



LAND
STEWARDSHIP
PROJECT

LSP Myth Buster #20

An ongoing Land
Stewardship Project
series on ag
myths & ways
of deflating them.

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Myth: Because of petroleum-based fertilizers, we do not need to build soil using plant residue and other natural sources of organic matter.

Fact:

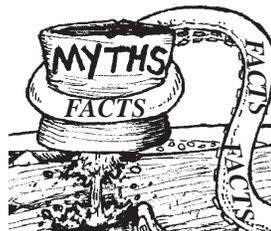
From tropical rain forests to Midwestern crop fields, nitrogen is a keystone of plant growth. And man-made nitrogen fertilizer is seen as a critical element in the production of crops such as corn. Indeed, the technology that allows us to create nitrogen in a factory (it has its basis in World War II munitions research) has made some pretty impressive corn yields possible over the years. Nitrogen fertilizer use on the farm has created a bit of a treadmill effect: as better hybrids and other advances increase yields, farmers have been advised to apply higher doses of fertilizer in an effort to replace the increasing amounts of nitrogen being removed from the soil by all that nutrient-hungry super-corn.

In recent years, another argument for applying lots of nitrogen has been that since it increases soil fertility, it builds that soil's organic matter and this increases its ability to trap carbon, thus reducing greenhouse gas emissions. But a study out of the world's oldest experimental field under continuous corn finds that excessive nitrogen fertilizer actually accelerates decomposition of crop residue such as corn stalks by sending soil microbes on a kind of manic feeding frenzy.

In fact, research at the famous Morrow Plots at the University of Illinois found that heavy doses of nitrogen not only burn through all the crop residue, but also start working on the organic carbon in the soil itself. Over a 50-year period, this reduced yields in continuous corn by 20 percent, and released a lot of carbon dioxide into the atmosphere. These results are confirmed by long-term field studies from around the world.

The Illinois study is significant for a lot of reasons, not the least of which is that the results come out of a highly-respected experimental field that's been around for 100 years. Since synthetic nitrogen fertilizer was first applied to the Morrow Plots in 1955, researchers have

been able to compare the impact on soil carbon and organic matter content both pre-nitrogen and post-nitrogen. The scientists began the study after they noted that corn growth and yields in the plots had been dropping despite massive applications of nitrogen and residue such as corn stalks. They soon found out why.



“What we learned is that after five decades of massive inputs of residue carbon ranging from 90 to 124 tons per acre, all of the residue carbon had disappeared, and there had been a net decrease in soil organic carbon that averaged 4.9 tons per acre,” says Saeed

Khan, one of the soil scientists who conducted the research. “Regardless of the crop rotation, the decline became much greater with the higher nitrogen rate.”

Khan and the other scientists are quick to point out that nitrogen fertilizer has its place in corn production. But this and other studies make it clear that in many cases, we are still applying too much of a good thing. Too often manure and nitrogen-fixing plants such as alfalfa are not given proper credit by agronomists and farmers for their ability to increase fertility. And rather than rely on fertilizer rate recommendations that cover a general region or soil type, farmers should use precise soil tests that measure exactly how much nitrogen their plants need to grow. The “late season nitrogen test” can be particularly useful, since it provides precise information on how much fertilizer growing corn plants need during the growing season itself.

Reducing nitrogen applications helps the farmer's financial bottom line, but it's also good for the environment. For one thing, excessive nitrogen runoff from the

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This Myth Buster is brought to you by the members and staff of the Land Stewardship Project, a private, nonprofit organization devoted to fostering an ethic of stewardship for farmland and to seeing more successful farmers on the land raising crops and livestock. For more information, call 651-653-0618 or visit www.landstewardshipproject.org.

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Midwest has been blamed for contaminated drinking water, as well as for creating an oxygen-starved “Dead Zone” in the Gulf of Mexico.

In addition, there has been talk lately of utilizing corn “stover” or “stalks” to produce cellulosic biofuels. Although such material, which is left in the field after harvest, helps build up soil quality, reduce erosion and retain moisture, some have argued that fertilizers can take their place, freeing us to use the entire corn plant as fuel.

The Morrow research shows that nitrogen fertilizer

is not a good replacement for crop residue and that removing this “waste product” is bad for the soil, bad for our water and bad for the climate.

More information

For more on the research at the Morrow Plots, see the Nov./Dec. 2007 issue of the *Journal of Environmental Quality* at <http://jeq.scijournals.org/cgi/content/abstract/36/6/1821>.