Commercial Nutrient Handler Calculation Review

Review

What does a fertilizer label tell you?

Fertilizer bag reads: 15-10-10

This is the percent N-P (P_2O_5)-K (K_2O) by WEIGHT. If you have a liquid fertilizer you need to know how much it weighs per gallon to be able to figure out how much fertilizer you are applying.

(Actually, the analysis 15-10-10 is the percent N, P_2O_5, K_2O by weight, but the test will **NOT** require you to convert between the oxide forms, P_2O_5 and K_2O, and the elemental forms, P and K. For all of the following examples we will **SAY** P and K but in reality we are calculating P_2O_5 and K_2O)

When you work with a percentage, remember that you need to convert the percentage to a decimal number. For example, the bag of fertilizer reads 15-10-10, you can convert the percentages to decimal numbers as follows:

15% N = 15 % ÷ 100 % = 0.15 *N*

10 % P (P_2O_5) = 10 % ÷ 100 % = 0.10 *P* (P_2O_5)

10 % K (K_2O) = 10 % ÷ 100 % = 0.10 *K* (K_2O)

Sample Questions

1. You have a 70 lb bag of 0-46-0 fertilizer. This bag will supply how many lbs of:

This fertilizer has 0 % N and K (K_2O).

a. N = 0 lbs

$$0\%\ N\ \div 100\% = 0.00\ lbs\ N\ per\ lb\ of\ fertilizer$$

$$0\ lbs\ N\ per\ lb\ fertilizer \times 70\ lbs\ fertilizer = 0\ lbs\ N$$

b. P (P_2O_5) = 32.2 lbs

$$46\%\ P(P_2O_5) \div 100\% = 0.46\ lbs\ P(P_2O_5)\ per\ lb\ fertilizer$$

$$0.46\ lbs\ P(P_2O_5)\ per\ lb\ fertilizer \times 70\ lbs\ fertilizer = 32.2\ lbs\ P(P_2O_5)$$

c. K (K_2O) = 0 lbs

$$0\%\ \text{K}\ (K_2O)\ \div 100\% = 0.00\ lbs\ K(K_2O)\ per\ lb\ of\ fertilizer$$

$$0\ lbs\ K\ (K_2O)\ per\ lb\ of\ fertilizer\ x\ 70\ lbs\ fertilizer = 0\ lbs\ K\ (K_2O)$$

2. You have a 50 gallon tank of 10-15-10. Each gallon weighs 11 lbs. This tank will supply how many lbs of:

a. N = 55 lbs

$$(11\ lbs/gal\ x\ 50\ gal\ tank = 550\ lbs\ fertilizer)$$

$$(10\ \%\ N\ \div 100\% = 0.10\ lbs\ N\ \times 550\ lbsfertilizer = 55\ lbs\ N)$$

b. P (P_2O_5) = 82.5 lbs

$$(11\ lbs/gal\ x\ 50\ gal = 550\ lbs\ fertilizer\ )$$

$$(15\ \%\ P(P_2O_5) \div 100\% =\ 0.15\ P(P_2O_5)\ \times 550\ lbs = 82.5\ lbsP(P_2O_5))$$

c. K (K_2O) = 55 lbs

$$(11\ lbs/gal\ x\ 50\ gal = 550\ lbs\ \ fertilizer)$$

$$(\ 10\ \%\ K(K_2O) \div 100\% = 0.10\ K(K_2O) \times 550\ lbs = 55\ lbs\ K(K_2O))$$

