



How to Convert an Inorganic Fertilizer Recommendation to an Organic One

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Successful production of any crop begins with the soil. A fertile, biologically active soil provides plants with most of the nutrients needed for good growth. Fertilizers can supplement or renew these nutrients, but they should be added only when a soil test indicates the levels of available nutrients in the soil are inadequate for proper plant growth and high yields.

Whether you are growing annuals or perennials, vegetables or flowers, most crops have a few short months to grow and develop flowers and fruits. The soil must provide a steady, uninterrupted supply of readily available nutrients for maximum plant growth. Fertilizer form, particle size, solubility, the amount applied and the potential uptake are important factors in providing fertility for successful growth.

Many farmers and gardeners use natural minerals and organic fertilizers rather than synthetic ones to build their soil. If you use organic materials as all or part of your fertilization program, this publication will help you calculate the proper amount to use from the recommendations provided by a soil test.

Certified Organic growers use fertilizers that meet standards in the National List by the USDA National Organic Program (www.ams.usda.gov/nop). The Organic Materials Review Institute (OMRI – www.OMRI.org), a private organization, evaluates and endorses products that meet these standards. If you are a Certified Organic grower, you should always check with your certifier before using new products.

Organic Matter

Organic matter consists of a wide variety of carbon-containing compounds in the soil. It is created from plant debris, roots, microbes and other organisms that live in the soil. Organic matter provides energy and a food source for biological activity. Many nutrients are held in organic matter until soil microorganisms decompose the materials and release them for plant use. This is an important point, because although organic growers add fertilizer in an organic form, the nutrients have to be converted to an inorganic form before they are available for plant use. For example, nitrogen in an organic fertilizer can be in the form of a protein (the organic form) that must be converted to ammonium and/or nitrate before it can be taken up by plants.

Organic matter also helps attract and hold plant nutrients, reducing the amount lost through leaching. It improves the soil structure so that air reaches plant roots and also aids in retaining soil moisture. Because organic matter has such a strong influence on the chemical, biological and physical properties of the soil, building and maintaining soil organic matter is central to organic production.



Georgia soil with high organic matter content.

Fertilizer Labels – What They Mean

Georgia law requires fertilizer producers to display the guaranteed analysis or grade on a label on the fertilizer container. A fertilizer grade or analysis that appears on the bag gives the percentages of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) in the material. A 5-10-15 grade fertilizer contains 5 percent N, 10 percent P_2O_5 and 15 percent K_2O . A 50-pound bag of 5-10-15 fertilizer contains 2.5 pounds of N ($50 \times 0.05 = 2.5$), 5 pounds of P_2O_5 ($50 \times 0.10 = 5$) and 7.5 pounds of K_2O ($50 \times 0.15 = 7.5$).

The fertilizer ratio is the ratio of the percentages of N, P_2O_5 and K_2O in the fertilizer mixture based on the nutrient present in the smallest percentage. Examples of a 1-1-1 ratio fertilizer are 10-10-10 and 8-8-8. These fertilizers have equal amounts of nitrogen, phosphate and potash. An example of a fertilizer with a 1-2-3 ratio is 5-10-15. This fertilizer would have twice as much phosphate and three times as much potash as nitrogen.

Fertilizer Recommendations

Although different crops have different nutrient needs, in general, crops need major nutrients in an approximate ratio of 4-1-2 (N- P_2O_5 - K_2O). Because soils differ in their ability to supply nutrients and because the proportion of N, P_2O_5 and K_2O in any given organic fertilizer does not usually match the proportions a crop needs, it is rare to be able to supply all plant nutrient needs from only one organic material. Consequently, most organic fertilizers are used in combinations. Table 1 lists commonly available organic fertilizers and the usual proportions of N, P_2O_5 and K_2O .

