It's in the Bag . . .

FERTILIZER What's It Worth?

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CONFUSED with such semiscientific terms as "formula, ratio, rate, and demands"?

Let's review some facts about fertilizers. Plants remove nutrients at varying rates. For example, Kentucky bluegrass turf will deplete soil nutrient reserves at the rate of about 150 lbs. of nitrogen, 50 lbs. of phosphorus, and 100 lbs. of potassium per acre each year, with between two and three tons of clippings.

Mixed landscape tree leaves show a dry weight composition of approximately 0.75% nitrogen, 0.16% phosphorus, and 0.3% potassium. In both of these instances, it may be noted that the ratio is approximately 3:1:2 of nitrogen to phosphorus to potassium. What ratio are you using to replace these losses?

The Institute of Maintenance Research recommends a 3:1:2 ratio through a 22:7:15 or 24:8:16 fertilizer. Why? Because it gives us the desired ratio and application rate without too much labor.

Table 1. How Much Actual Ingredient Are You Buying? Pounds of Actual N, P_2O_5, or K_2O per Bag.

When Nutrient Formula % Is:	25 Lb. Bag	40 Lb. Bag	50 Lb. Bag	80 Lb. Bag	100 Lb. Bag
1%	0.25	0.4	0.5	0.8	1.0
3%	0.70	1.2	1.5	2.4	3.0
4%	1.00	1.6	2.0	3.2	4.0
5%	1.25	2.0	2.5	4.0	5.0
6%	1.50	2.4	3.0	4.8	6.0
10%	2.50	4.0	5.0	8.0	10.0
16%	4.00	6.4	8.0	12.8	16.0
21%	5.25	8.4	10.5	16.8	21.0
22%	5.50	8.8	11.0	17.6	22.0
24%	6.00	9.6	12.0	19.2	24.0
34%	8.50	13.6	17.0	27.2	34.0
44%	11.00	17.6	22.0	35.2	44.0
60%	15.00	24.0	30.0	48.0	60.0

Check the left hand column against the fertilizer package formula—read across to the right to find actual quantity of specific nutrient in bag (top row) of either N—P_2O_5 or K_2O.

Table 2. How Much Fertilizer Do You Really Need to Get a Desired Coverage? Use This Amount per 1,000 Sq. Ft. for Indicated Formulation Percent.

To Get This Pound Rate 1000 Sq. Ft.	1%	4%	6%	10%	16%	21%	24%	34%	44%	51%	60%	To Get This Rate/Acre (Close Approx.)
0.25	25	6.25	4.17	2.5	1.56	1.20	1.04	.74	.57	.49	.42	10.89
0.5	50	12.50	8.33	5.0	3.13	2.38	2.08	1.47	1.14	.98	.83	21.78
1.0	100	25.00	16.70	10.0	6.25	4.76	4.16	2.94	2.27	1.96	1.67	43.56
1.5	150	37.50	25.00	15.0	9.37	7.14	6.25	4.41	3.41	2.94	2.50	65.34
2.0	200	50.00	33.30	20.0	12.50	9.50	8.33	5.88	4.54	3.93	3.33	87.12
3.0	300	75.00	50.00	30.0	18.75	14.28	12.50	8.82	6.81	5.88	5.00	130.68
4.0	400	100.00	66.70	40.0	25.00	19.04	16.67	11.76	9.09	7.84	6.67	174.24
5.0	500	125.00	83.30	50.0	31.25	23.80	20.80	14.70	11.36	9.80	8.33	217.80
10.0	1000	250.00	166.70	100.0	62.50	47.60	41.60	29.40	22.07	19.60	16.67	435.60

Where total nutrient need is indicated (check left column chart # 2), read across top row to formulation % column as listed. Chart will then give you the *total quantity of material needed* to give the actual quantity desired (in lbs/1000 sq. ft.)

Compare liquid fertilizers purchased in 5-gal. cans with the same material purchased in 1-gal. cans: If one 5-gal. can is bought instead of five 1-gal. cans and two minutes more are spent each time the 5-gal. can is handled, as opposed to the 1-gal. can, and if the 5-gal. can is handled 12 times for each gallon of fertilizer for a total of 60 times, then two hours are being wasted in handling. At $2.50 per hour for labor, you could afford to pay $1.00 more per gallon to get the material in the smaller size. Then consider convenience, safety, etc.

