

Sustainable Corn Stover Harvest Strategies

A. What is this research project?

Project Goal: To develop sustainable strategies to harvest corn stover for bio-fuel or other bio-products

B. What problem does it address?

Objectives:

- Develop a one-pass harvesting system for corn grain and stover
- Quantify nutrient removal
- Quantify feedstock quality for ethanol production
- Quantify sustainability using soil quality indicators and productivity assessments

C. How is the project different from or how does it enhance other projects?

- Preliminary studies indicated that harvesting the cob and stover from the upper 50% of the corn plant would provide a high-quality bio-energy feedstock and some soil residue cover at a reasonable harvest speed. This replicated study confirmed those initial findings.
- Harvesting lower stalk portions increases pre-treatment cost, nutrient replacement cost, and results in very little soil cover.
- Initial soil samples showed that before crop residues are removed, producers should be sure their soil-test levels are not limiting.

D. What are the potential benefits of partnering with ARS on this research?

- ARS provides the bridge between bioenergy production, soil-water-air quality, food-feed-fiber production, economics, and other aspects of the entire agricultural system.
- This partnership allows university agricultural and biosystems engineers to focus on equipment development, biochemists at the Idaho National Laboratory to focus on feedstock quality and ARS scientists to focus on soil resource, crop production, water quality, and other aspects of sustainability.

E. Who are the potential customers?

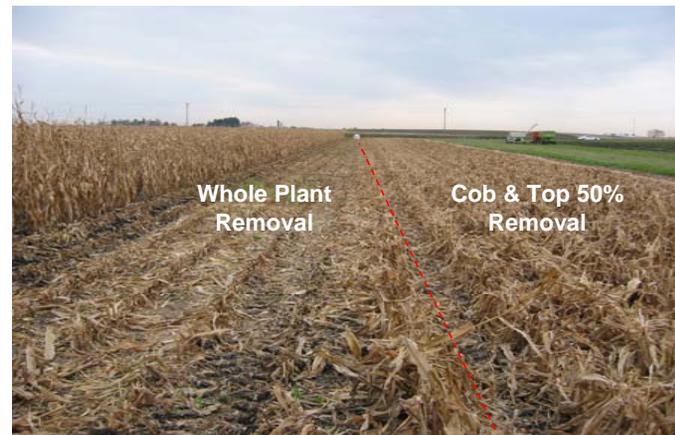
Farmers and the biomass-to-energy industry will benefit from sustainable strategies for harvest of corn stover.



Commercial combine equipped for one-pass crop residue collection

Total nutrient replacement cost

Stover Harvest Scenario	Value
<u>U.S. \$/ton of stover</u>	
Whole plant	\$9.67
Cob & top 50%	\$9.49
Bottom 50%	\$10.10
<u>U.S. \$/gal of ethanol ('05 & '06)</u>	
Whole plant	\$0.121
Cob & top 50%	\$0.118
Bottom 50%	\$0.126



Autumn soil surface cover with and without residue removal

Stage of Development

A one-pass corn and stover harvesting machine has been developed and is being patented by Iowa State University in cooperation with John Deere.

Moving Forward

- This study has resulted in one new partnership with an ethanol producer to conduct similar field research on one of their sites in Iowa.
- Another new study is being initiated with an ISU economist to increase the economic assessments associated with this research.
- A third study in cooperation with INL is being planned to examine water quality and greenhouse gas impacts of stover removal.

Researchers

Douglas L. Karlen, ARS, Ames, IA
 Stuart J. Birrell, Iowa State University
 J. Richard Hess, Idaho National Laboratory
 W. W. Wilhelm, ARS, Lincoln, NE



Contact Information

Doug Karlen, National Soil Tilth Laboratory
 (515)294-3336; Doug.Karlen@ars.usda.gov



USDA ARS MWA BIOENERGY RESEARCH
Challenges for Today. Solutions for Tomorrow.

www.ars.usda.gov/mwa