Small Grains, Large Gains

A Boone County, Iowa Case Study

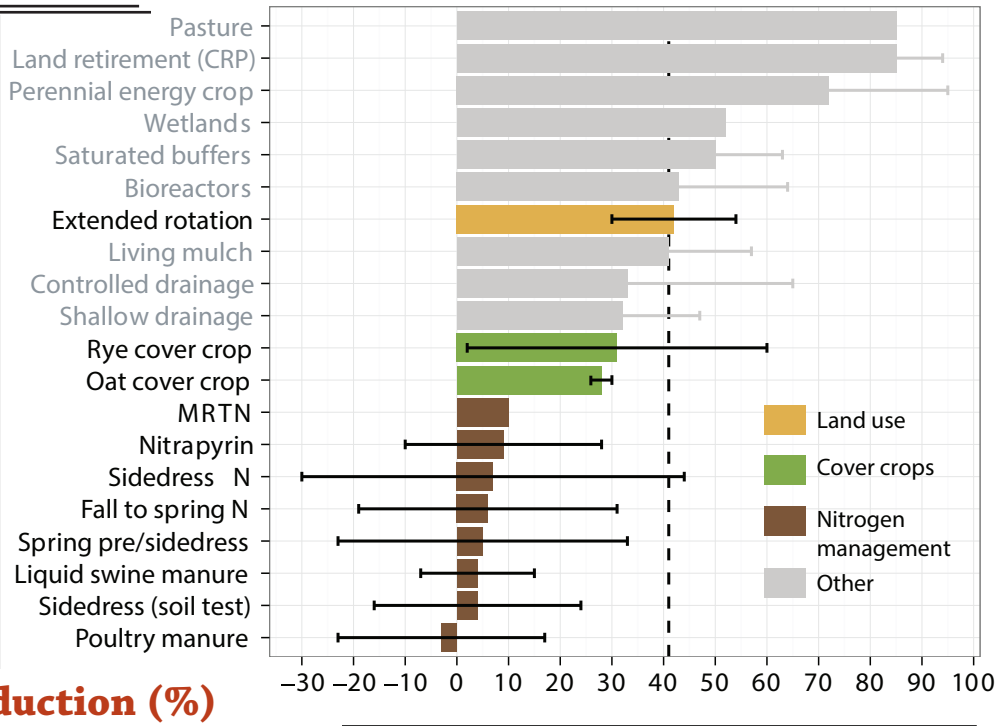
Data from farms in Boone County show that adding a third crop – a small grains crop such as oats – to the more common 2-year corn-soybean crop rotation would support soil and water conservation and reduce greenhouse gas emissions and energy use.

1 Water Quality

There are three major agricultural contaminants of water in Iowa: nitrogen (N), phosphorous (P) and sediment. Nitrogen is leached when water moves through the soil while P is held in soil particles which are lost through erosion.

