

BMAP Corn Stover Harvest and Storage Tasks

The BMAP project is an integrated project combining the efforts of Iron Horse Farms, MAT, Iowa State University and NatureWorks LLC. Iron Horse Farms is evaluating the logistics of collecting stover in western Iowa and eastern Nebraska, including investigating potential collection center locations. Additionally Iron Horse is evaluating different harvest and cultivation practices as they impact collection cost. MAT is constructing and testing a storage bunker for corn stover with the objective of storing stover for up to 2 years for use as hydromulch. The corn stover will also be evaluated for various compositional aspects related to corn stover conversion by NatureWorks LLC. Iowa State University in collaboration with John Deere is developing and testing prototype one pass harvesting equipment. NatureWorks LLC is developing a fermentation process to convert corn stover hydrolysate to lactic acid and/or ethanol. This presentation will report on the objectives, plans and progress to date for the harvest and storage portions of the BMAP project.

The MAT storage task objective is to prepare a site and construct a storage bunker in which stover will be stored. This includes stover procurement, delivery to the bunker, validation of the storage system under various conditions, taking and providing samples for analysis purposes, review the analytical data collected, establish benchmarks validating most practical storage methods and to determine storage impact on corn stover fiber quality.

During the first year a multi-cell bunker was designed and a requested for bids submitted to companies specializing in ensilage bunker construction. The winning bidder (Wieser Concrete) was selected and the bunkers were in place prior to the 2004 harvest season. Stover used to fill the bunkers included bales from both the 2003 & 2004 harvest seasons as well as stover from equipment able to complete a standing whole stalk harvest. Stover has been stored after several processing methods and using various moisture levels. Leading industry representatives were shown the storage bunker and offered samples for their future use. Stover storage conditions and results for the incomplete testing will be presented at the review.

At Iowa State University the task objective is development of harvesting and transportation systems that efficiently and economically move corn stover from the field to biomass processing facilities such as the MAT bunkers. To achieve this goal, simple and effective equipment must be developed that allow rapid collection of large quantities of stover, without significantly interfering with other production operations. The primary emphasis of this work has been innovative single-pass corn and stover harvesting systems, which have both economic and technical advantages for bioconversion processes. The two fundamental issues that must be addressed are the development of biomass harvesters and supporting equipment for field operations, and densification of the harvested material to minimize transportation costs.

The specific objectives of this work include:

1. Laboratory research on functional characterization of fundamental processes, to provide baseline information for the design of biomass harvesting and transportation systems.
2. Economic analysis of the different harvest and transportation systems under consideration.
3. The design, development, and evaluation of prototype harvest equipment, for single pass corn and stover harvesting.

Equipment to harvest corn and corn stover in a single pass has been designed, built and tested in the field. Corn stover collected has been used to generate results on the bulk density of corn stover material at various moisture contents and various corn stover particle sizes.