DEVELOPMENT OF SUSTAINABLE CORN STOVER HARVEST STRATEGIES

D.L. Karlen[1], S.J. Birrell[2], C.W. Radtke[3], and W.W. Wilhelm[4]

[1]National Soil Tilth Laboratory, ARS-USDA, 2110 Univ Blvd, Ames, IA 50011, USA
[2]Iowa State University, [3]Shell Oil – formerly with Idaho National Laboratory (INL), and
[4] Agroecosystem Management Research, U. of Nebraska, USDA-ARS, Lincoln, NE, 68583, USA

Interest in harvesting crop biomass for bioenergy feedstock increased rapidly following release of the Billion Ton report by the Department of Energy (DOE) and USDA. This poster shows the type of field and laboratory data being gathered through a three-way partnership among ARS, Iowa State University (ISU), and Idaho National Laboratory (INL) scientists near Ames, IA to be sure the practices will be sustainable. Our objectives are to (1) develop a 1-pass harvesting system, (2) quantify nutrient removal, (3) quantify feedstock quality for ethanol production, and (4) quantify sustainability using soil quality indicators and productivity assessments. Treatments at this site include using a one-pass harvesting system to collect grain and (1) the top 50% of the plant, (2) bottom 50% of the plant, (3) all harvestable stover, or (4) no stover for both continuous corn and corn grown within a corn-soybean rotation. Harvesting corn stover increases nutrient removal so care must be taken to avoid implementing these practices on areas where soil test P and K may be limiting crop growth. Continuous corn yielded more where the previous crop's residue was harvested than where it was returned, but the 3-year average corn grain yield was 20 to 40 bu ac^{-1} lower than where corn was rotated with soybean. This reconfirms a well-documented yield penalty associated with continuous corn on many Midwestern soils, and emphasizes that the merits of crop rotation must not be forgotten as management plans are made. The need for higher N fertilization rates to support continuous corn for bioenergy will almost certainly lead to greater N-leaching loss and further contamination of surface and ground water resources. Corn stover will be a primary feedstock for lignocellulosic ethanol plants in the Midwest and sustainable practices can be developed. The key is to use a systems approach in which bioenergy, water quality, carbon sequestration, wildlife habitat, community development and numerous other factors are all given appropriate consideration.

Contact: Douglas L. Karlen, USDA-ARS-NSTL, 2110 University Blvd., Ames, IA 50011-3120, USA. Tel: 515-294-3336. E-mail: Doug.Karlen@ars.usda.gov.