— Soil Fertility Note 12 —
Fertilizing with Organic Nutrients

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Some growers prefer to use organic sources of nutrients (Table 1) instead of chemical fertilizers to grow plants. Organic sources do have the advantages of containing slow-release nutrients, posing little risk of soluble salt injury, and contributing considerable amounts of organic matter to the soil. Some of the beneficial response that organic growers see may actually be coming from the increased organic matter they are adding to the soil.

Animal Manures

Animal manures are an excellent source of organic nutrients. Fresh manure may be available directly from livestock operations. Commercial, packaged manures generally contain composted material. Since manures are highly variable in nutrient content, it is advisable to purchase an analyzed manure or have an analysis done to determine nutrient content. The Waste Analysis Section of the NCDA&CS Agronomic Division can conduct tests to determine exact nutrient concentrations in either fresh manure or noncommercial, composted manure.

Composted manures have several advantages over fresh manures. They are less likely to have a strong odor, attract undesirable insects, or burn plants if applied directly. Also, since they contain lower levels of moisture and higher concentrations of nutrients than fresh manures, smaller quantities are needed to supply a given amount of nutrients. In addition, composted manures usually have labels that specify the exact nutrient concentrations they contain.

Compost

Many materials from yard waste to sawdust to industrial by-products can be composted. Compost is generally ready to mix into the soil when you can no longer identify what the material originally consisted of. It usually has a dark brown appearance, is granular in size, and has a musty smell.

Uncomposted waste, such as leaves and grass clippings, is useful as mulch but not as a nutrient source. When uncomposted organic matter is mixed into the soil, plants may become nitrogen deficient. This situation is due to the build up of microorganisms that break down organic matter and tie up nitrogen, making it unavailable to plants.

Cover Crops

Legumes, such as clover or vetch, make excellent cover crops. When killed or mixed back into the soil prior to planting, they can supply up to 100 lb of nitrogen per acre. For small gardens, this would be about 2 lb of nitrogen per 1000 ft^2. Mixing a cover crop into the soil also adds organic matter to the soil, making clay soils easier to work and sandy soils more able to retain nutrients.

Lime

Lime is a naturally occurring material produced by crushing rock containing high amounts of calcium and magnesium carbonates. Because it is not chemically altered, it can be used by organic growers. Lime is also the primary source of calcium and magnesium.

Management Considerations

Never fertilize without knowing the nutrient status of your soil and of the organic source you intend to apply. The NCDA&CS Agronomic Division can perform these tests for you. A soil test report is good for at least two years and contains recommendations for lime and fertilizer applications, including micronutrients.

For lawns and gardens, the fertilizer rate suggested on the soil report can be applied more than one time per growing season. For field crop situations, however, the suggested rate is for the entire growing season and should not be exceeded. The total amount of fertilizer applied during the growing season will depend on soil type, crop, and weather conditions. You can use the suggested fertilizer rate for several years until a subsequent soil test gives a new recommendation.

Soil pH. As a rule, plants grow well at a pH of 6.0 although vegetable gardens do better at a pH of 6.5. In North Carolina, soil pH is usually less than optimum. Rainfall and fertilization, even with some organic sources, tend to lower soil pH over time.

The chief purpose of applying lime is to raise the pH to a more desirable level. When the pH is too low, levels of aluminum and hydrogen in the soil are toxic to the root systems of plants. If the pH is too high, micronutrients may be bound in forms unavailable for plant uptake.

The amount of lime recommended on a soil test report is based on the existing pH, exchangeable acidity in the soil, and the crop you want to grow. Although you can apply it at any time, lime requires weeks to months to neutralize excess acidity. Therefore, it is wise to apply lime well in advance of planting and to mix it into the soil whenever practical.

Nutrient availability. Nutrients from most organic sources are slowly available over time. Therefore, it is wise to apply organic fertilizers well before planting so that adequate amounts of nutrients will be released before plants need them. When a deficiency does occur, it is not easy to get quick corrective action from organic sources.

Soil moisture, temperature, and pH all affect nutrient availability. Very wet, dry, or cool soil can prevent nutrient release. Phosphate availability is limited in soils with pH values below 6.0, even when materials rich in phosphate (e.g., rock phosphate) are applied.

Rates of application. A typical organic fertilization strategy might be to apply a poultry litter product (3-2-3 or 3-2-2) at the rate of 20–35 lb per 1000 ft^2 prior to planting. Later in the season, application of a liquid fish emulsion and seaweed product (~4-1-1) or a blended mixture of cottonseed and bonemeal can supply additional nitrogen. Most soils contain adequate levels of micronutrients so outside sources are usually unnecessary.

Using a current NCDA&CS soil test report, you can calculate the application rate for any chemical or organic fertilizer you choose. First, look on the product packaging to find the percentage of nutrients contained in the material. If you are using a nonpackaged source, use the results listed in the waste analysis report or the appropriate value from in Table 1. Then, divide this number into the pounds of actual nutrient recommended on the soil test report.

For example, if the soil test report recommends 1 lb of nitrogen per 1000 ft^2 and you intend to apply bloodmeal (12% N), then divide the nitrogen recommendation (1 lb) by the percentage of nitrogen in the bloodmeal (0.12). The results of this calculation indicate that 8.3 lb of bloodmeal per 1000 ft^2 will supply the recommended nitrogen.

If you want to supply 1 lb of nitrogen per 1000 ft^2 with fish meal (8-4-0.5), follow the same process. Divide the nitrogen recommendation (1 lb) by the percentage of nitrogen in the fish meal (0.08). You find that you need to apply 12.5 lb of meal per 1000 ft^2 to meet the nitrogen requirement. In addition, you will be applying 0.5 lb P_2O_5 [0.04 x 12.5] and 0.06 lb K_2O [0.005 x 12.5] per 1000 ft^2.

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Table 1. Approximate nutrient content and availability of organic materials

Material	%Nitrogen (N)	% Phosphate (P_2O_5)	% Potash (K_2O)	Availability
bloodmeal	12.0	1.5	0.57	medium–fast
bone meal (steamed)	0.7–4.0	18.0–34.0	0	slow–medium
compost	1.5–3.5	0.5–1.0	1.0–2.0	slow
cottonseed meal	6.0	2.0	1.0	slow
cow manure	0.25–2.0	0.15–0.9	0.25–1.5	medium
fish meal	8.0	4.0	0.5	
greensand*	0	0	6.0	very slow
horse manure	0.3–2.5	0.15–2.5	0.5–3.0	medium
poultry manure	1.1–2.8	0.5–2.8	0.5–1.5	medium–fast
rock phosphate	0	28.0	0	very slow
seaweed	0	0	4.0–13.0	
soybean meal	7.0	0.0	1.0	
swine manure	0.3	0.3	0.3	medium
tankage*	9.0	10.0	0	
wood ashes	0	1.0–2.0	3.0–7.0	rapid

*Greensand is a hydrated salt of iron and potassium silicate. Tankage is a mixture of dried, ground-up by-products from animal slaughter.

Questions or comments should be directed to the Soil Testing Section of the NCDA&CS Agronomic Division. Additional information on soil testing, nematode assay and plant/waste/solution/media analysis is available from the NCDA&CS Agronomic Division.

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