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# Analysis of Corn Stover Harvesting Equipment and Corn Stover Storage Methods

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# Analysis of Corn Stover Harvesting Equipment and Corn Stover Storage Methods

## **Abstract**

Research was conducted at the Ag Engineering and Agronomy Farm and the ISU Dairy Farm Complex in the fall of 2009. The research equipment, a John Deere 9860 STS combine and an AGCO 4790 large square baler, were prepared in the Ag Engineering/Agronomy (AEA) Farm shop with updated biomass processing attachments and a hitch that would allow for the baler to be pulled behind the combine during field operations. Initial testing was carried out on the Marsden Farm in an area designated for the Advance Machinery Group.

## **Keywords**

RFR A9129

## **Disciplines**

Agricultural Science | Agriculture | Bioresource and Agricultural Engineering

# Analysis of Corn Stover Harvesting Equipment and Corn Stover Storage Methods

## RFR-A9129

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*Harvest.* Research was conducted at the Ag Engineering and Agronomy Farm and the ISU Dairy Farm Complex in the fall of 2009. The research equipment, a John Deere 9860 STS combine and an AGCO 4790 large square baler, were prepared in the Ag Engineering/Agronomy (AEA) Farm shop with updated biomass processing attachments and a hitch that would allow for the baler to be pulled behind the combine during field operations. Initial testing was carried out on the Marsden Farm in an area designated for the Advance Machinery Group. Testing continued from October 27 to December 2 at the ISU Dairy site. Tests conducted at the ISU Dairy included both logistical and productivity analysis at various collection rates of corn stover (0%, 50%, 100%). These rates were applied in two different collection tests. The first was bulk collection, which included support machinery in the field to collect stover from the combine during harvest. The second system tested was a single pass baling system. Data loggers connected to the machine's Controller Area Network (CAN) systems logged GPS location, fuel consumption, and yield data for the combine and supporting vehicles in the field. These data are now being analyzed for both productivity and cost analysis of the systems. Field tests were duplicated during the testing phase to analyze affects of crop and plant moisture on overall

machine productivity. Testing will continue next fall to confirm results.

*Storage.* Corn stover collected from the harvesting tests was stored in the form of bulk flowable stover, cobs, and bales. The stover and cob material was stored in 55 gallon storage containers with different treatments: 1) control, 2) wet storage, and 3) dry storage, for 2 time periods—short-term (3 months) and long-term (9 months). Wet storage included ensiling. Dry storage included: 1) continuous aeration during storage and 2) storage of pre-dried (zero moisture content) biomass. Trials were replicated three times and housed in the Harvest, Storage and Transportation (HST) Building at the Bio-Century Research Farm, Boone, IA.

Corn stover that was baled at the ISU Dairy Farm was also placed in storage. Like the bulk stover, the bales have been stored in two periods—short-term (3 months) and long-term (9 months). Bales were also tested for storage quality based on the composition of the material collected from the combine. Bales were made and stored at different moisture levels. To evaluate different storage methods, bales were stored as: 1) control, 2) covered with tarp, and 3) covered with Dupont Tyvek.

## Results and Discussion

Results from testing in the fall showed a reduction in overall productivity of in-field harvesting by the combine when pulling the baler for 16%, 40% (50% stover collection), and 65% (100% stover collection) of husk and cob collection. The combine during bulk harvesting saw an overall reduction in harvest productivity of 10.5%, 32% (50% stover Collection), and 47% (100% stover collection) of husk and cob collection. Further analysis

shows an overall reduction of about 7% in productivity between single pass bulk harvesting and baling. Further analysis of the costs applied with the additional equipment required for harvesting will be completed this winter.

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**Figure 1: Bulk flowable collection of corn stover in a single pass collection system was conducted with specially developed harvesting equipment. Single pass collection of corn cobs as well as corn stover bales also was evaluated as part of this project.**