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Calculations For Fertilizer Blends To Meet Soil Test Recommendations

Carl Fanning
Extension Soil Specialist

Arithmetic for calculating fertilizer blends that meet soil test recommendations is straight forward. These calculations can also be used to compare alternate product costs in a fertilizer blend.

Those with access to a computer can perform these calculations using Fertalt, Fertcost or Fertsimp, software packages available through NDSU.

The calculations are simple and can be made quickly with a hand held calculator. Calculations are simplified and errors reduced when a chart is prepared and a sequence of steps is followed. Examples are given in tables 1 and 2.

These steps tabulate total product needs and costs on an acre basis. Alternate products or product blend costs can be readily compared.

Table 1. Sample Chart Format For Fertilizer Calculations

Fertilizer Product	Cost Analysis $/T*	#/A	$/A	Nutrients (lb/A) N	P_2O_5	K_2O	Cl
(Soil Test Recommendations)				(72)	(43)	(40)	(50)
18-46-0	250.00	94	11.75	16.9	43		
46-0-0	180.00	120	10.80	55.1			
0-0-60	138.00	106	7.31			64	50
	Total	320	29.86	72	43	64	50

* Local fertilizer product cost.

Table 2. Progressive Calculation Steps to Obtain Values in Table 1.

Fertilizer Product	Cost Analysis $/T	#/A	$/A	Nutrients (lb/A) N	P_2O_5	K_2O	Cl
(Soil Test Recommendation)				(72)	(43)	(40)	(50)
18-46-0	250.00	B	C	D	A		
46-0-0	180.00	F	G	E			
0-0-60	138.00	I	J			K	H
	Total						

Progressive Calculations:

A. 43 pounds/acre phosphorus - This is to be obtained from 18-46-0 (diamonium phosphate) that costs $250/ton. The product also contains nitrogen. Calculation D will identify the amount of nitrogen received when 43 pounds of phosphorus is obtained.

B. 94 pounds/acre of 18-46-0 is required to provide 43 pounds P_2O_5 per acre.

Calculation: $$\frac{\text{Amount Needed}}{P_2O_5 \text{ in } 18\text{-}46\text{-}0} = \frac{43\#}{.46} = 94\#$$

C. $11.75; the cost for 94 pounds of 18-46-0

Calculation: $$\frac{94\# \times \$250.00/T}{2000\ \#/T} = \$11.75$$

D. 16.9 pounds nitrogen; the amount of nitrogen obtained from 94 pounds of 18-46-0 when the product was used to get 43 pounds/acre phosphorus.

Calculation: $94\# \times .18 = 16.9\#$
(wt. 18-46-0 x nitrogen in 18-46-0)

E. 55.1 pounds nitrogen; Remaining nitrogen needed from another nitrogen source.

Calculation: $72 - 16.9 = 55.1$

F. 120 pounds 46-0-0; the amount of 46-0-0 (urea) required to provide 55.1 pounds nitrogen.

Calculation: $$\frac{55.1\#}{.46} = 120\#$$

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G. $10.80, the cost for 120 pounds of 46-0-0.

Calculation: $$\frac{120\# \times \$180.00/T}{2000\ \#/Ton} = \$10.80$$

H. 50 pounds chloride per acre - This is available from murate of potash (KCl), 0-0-60. This product contains 60% K_20 and 47% chloride.

Note: The potassium content (K) in murate of potash (KCl) has historically been measured as % K_20 for fertilizer applications.

I. 106 pounds 0-0-60; the amount of 0-0-60 required to provide 50 pounds per acre chloride.

Calculation: $$\frac{\text{Amount needed}}{\text{Chloride in 0-0-60}} = \frac{50\#}{.47} = 106\#$$

J. $6.89; the cost for 106 pounds of 0-0-60.

Calculation: $$\frac{106\# \times \$138.00/T}{2000\#/T} = \$7.30$$

K. 64 pounds K_20; Potassium received when 106 pounds of 0-0-60 was used as a chloride source to obtain 50 pounds per acre chloride.

Calculation: $106\# \times .60 = 64\#$

Note: The potassium soil test recommendation level is exceeded in this example. Excess potassium is not harmful.

One ton Fertilizer Mix

Fertilizer blends are purchased by the ton. The rates per acre calculated in Table 1 extrapolates to ton blend rates and costs as shown in Table 3.

Table 3. Calculating Rates For A Ton Of Fertilizer Blend From Rate/Acre Needs

Fertilizer Product	$/Ton	#/A		#/Ton	$/A		$/Ton
18-46-0	250.00	94 x (6.25)	=	588	11.75 x (6.25)	=	73.43
46-0-0	180.00	120 x (6.25)	=	750	10.80 x (6.25)	=	67.50
0-0-6	138.00	106 x (6.25)	=	662	7.31 x (6.25)	=	45.68
	Total	320		2000	29.86		186.61

The constant (6.25) will vary with each product mix. It is found with the following relationship:

$$\frac{2000\#/Ton}{320\#/A} = 6.25$$

Fertilizer Analysis Calculations

The fertilizer analysis for the ton mix is identical with the ratio in the acre rate blend. In the example used the analysis is (22.5 N - 13.4 P_2O_5 - 20 K_2O - 15.6 Cl).

The fertilizer analysis is calculated as following:

$$\frac{\text{Nutrient (\#/A)}}{\text{Total Mix Weight (\#/A)}}$$

The arithmetic used divides the nutrient needed by the total fertilizer mix weight required; ie.,

$$\frac{72\ N}{320} = 22.5\ N \qquad \frac{64\ K_2O}{320} = 20\ K_2O$$

$$\frac{43\ P_2O_5}{320} = 13.4\ P_2O_5 \qquad \frac{50\ Cl}{320} = 15.6\ Cl$$

Sample Chart - Fertilizer Calculations

Fertilizer Product	$/T	#/A	$/A	N	P_2O_5	K_2O	Cl	Other Nutrients	
(Soil Test Recommendations)				( )	( )	( )	( )	( )	( )
TOTAL:									

Sample Chart - Fertilizer Calculations

Fertilizer Product	$/T	#/A	$/A	N	P_2O_5	K_2O	Cl	Other Nutrients	
(Soil Test Recommendations)				( )	( )	( )	( )	( )	( )
TOTAL:									

Sample Chart - Fertilizer Calculations

Fertilizer Product	$/T	#/A	$/A	N	P_2O_5	K_2O	Cl	Other Nutrients	
(Soil Test Recommendations)				( )	( )	( )	( )	( )	( )
TOTAL:									

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