There are no one-size-fits-all fertilizer recommendations. All fertilizer recommendations should take into consideration soil pH, residual nutrients and inherent soil fertility as well as the needs of the crop to be grown. Fertilizer recommendations based on soil analyses are the best chance for getting the right amount of fertilizer without over- or under-fertilizing and result in the most efficient use of lime and fertilizer materials. This efficiency can occur only when valid soil sampling procedures are used to collect the samples submitted for analyses. To be beneficial, a soil sample must reliably represent the field, lawn, garden or “management unit” from which it is taken. Information on how to take a representative soil sample is referenced in the back of this publication. If you have

other questions about soil sampling, contact your local county Extension office for more information.

Soil test results do not include nitrogen because the amount of plant-available nitrogen in soils can change quickly due to unpredictable weather conditions such as heavy rainfall. Consequently, tests of plant-available nitrogen taken weeks ahead of planting are not reliable and do not correlate well with crop yields. Instead, inorganic nitrogen fertilizer recommendations are based on many research trials of crop yield response to nitrogen fertilizer rates. These trials and the resulting recommendations *do not account for nitrogen available from a previous cover crop* because nitrogen from cover crops varies from season to season. Nitrogen fertilizer rates should be reduced by the amount of nitrogen available from a cover crop. This is called nitrogen credit. A quick estimate of nitrogen credits from a cover crop can be made using the calculations found on pages 22-23 of “Managing Cover Crops Profitably” (see Reference section).

pH

An underlying cause of poor fertility in Georgia is acidic soil. Soil pH strongly influences plant growth, nutrient availability and microorganism activity in the soil. It is important to keep soil pH in the proper range to obtain the best yields and high-quality growth. A pH that is too low or too high can cause nutrients to become unavailable to plants.

The best pH range for most plant growth is 6.0 to 7.0. There are some exceptions, including Irish potatoes, blueberries and rhododendrons, which grow well at pHs of approximately 5.5, less than 5.0 and around 5.5, respectively.

Most soils in Georgia are naturally acidic. Limestone that contains calcium and magnesium carbonates, which increase soil pH, must be applied to keep the soil pH in the proper range. A soil test is essential for determining how much limestone should be applied. This type of testing should be conducted at least every two years.

Calcium does not move quickly down through the soil profile. If lime is recommended for vegetable crop production, in most cases, limestone should be broadcast and thoroughly incorporated to a depth of 6 to 8 inches before planting to neutralize the soil acidity in

the root zone. For farmers using no-till, lime can be surface applied regularly to maintain pH. For best results, limestone should be applied two to three months before seeding or transplanting. However, liming can still be beneficial if applied at least one month before seeding or transplanting.

There are two types of limestone. One is composed primarily of calcium materials and is referred to as calcitic limestone. The second, known as dolomitic limestone, contains both calcium and magnesium. Your soil test will indicate which limestone is most suitable for your situation. If plant-available magnesium levels in the soil are low, dolomitic limestone is preferred.

Environmental Effects on Organic Nutrient Uptake

Soil Temperature – Early spring in Georgia is cool and soil temperatures rise slowly to the point where microorganisms are active. Until the soil warms sufficiently and the organic fertilizer materials are broken down into their usable form, these fertilizers may not successfully stimulate plant growth.

Soil Moisture – In addition to warmer temperatures, soil microorganisms need a moist soil to grow and thrive. If rainfall is not adequate, crops may need to be irrigated for good nutrient release.

Calculating Organic Fertilizer Needs

Soil test reports give fertilizer recommendations in three ways. The first, generally used by larger commercial farms, gives the nutrients needed for a particular crop in pounds per acre (lbs/ac). The second, generally used for smaller farms or larger gardens, gives a particular fertilizer grade or combination of grades that should be used per 1,000 square feet (sq. ft.). The third gives fertilizer grades per 100 feet of row. Examples of how to make conversions in each of these cases are included below.

Because a combination of organic fertilizers is usually needed, the conversion process has several steps. In general, start with the most complex organic fertilizer, such as compost and animal manures (e.g., poultry litter). Many organic growers use these as a fertilizer base. These fertilizers will contain amounts of all three major nutrients – N, P and K – as well as micronutrients; however, the amount of nutrients in a given animal manure or compost is variable, so these materials should be analyzed. The amount of moisture in animal manures and composts can greatly affect the amount of nutrients applied. The University of Georgia reports nutrient content based on the moisture in the sample as it was received; consequently, these numbers do not have to be corrected for moisture content.

