

*If we understand a soil,
we can improve it*

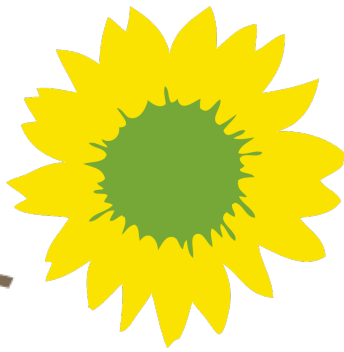
Estimated Nitrogen Release (ENR)

Do you need to add nitrogen to your soil? 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. Organic matter contains nitrogen. When organic matter is consumed by soil microbes, the nutrients can be released into the soil or incorporated into the bodies of the microbes. If nitrogen is released into the soil, it becomes available to plants or other microbes. If it is not taken up by either, it may combine chemically with other nutrients 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 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 percentage of 6 or greater. If a soil's organic matter level 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 percent, 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 its 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 would be required to break down the



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alfalfa meal to release the nitrogen, if the soil is cold or dry, less than normal amounts of nitrogen would be 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 that microbial interface, the nitrogen in these fertilizers can fairly readily leave the soil through leaching, particularly in sandy soils, without being taken up by either plants or microbes, so the timing of the application and the rate of the application become much more critical and more difficult to optimize. The second disadvantage is that with the exception of urine, they 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, soy bean meal as well as a variety of composted manures are all examples of organic nitrogen fertilizers. Each of these is 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 not well managed often needs specific organic fertilizers, determined by testing and a recommendation service like Grow Your Soil. However, a good goal is to try to increase a soil's fertility to a level where it can produce enough organic matter that can be composted and returned to the soil to maintain or increase its organic matter level. 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 its fertility in as close to a closed, sustainable system as possible.