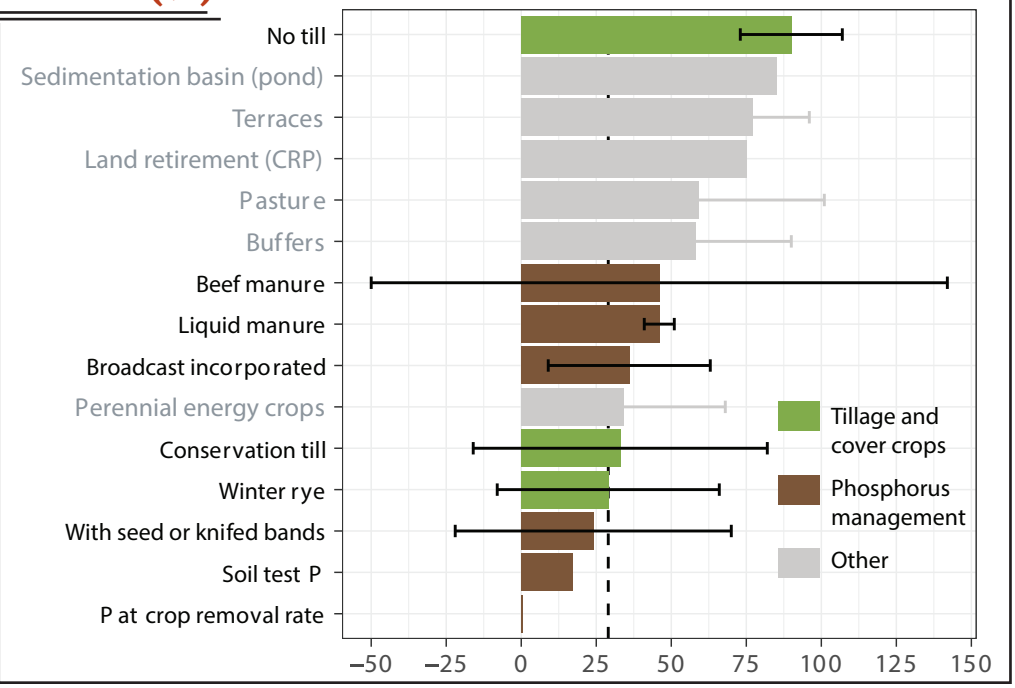
Nitrogen Load Reduction (%)

The N graph from the Nutrient Reduction Strategy shows us that precision application of N (brown bars) to limit excess nutrients in the soil has a relatively small impact on nitrate loads in water ways compared to practices that keep living roots in the ground year round (green and gold bars). When cover crops or small grains are used, the ground is covered by living roots that take up and hold N in place so that it can't be leached into subsurface drainage tiles and washed downstream.



Phosphorous Load Reduction (%)

The P graph shows us that reducing P applications to the removal rate (lowest brown bar) has an almost non-existent effect on P loads in waterways. Reducing tillage and keeping the soil covered (green bars) is much more effective because these activities prevent soil erosion. This graph also shows us that relying on manure to replace P (as Jeremy does) over synthetic products is also a fairly effective strategy.

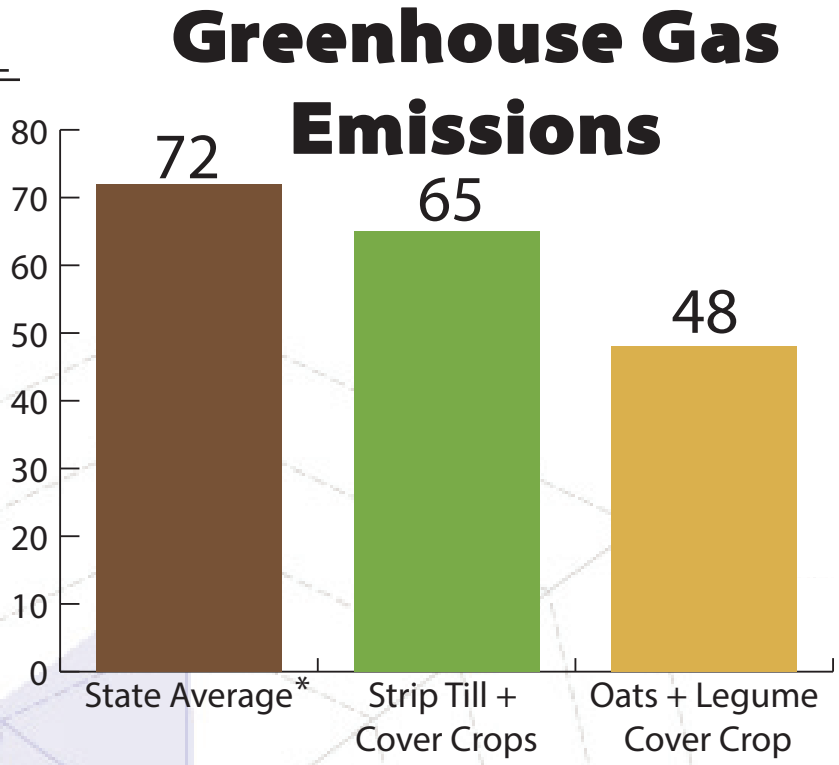


Error bars represent one standard deviation above and below the mean. Dashed lines indicate the target for nutrient reductions. Data from the Nutrient Reduction Strategy (IDALS, IDNR, and ISU CALS, 2014). Graphic created by Chris Hay, Iowa Soybean Assoc.