If you don't have the animal manures and composts tested, approximate values for N, P_2O_5 and K_2O are listed in Table 1. When using these materials as a fertilizer base, calculate how much N, P_2O_5 and K_2O are supplied by these materials, then supplement nutrients from other sources as needed for a particular crop.

See Examples 1-4 on the following pages.

Example 1: Conversion for Farms on an Acre Basis

Farmer Jolene receives a soil test report for Plot 1 that indicates the soil organic matter is 1.5%, the pH is 6.0, the soil test P is medium and the soil test K is low. She will be growing peppers in this section next spring. The soil test fertilizer recommendations call for: 150 lbs/acre of N, 80 lbs/acre of P_2O_5 and 120 lbs/acre of K_2O . She usually applies 1 ton of poultry litter compost (3-4-3) over her 1-acre plot and tills it in to build organic matter.

Step 1. Calculate the amount of nutrients provided by the compost.

$$2,000 \text{ lbs compost (1 ton)} \times 0.03 \text{ (percent N)} = 60 \text{ lbs Total N}$$

- Adjust total N provided by compost for the amount that will be available during that growing season, usually about 10%.

$$60 \text{ lbs Total N} \times 0.1 = 6 \text{ lbs}$$

$$2,000 \text{ lbs compost (1 ton)} \times 0.04 \text{ (percent } P_2O_5) = 80 \text{ lbs } P_2O_5$$

$$2,000 \text{ lbs compost (1 ton)} \times 0.03 \text{ (percent } K_2O) = 60 \text{ lbs } K_2O$$

- Nutrients supplied by compost are: 6 lbs N, 80 lbs P_2O_5 and 60 lbs K_2O

Step 2. Subtract nutrients supplied by the compost from the nutrients needed.

$$150 \text{ lbs N} - 6 \text{ lbs N} = 144 \text{ lbs N}$$

$$80 \text{ lbs } P_2O_5 - 80 \text{ lbs } P_2O_5 = 0 \text{ lbs } P_2O_5$$

$$120 \text{ lbs } K_2O - 60 \text{ lbs } K_2O = 60 \text{ lbs } K_2O$$

- Here, the compost supplies all of the P_2O_5 needed. Additional nutrients needed by plants are 144 lbs N and 60 lbs K_2O .

Step 3. Pick an additional organic fertilizer to supply the rest of the needed nutrients.

The greatest fertilizer need is for N. Consequently, Jolene wants a fertilizer with a fairly high N content that can also supply K_2O . She picks a commercially available OMRI product with an 8-5-5 content. Remember, this will supply 8 lbs of N, 5 lbs of P_2O_5 and 5 lbs of K_2O per 100 lbs of fertilizer.

- Jolene decides to apply enough of this fertilizer to supply the K_2O needs.

$$\begin{aligned} \text{lbs of fertilizer needed} &= 60 \text{ lbs } K_2O / (5 \text{ lbs } K_2O / 100 \text{ lbs fertilizer}) \\ &= 60 \text{ lbs } K_2O / 0.05 \\ &= 1,200 \text{ lbs of fertilizer} \end{aligned}$$

- How much N and P_2O_5 will be added?

$$N: 1,200 \text{ lbs fertilizer} \times (8 \text{ lbs N} / 100 \text{ lbs fertilizer}) = 96 \text{ lbs N}$$

$$P_2O_5: 1,200 \text{ lbs fertilizer} \times (5 \text{ lbs } P_2O_5 / 100 \text{ lbs fertilizer}) = 60 \text{ lbs } P_2O_5$$

Step 4. Subtract the nutrients supplied by the fertilizer to determine if additional N or P_2O_5 are needed.

