

Final Report

Award Number: DE-FG36-08G088040

Recipient: Southern Illinois University – Carbondale

Project Title: Equipment Request for the Belleville Agricultural Research and Education Center

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Executive Summary

The funding provided by the DOE for this project was used exclusively to purchase research equipment involved with the field development and evaluation of crop production technologies and practices for energy crop production. The new equipment has been placed into service on the SIU farms and has significantly enhanced our research capacity and scope for agronomy and precision ag research to support novel seed traits or crop management strategies for improving the efficiency and productivity of corn and soybeans. More specifically, the precision ag capability of the equipment that was purchased has heightened interest by faculty and associated industry partners to develop collaborative projects. In addition, this equipment has provided SIU with a foundation to be more successful at securing competitive grants in energy crop production and precision ag data management. Furthermore, the enhanced capacity for agronomy research in the southern Illinois region has been realized and will benefit crop producers in this region by learning to improve their operations from our research outcomes.

Actual Accomplishments

The primary objective for this project was to utilize the DOE funding to purchase equipment required for energy crop field research in the Midwestern United States. This equipment was to facilitate the cultivation of, and research on, corn and soybean planted on field research stations under the management of Southern Illinois University. These objectives were met as the field research equipment was purchased and the equipment has been an integral part of ongoing agronomy research in both corn and soybeans. Moreover, the presence of the new research equipment has stimulated and enabled the conduct of research in precision agriculture and the evaluation of new crop genetics in corn and soybean used for biofuel generation which was an overarching strategic goal for the project. Thus, the actual accomplishments of this project have achieved the original stated objectives and goals of the project.

Summary

At the time of the original proposal to the DOE the College of Agricultural Sciences at SIU did not possess sufficient energy crop production equipment to allow meaningful involvement in our country's initiatives with energy crop production. Existing equipment varied in age from 15 to 30 years old, with antiquated technology that is not suited for the next generation of crop production research. Our top-notch research scientists, while successful in many arenas, were prevented by this outdated equipment from applying their expertise toward answering the challenges of energy grain crop production.

The funding sought from DOE was to be used exclusively for the purchase of needed essential equipment for capacity building required for contemporary research on biofuel crop production and management within a framework of soil and water conservation and overall environmental stewardship. Specifically, the funds would be used to purchase: 1) small-plot research combine suited for harvest and handling of genetically-modified energy grain crops; 2) GPS-enabled large platform combine to facilitate field-scale research and demonstration of precision ag and variable-rate technologies that are designed to maximize energy crop production; 3) GPS-enabled tractor with precision grain planter for research on input efficiency (seed with specific traits, strategic fertilizer placement) and maximizing yield; and 4) field sprayers with precision application and electronics technologies to optimize crop protection inputs while enhancing energy crop yield along and maintaining environmental stewardship.

An initial delay in securing the funds from the DOE resulted in a subsequent interruption in our ability to make timely equipment purchases for field research use. A project extension from the DOE was granted and the equipment was eventually purchased and placed into service as planned. The equipment

purchased includes:

- 1) Tractor and planter for variable rate seeding applications using GPS hardware/software
- 2) Large platform commercial combine with GPS yield mapping capacity
- 3) Small plot research combine for corn and soybean harvesting
- 4) Field research sprayers with GPS for accurate application of crop inputs

The commercial scale combine along with the tractor and planter equipped with GPS capability were the base equipment used for SIU to conduct the first variable rate seeding trial conducted in corn on our campus. Six corn hybrids were planted at three different seeding rates across a field using the planter (Figure 1). Corn grain was then harvest with the large-scale combine with harvest mapping capability (Figure 2). Analysis of this data reveals that corn grain production can be optimized through improved crop management practices such as those allowed by precision ag tools, in this instance variable crop seeding rates and corn hybrid seed selection. Therefore, the improved efficiency in corn grain production will indirectly enhance the efficiency of ethanol production from corn on a land area basis (acre).

The small-plot research combine has been used in the evaluation of corn and soybean genetics and related crop management research for several hundred field trials since it was first acquired in 2010. This combine is a dramatic improvement in terms of research capacity, reliability, and data collection compared with previous small-plot combines at SIU. The combine has equipment options that enable the safe and compliant conduct of field research trials with regulated seed for energy crop production. The field research sprayers with GPS functionality have been used throughout the crop production season to apply crop nutrient or crop protection products to research plots that allows for accurate applications with mapping capability.