2 Climate and Energy

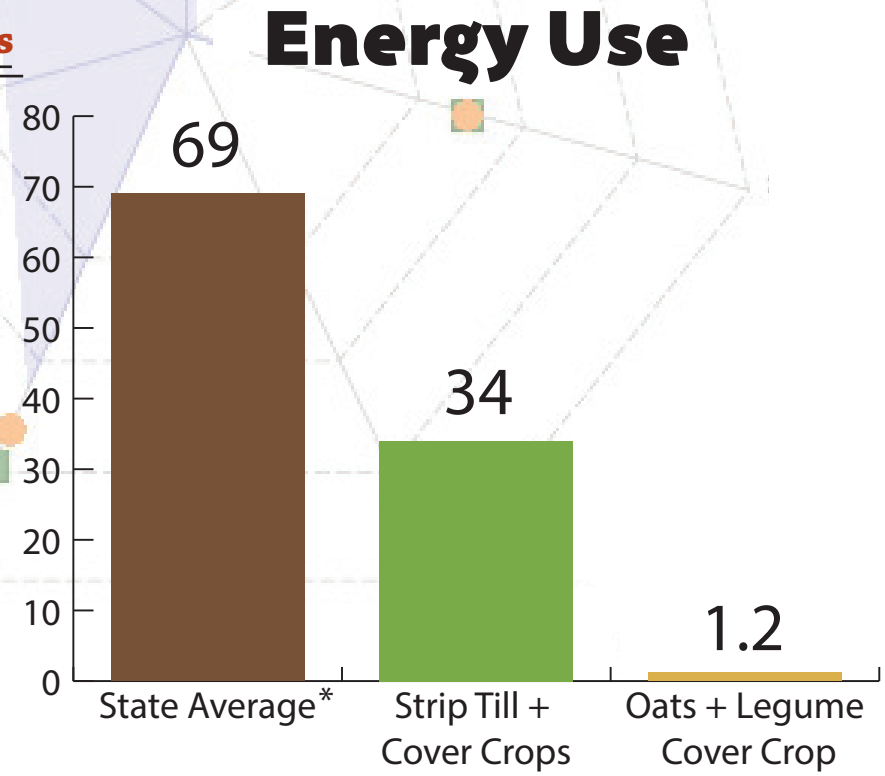
Progress with Cover Crops

With calculations from the Field to Market Fieldprint® Calculator , we see that Jeremy's farm (green bar) shows a moderate decrease in energy use and greenhouse gas emissions by practicing strip tillage and cover crops. We often see farmers reduce tillage as they adopt cover crops – either eliminating fall or spring tillage passes in order to avoid disturbing the cover crop or, like Jeremy, adopting a system like strip till that shrinks the tilled surface area. Tilling soils releases some sequestered carbon, so reducing tillage lowers greenhouse gas emissions. It also reduces the diesel fuel used to drive the tillage equipment. These two elements combined create the reductions as compared to the state average.



Big Gains with Small Grains

We see even greater reductions when adding a small grain year (gold bar). This is largely due to the use of nitrogen-fixing legume cover crops after the small grain, which displaces synthetic nitrogen fertilizer applications needed for corn in the following year. Synthesizing nitrogen is an energy intense process that is normally powered by burning fossil fuels; therefore, these products have large embedded energy and greenhouse gas emissions that nitrogen from manure and legumes does not. This accounts for the substantially lower embedded energy use and greenhouse gas emissions seen for the oat+legume cover crop system.



*On average farmers till four times and apply 160-170 lbs of synthetic nitrogen fertilizer in Iowa. The majority do not use cover crops.

PRACTICAL farmers of Iowa
working together, always learning

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