$$144 \text{ lbs N} - 96 \text{ lbs N} = 48 \text{ lbs N}$$

$$0 \text{ lbs } P_2O_5 - 60 \text{ lbs } P_2O_5 = -60 \text{ lbs } P_2O_5$$

These calculations indicate that much of the N and all of the K_2O needs for the pepper crop can be met by applying the usual 2,000 lbs of compost plus 1,200 lbs of the organic 8-5-5 on Jolene's 1-acre plot. Notice that with this combination of fertilizers, P_2O_5 is **overapplied**. Because Jolene's soil test P is in the medium range and all the compost P may not be immediately available, this is not an immediate problem. But, if she continues to use this combination, she will end up with high levels of phosphorus in her soils. In some cases this can cause environmental problems. For true sustainability, she should try to better match the crop needs with the applied P_2O_5 . By our calculations, Jolene is still 48 lbs of N short. She would need to use an N-only fertilizer like blood meal to make up this difference.

Example 2: Conversion on a 1,000 sq. ft. Basis

This is the same scenario as above with Farmer Jolene, except she is working with a 1,000 sq. ft. plot. She usually puts out 50 lbs of compost as her base soil amendment.

Step 1. Convert the lbs/acre recommendations to lbs/1,000 sq. ft.

$$1 \text{ acre} = 43,560 \text{ sq. ft.}$$

$$1,000 \text{ sq. ft.} / 43,560 \text{ sq. ft.} = 0.023 \text{ acres} / 1000 \text{ sq. ft.}$$

- Multiply the lbs/acre recommendations by 0.023

$$150 \text{ lbs / acre of N} \times 0.023 = 3.5 \text{ lbs N} / 1,000 \text{ sq. ft.}$$

$$80 \text{ lbs / acre } P_2O_5 \times 0.023 = 1.8 \text{ lbs } P_2O_5 / 1,000 \text{ sq. ft.}$$

$$120 \text{ lbs / acre } K_2O \times 0.023 = 2.8 \text{ lbs } K_2O / 1,000 \text{ sq. ft.}$$

Step 2. Calculate the amount of nutrients provided by the compost.

$$50 \text{ lbs compost} \times 0.03 \text{ (percent N)} = 1.5 \text{ lbs Total N}$$

- Because the N is only about 10% available, N would only be about 0.15 lbs in the first growing season.

$$50 \text{ lbs compost} \times 0.04 \text{ (percent } P_2O_5) = 2 \text{ lbs } P_2O_5$$

$$50 \text{ lbs compost} \times 0.03 \text{ (percent } K_2O) = 1.5 \text{ lbs } K_2O$$

- Nutrients supplied by the compost are: 0.15 lbs N, 2 lbs P_2O_5 , and 1.5 lbs K_2O

Step 3. Subtract nutrients supplied by the compost from the nutrients needed.

$$3.5 \text{ lbs N} - 0.15 \text{ lbs N} = 3.4 \text{ lbs N}$$

$$1.8 \text{ lbs } P_2O_5 - 2 \text{ lbs } P_2O_5 = -0.2 \text{ lbs } P_2O_5$$

$$2.8 \text{ lbs } K_2O - 1.5 \text{ lbs } K_2O = 1.3 \text{ lbs } K_2O$$

- Nutrients needed by plants are: 3.4 lbs N, 0 lbs P_2O_5 and 1.3 lbs K_2O per 1,000 sq. ft. The compost application has met the P_2O_5 need, if all the P_2O_5 is available over the growing season.

Step 4. Pick an additional organic fertilizer to supply the rest of the needed nutrients.

Jolene picks a commercially available OMRI product with an 8-5-5 content. Remember, this will supply 8 lbs of N, 5 lbs of P_2O_5 and 5 lbs of K_2O per 100 lbs of fertilizer. Jolene decides to apply enough of this fertilizer to supply the N needs.

$$\text{lbs of fertilizer needed} = 3.5 \text{ lbs N} / (8 \text{ lbs N} / 100 \text{ lbs fertilizer})$$

$$= 3.5 \text{ lbs N} / 0.08$$

$$= 44 \text{ lbs of fertilizer per 1,000 sq. ft.}$$

- How much P_2O_5 and K_2O will be added?

