Control Number: 2029-1516

PROJECT TITLE:	Enhanced Feedstock Characterization and Modeling to Facilitate Optimal Preprocessing and Deconstruction of Corn Stover
NAME OF THE APPLICANT:	Montana State University
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This project will address the challenge of processing this heterogeneous feedstock by fractionating the biomass feedstock and to both streamline processing and generate new potential co-product. Additionally, we will develop new field-deployable analytical tools that will be coupled with empirical models that will be used to predict feedstock properties and processing performance. The overall scope of this project is to **(OBJECTIVE 1)** identify conditions for optimal corn stover fractionation using a two-stage physical fractionations, **(OBJECTIVE 2)** assess how physical fractionation impacts properties, partitioning of biomass, and response to processing, **(OBJECTIVE 3)** further adapt, develop, and validate several advanced characterization tools for assessing biomass properties that can be linked to processing behavior , and **(OBJECTIVE 4)** develop and validate predictive models based on measurements that can be performed “in the field” or “at the biorefinery gate” to predict feedstock processing behavior (preprocessing and deconstruction). The first objective will employ pre-separation processing (size reduction) which are next subjected to enhanced separations (scalping separation, sieving, and air classification) to yield fractions enriched or depleted in select compositional components or properties. For the second objective, fractions will be screened for their response to post-separation processing (pretreatment and enzymatic hydrolysis) and detailed characterization profiles will be developed employing at least two techniques to assess the state of water association with the biomass (water retention value and low-field, NMR relaxometry) and dynamic image analysis to assess distribution of particle size and morphology. For the final objective, we will utilize these tools to develop empirical models to assess the relative abundance of tissue type in order to assess fractionation efficacy and to predict fraction performance during pretreatment and enzymatic hydrolysis.

A key impact of this project will be to develop the capability to tailor feedstock properties to the conversion process, allowing for more streamlined processing. Another important impact will be the ability to generate lignocellulose fractions enriched or depleted in select properties that could be used in other applications as co-products, which is an important component of enabling the economics of cellulosic biofuels processes. This technology also has the potential to be employed at the regional depot scale, which addresses the critical challenge of feedstock logistics for low bulk density herbaceous feedstocks such as corn stover. Finally, this project will generate new, industry-relevant knowledge on biomass processing, providing value to industry and enabling commercialization of technologies for the conversion of biomass to biofuels and bio-products.