

20 WAYS TO BOOST SOIL FERTILITY

Nitrogen Sources

Manure and compost-based products

1. Manure—Animal manures supply different amounts of nutrients depending on the animal species, feed, bedding and manure storage practices. The amounts of nutrients that become available to the plants depend on the time of year the manure is applied and how quickly it is worked into the soil. Existing soil conditions also affect how quickly the nutrients in the manure are available. On average, cow manure contains approximately 10 to 15 pounds of N, 5 to 10 pounds of phosphorous, and 10 to 12 pounds of potassium per ton. Poultry manure has a higher percentage of all three elements. The National Organic

Program (NOP) is very specific about the use of manure. Composted manure is definitely preferred, but if raw manure is applied, then the timing of application is critical. Where raw manure is used on land growing crops for human consumption, it must not be applied within 120 days of harvest for a crop where the edible portion touches the soil, or 90 days of harvest where the edible portion does not touch the soil.

2. Compost—For a product to technically qualify as compost under the NOP, it must start with a carbon to nitrogen ratio between 25:1 and 40:1 and be maintained at a temperature of between 131°F and 170°F for 15 days, during which time the materials must be turned a minimum of five times. If compost is made in this manner, then it can be applied to plants with no restrictions of timing.

If you use composted manure or compost made with some manure and want to apply it less than 90 days before harvest on food-grade crops, you will need full documentation on how the compost was made to prove it complies with the NOP requirements. However, if compost is not made in this way and contains manure and/or animal products, then it must be applied according to the timing restrictions for raw manure. If the compost contains only plant material, then it is considered plant waste and carries no timing restrictions.

3. Compost Tea—Long favored by organic gardeners and biodynamic farmers, compost tea is coming under criticism by the NOP because improperly made compost tea may have the

potential for spreading food-borne pathogens onto plant parts destined to be eaten raw by people. It continues to be a major topic of discussion among federal regulators. In April, the National Organic Standards Board (NOSB) made its recommendations to the NOP concerning the use of compost tea. Basically, if you are very careful to use only compost that meets all of the NOP compost requirements, can document that and are not using compost tea additives, that compost tea should be acceptable.

If you aren't sure whether your compost has meet all the requirements, especially if you are using purchased compost, then the timing restrictions of raw manure will probably apply. If additives are used, according to NOSB recommendations, the tea and brewing process must undergo a rigid series of tests to make sure no harmful pathogens are being produced or the 90-120 day timing restrictions apply. Check with your certifier!

Plant and seaweed products

4. Alfalfa meal or pellets contain around 3 percent nitrogen and are commonly used as an animal feed. This is an excellent fertilizer material in high-value horticultural crops but would probably be too expensive for field crops. It is thought to contain unknown growth factors which make its mineral content more effective as plant nutrients.

5. Leaf and plant-waste compost is increasingly available, or you can make it yourself. In many cases, the compost is a good product, but it is sometimes ridden with “impurities” such as car waste, pesticides and garbage.

6. Soybean meal is about 6 – 1.4 – 4 NPK; it can be useful, but is extremely expensive. Organic farmers should be careful about not using conventional GMO soybean meal although it is not specifically prohibited under the NOP.

7. Most seaweed fertilizers come from kelp that has been harvested, dried, and ground. Kelp meal can be applied directly to the soil or in starter fertilizer. It flows well and is easily applied with most fertilizer applicators. It can be mixed with other dry fertilizers and amendments. Soil application rates for kelp meal commonly range from 150 to 250 pounds per acre for pastures, forages and small grains. About 200 to 400 pounds per acre are recommended for corn, horticultural crops, and gardens. Since it is expensive, kelp meal is most commonly used only on high-value crops.

8. Dried raw seaweed tends to contain about 1 percent nitrogen, a trace of phosphorus, and 2 percent potash, along with magnesium, sulfur, and numerous trace elements. Raw seaweeds are prepared by various methods and sold under a number of brand names.

Animal Byproducts

9. Blood meal is dried slaughterhouse waste and allowed under the NOP, even from non-organic animals. Blood meal contains about 12 to 13 percent nitrogen and unless used carefully, it can burn plants with ammonia, lose much of its nitrogen through volatilization and encourage fungal growth. It is also very expensive.

10. Feather meal is a common by-product of the poultry slaughter industry and is allowed under the NOP. Although total nitrogen levels are fairly high (7 to 10 percent), the nature of feathers is such that they break down and release their nitrogen much more slowly than many products of similar price.

11. Fish meal and fish emulsion are, like most animal by-products, rich in nitrogen. Fishmeal contains about 10 percent nitrogen along with about 6 percent phosphate. It is most frequently used as a feed additive but can be used as a fertilizer. Fish emulsion usually has an analysis around 4-4-1. Fish emulsion may be fortified with chemical fertilizer, so organic farmers should be suspicious of any product with phosphorus content in excess of 4 percent. Fish products may also contain synthetic preservatives, stabilizers and other products prohibited under the NOP.