$$P_2O_5: 44 \text{ lbs fertilizer} \times 0.05 = 2.2 \text{ lbs } P_2O_5 \text{ per 1,000 sq. ft.}$$

$$K_2O: 44 \text{ lbs fertilizer} \times 0.05 = 2.2 \text{ lbs } K_2O \text{ per 1,000 sq. ft.}$$

Step 5. Subtract nutrients supplied by the fertilizer to determine if additional P_2O_5 or K_2O are needed.

$$-0.2 \text{ lbs } P_2O_5 - 2.2 \text{ lbs } P_2O_5 = -2.4 \text{ lbs } P_2O_5$$

$$1.3 \text{ lbs } K_2O - 2.2 \text{ lbs } K_2O = -0.9 \text{ lbs } K_2O$$

In this case, Farmer Jolene is overapplying both P_2O_5 and K_2O . Because her soil test P_2O_5 is medium and K_2O is low, the overapplication will not be detrimental at this point. The overapplication of K_2O will help build the soil test K into a medium or high range.

Examples 1 and 2 describe a method to balance a crop's nutrient needs with fertilizers and compost. This method will help prevent nutrient imbalances in the soil. You may need to try several different combinations of fertilizers or amendments to find the best combination. You should also compare costs of various combinations.

Another way of converting the inorganic fertilizer recommendations to organic ones is to look for organic fertilizer that contributes most of one nutrient. You can then calculate the amount of each fertilizer you need to meet the crop's needs. Example 3 shows you how to use this approach.

Example 3: Working with Fertilizer Grades on 1,000 sq. ft. Basis

Gardener Joe has received his soil test report for his 1,000-sq.-ft. garden. The soil test report indicates the pH is 5.5 and recommends 20 lbs of lime to correct the soil pH. It also recommends 20 lbs of 5-10-15 plus 1 lb of 34-0-0 per 1,000 sq. ft.

Step 1. Calculate the nitrogen (N) recommendation.

- Use a high N source of fertilizer such as blood meal (12-1.5-0.6). Divide the nitrogen number of the inorganic source (5 in the 5-10-15) by the nitrogen number of the blood meal (12 in the 12-1.5-0.6). Multiply this answer by the lbs of inorganic fertilizer recommended.

$$5 \div 12 = 0.42$$
$$0.42 \times 20 \text{ lbs.} = 8.3 \text{ lbs. of blood meal per 1,000 sq. ft.}$$

- For the 1.0 lb of ammonium nitrate (34-0-0) called for using blood meal, calculate:

$$34 \div 12 = 2.8 \times 1.0 \text{ lb.} = 2.8 \text{ lbs of blood meal per 1,000 sq. ft.}$$

Total organic nitrogen = 11 lbs of blood meal
(8.3 lbs + 2.8 lbs)

The amount of P_2O_5 and K_2O can be calculated the same way. The 0.17 lbs of P_2O_5 and 0.07 lbs of K_2O in the blood meal are not significant enough to be counted.

Step 2. Calculate the phosphorus (P_2O_5) recommendation.

- Use steamed bone meal (approximately 1-11-0) for the phosphorus source. Divide the P_2O_5 (10) by the organic P_2O_5 number (11) to get 0.91. Multiply 0.91 by the 20 lbs needed for a total of 18.2 lbs of steamed bone meal required for 1,000 sq. ft.

$$\text{Total organic phosphorus} = 10 \div 11 = 0.91 \times 20 \text{ lbs} = 18.2 \text{ lbs of steamed bone meal per 1,000 sq. ft.}$$

Because bone meal contains 1% N, you will also be adding 0.18 lbs of N, but this is not significant enough to be counted.

Step 3. Calculate the potassium (K_2O) recommendation.