Overall, this DOE project has built interest among the faculty and industry partners who can benefit from our new research equipment at SIU. As a result we have been able to evaluate crop production elements such as seed, crop nutrients, and plant protection technologies in collaboration with industry partners. Currently, the precision ag sector hold significant promise for future gains in crop production efficiency and the equipment that we have secured with the DOE grant serves as the base for future activity down this path. This research equipment is part of the justification being expressed to fill a much needed faculty position in the area of precision ag data management to merge the technical capabilities of precision ag equipment, the historical mapping data, and novel data analysis methods to learn more from past agronomic practices to advance our efficiency in producing energy crops.

Products Developed and Technology Transfer

Patents: none

Public releases: none

Presentations: DOE Feedstocks Peer Review

http://www.bcsmain.com/mlists/files/biomass/obpreview2009/feedstocks/documents//Feedstock_Logistics_Young_7.7.1.8.pdf (Hyperlink no longer active)

Figure 1.

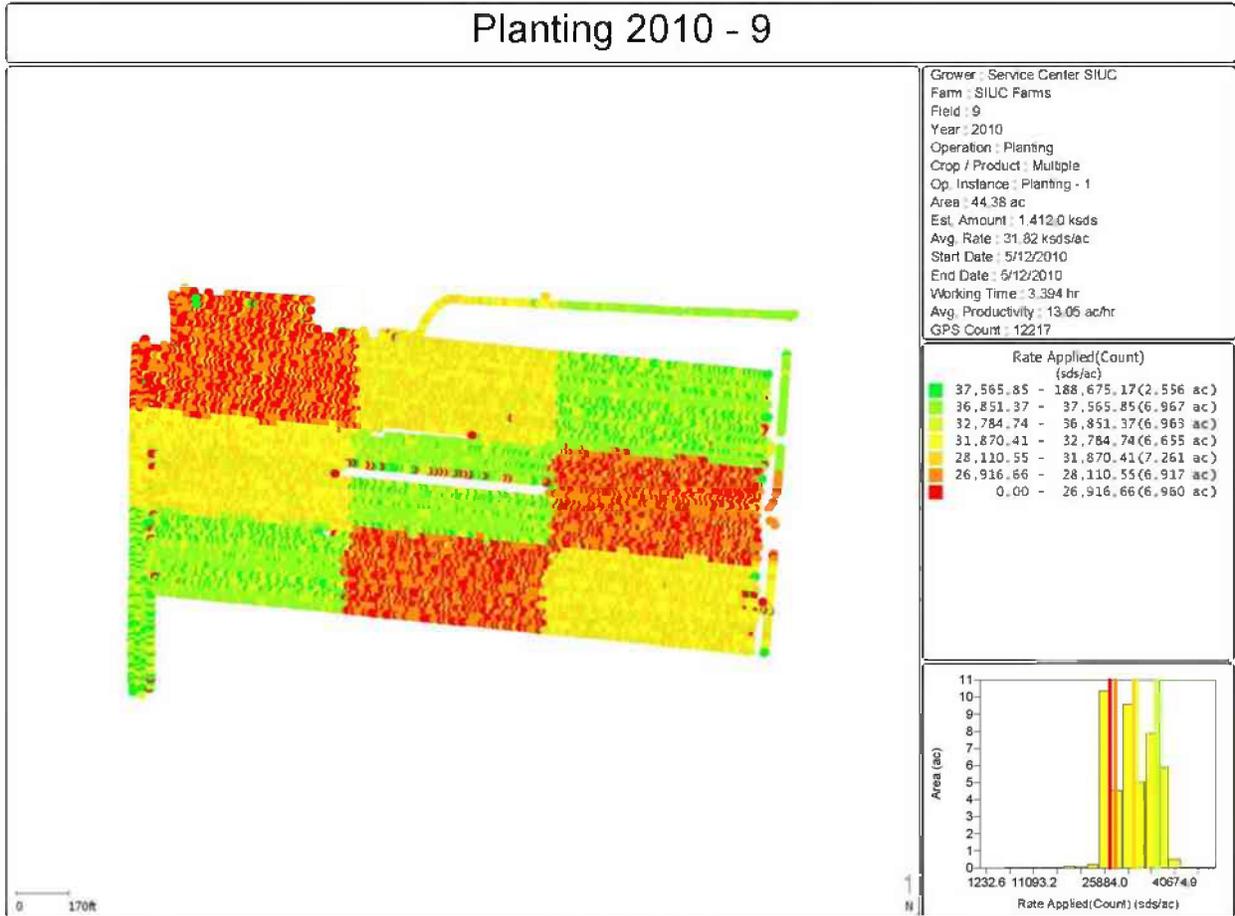


Figure 2.