3. You have a 40 lb bag of 10-10-10. This bag will supply how many lbs of:

a. N = 4 lbs

$$(10\%\ N\ \div 100\% = 0.10\ lbs\ N\ per\ lb\ fertilizer\ \times 40\ lb\ of\ fertilizer = 4.0\ lbs\ N)$$

b. P (P_2O_5) = 4 lbs

$$(10\%\ P(P_2O_5) \div 100\% =\ 0.10\ lbs\ P(P_2O_5)\ per\ lb\ fertilizer \times 40\ lbs\ of\ fertilizer = 4.0\ lbs\ P(P_2O_5))$$

c. K (K_2O) = 4 lbs

$$(10\%\ \mathrm{K}\ (K_2O) \div 100\% =\ 0.10\ lbs\ \mathrm{K}\ (K_2O)\ per\ lb\ fertilizer \times 40\ lbs\ of\ fertilizer = 4.0\ lbs\ \mathrm{K}\ (K_2O))$$

Review

When we calculate the amount of fertilizer needed to supply a certain amount of N, P(P_2O_5), or K(K_2O), we need to know:

a. How much N, P(P_2O_5) or K(K_2O) is needed per unit area (1,000 square feet, acre, etc.)
b. The analysis of the fertilizer (percent N, P(P_2O_5) , and K(K_2O))
c. How much fertilizer do we need per unit area? Divide #1 by the percentage given in #2. Note that 10% would be 0.10!!
d. How much area we need to fertilize.

Take this example: you are told you need to apply 2 lbs of N per 1,000 square feet, that the fertilizer you have available is a 30-0-0, and that you are going to fertilize 150,000 square feet. The easiest way to calculate this:

Step 1. How much N do we need? We need 2 lbs per 1,000 square feet

Step 2. What is the fertilizer analysis? It is a 30-0-0, which means it is 30% N by weight (or 0.30)

Step 3. How much fertilizer do we need per 1,000 square feet? Divide 2 by 0.30 (30%), which gives you 6.66 lbs of fertilizer per 1,000 square feet.

Step 4. How much area are we fertilizing? We have a total of 150,000 square feet, which means that we multiply by 6.66 lbs by 150, giving a final answer of 1,000 lbs of fertilizer.

Sample Questions

5. You need to apply 2 lbs of N per 1,000 square feet. You have a 15-10-10 fertilizer available, and the total area to be fertilized is 3 acres. How much fertilizer will you need? (Given: an acre is 43,560 square feet)

Step 1. How much N do we need? We need 2lbs of N per 1,000 square feet

Step 2. What is the fertilizer analysis? It is 15-10-10

Step 3. How much fertilizer do we need?

$$2\ lbs\ of\ N\ per\ 1000\ sqft\ \div\ 0.15\ lbs\ N\ per\ lb\ fertilizer$$
$$= 13.3\ lbs\ of\ 15-10-10\ per\ 1{,}000\ sqft$$

Step 4. How much area are we fertilizing?

$$\frac{43{,}560\ sq\ ft}{1\ acre} \times 3\ acres = 130{,}680\ sq\ ft$$

Final Answer

$$130{,}680\ sq\ ft\ \div 1000\ sq\ ft = 130.68\ \times 13.3\ lbs\ of\ 15-10-10\ = 1{,}738\ lbs\ 15-10-10$$

6. You need to apply 60 lbs of N, 50 lbs of P (P_2O_5), and 65 lbs of K (K_2O) per acre. If DAP fertilizer (which is 18-46-0) is used to supply the phosphorus recommendation, how many lbs per acre of urea (which is 46-0-0) will be needed to meet the nitrogen recommendation? How much potassium oxide (0-0-60) will be needed to meet the K requirement?

Step 1. How much N, P (P_2O_5) and K (K_2O) do we need? We need 60lbs of N, 50lbs of P (P_2O_5) and 65 lbs of K(K_2O) per acre

Step 2. What are the fertilizer analyses? We have 18-46-0, 46-0-0 and 0-0-60

Step 3. Which analysis should we start with? We start with 18-46-0 because it supplies N and P (P_2O_5). This is the only source of P (P_2O_5) so this formulation should be used to meet the whole P (P_2O_5) requirement. This formulation will also supply N.

