Grow YOUR SOIL

Soil Science Spotlight

If we understand a soil, we can improve it

Estimated Nitrogen Release (ENR)

Do you need to add nitrogen to your soil? When organic matter is consumed by soil microbes, the nutrients can be released into the soil or incorporated into the bodies of the microbes. Organic matter contains nitrogen, and the amount of nitrogen available to your crops is based on the amount of organic matter in your soil and the rate at which that organic matter is decomposing, as well as the amount of nitrogen added as fertilizer. If nitrogen is released into the soil (either by microbes or the addition of fertilizer), it becomes available to plants or other microbes. If it is not taken up by either, it may combine chemically with other nutrients in the soil, or it may leave the soil through leaching or as a gas. Microbial activity controls the availability of nitrogen released from organic matter to plants. If there is a lot of organic matter in the soil and a lot of active microbes, nitrogen availability is generally high. If the soil is low in organic matter or low in microbial activity, nitrogen availability is low.

While soil organic matter is the main factor determining microbial activity and nitrogen availability, soil temperature, moisture and texture also play a role. If the soil is cold and/or dry, microbial activity will be low and nitrogen availability will be low, even if a soil's organic matter level is high. Soil texture also plays a role, though a smaller one than organic matter, temperature, and moisture. A clayey soil tends to hold and protect organic matter from microbial decomposition more than a sandy soil, so relatively less nitrogen will be available in a clayey soil compared to a sandy soil with the same conditions.

Organic matter, temperature, moisture and texture all determine the amount of nitrogen available to a crop but estimating the amount available is not precise. *ENR or Estimated Nitrogen Released* is described in pounds per acre, or kilograms per hectare, and is determined in various ways by soil testing laboratories based on methods in published literature as well as their own trials and experience. At *Grow Your Soil*, we have tried to unify these methods by assigning factors to organic matter, temperature, moisture, and texture to generate more accurate estimates. Typically, there will be enough nitrogen (greater than 150 lbs. per acre) available for any crop during the growing season if the soil's organic matter is 6% or greater. If a soil's organic matter percentage is slightly lower than 6, there is still likely to be adequate nitrogen available if the soil is sandy. For soils that do not currently provide enough nitrogen for crops, an organic nitrogen fertilizer can be applied. As an example, a soil with an organic matter level of 3%, in a relatively warm and moist environment, might require 10 to 12 lbs. of alfalfa meal per 100 square feet to provide enough nitrogen for to grow crops.

Selecting the correct nitrogen fertilizer depends again on the temperature, moisture, and texture of the soil, as well as the needs of the crop. Alfalfa meal is a commonly used organic nitrogen fertilizer for

gardeners and small growers due to its availability. Since microbes are required to break down the alfalfa meal to release the nitrogen, if the soil is cold or dry, lower than expected amounts of nitrogen are released, causing the grower to either apply more alfalfa meal or select a nitrogen fertilizer that is less dependent on microbial activity to make its nitrogen available. Blood meal, properly treated urine, and commercially available liquid nitrogen fertilizers that can be applied to irrigation lines are examples of organic fertilizers with more readily available nitrogen. While the advantage of these fertilizers is that they are much less dependent on soil microbial activity, it is also one of their disadvantages. Without a vigorous microbial interface, the nitrogen in these fertilizers can leave the soil through leaching, particularly in sandy soils, without being taken up by either plants or microbes, so the timing and the rate of application become much more critical and more difficult to optimize. The second disadvantage is that except for urine, all these fertilizers can be more costly either directly or through environment costs. There are a wide range of organic nitrogen fertilizers that release their nitrogen at varying rates. Feather meal, cotton seed meal, fish meal, soybean meal, as well as a variety of composted manures are all examples of organic nitrogen fertilizers. While functional at providing nitrogen to a deficient soil, it is important to remember that each of these fertilizers requires the removal of nutrients from the soils that grew them or the feed that grew the animals, as well as energy for processing and transportation.

A soil that has been neglected or poorly managed often needs specific organic fertilizers to begin producing, determined by testing and a recommendation service like *Grow Your Soil*. However, a good goal is to try to increase your soil fertility level to the point where it can produce enough organic matter that can be composted and returned to the soil to maintain or increase its organic matter level and microbial activity. In addition, if we can return as many harvested nutrients to the soil as possible, we can minimize the amount of supplemental, non-sustainable organic fertilizers needed and maintain soil fertility in as close to a closed-loop, sustainable system as possible.