Scientist Rooted Out Alfalfa's Benefits

Fae Holin, Midwest Forage Association

Russelle with MFA's Outstanding Service Award.

Although he grew up in a Portland suburb, Michael Russelle has "deep roots" in the alfalfa industry. In fact, the 33-year career soil scientist with USDA's ARS based at the University of Minnesota, has been instrumental in helping growers and others realize many of the benefits of alfalfa and its root system.

Russelle retired in January from what others call "an amazing career" evolving around forage-based cropping systems. MFA members remember him for his service on the board and for highlighting alfalfa's value as a major crop, says Beth Nelson, MFA president. He and his technician, Karena Schmidt, grew alfalfa in PVC pipe and preserved its 14' long root system to help demonstrate the crop's deep-rooting abilities to absorb nitrate in soil and protect surface and groundwater. At Nelson's request, he was able to get the alfalfa root through airport security and explain its capabilities to Congressional members in Washington D.C. He and the root system also exhibited at several state fairs and appeared on television (go to midwestforage.org and click on "Farm Connections Forage Video").

Russelle has accomplished much more, says colleague Deborah Samac, a plant pathologist with ARS. He focused on nutrient acquisition of perennial forages and worked with others focusing on having sufficient nutrients for plants while protecting soil and groundwater. He created knowledge on understanding nitrogen cycling, particularly on crop rotations; developing new methods for following nitrogen in the plant and field and tracking it through the watershed. He could then assess alfalfa's nitrogen fixation contribution to the Corn Belt. Most recently, he worked with Jeff Coulter (UM Extension corn specialist) to develop a new Extension bulletin that will help farmers appreciate the nitrogen credits from alfalfa for the next corn rotation, know how much nitrogen they get from an alfalfa crop, which soil types need more starter nitrogen and which do not. Each state has different recommendations for calculating alfalfa nitrogen credits, so this will help standardize calculations. "This is really significant work in that farmers are often putting too much nitrogen on corn, and it's entering water systems and creating local pollution as well as increasing the Dead Zone in the Gulf of Mexico," Samac says.

Russelle, she adds, is "really good at listening to producers' problems and coming up with experiments and ideas to address those problems." For example, after learning how farmers found it difficult to maintain alfalfa-grass mixtures in which both species persist, Russelle teamed with JoAnn Lamb, a recently retired ARS plant geneticist. Their new alfalfa types allow grasses to take up more N – conventional alfalfa usually steals soil N before grasses take it up – so alfalfa-grass mixes can persist longer together.

Russelle had "a real impact," says Samac, in using alfalfa to clean up excess N. He planted alfalfa that could not fix N to reclaim farmland soaked with N fertilizer from a train derailment. "The crop absorbed the nitrate within three years while producing valuable feed," adds Russelle. He also showed that planting crops such as alfalfa above tile drains and in buffer strips can keep excess nutrients from moving into waterways.

"This has been the perfect job," says Russelle, who, after three years working on an Oregon farm, realized his interests in ag and science would make a good career match. He obtained Bachelors and Masters degrees in dryland wheat and barley cropping at Oregon State, then his PhD working on irrigated corn at the University of Nebraska. "I would have gone into forages for my Masters, except the forage specialist at OSU didn't have any money for a grad student," he remembers. After graduation, Russelle was offered his "perfect job" by ARS and given the freedom to research topics addressing problems that needed solving. But "when people talk about my work, they should realize that very little of it is 'my work.' Almost all has been teamwork with colleagues. That leverages a lot of wisdom and experience, methodology, creativity and energy."

Michael Russelle and Matt Yost showing 14' alfalfa roots on KMSQ's "Farm Connections" interview with Dan Hoffman.

He hopes he's helped people realize the value of perennial forages, especially deep rooted ones like alfalfa. "They help protect water quality by reducing runoff and by limiting nitrate leaching to groundwater. They improve soil quality, sequester carbon, and break disease and pest cycles in cropping systems. There are many benefits beyond producing feed."

As he ties up projects, he challenges the alfalfa community to develop a multi-state database of full-field alfalfa yields, following the lead of former Wisconsin Extension advisor Mike Rankin. "If the yields farmers reported to the National Ag Statistics Service are correct, they are two to three times lower than achievable yields. There are huge gains to be made with better alfalfa management."

He'd like to see further work on ways to predict N requirements of crops grown after alfalfa. "We've found... the nitrogen supply, when rotating from alfalfa to corn, can be enough in many cases to provide all of the nitrogen needs of two years of corn. But in other cases, corn still needs a full dose of nitrogen after alfalfa. So far, we don't know how to predict that reliably."

In his personal life, Russelle and his wife, Regula, are involved in community service, including the "Transition Town" project building resilience in response to climate change, reducing fossil fuel use, and building stronger community networks. "We all need to find ways to reduce greenhouse gas emissions. I am proud efficient and far-sighted ag producers are leading the way."