



LAND
STEWARDSHIP
PROJECT

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Myth Buster #36

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

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→ **Myth:** Diverse crop rotations may be a boon to the land, but are a bust when it comes to farmers' bank accounts.

→ **Fact:**

It's no big surprise that cropping systems more diverse than the typical corn one year-soybeans the next, routine are friendlier to the environment.

Breaking up this monotonous cycle by throwing small grains and forages into the mix not only reduces the need for chemicals that can make their way into our water, but cuts soil erosion.

However, it's long been assumed that diversifying a crop rotation came with a major Achilles' heel: it lowered yields of the main cash crops, resulting in less farm income.

But recent research out of Iowa is questioning the conventional wisdom that more diversity equals less profit. From 2003 to 2011, researchers compared three cropping systems on the Marsden Farm, an experimental operation in central Iowa. One system was the typical corn-soybean duo-culture. It was then compared to two diversified systems. One involved a rotation where during the third year instead of corn or soybeans a small grain such as triticale or oats was grown in conjunction with red clover. The other was a four-year rotation: corn, soybeans, small grains and alfalfa.

Chemical fertilizers and herbicides were used in the more diverse rotations, but at lower rates than the two-crop systems (composted cattle manure as well as clover and alfalfa residues were used to replace some petroleum-based fertilizers in the more diverse systems).

The study, which was published on the peer-reviewed *PLoS ONE* website last fall, found some significant energy/environmental benefits from the longer rotations. Synthetic nitrogen use in the diverse rotations dropped 80 to 86 percent, compared to the conventional system. After several years, good weed control was possible in the more diverse systems, even though herbicide use was slashed by 86 to 90 percent. This meant potential herbicide-related freshwater toxicity associated with the diverse rotations was eventually *200 times lower* compared to the conventional system. Diverse rotations also used around half the amount of energy per-acre, per-year.

These results are pretty much common sense: a greater diversity of plants on the land breaks up pest cycles, helps soil build its own fertility and reduces the need for intense tillage year-after-year. In addition, legumes like alfalfa and clover help to provide for "free" the nitrogen so critical for growing corn.

Diversity = Stable Profits

But what is surprising is that the diverse rotations produced competitive yields and similar—in some cases slightly higher—profits compared to their conventional counterparts. This was true during both the transition years (2003 to 2005) and the years when the longer rotations were well established (2006 to 2011). That's important information for any farmers who are considering making the transition to a more diverse system, but are concerned

they can't afford even a year or two of lower profits.

This research, which was conducted by scientists from the USDA Agricultural Research Service, the University of Minnesota and Iowa State University, makes another important point about profitability: once the diverse systems were established, they were more financially stable from year-to-year. That's because when a system relies less on inputs like petroleum-based fertilizer, it's not as likely to have its bottom line jerked around by price swings in the oil and natural gas markets.

If this study shows there is more consistent profitability with diversity, why wouldn't more farms adopt such a system? Remember, corn and soybeans are not grown every year when you add small grains and forages to the rotation. That means a farmer needs a way to make something like oats or hay pay during those "off" years when there aren't corn or soybeans available to sell. In most cases, that means having cattle and other livestock present on the farm, or at least on neighboring farms, to add economic value to those plants by using them as feed and to help provide fertility through manure cycling. In many farming communities, livestock have been removed from the land and put into specialized, large-scale concentrated animal feeding operations while crop farmers focus on just raising corn and soybeans.

The other issue is labor. The Marsden Farm researchers concede that the more diverse systems require a more management-intensive approach, with farmers actually walking the fields, observing changes and juggling various plant growth schemes, not to mention dealing with livestock. To a specialized corn and soybean producer used to just planting, applying chemicals and harvesting, this can be a radical paradigm shift, no matter what the profit margin.

However, the Marsden study could help make a diverse farming system more attractive to conventional producers by showing that sustainability doesn't require going cold turkey on inputs. It just may require putting chemicals in their proper place—as tools in a toolbox, not the toolbox itself. As the researchers concluded: "...more diverse cropping systems can use small amounts of synthetic agricultural inputs as powerful tools with which to tune, rather than drive, agroecosystem performance..."

→ More Information

- To read the Marsden Farm study, "Increasing Cropping System Diversity Balances Productivity, Profitability and Environmental Health," on the *PLoS ONE* website, see www.plosone.org.

- More on the Leopold Center for Sustainable Agriculture's ongoing research into diverse crop rotations is at www.leopold.iastate.edu/news/10-11-2012/benefits-of-longer-rotations.

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