- Sulfate of Potash Magnesia (0-0-22) is a mined material that can be used for the K_2O requirements. Dividing the K_2O number recommended (15) by the K_2O number of the Sulfate of Potash Magnesia (22) equals 0.682. Multiplying 0.682 by 20 lbs of fertilizer needed results in 13.6 lbs of Sul-Po-Mag per 1,000 sq. ft.

$$K_2O = 15 \div 22 = 0.682 \times 20 \text{ lbs} = 13.6 \text{ lbs of Sulfate of Potash Magnesia per 1,000 sq. ft.}$$

These calculations indicate Farmer Joe can meet his garden's nutrient needs by applying 11 lbs of blood meal, 18.2 lbs of steamed bone meal and 13.6 lbs of Sulfate of Potash Magnesia.

Example 4: Organic Fertilizer for 100 Feet of Row

Farmer Jack's soil test results recommend 7 lbs of 5-10-15 plus 0.5 lbs of ammonium nitrate per 100 linear feet of garden row.

Step 1. Calculate the nitrogen recommendation.

- Using poultry litter (4-4-3) for the nitrogen source of fertilizer, divide the nitrogen number of the inorganic source (5) by the nitrogen number of the poultry litter (4). Multiply this answer by the lbs of inorganic fertilizer recommended.

$$5 \div 4 = 1.3 \times 7 \text{ lbs} = 8.8 \text{ lbs total N of poultry litter per 100 linear feet of row}$$

- For the 0.5 lbs of ammonium nitrate called for using poultry litter, calculate:

$$34 \div 4 = 8.5 \times 0.5 \text{ lbs} = 4.3 \text{ lbs total N from poultry litter}$$

- By these calculations, Farmer Jack should apply 13 lbs of poultry litter per 100 linear feet of row to meet his N fertilizer needs.

$$(8.8 + 4.3 \text{ lbs} = 13.1 \text{ lbs of poultry litter})$$

- Remember:** With animal manure, not all of the total N will be available. UGA Cooperative Extension estimates only 65% of the N in poultry litter that has been incorporated in the soil is available for plant use. Consequently, adjust the amount to be applied to ensure the crops get sufficient N.

$$13 \text{ lbs total N} \div 0.65 = 20 \text{ lbs of poultry litter}$$

This amount should be applied to meet the N needs.

Step 2. Calculate P_2O_5 and K_2O supplied by the poultry litter.

$$P_2O_5: 20 \text{ lbs of poultry litter} \times 0.04 = 0.8 \text{ lbs } P_2O_5$$

$$K_2O: 20 \text{ lbs of poultry litter} \times 0.03 = 0.6 \text{ lbs } K_2O$$

Step 3. Calculate the phosphorus recommendation.

- The fertilizer recommendation is 7 lbs of 5-10-15. Calculate the amount of P_2O_5 needed by multiplying 7 lbs by the P_2O_5 proportion in the fertilizer ($10 \div 100 = 0.1$).

$$7 \text{ lbs} \times 0.1 = 0.7 \text{ lbs } P_2O_5$$

- Compare this number (0.7 lbs P_2O_5) with the amount of P_2O_5 applied with the poultry litter (0.8 lbs P_2O_5). In this case, the poultry litter supplies sufficient P_2O_5 .

Step 4. Calculate the potassium recommendation.

- The fertilizer recommendation is 7 lbs of 5-10-15. Calculate the amount of K_2O needed by multiplying 7 lbs by the K_2O proportion in the fertilizer ($15 \div 100 = 0.15$).

$$7 \text{ lbs} \times 0.15 = 1.1 \text{ lbs } K_2O$$

- Compare this number (1.1) with the amount of K_2O applied with the poultry litter (0.6).

$$1.1 - 0.6 = 0.5 \text{ lbs } K_2O \text{ per 100 ft. of row}$$

Farmer Jack needs to apply an additional 0.5 lbs K_2O per 100 ft. of row. He can use Sulfate of potash Magnesia, as in Example 2.

NOTE – Wood ash has long been used as a source of K_2O ; however, it should be used sparingly. Overapplication can raise the pH above the recommended range for crops and can create problems due to high salt concentrations. If you use wood ash, it is recommended that no more than 10 to 12 lbs be used per 1,000 sq. ft. per year, or about 1 lb per 100 ft. of row. An analysis of the wood ash will help you know how much to apply.