Table 3. What is Extra Labor Costing You? Compare Labor Expended to Cash Lost.

Annual Salary	**$2500.00**	**3000.00**	**3500.00**	**4000.00**	**4500.00**	**5000.00**	**5500.00**	**6000.00**
Hourly Equivalent	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**2.75**	**3.00**
Cents per Minute	**2.08**	**2.50**	**2.91**	**3.33**	**3.75**	**4.16**	**4.59**	**5.00**
Extra Minutes Lost in Waiting or Handling	**Minimum Cost To Be Added To Actual Cost (To Nearest ¢)**							
1 min.	.02	.02	.03	.03	.04	.04	.05	.05
2 min.	.04	.05	.06	.07	.07	.08	.09	.10
3 min.	.06	.07	.09	.10	.11	.12	.14	.15
4 min.	.08	.10	.12	.13	.15	.17	.18	.20
5 min.	.10	.12	.15	.17	.19	.21	.23	.25
7 min.	.15	.17	.20	.23	.26	.29	.32	.35
10 min.	.20	.25	.29	.33	.37	.42	.46	.50
20 min.	.40	.50	.58	.67	.75	.83	.92	1.00
50 min.	1.00	1.25	1.45	1.66	1.95	2.08	2.29	2.50

These Figures Based on 250 Eight Hour Days per Year or 2000 Working Hours per Year

with 2 lbs. actual nitrogen applied in midwinter and 1 lb. applied around Labor Day.

Check your fertilizer for actual ingredients, along with ratios and rates, in the accompanying tables and formulas. Check these to compare the value of your materials with others. Comparative values of different formulations can be confusing when you have both actual pounds of nutrient and percent figures to contend with. These tables and formulas let you compare products competitively.

Tables 1 and 2 provide actual quantity of specific nutrients in fertilizers and total quantity of material needed to obtain a desired coverage. Actual cash values of these nutrients will require checking into retail selling prices for your area.

For rough formulation evaluation, compute the price per pound of actual nitrogen (N), phosphate (P_2O_5), or potash (K_2O). This is done by dividing the cost of material per 100-lb. bag by the percent of material in the bag. Sample percentages are given below:

Ammonium sulfate	21%	N
Ammonium nitrate	34%	N
Blood meal	13%	N
Muriate of potash	60%	K_2O
Potassium sulfate	51%	K_2O
Triple superphosphate	44%	P_2O_5

For example: What is the cost per pound of actual nitrogen in an 80-lb. bag of ammonium sulfate? Based on local retail price, the bag would cost about $3.95. Divide this by 21% of 80 lbs., or the amount of actual nitrogen in the bag. This figure, which can be obtained from Table 1, is 16.8 lbs. Therefore:

$$\frac{\$3.95}{16.8 \text{ lbs.}} = 23.5¢ \text{ per lb.} = \text{cost of actual nitrogen}$$

In general, it will be found that nitrogen costs about three times as much as potash, and that phosphate costs about twice as much as potash. This gives N a value of about 24¢, P_2O_5 a value of 16¢, and K_2O a value of about 8¢.

The approximate worth of materials in 100 lbs. of 10:6:4 fertilizer would then be: 10x24¢ + 6x16¢ + 4x8¢ or $2.40 + $.96 + $.32 = $3.68. When thinking of mixing your own, don't forget to add costs of mixing, packaging, warehousing, and labor of handling bulk over packaged fertilizers (see Table 3).

For a more exact cost determination, price out all basic ingredients to cents-per-pound and insert into this formula:

XA + YB + ZC = value of 100 lbs. of mix
X = cost/lb. of actual N
Y = cost/lb. of P_2O_5
Z = cost/lb. of K_2O
A = % of N in formulation
B = % of P_2O_5 in formulation
C = % of K_2O in formulation

*Actual cost figures then become:
X (23.5¢) x A (10) = $2.350
Y (16.9¢) x B (6) = 1.014
Z (7.9¢) x C (4) = .316
$3.68

Or, a value of $3.68 for raw materials in 100 lbs. of the fertilizer mix—close either way it's computed. A little pencil-and-paper work with these charts and formulas can remove a great deal of confusion and save many dollars in wasted expenses. Remember, consider labor costs, too, if mixing your own fertilizer.

Also, when thinking of fertilizers, be sure you are supplying your plants with the materials they need. Many established landscapes and turf areas can benefit from added iron and trace elements. If these are to be included in the fertilizer mix, add approximately 75¢ to the value of a 50-lb. bag.

