The Most Interesting Dairy Forage Farm by Far

Lori Ward Bocher, U.S. Dairy Forage Research Center

In my 40-year career in agricultural communications, I've been on hundreds of farms across the U.S. By far, the most interesting I've seen is the U.S. Dairy Forage Research Center (USDFRC) farm near Prairie du Sac, WI. Here are the reasons why:

USDFRC research farm on the banks of the Wisconsin River.

History. How many farms do you know operating within an Army ammunition plant? At the U.S. entry into World War II, the Department of Defense (DOD) confiscated ~10,000 acres of rich farmland from 80 families in order to build a munitions factory, the Badger Army Ammunition Plant (BAAP). The facility manufactured gun and rocket powder during three wars and was put on standby status in 1976.

At about the same time, the USDA was looking for a new research farm site. It chose the BAAP location because it could obtain a special permit through the DOD to farm ~1,500 acres "inside the fence" of the ammunition plant in areas never heavily developed. Construction of the USDA farm buildings, which were built "outside the fence," began in 1980. For more than 30 years, farm employees had to go through locked gates, controlled by BAAP, in order to access most of the farmland. In 1997, the U.S. Army determined the BAAP was no longer needed to meet the nation's defense needs. Thus began a long process to determine how the land would be transferred. In 2004, the USDFRC gained ownership of the land it had been farming for 25 years.

Federal-state partnership. The USDFRC farm is operated jointly with the University of Wisconsin-Madison College of Agricultural and Life Sciences, Agricultural Research Stations. UW owns and manages the dairy herd and uses revenue from milk sales to offset operating costs and to pay state employees who work at the farm. USDA owns and manages the land and buildings, including the cropping systems and research programs.

Today the farm consists of 2,200 acres, ~390 cows in milk, and ~350 calves and heifers. Most of the cropland is used to produce feed for the herd. There are also areas for plant breeding nurseries, grazing research, and agronomic research. About 80 acres are enclosed with fencing, keeping deer from interfering with research.

Research. From the beginning, the USDFRC has used a multidisciplinary approach to improve forage utilization by dairy cattle. Research covers the dairy farm nutrient cycle, from soil, to crops, to feed and nutrition and rumen microbes, to manure that's put back on the soil. Put another way, much of the USDFRC research has focused on finding ways for dairy cattle to put more nutrients into milk (more economically sustainable) and fewer nutrients into manure (more environmentally sustainable).

While much of the research is conducted at the Madison laboratory, the farm plays an integral role. There are several plant nurseries for breeding more persistent and higher yielding pasture legumes. A 20-acre site is set up for research on intensive rotational grazing management. Air emission chambers monitor gases cows give off when certain feeds and/or bedding are used.

One barn section is equipped with individual feeding tubs, and small TMR carts deliver various rations used in feeding trials. About 40 cows have been rumen cannulated so researchers can grab partially digested feed for various feeding studies, with a special emphasis on improved utilization of fiber, protein, and carbohydrates in dairy cattle rations.

A research farm is expensive to run, but the dividends can be great. Here are three examples.

- **Reducing dietary and manure nitrogen.** When excess nitrogen in air and water became environmental and human health issues, USDFRC researchers set out to determine the optimal level of dietary protein for high-producing dairy cows. The answer, 16-17%, was lower than what many dairy farmers were feeding. The resulting reduction in dietary protein has saved the U.S. dairy industry at least $740 million annually in reduced protein supplement purchases, and reduced the amount of nitrogen reaching the environment.

- **Reducing dietary phosphorus and manure runoff.** Too much phosphorus in surface water runoff, some of it coming from manure spread on farm fields, contributes to excessive algae growth in bodies of water. USDFRC researchers determined recommended feeding levels for phosphorus at the time were higher than necessary. The subsequent reduction in dietary phosphorus has saved the U.S. dairy industry an estimated $109-$182 million annually.

- **Saving silage feed and dollars.** As dairy farmers made a major shift to ensiling feed in large bunkers and piles, more feed was being lost to spoilage and decomposition. Collaborative research led to recommendations for packing and covering bunker and pile silos, along with spreadsheet tools to evaluate packing techniques. In the U.S. livestock industry, reducing feed losses from bunker and pile silage one percentage point translates to an annual savings of ~$30 million.

Future. In the past and present, USDFRC research has been about production agriculture, and that will continue. But today there is also interest in researching whole-farm systems and ways agriculture can improve its environmental sustainability. USDFRC leadership realized its land could accommodate whole-farm research on a large scale. In 2016, the USDFRC created an ecologist position. This scientist is creating a whole-farm, outdoor laboratory to study farm management at the intersection of agriculture and conservation.

The vision for the FarmLab is, "A model production dairy system that advances dairy sustainability through integrated agroecosystem research and outreach." Objectives are to explore ecological and economic trade-offs associated with whole-farm management, and to improve dairy sustainability by developing metrics of performance of different land use and land management practices. USDFRC staff and collaborators are currently collecting information about the land base and writing the initial land use plan.