Preventing soil erosion in continuous corn

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With recent increase in the cost of energy and subsequent explorations into alternative energy sources, the increased harvest of corn residue for cellulosic ethanol production is likely in the future. This may be especially true in fields where corn is grown continuously, in part because perennially high residue amounts favor annual harvests, and also because corn residue left on the soil surface is a source of inoculum for corn diseases.

Removal of corn residue, however, may require changes in tillage for increased efficiency and protection against soil erosion. Yet, the amount of N fertilizer needed to optimize corn grain yield can vary among tillage systems due to differences in soil N cycling. Thus, understanding the response of continuous corn to fertilizer N when residue is removed in different tillage systems will be necessary for optimizing N use in such systems.

A recent article in the November-December issue of *Agronomy Journal* summarized the results of field experiments conducted during 2006 and 2007 at four locations in Illinois, which focused on understanding how residue removal and tillage system affect the response of continuous corn to N fertilization. The research was also presented in New Orleans, LA at the American Society of Agronomy annual meeting in November 2007.

On dark prairie-derived soils with abundant rainfall, the authors, Jeffrey Coulter of the University of Minnesota and Emerson Nafziger of the University of Illinois, observed that the economically optimum N

fertilizer rate (EONR) for continuous corn was reduced by 13% with full or partial removal of corn residue when compared to no removal of residue. This was consistent for both chisel plow and no-tillage systems. Averaged across N fertilizer rates in these environments, corn grain yield was similar between no-till and chisel plow tillage systems with full removal of residue. However, with partial and no removal of residue, yields were 5 and 12% greater with the chisel plow than with the no-tillage system, respectively.

"Higher yields with tillage when residue was returned in these environments were likely due to improved seedling growth resulting from warmer soil temperatures," said Coulter.

These results show that on productive soils with adequate rainfall, removal of residue has, at least in the short term, the potential to lower N fertilizer requirements. However, the authors warn that this advantage needs to be balanced against the need to retain adequate residue to maintain soil C and protect against erosion. While no-till continuous corn worked well with full removal of residue in these highly productive environments in the central Corn Belt, Coulter says that "no-till continuous corn may be less applicable in the northern Corn Belt when residue is removed because of heavier soils and a shorter growing season."

In his new role as a corn cropping systems agronomist in Minnesota, Coulter believes that strip-till continuous corn might be a viable alternative to no-till when residue is removed. Research is ongoing at the Universities of Minnesota and Illinois to identify best management practices with regard to economic and environmental sustainability when corn residue is removed in corn-intensive cropping systems.

View the study abstract at agron.scijournals.org/cgi/cont … /abstract/100/6/1774 .

Source: American Society of Agronomy