From Field to Fuel: MSU Research Drives Future Planting Decisions

Some call it corn, others call it maize, but at MSU, it's what is driving research to fuel the emerging bioeconomy.

Corn has been produced as food for thousands of years, but until recently, exploring its role in producing energy was a new frontier.

"With a growing demand for corn grain to supply the burgeoning ethanol market, the time had come to find an effective way to identify which hybrids would yield the highest amounts of ethanol," said **Kurt Thelen**, MAES crop and soil sciences researcher. "This type of work had never been done, so a lot of basic questions had to be answered."

Thelen's research will benefit growers seeking higher ethanol-yielding hybrids, the biorefineries set up to process corn into ethanol, and the end users who fill their vehicle or farm machinery tanks with ethanol-based fuel.

"The work we're doing is directly applicable to Michigan growers. It will not only benefit our state economically, but it will ultimately provide us with access to more sustainable and environmentally beneficial energy sources," he said. "As a state, Michigan is committed to becoming the leader in developing alternative energy sources, and research such as this helps to establish our position as a leader."

Thelen and his colleagues compared 286 hybrids under Michigan growing conditions to measure the differences in the amounts of starch-generated ethanol produced. They were surprised to find up to a 22 percent difference among hybrids.

"The variability between hybrids was surprising. We have confidence in our methods because our average ethanol yield matched up with the national average of 2.8 gallons of ethanol per bushel, but we were also surprised by the percentage differences in variability within individual fields and also across the state," he said.

The difference of a few percentage points can make a difference of thousands of dollars in return.

"For a plant producing 50 million gallons of ethanol per year, even a small increase of 4 percent in hybrid ethanol yield results in significant returns," Thelen said. "Fifty million gallons multiplied by 4 percent would result in 2 million additional gallons of ethanol per year, and at $2 per gallon for ethanol, this equals out to $4 million."

Thelen noted that researchers are only beginning to understand how crop genetics and landscape and environmental characteristics contribute to the variability of ethanol yield.

"With the 2006 crop we observed that the farther north we sampled in the state, the higher the ethanol yield. Additionally, we saw swings of 20 percent in the gallons of ethanol produced per bushel of corn depending upon where it was grown in the same 120-acre field," he said. "Ongoing work will focus on identifying how field-level and latitudinal variability contribute to differences in ethanol yield."

The next logical step will be to apply the same types of experiments being used with corn to cellulosic sources of ethanol such as switchgrass and corn stover.

"Branching off into switchgrass and other crops to determine the role they can play in the ethanol industry will help minimize the potential ramifications of the food versus fuel debate," Thelen said. "We believe we can supply both markets."

Funding for this project was provided by Project GREEEN, the U.S. Department of Energy, Chrysler LLC and the Michigan Agricultural Experiment Station, with participatory support provided by the plant industry groups