

Seeking the future

New places, new faces, new ideas. Oklahoma State University plant and soil sciences graduate students are researching south of the border on one of the brightest new innovations in North American farming.

This new idea is the GreenSeeker. This top-dress fertilizer spray applicator optically senses a plant's nutrient requirements and then it applies nitrogen fertilizer as needed.

The GreenSeeker was developed during 10-plus years of research by a team of four OSU scientists: Marvin Stone and John Solie of agricultural engineering, and Gordon Johnson and William Raun of plant and soil sciences.

Their collective efforts have the potential to maximize production rates through exact fertilizer application and increased yield rates, which could help in the fight against food shortages worldwide, said Raun.

After building the GreenSeeker, which has been tested solely on wheat varieties in Oklahoma, the OSU team wanted to make sure the technology would actually perform as they were predicting it would. Four years of research on test plots confirmed everything they had been calculating in the lab.

The GreenSeeker was unveiled Oct. 15, 2001, at the OSU Noble Research Center. During the ceremony, license and master research agreements were signed with NTech Industries Inc., a private commercial manufacturing company.

NTech Industries Inc., an innovator, developer and marketer of proprietary technology for sensor-based agricultural nutrient and herbicide delivery systems, has agreed to manufacture the GreenSeeker. The agreement will benefit OSU by returning a percentage of sales revenue from the GreenSeeker product to the university for further research.

GreenSeeker is such a futuristic product because of its ability to sense and calculate a plant's physical and chemical needs for fertilizer (at a range of one meter squared) and then apply it while traveling 20 miles per hour over a field.

"That is what I enjoy the most about working with this project, being part of something that pushes the edge of science," said Paul Hodgen, soil fertility master's student from Roachdale, Ind. "At the same time, GreenSeeker will make us better stewards of the land and will reduce the risk of polluting the environment by agricultural inefficiencies."

The research behind GreenSeeker may not have been possible without the help of many different collaborators, including past and present students who aided in gathering information and building the current product.

A total of 26 participants have been involved in this joint program between plant and soil sciences and biosystems and agricultural engineering that has allowed the GreenSeeker project to develop. GreenSeeker is also part of an international research project with Mexico's International Maize and Wheat Improvement Center, or CIMMYT.

The CIMMYT research project is aimed at developing specific plant lines for varying types of climates and soil types so that not only will nitrogen application be maximized by the plants, but also specific plant breeds will be adapted for specific areas. Research in Mexico allows scientists a longer growing season to develop the kinds of specific plants needed.

Raun and Johnson are supervising staff members who have been using collaborative research opportunities at CIMMYT in Mexico for the GreenSeeker project. Raun developed the international research opportunity due to his extensive ties with CIMMYT, where he was employed for six years. Raun said this opportunity gives students valuable international experience that is beneficial to today's graduates seeking employment.

"This allows OSU students to travel and work abroad, and to work with some of the foremost researchers in their field," said Raun.

Those who have taken this opportunity said it has benefited them greatly.

"The experience I had at CIMMYT was absolutely amazing. I lived and learned a different way of life," said Kyle Freeman, soil fertility master's student from Tuttle, Okla.

"I had the opportunity to work with some of the best scientists from all over the world," said Freeman. "The international experience I gained will be invaluable for the rest of my life, and I will certainly never forget it."



Kyle Freeman collects data samples in Mexico on wheat plots following the application of Nitrogen with the GreenSeeker technology. (Photo courtesy of CIMMYT)

“Working with the GreenSeeker project gave me the opportunity and interest to continue my education,” said Freeman. “I had the chance to work with a team of professors devoted to delivering a product beneficial not only to the wheat producers of Oklahoma, but also a product that can be developed to use on crops all over the world.”

Hodgen is currently at CIMMYT doing research to expand GreenSeeker’s capabilities in other areas of plant and soil sciences. He too is adamant about the international research opportunity and the GreenSeeker project.

“Working within these two projects has provided me with countless opportunities, including educational experience, travel and real-world experiences as well as many professional contacts,” said Hodgen. “These opportunities may or may not have been offered in other traditional disciplines to the extent that they have been made available through this project.”

The research being done in Mexico will help adapt GreenSeeker technology worldwide. One of the many goals for the project is to have this technology used in developing countries where much of the farmland is of marginal quality. GreenSeeker has the potential to improve the nitrogen use efficiency for crop production everywhere.

The preparation and skills learned while being able to work on such an innovative project have allowed students to move on to successful careers, said Raun. Upon completion of the CIMMYT program, many of these students have returned to OSU to finish successful academic careers.

As a result of working with both projects, seven students have received the outstanding master’s and doctoral student awards from the plant and soil sciences department.

In addition, two students who worked on the GreenSeeker received the Sitlington Scholarship, a presti-



John Solie, agricultural engineering professor (left); Gregory Bell, horticulture and landscape architecture assistant professor; John Mayfield Jr., NTech CEO; Marvin Stone, agricultural engineering professor; William Raun, plant and soil sciences professor; and Gordon Johnson, plant and soil sciences professor; examine the GreenSeeker sprayer technology during the NTech licensing agreement. (Photo by Kristen Andrews)

gious honor awarded to students in the OSU Division of Agricultural Sciences and Natural Resources.

More than school awards are on the list of accomplishments for past CIMMYT research exchange students. Many have taken positions with top companies in related fields. SST, a leading agricultural technology company, The Noble Foundation and Ford Motor Co. are just a few of the companies who have hired plant and soil sciences students.

Current students and those to come will have opportunities within the GreenSeeker project and the international research project with CIMMYT. These projects are now aimed toward studying the application methods and determining correct algorithms enabling applicators to apply fertilizer to various crops.

Keeping these goals and the continuing problem of world hunger in mind as motivation, those involved with the GreenSeeker and CIMMYT international research projects will continue to go to new places, meet new faces and work on new ideas.

◆ *By Shane Richey, Plymouth, Ind.*

