



Chang Lian, Chinese Transfer Student, Gains Soil Fertility Research and Extension Skills Through Honor's Thesis

By Lisa Fields

In the fall of 2008, Chang Lian came to the U.S. for the first time, transferring as a junior to Cornell University from China Agricultural University in Beijing. Lian enrolled as an Agricultural Sciences major in the College of Agriculture and Life Sciences, focusing on agronomy and agricultural economics. He explained his choice. "The driving force behind my interest is the importance of agriculture for my country. Farmers are 70-75% of China's population, yet their standard of living is very low. Economic policy changes are needed and I hope to be part of that one day."

In addition to taking a rigorous course load and being active as an ambassador for the Agricultural Sciences program, Lian sought to integrate soil science and economics when he chose an Honor's Thesis research project on potassium management of alfalfa, working with Dr. Quirine Ketterings of the Cornell Nutrient Management Program in the Department of Animal Science.



Chang Lian (left) and Darren Usinowicz of Agricultural Consulting Service (right) during alfalfa harvest.

Ketterings explains, "Alfalfa is an important forage crop for dairy herds in New York that removes about 50-60 lbs of K_2O per ton of harvested crop. Potassium fertilizer costs have been as high as \$800 per ton in recent years. This drove the need for us to work with extension, consultants and farmers on a potassium research project."

Lian described his work. "In my research project we compared two approaches used to provide potassium recommendations for alfalfa, the sufficiency concept and the cation saturation ratio concept. To do this we had to determine the correlation between crop response to added K and the soil test K (sufficiency concept) or K saturation levels (cation saturation ratio concept) at the start of the experiment," Lian explained.

The K sufficiency concept is used at Cornell University and most Land Grant Universities. At Cornell, the Morgan soil test K extraction is the basis with recommendations going to zero when the critical soil test level is reached. The cation saturation ratio is based on the concept that calcium, magnesium and potassium should be present in the soil in a particular ratio to achieve maximum crop yield. Recommendations are based on achieving a certain K saturation in the soil, usually 3-5%.

Lian described the research process, "My work included both a field study and greenhouse research. The field study involved setting up plots in 16 alfalfa fields on two dairy farms. In the greenhouse, I worked with 12 soils and annual ryegrass as a bioassay to test K response. For both studies, the treatments consisted of 350 lbs of potash using 0-0-60 fertilizer per acre and a no-K control."

Lian worked with Greg Godwin, Research Support Specialist, and Sanjay Gami, Postdoctoral Researcher with the NMSP throughout his project. He also had help from other students and SUNY Cobleskill interns during setup and harvest of the on-farm alfalfa trials.

"The team work and support were great. Greg guided me through the field work logistics and research steps. Sanjay helped me out a lot in the lab with the chemical preparations and analytical procedures. I also learned a tremendous amount from Quirine as my research advisor," Lian said.

Dr. Gary Fick, Lian's academic advisor commented, "Two of Chang's outstanding characteristics are his determination and his work ethic." Ketterings added, "Chang did a superb job. He delivered a well-researched literature review and completed two research projects. This April, he presented his work at the Cornell Undergraduate Research Board 25th Annual Spring Forum. His thesis work is the basis for further studies currently underway".

Lian noted, "The field was a new experience. I'm a city boy, and when a group of 30 heifers surrounded me it was pretty scary." Lian's teammates rescued him, and they all laughed together at the adventure.

In the field, Lian also worked with Brian Boerman and Darren Usinowicz of Agricultural Consulting Services (ACS) and Janice Degni of Cornell Cooperative Extension. The outreach and delivery of research results impressed him. "China lacks this strength, as currently there isn't the political will to develop a vital extension system to support farmers. Farming is too much perceived as a lowly occupation."

Ketterings emphasized, "The students benefit from a broad exposure to farming, consulting, extension and agricultural environmental management and gain a better understanding of the challenges a farmer faces. We hope that helps them think about relevant research questions, practical approaches to address those questions, and effective delivery methods to communicate the findings. Our goal is on-farm implementation of management changes that help farms be more sustainable, both economically and environmentally. In addition, students bring in their unique experiences and all of us on our team benefit from their fresh perspectives."

Lian was excited by his research outcomes.

"We found clear differences between the critical soil test levels for the two approaches to K recommendations." Ketterings adds, "The data supported the current guidelines for the sufficiency approach based on the Cornell Morgan soil test. It also showed that the base saturation approach can be used, but that the critical values might be lower than expected. This could mean opportunities for K fertilizer savings and lower cost of production for some fields. But, more work is needed so this year we expanded the project to six farm locations."

Lian's project was challenging, too. He said, "I really had to work at portraying the data accurately in the tables and figures. I spent a lot of time editing the text to be readable and convey my main message as well as meet scientific standards." Ketterings adds, "Learning to summarize data for scientific review and to translate the findings is a really good exercise for the students. It helps them think through the results and evaluate them for their practical importance to farmers."

Lian was invited by the Golden Opportunities Scholar Institute to attend the national Agronomy, Soil, and Crop Science Society of America meetings in Pittsburgh in the fall of 2009 and graduated with distinction in research at the end of May this year. Lian's next step is the University of Wisconsin in Madison's Agricultural Economics program as a Master's candidate. True to his visionary nature, he looks beyond that to a doctoral degree and international work, traveling between the U.S. and China. Lian's time at Cornell and with the NMSP played a key role in his choices. "Working with the Spear program has been a great learning experience. The skills I've acquired will serve me well in graduate school and beyond. The team is also a warm, welcoming family and I greatly value the friendships I've made."

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The **Nutrient Management Spear Program** (NMSP) is an applied research, teaching and extension program for field crop fertilizer and manure management on dairy and livestock farms. It is a collaboration among faculty, staff and students in the Department of Animal Science, Cornell Cooperative Extension, and PRO-DAIRY. Our vision is to assess current knowledge, identify research and educational needs, facilitate new research, technology and knowledge transfer, and aid in the on-farm implementation of strategies for field crop nutrient management including timely application of organic and inorganic nutrient sources to improve farm profitability while protecting the environment. An integrated network approach is used to address research, extension and teaching priorities in nutrient management in New York State. For more information on NMSP projects and extension/teaching activities, visit the program website (<http://nmsp.cals.cornell.edu>) or contact Quirine Ketterings at qmk2@cornell.edu or (607) 255-3061.