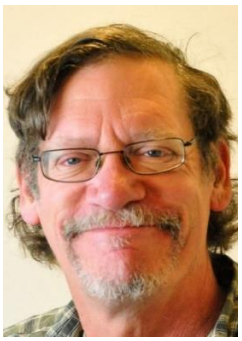
Fertilizers: Processed vs. Organic



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The difference is method of delivery

As far as a plant is concerned, there is no difference between processed and organic fertilizers. All a plant needs is nitrogen in the form of ammonia or nitrate as well as some phosphorus and potassium.

The main difference between the two types of fertilizers is the method of delivery. Most processed fertilizers are designed to dissolve and release their nutrients as fast as possible. In contrast, most organic fertilizers are slow release in that they're based on the biological breakdown of plant materials and animal by-products such as feathers, blood and bone meal all of which would otherwise go into the waste stream. Fruit and vegetables not purchased in stores can also become a form of organic fertilizer. A large percentage of materials going to landfills is food waste, which causes many problems. This amount can be reduced by turning food waste into fertilizer and compost.

The three main nutrients in fertilizers are nitrogen, phosphorus and potassium listed in that order on fertilizer packaging. Nitrogen comprises about seventy-eight percent of our atmosphere yet, nitrogen is almost always the most limiting nutrient in agriculture. Atmospheric nitrogen consists of two nitrogen atoms combined together with a very strong chemical bond and cannot be absorbed by plants. For thousands of years farmers have gotten around this problem by using the manure of various animals as a source of available nitrogen. No one understood the chemistry of what was going on at the time, but they figured out what seemed to work. They also grew peas and beans and noticed that a crop following these legumes did better than following other crops such as corn.

Now we know that legumes, consisting of plants such as clover, alfalfa, beans, peas and many others, have a relationship with a certain genus of bacteria that can fix nitrogen from the atmosphere in a form that plants can use. These legume cover crops, or green manure crops, when tilled into the soil slowly release their nitrogen as they break down for younger plants to use for their own growth. These legume cover crops were the basis of the agricultural source of nitrogen for thousands of years.

Chilean saltpeter was also a major source of nitrogen for a while in the early nineteen hundreds. During WWI, however, there was a blockade of Chilean saltpeter to Germany because nitrate, which is high in saltpeter, is the primary component of explosives. German scientists developed the Haber-Bosch process that could turn atmospheric nitrogen into ammonia, but it required a lot

of energy to break the nitrogen molecule apart. The United States learned this process and also used it to make explosives. After WWII these processes were used to make high nitrogen-based fertilizers. The availability of these high nitrogen fertilizers increased production immensely and was part of the basis of the "Green Revolution" in the sixties.

Rows of cover crop. *Photo courtesy of WSU Skagit County Extension Master Gardeners.*

Everything was fine until scientists noticed that nitrate and nitrite were leaching into the water table, causing all kinds of health problems. It was also leaching into lakes and rivers causing algae blooms and subsequent fish kills. Much effort has been made to prevent these problems by a return to old methods of the use of green manures consisting of legumes and grasses. More careful use of processed nitrogen fertilizers has also become standard. Some processed fertilizers are now made to be slow release by the use of various chemical coatings.

Phosphorous is the second element essential for plant growth. There is worldwide demand for phosphorus and sources consist of beds of fossilized fish bones and other deposits around the world that are limited and will eventually run out. This situation is exacerbated because the chemistry of phosphorus is very complex and most of the phosphorus applied to agricultural fields becomes unavailable to plants. It is very reactive with iron and calcium becoming a form that plants cannot absorb. The standard practice for most conventional farming is to just keep adding more phosphorous fertilizer to compensate for that which cannot be absorbed by plants.

Organic farming has a different approach. It has been shown that fungi and humic acid can actually make phosphorus available by breaking down forms of phosphorous that would not

otherwise be available to the plant. Organic fertilizer not only provides the basic nutrients for plants, it feeds and nourishes the fungi and bacteria that help the plant root absorb nutrients. Winter cover crops consisting of grasses and legumes will also use nutrients, so they are not leached from the soil into the water table.

Potassium is the third macronutrient listed on fertilizer products. It's also mined from deposits that are limited and not sustainable because they cannot be replenished. The thing is, there is already enough potassium and phosphorus in circulation in some areas; all we need to do is learn how to keep them from being leached from soils into the water table. We also need to recover the nutrients from food waste. Forty percent of food production every year ends up in the landfill as food waste.

The intent of organic farming and organic fertilizers is to improve soil quality, grow healthy food, minimize food waste and keep unwanted nutrients out of water systems. Human populations are rapidly growing, and we need to develop a more sustainable agricultural system.

Left: A close up view of a cover crop. *Photo courtesy of WSU Skagit County Extension Master Gardeners.* **Right:** There are numerous fertilizers to choose from. Take time to do a little research to find out what best serves your needs. *Photo by Nancy Crowell / WSU Skagit County Extension Master Gardeners.*

RESOURCES:

- Chalker-Scott, Linda. How Plants Work-The Science Behind the Amazing Things Plants Do. Timber Press; 2015.

- Weil, Ray R., Brady, Nyle. The Nature and Properties of Soils. Pearson; 2017.