Let's follow through with a fertilizer problem:

Fertilizer A is a 6:22:16 mix, sells for $7.50 per 50-lb. bag, and is listed to cover 10,000 sq. ft.

Fertilizer B is a 22:7:15 mix, sells for $7.95 per 50-lb. bag, and is also listed to cover 10,000 sq. ft.

*Based on the Salt Lake City, fall 1966 list prices.

Problem: 25,000 sq. ft. of turf needs a 3:1:2 fertilizer, applied at 2 lbs. actual N per 1,000 sq. ft.

From Table 2, we find that fertilizer "A" will require 33.3 lbs. of material to provide 2 lbs. of nitrogen. Multiply 33.3 lbs. by 25 (thousand square feet to be covered). This gives 832.5 for the total pounds of "A" required. Thus, 17 50-lb. bags of "A" would be needed at a cost of $127.50.

Fertilizer "B" will require 9.5 lbs. of material to yield 2 lbs. of nitrogen. Multiply 9.5 by 25, which gives 237.5 for the total pounds of "B" required. Only five 50-lb. bags of "B" would be needed at a cost of $39.75, a savings of $87.75 over fertilizer "A", not including the additional savings in labor from handling 600 lbs. less material.

Also, if "A" had been selected, an excessive buildup in phosphate and potash reserves would have resulted. Cutting the quantity would only have caused a shortage of nitrogen.

Do You Consider These Factors Before Buying Fertilizers?

1. Fertilizers vary greatly in price because of *nutrient content, ingredients, form, added materials, and package size.* Are the more expensive products worth the additional cost? After considering these factors, you may decide they are. Or, you may decide that the least expensive fertilizer is satisfactory for your needs.

2. *Nutrient content.* Products containing a high percentage of plant nutrients cost more per pound than those containing a smaller percentage of nutrients. For example, 1 lb. of 10-20-10 contains the same amount of nutrients as 2 lbs. of 5-10-5. But, an 80-lb. bag of 10-20-10 may cost only one-third more than an 80-lb. bag of 5-10-5. For greatest economy, buy fertilizer for its weight of nutrients, not its total weight.

3. *Ingredients.* Products containing slowly available forms of nitrogen (as ureaform and other organic sources) cost more per pound than those containing quickly available forms. Before plants can make use of the nitrogen in a fertilizer mixture, the nitrogen source material must break down into soluble forms, nitrates or, in some cases, ammonia. More expensive forms of nitrogen break down slowly and release nitrogen to plants over a long period of time. Less expensive nitrogen fertilizers are already in available form; they can be used by plants immediately.

4. *Form.* Pelleted or granular fertilizers, and soluble fertilizer concentrates cost more than powdered materials. However, they may be a lot more convenient to use. Powdered fertilizers can be objectionable because they are too dusty, particularly on windy days. They may become damp, and cake, and fail to feed evenly through fertilizer spreaders. And they may stick to plant foliage, causing fertilizer burn. On the other hand, pelleted materials spread readily and roll off plant foliage, reducing burn hazard. Fertilizer concentrates, mixed with water, are readily available to plants, and some nutrients are absorbed by plant leaves. Because materials are considerably diluted in application, there is little danger of damaging foliage.

5. *Added materials.* Adding trace elements, insecticides, or weed killers to fertilizers increases their cost. Usually, these added components cost more when bought in combination products than when bought separately. Combinations may be more convenient to use since only one application is necessary. However, their misuse can kill desirable plants or make soil unproductive.

   Trace elements (more properly, micronutrients) are essential to plant growth, but are needed only in very small amounts. Known micronutrients are iron, manganese, zinc, copper, molybdenum, boron, and chlorine. There may be others. Do not apply trace elements routinely; an overabundance may be toxic to plants.

   Combinations of fertilizer with insecticides or herbicides are generally designed for lawn use. They may be satisfactory *if* the proper season for applying both fertilizer and pesticide is the same, and *if* nutrient content and pesticide concentration are so adjusted in combination that both are applied at the proper rate.

6. *Package size.* Fertilizer in small containers costs more per pound than the same product in larger containers. Packaging costs account for much of the expense of fertilizer merchandising. Paying the higher rate for smaller containers is justified if only a small amount is needed, if the ease and time saving of handling smaller packages is enough of an advantage, or if storage of large packages is a problem.

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