$$50\ lbs\ of\ P\ (P_2O_5) per\ acre\ \div\ 0.46\ lbs\ P(P_2O_5)\ = 108.69\ lbs\ of\ 18-46-0$$

$$108.69\ lbs\ \times\ 0.18\ lbs\ N\ =\ 19.56\ lbs\ of\ N\ with\ 18-46-0$$

Step 4. How much additional N is needed and which formulation will be used to supply it?

$$60\ lbs\ of\ N - 19.56\ lbs\ of\ N\ from\ 18-46-0 = 40.44\ lbs\ of\ N\ still\ needed$$

$$40.44\ lbs\ of\ N\ per\ acre \div 0.46\ N = 87.9\ lbs\ of\ 46-0-0\ to\ supply\ remaining\ N$$

Step 5. Which formulation will we use to supply the K(K_2O) and how much will be needed?

$$65\ lbs\ of\ \mathrm{K}(K_2O) per\ acre\ \div 0.60\ K(K_2O) = 108.3\ lbs\ of\ 0-0-60$$

Final Answer

108.69 lbs per acre of 18-46-0
87.9 lbs per acre of 46-0-0
108.3 lbs per acre of 0-0-60

7. A fertilizer spreader has an application width of 7 feet. A 100-foot long area is used for calibration of a 25-5-3 fertilizer. If 5 lbs of fertilizer is collected from this calibrations area, what is the rate of potassium that is being applied per acre with this fertilizer? (Given: an acre is 43,560 square feet)

Step 1. How much K (K_2O) is in the 5 lbs of fertilizer that was collected?

$$5\ lbs\ \times\ 0.03\ lbs\ K\ (K_2O) = 0.15\ lbs\ K(K_2O) is\ delivered\ from\ 25-5-3$$

Step 2. Calculate square footage and acreage of application area.

$$7\ feet \times\ 100\ feet = 700\ sq\ ft\ of\ collection\ area$$

Step 3. How what is the rate of potassium per acre?

$$43{,}560\ sq\ ft\ per\ acre \times \frac{0.15\ lbs\ K\ (K_2O)}{700\ sq\ ft\ collection\ area} = 9.33\ lbs\ of\ K(K_2O) per\ acre$$

Final Answer

9.33 lbs of K (K_2O) per acre

8. An organic material that contains 4% total nitrogen is applied to the soil at a rate of 60 pounds per 1,000 square feet. The nitrogen recommendation is 4 pounds of available nitrogen per 1,000 square feet. If it is assumed that 60% of the nitrogen in the organic material (i.e. manure) will mineralize to available nitrogen for this crop, how many pounds per 1,000 square feet of ammonium sulfate (which is 21-0-0) should be applied to meet the nitrogen recommendation?

Step 1. Calculate how much Total N is in the organic material

$$60\ lbs\ of\ material\ per\ 1000\ square\ feet\ \times\ 0.04\ Total\ N$$
$$= 2.4\ lbs\ of\ Total\ N\ per\ 1000\ square\ feet$$

Step 2. Calculate how much N will be available for the crop from the organic material

$$2.4\ lbs\ of\ Available\ N\ per\ 1000\ square\ feet\ \times 0.60$$
$$= 1.44\ lbs\ of\ Available\ N\ per\ 1000\ square\ feet$$

Step 3. Calculate how much additional N is need from the 21-0-0?

$$4\ lbs\ of\ \text{Available N}\ per\ 1000\ square\ feet$$
$$- 1.44\ lbs\ of\ Available\ N\ per\ 1000\ square\ feet =$$

2.56 lbs of N per 1000 square feet is still needed

Step 4. Calculate how much 21-0-0 is needed

$$2.56\ lbs\ of\ N\ per\ 1000\ square\ feet\ \div 0.21$$
$$= 12.1\ lbs\ of\ 21-0-0\ per\ 1000\ square\ feet$$

Final Answer

$$12.1\ lbs\ of\ 21-0-0-\ per\ 1000\ square\ feet$$