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Study: No-till farming reduces greenhouse gas

INDIANAPOLIS -- Cropland that's left unplowed between harvests releases significantly smaller amounts of a potent greenhouse gas than conventionally plowed fields, according to a new study that suggests no-till farming can combat global warming.

Researchers said the findings could also help farmers make more efficient use of the costly nitrogen-based fertilizers used to promote plant growth. No-till farming apparently slows the breakdown of fertilizers in the soil, they said.

The three-year, federally funded Purdue University study looked at the amount of nitrous oxide released by no-till fields compared to plowed fields. No-till farmers don't plow under their fields between crops and disrupt the soil surface as little as possible, although they do cut into it to plant seeds and inject fertilizers.

The study found no-till fields released 57 percent less nitrous oxide than chisel tilling, in which plants are plowed back into the soil after harvest, said Purdue agronomist Tony Vyn, who led the research. They also produced 40 percent less gas than fields tilled with moldboard plows, which turn the dirt over onto itself.

Those numbers are averages, he said. Researchers looked at fields where corn and soybeans were alternated from year to year and others that were planted each year from corn. Emissions in fields where crops were rotated were lower than in those where they weren't, he said.

Vyn said he was stunned by the large amounts of nitrous oxide his team detected in the air above the plowed fields compared with those that had long been farmed using the erosion-fighting no-till approach.

The results are particularly disconcerting in light of the fact that nitrous oxide packs 310 times the heat-trapping power of carbon dioxide, the greenhouse gas largely blamed for climate change, he said.

The U.S. Environmental Protection Agency has determined that nitrous oxide can remain in the atmosphere for 120 years, adding to its global warming impact.

"Because it's so long lived, we need to do everything we can in terms of farming practices to reduce these releases," Vyn said. "Once it's released, it's going to be in the air for a long time - longer than anyone's lifetime."

His team's research results appear in the January-February issue of the Soil Science Society of America Journal.

Robert Horton, a professor of agronomy at Iowa State University who was not involved in the study, called the results exciting and said they highlight another potential benefit of no-till farming, which has already been shown to reduce erosion and improve soil quality.

"Now we can add an air quality advantage of no-till rotations to the list," he said.

Vyn's team conducted its research in fields Purdue maintains near the West Lafayette campus in rich soils that once were tall grass prairie. The university has farmed those fields for three decades using either no-till or one of

the common plowing practices. The differences seen in the nitrous oxide emissions are likely due to variations in microbial life and soil chemistry created by the different farming practices, Vyn said.

Rodney Venterea, a soil scientist with the U.S. Department of Agriculture's research arm, said the Purdue study supports his research, which also found that scaling back on field plowing reduces nitrous oxide emissions.

But he said the release of the gas is complex and not simply a matter of one farming practice versus another. For example, he's found no-till fields release more nitrous oxide than plowed land when fertilizer is applied to the soil surface rather than injected into the dirt. The Purdue researchers injected the liquid nitrogen fertilizer a few inches into the soil.

Venterea said it's important to note those different outcomes because some no-till farmers still use the surface-application approach, instead of injecting fertilizer below the surface, where plant matter accumulates and bacteria and fungi are active and can break down chemicals.

"So if you can get your nitrogen fertilizer down below that active zone then that's the best scenario," he said. "The more nitrogen fertilizer that stays in the soil, the more that's available for the plants and there's less that can be released as (nitrous oxide) and other forms that have other environmental effects."

Sixty-eight percent of the nitrous oxide emissions in the U.S. in 2008 came from farmland, according to an EPA report leased last year. It said U.S. emissions of the gas grew about 6 percent between 1990 and 2008.

Although the study looked at conventional farming techniques and industrial fertilizers, Vyn said manure used as fertilizer by some farmers, including organic farmers, can also release nitrous oxide if it is applied in large amounts.