
- How much elemental K is applied in 307.7 #26-4-8/ac?
 - $307.7 \text{ #26-4-8/ac} * 0.08 \text{ #K}_2\text{O/#26-4-8} = \mathbf{24.62 \text{ #K}_2\text{O}}$
- $24.62 \text{ #K}_2\text{O} * 0.83 \text{ #P/#K}_2\text{O} = \mathbf{20.43 \text{ #K/ac}}$

Continued...



- To apply a total of 120 #elemental K/ac, need 99.57 #K/ac ($120 - 20.43$) from some other source.
 - Let's use KCl (0-0-60)
- How much extra K is needed?
 - $99.57 \text{ #K/ac} * 25 \text{ ac} = \mathbf{2,489 \text{ #K}}$
- Convert from actual K to K_2O :
 - $2,489 \text{ #K} / 0.83 \text{ #K}_2\text{O}/\text{#K} = \mathbf{2,999 \text{ #K}_2\text{O}}$

Continued...



- How much 0-0-60 is needed?:
- $2,999 \text{ \#K}_2\text{O} / 0.60 \text{ \#K}_2\text{O}/\text{\#KCl} =$
4,998 \#KCl