



Isaac graduated at Purdue University with a B.Sc. in Agriculture Systems Management in 2009. He has since completed work on his Master of Science in Agriculture Systems Management from the Agricultural and Biological Engineering department at Purdue University working on the logistics and economics of sweet sorghum bio-feedstocks. In addition to his research work, Isaac has co-lectured ASM 420 with Dr. Klein Ileleji and traveled abroad to China for cooperative research work at Zhejiang University. Isaac has accepted an Operations Engineer and Manager Position with DOW Agriscience, where he will be leading the development and renovation of current and newly acquired seed production facilities owned by DOW in the Midwest.



# Agricultural & Biological ENGINEERING

## Thesis Defense

**Speaker:** Isaac P. Serbin

**Title:** Harvest Logistics and Economics of Sweet Sorghum Crop for Fuel Ethanol, Grain Feed, and Bioproducts Under Midwest Conditions

**Professor:** Dr. Klein E. Ileleji

**Date:** April 20, 2011

**Time:** 3:30 pm

**Place:** ABE 301

### Abstract:

Sweet sorghum is well suited for nearly all climate and soil types. When compared to sugarcane and corn, sweet sorghum requires less water, fewer nutrients, and its higher sugar content makes it ideal for ethanol production. For example, an average of 2.8 gal/bu of ethanol can be produced using corn grain. With an average year of 170 bu/acre, corn can only produce 476 gal/acre of ethanol. Sweet sorghum juice alone can produce an average ethanol yield of 550 gal/acre. Using its solid residues (bagasse, grain and leaves) along with juice using cellulosic digestion, sweet sorghum can yield over 800 gal of ethanol/acre.

Due to the large quantities of degradable juice and the large quantities stem and leaf bagasse, developing logical pathways is one of the problems making sweet sorghum a difficult crop to use. There are a number of decisions and research questions, which need to be addressed in order to utilize sweet sorghum. To determine the best economic pathway for utilizing sweet sorghum we must first understand its logistics, its requirements, and its costs. Some of the challenges include: the methods of harvest, storage requirements, transportation requirements, processing systems, and utilization.

This thesis will follow through and analyze the logistics and economics of various pathways for sweet sorghum utilization. The goal is to find the best pathway for sweet sorghum through discrete rate simulations and an economic cost analysis.

**Keywords:** Sweet sorghum, Fuel Ethanol, Harvest Logistics, Storage Logistics, Economics.