Other nitrogen sources

12. Most organic farmers try to supply their nitrogen needs with legumes in the crop rotation or with manures and composts. Sodium nitrate or Chilean nitrate were added to the NOP National list after much discussion. The NOP stipulates that the nitrogen obtained from sodium nitrate must account for no more than 20 percent of the crop's total nitrogen requirement. This mined product is about 16 to 20 percent nitrogen and highly reactive. Even though it is 'natural,' it acts more like a synthetic fertilizer and can cause sodium buildup in the soil. This can be used cautiously when rapidly available nitrogen is needed. *Sodium nitrate is prohibited by the Farm Verified Organic (FVO) and Organic Crop Improvement Association-International Federation of the Organic Agriculture Movements (OCIA-IFOAM)-accredited levels of certification.*

Phosphate Sources

There are 3 main types of mineral phosphate:

13. Colloidal phosphate from clay
14. Soft rock phosphate mostly from ancient sea deposits, and
15. Hard rock phosphate from volcanic deposits.

Clay-based phosphates tend to be more readily available than the rock phosphates, and soft rock phosphate is more available than hard rock phosphate. Synthetic phosphorus fertilizers (prohibited in organic production) are made by reacting rock phosphate with acids and other chemicals to convert the phosphorus into a water soluble form. Bone meal typically contains about 27 percent total phosphate, and nearly all of that is readily available.

The analysis numbers tend to be quite low for rock phosphates because little of the phosphorus present is water soluble. Rock phosphate is generally made up not only of phosphorus, but also of calcium, carbon and lots of trace elements, most of which are valuable plant food. Unfortunately, some sources of naturally mined phosphate can also be high in heavy metals. Organic phosphate materials are most effectively when applied to a growing cover crop a year or more before the crops will need the nutrients. This will give the soil microbes the opportunity to convert the insoluble phosphate into more available and stable forms. Legumes, like clover, are very efficient at breaking down rock phosphate into more available forms.

Another efficient way to use rock phosphate is to add it directly to livestock manure in the barn where the manure acids dissolve

much of the total phosphate and the phosphate stabilizes the nitrogen in the manure. Many of the same advantages can be had by adding 20 to 50 pounds of colloidal or rock phosphate to one ton (two cubic yards) of manure when composting.

Potassium Sources

16. Potassium sulfate and potassium magnesium sulfate (langbeinite) are allowed under the NOP if you can clearly document that you are using a mined source that has not been treated with acid or any other chemical reaction to make the potassium more available. Potassium sulfate is the better choice for high Mg soils, but it is fairly reactive and must be used carefully. There are synthetic forms of potassium sulfate, so make sure you are getting the mined product.

Sulpomag and K-Mag are two brand names for langbeinite. Amazingly enough, potassium chloride (muriate of potash) is allowed on the NOP National List if it can be documented that it is from a mined source and “applied in a manner that minimizes chloride accumulation in the soil.” This product is extremely soluble and is a popular conventional fertilizer. It is the opinion of some organic farmers that it should not be allowed in organic production because it is so harsh on soil life and soil structure and can cause chlorine buildup in the soil. *Potassium chloride is prohibited by the FVO and OCIA-IFOAM-accredited levels of certification.*

17. Granite dust is often sold as a “slowly available” potash source for organic production. Granite dust typically contains from 1 to 5 percent potash depending on overall mineral composition of the

rock, but granite is mostly feldspar, a highly insoluble mineral, so little of that potassium is easily available.

18. Another source of slowly available potash is the clay-type mineral glauconite, commonly sold as greensand. Total potash content of greensand is around 7 percent, all of which is deeply locked into the mineral and only slowly available. The high price of greensand, however, limits its use solely to high-value horticultural applications or to small amounts of banded starter fertilizer. Certain micas, particularly biotite (black mica), contain potash, which because of mica's physical structure, is more available than most rock-type materials in microbially active environments.

Calcium Sources

19. Lime and gypsum are valuable products to moderate the soil pH and deliver essential calcium. Here in New York, few soils need more magnesium! Our glacial heritage has left us with soils high in Mg, with the tendency to become hard, compacted, and crusty. This soil condition favors certain tough species of weeds. Therefore, when rising soil pH and adding calcium, we might want to avoid hi-Mag or dolomitic lime. Hi-calcium lime or gypsum, which is calcium sulfate, are better choices for us. (Talking to other organic farmers and soil testing will help you determine your own baseline conditions.) Gypsum is also a valuable source of sulfur, which is critical for healthy plants, and for healthy animals that eat the plants. Make sure that the lime and gypsum are naturally mined, not industrial waste products. Burned lime is not allowed.

Secondary and Minor Nutrients from Rock Powders

20. Micronutrients can be supplied in small quantities in a variety of rock dusts. Certain types of synthetic micronutrients may be allowed in tiny quantities in a mixed organic fertilizer if it can be shown (with a soil test) that they are correcting a documented deficiency. Basalt dust, if available at a reasonable cost, can provide a wide range of trace minerals to agricultural systems over a period of several years. As with most rock powders, transportation costs are a major factor in determining cost-effectiveness. Most of the rich volcanic soils of the world are derived from basalt. Even when too expensive for land application, basalt dust can be beneficial when mixed with manure in the composting process.