Summary

These examples can help you convert inorganic fertilizer recommendations to organic ones. If you need further help, your local county agent is a good resource. How you use these inorganic fertilizer recommendations may depend on whether the field is in a soil building or soil maintenance stage. New and transitioning growers often have fields that need more soil organic matter and available nutrients because the soils are moving to a new biological and chemical equilibrium. If you are in a soil building stage, following the fertilizer recommendations will help you improve your soil fertility and quality.

Fields are likely in the soil building stage if:

- soil organic matter is below 1.5% in the Coastal Plain or 2.5% above the fall line, and/or
- soil test indices for P, K and other nutrients are in the low or medium range.

Many organic growers reduce fertilizer use by 10 to 20% in the soil maintenance stage. The percent reduction depends on site-specific conditions such as the amount of soil organic matter buildup and nutrients available as well as yield goals.

References and Further Information

Soil Testing for Home Lawns, Gardens and Wildlife Food Plots. University of Georgia Cooperative Extension Circular 896. http://www.caes.uga.edu/Publications/pubDetail.cfm?pk_id=7440

Managing Cover Crops Profitably. <http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition>

Manures for Organic Crop Production (ATTRA) <https://attra.ncat.org/attra-pub/manures.html#fieldapp>

Organic Fertilizer Calculator (Oregon State University) http://smallfarms.oregonstate.edu/sites/default/files/em8936-e_med_res_0.pdf

Table 1. Guide to the mineral nutrient value of organic fertilizers.

All values are percent on an as-is basis unless otherwise noted.

These percentages can be highly variable and should be used as an estimate.

Materials	N	P ₂ O ₅ ¹	K ₂ O	Relative Availability ¹
Alfalfa Meal	3.0	1.0	2.0	Medium-Slow
Blood Meal	12.0	1.5	0.6	Medium-Rapid
Bone Meal (steamed) ²	0.7-4.0	11.0-34.0	0.0	Slow-Medium
Brewers Grain (wet)	0.9	0.5	0.1	Slow
Castor Pomace	5.0	1.8	1.0	Slow
Cocoa Shell Meal	2.5	1.0	2.5	Slow
Coffee Grounds (dry)	2.0	0.4	0.7	Slow
Colloidal Phosphate	0.0	18.0-24.0	0.0	Slow
Compost (not fortified) ³	1.5	1.0	1.5	Slow
Corn Gluten Meal	9.0	0.0	0.0	Medium
Cotton Gin Trash	0.7	0.2	1.2	Slow
Cottonseed Meal (dry)	6.0	2.5	1.7	Slow-Medium
Eggshells	1.2	0.4	0.1	Slow
Feather meal	11.0-15.0	0.0	0.0	Slow
Fish Meal	10.0	4.0	0.0	Slow-Medium
Fish Emulsion	5.0	2.0	2.0	Medium-Rapid
Fish Powder (dry) ⁴	12.0	0.25	1.0	Rapid
Grape Pomace	3.0	0.0	0.0	Slow
Granite Dust	0.0	0.0	6.0	Very Slow
Greensand	0.0	1.0-2.0	5.0	Slow
Guano (bat)	5.7	8.6	2.0	Medium
Guano (Peru)	12.5	11.2	2.4	Medium
Hoof/Horn Meal	12.0	2.0	0.0	Medium-Slow
Kelp ⁵	0.9	0.5	1.0	Slow
Manure ⁶ (fresh or as is)				
Broiler Litter	3.1	3.1	2.8	Medium-Rapid
Cattle	0.5	0.2	0.4	Medium
Horse	0.6	0.3	0.6	Medium
Sheep/Goat	0.6	0.33	0.75	Medium
Swine	0.6	0.2	0.4	Medium
Manure ⁶ (dry)				
Cricket	3.0	2.0	1.0	Medium-Rapid
Dairy	0.5	0.2	0.5	Medium
Rabbit	2.0	1.3	1.2	Medium
Marl	0.0	2.0	4.5	Very Slow
Mushroom Compost	0.7	0.9	0.6	Slow-Medium
Sulfate of Potash Magnesia ⁷	0.0	0.0	22.0	Rapid
Soybean Meal	6.7	1.6	2.3	Medium-Slow
Wood Ashes ⁸	0.0	1.0-2.0	3.0-7.0	Rapid

