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Sorghum--Fuel of the Future? Agronomist Studies Sorghum and Grass for Future Energy Source

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Scott Staggenborg, right, and Wahab Abdul Tour wait for the ferry to cross the Niger River in Northern Mali.

Courtesy of Scott Staggenborg

Weighing in on crop production in West Africa might seem a bit of a stretch for a K-State agronomist; however, that's not the case for Scott Staggenborg. He recently returned from his second visit to West Africa, where he reviewed sorghum research and crop production.

During the research trip to Tombouctou (also spelled Timbuktu), a West African city near the Niger River, he joined Malian researchers in exploring opportunities to improve sorghum production and management. The research effort is supported by the International Sorghum and Millet Improvement Program (INTSORMIL).

Growing conditions in the West African region are remarkably similar to conditions in Kansas, the crop scientist said.

The challenge, Staggenborg said, is to characterize the soil, identify new sorghum varieties that will work well with the growing conditions, and develop a plan for managing plant diseases and pests native to the area.

Staggenborg (BS '88, MS '90 agronomy) first nurtured his interest in plants and the environment while growing up on a farm in Marshall County. He admitted that his career stems from a lifelong curiosity about the world around him, and particularly, plants and the environment.

While considering a career in agriculture, Staggenborg viewed a filmstrip on corn production at an FFA event, and immediately thought: "That's what I want to do." His choice of career has proved a good fit.

Staggenborg is optimistic about Kansas' crops, crop production, and the economic viability of the state's ability to fulfill a niche in producing biofuels.

"Kansas is positioned to succeed in the biofuels marketplace," Staggenborg said.

With much discussion and debate about using corn as fuel, rather than food, the K-State team is researching sorghum, native grasses such as switchgrass and big bluestem, and an Asian perennial, *Miscanthus* × *giganteous*, which is fast-growing and produces a substantial amount of biomass for potential production of biofuels.

Staggenborg, with the help of agronomy graduate students, planted energy sorghum by the intersection of Kimball and College avenues. The tall, lush green crop,

which can grow to 13 feet, prompted more than a few inquiries.

Kansans are right to be interested in the crop research because it offers potential economic opportunities for the state, Staggenborg said. Grass is, of course, a renewable resource.

And, scientists know that sorghum grows well in Kansas. Sweet sorghum is somewhat like sugar cane; it can grow farther north and has a higher sugar content in the sap than regular forage sorghum.

Brown midrib sorghum (BMR) has a a genotypic trait that reduces the lignin content of the plant to increase digestibility for livestock feed and improve ethanol conversion efficiencies. Lignin gives plants stem strength, but it cannot be broken down in cellulosic-ethanol conversion processes, Staggenborg said.

Dual-purpose forage sorghum looks like grain sorghum and grows up to six feet in height. The variety is capable of producing up to 100 bushels an acre, said Staggenborg, who noted that moving forward with research on sorghum, rather than corn, as a potential source for biofuels could position Kansas in the emerging biofuel market.

"Sorghum is not viewed as a competitor for human food," he said.

K-State scientists also are researching processing and marketing issues for biofuels. One example, he said, involves pelleting plant biomass to facilitate transportation to processing centers.

Research is ongoing – and exciting, said Staggenborg,

Staggenborg brings his enthusiasm for agronomy into the classroom and encourages students to consider a career in agronomy.

"Our challenge as scientists is to study plants and the environment interactions, and then decide how best to manage them," he said.

Jonathan Propheter (BS '07 agricultural technology management) took Staggenborg's Cropping Systems class as an undergraduate, and he is one of seven graduate students working with Staggenborg.

"The biofuel cropping system projects I have been involved with while working on my master's degree have been great opportunities and learning experiences," said Propheter. "The research we are conducting will be influential in the continued development of the biofuel industry within Kansas and across the Great Plains."

In addition to the graduate students – Propheter, Kyle Shroyer, Scott Dooley, Yarid Assessa, Todd Ballard, Oliver Freeman, and Kevin Swenson – Staggenborg credited colleagues from agronomy and other departments for their collaborative efforts, including Chuck Rice, Agronomy; Alan Schlegel and John Holman, Southwest Research-Extension Center; Praveen Vadlani and Leland McKinney, Grain Science and industry; and Donghai Wang, Biological and Agricultural Engineering.

"By working together, we're able to do more," he said.

Yet, whether working with scientists from the campus or colleges and universities elsewhere in the United States or world, Staggenborg is firm in his belief that K-State scientists join others in sharing a common goal for sustainable agriculture, providing food for the larger world, and protecting the environment.

—Nancy Peterson

Kyle Shroyer (BS '08 agronomy) in front of the switchgrass at Troy, Kan.

Agronomy graduate students (l-r) Kyle Shroyer, Kevin Swenson, and Scott Dooley, and sophomore Josh Carlin harvest corn biomass at the Agronomy North Farm.

Courtesy of Jon Propheter (3)

Kyle Shroyer in front of photoperiod sensitive forage sorghum at Troy, Kan., in 2008.