Saving the soil and maintaining corn yields: research says yes to both

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The research plot on the Iowa State University Agronomy Farm shows how different combinations of cover crop and corn net different results. Early research has shown that with some combinations, almost all crop stover can be removed for biofuels while yields remain high and soil improves. Credit: ISU photo by Dan Kuester

Two years into a study looking at methods of combining a living cover crop between corn rows shows that yield can be maintained at high levels using environmentally friendly practices.

Researchers are testing between-row cover grasses as part of research looking at ways to reduce soil runoff and keep vital nutrients in the soils while crop residue, called stover, is removed from farm fields to produce biofuels.

With U.S. government targets requiring a 30 percent displacement of petroleum consumption with fuels made from biomass by the year 2030, agronomy researchers are studying methods of harvesting more and more stover, which previously was left on the field.

Targets will require removing 75 percent of stover to use as biomass in the production of biofuels.
Removing stover can cause more water runoff and deplete soil of the organic material needed to remain productive.

One method of keeping the soil in place and replenished with organic matter is to plant grasses between the corn rows that would stay on the field year round.

"We are looking at trying to grow corn in a perennial sod, so that we can protect the soil and provide these other environmental services at the same time," said Ken Moore, professor of agronomy.

Developing a cover crop system that allows nutrients, organic matter, water and carbon to remain in the soil is a great idea. But farmers won't do it if it reduces yields, said Moore.

The results so far have been very encouraging.

After the first two years of the study, researchers have already discovered a system that allows for removal of up to 95 percent of the corn stover, increases the amount of carbon kept in the soil, increases water use efficiency in corn and also maintains corn yield.

One cropping system the team examined in 2009, for example, increased harvest from 11,867 kilograms of corn grain per hectare using traditional production methods, to 12,768 kg/ha with the new system. All while improving the soil and harvesting almost all the stover.

The researchers are quick to point out they are not ready to proclaim that they have uncovered the perfect system, but they are encouraged.

"It's remarkable," said Jeremy Singer, assistant professor of agronomy and researcher at the USDA's National Laboratory for Agriculture and the Environment in Ames. "Even in two bizarre years - 2008 was the year of the floods and 2009 had the coolest July on record -- we harvested close to 100 percent of the corn stover and we're obtaining similar yields as the no-ground cover control, while increasing carbon additions to the soil."

The team tested more than 36 different ground covers, mostly grasses; different tillage systems such as no-till and strip-till; 50 different corn hybrids; and several chemical treatments.

One of the keys, according to the researchers, is finding a ground cover grass that is less active during the spring. This allows the corn to absorb needed water and sunlight at the beginning of the growing season without competing with the ground cover grass.

Later in the spring, as the corn creates a canopy over the shorter grasses, there is less competition for sunlight and nutrients as the corn becomes dominant.

Having more than one species thrive on the same piece of ground is not a new idea, says Moore. Traditional prairies contained many different species of grasses and plants that complemented each other as they competed for water, sun and other inputs.

"From an ecological perspective, it seems intuitive that we can do this," said Moore. "Nature does it all the time. The prairies that existed before farmers got here were complex plant communities that change with the season. And we have a succession of species which we are trying to set

up here."

Moore says one of the best features of the new systems is they are not that different from the way producers are currently farming.

"We are not talking about changing the whole system," said Moore. "We are talking about changing the way we use what we already have. It's just how you do it to make it work better."

Provided by Iowa State University