¹Rapid = < 1month; Medium = 1 to 4 months; Slow = 4 months to 1 year; Very Slow = > 1 year.²Research at Colorado State University indicates bone meal phosphorus is only available at soil pHs below 7.0.³Nutrient content varies considerably with feedstock used for compost.⁴Usually dissolved in water.⁵Primarily a micronutrient source.⁶Plant nutrients available during year of application vary with amount of straw/bedding and storage method.⁷Also known as Sul-Po-Mag, K-Mag or Langbeinite. For Certified Organic use must not be acid treated.⁸Potash content depends on the tree species burned. Wood ashes are alkaline, containing approximately 32% CaO.

For those who do not want to figure out the equivalent weights, here is an approximation of amounts of ingredients to use to attain the correct amounts of organic fertilizers called for in the soil test for 1,000 sq. ft. You should not rely on these approximations without doing soil testing to confirm nutrient needs.

Table 2. Organic fertilizer recommendations based on average nutrient contents for the various materials.

Recommendations for Inorganic Fertilizers	Nitrogen¹ Needed for 5 lbs of 5-10-15 from Organic Source	Phosphorus Needed for 5 lbs of 5-10-15 from Organic Source	Potassium Needed for 5 lbs of 5-10-15 from Organic Source
5 lbs 5-10-15 (using component fertilizers)	2.0 lbs blood meal 8.3 lbs alfalfa meal 4.2 lbs cotton seed meal 2.0 lbs feather meal 2.5 lbs fish meal 2.0 lbs hoof meal 8.0 lbs cricket manure 4.0 lbs soybean meal	4.5 lbs bone meal 1.4 lbs colloidal phosphate	3.1 lbs Sul-Po-Mag 15.0 lbs greensand 15.0 lbs granite dust 25.0 lbs kelp
	Nitrogen Needed for 5 lbs of 6-12-12	Phosphorus Needed for 5 lbs of 6-12-12	Potassium Needed for 5 lbs of 6-12-12
5 lbs 6-12-12 (using component fertilizers)	2.0 lbs blood meal 10.0 lbs alfalfa meal 5.0 lbs cotton seed meal 2.0 lbs feather meal 2.5 lbs fish meal 2.5 lbs hoof meal 10.0 lbs cricket manure 3.7 lbs soybean meal	5.5 lbs bone meal 3.0 lbs colloidal phosphate	2.7 lbs Sul-Po-Mag 12.0 lbs greensand 12.0 lbs. granite dust 20.0 lbs kelp
Nitrogen, Phosphorus and Potassium Needed for 5 lbs of 10-10-10			
5 lbs 10-10-10 (for even analysis fertilizers)	33.3 lbs of compost (1.5-1-1.5) 33.0 lbs of 30% poultry manure (3-2.5-1.5) 50.0 lbs of OMRI approved fertilizer 1-1-1		
	Nitrogen Needed for 5 lbs of 10-10-10	Phosphorus Needed for 5 lbs of 10-10-10	Potassium Needed for 5 lbs of 10-10-10
5 lbs 10-10-10 (using component fertilizers)	4.2 lbs blood meal 17.0 lbs alfalfa meal 8.3 lbs cotton seed meal 3.3 lbs feather meal 5.0 lbs fish meal 4.2 lbs hoof meal 16.7 lbs cricket manure 7.5 lbs soybean meal	4.5 lbs bone meal 2.8 lbs colloidal phosphate	2.3 lbs Sul-Po-Mag 10.0 lbs greensand 16.6 lbs kelp
¹ Use only one of these amounts of fertilizer materials to equal 5 lbs of nitrogen or use one-half of two different materials to make up the 5 lbs of nitrogen required. The same process can be used for any other nutrient in the chart.			