New 'Road Map' Focuses on Dairy Forage Research Challenges and Collaborations

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There are numerous challenges facing modern agriculture. Chief among these is preventing loss of nutrients and nutrient-bearing soil particles due to the sometimes rapid changes in weather events, e.g., heavy snows followed by rapid melting, heavy or continuous rain events, lack of rain coupled with high winds, etc. Forages play a crucial role in helping to diminish the harmful effects of such weather events. Unfortunately, more acres are being taken out of forage production and converted to row crop production due to short-term gains in profitability. As stewards of the land, and considering long-term sustainability goals, targets should be established that approach zero soil loss from our farm lands. Without the soil, we cannot farm. Perennial forages help hold soil in place. So what is the best route forward?

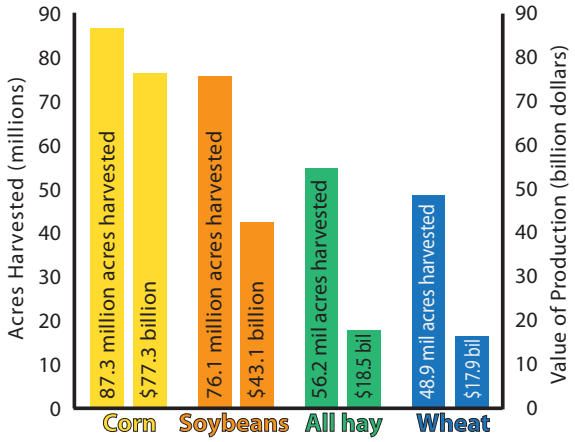
The U.S. Dairy Forage Research Center (USDFRC) in Madison, WI conducts research to help find the best route forward. A major part of its mission is to increase perennial forages on the landscape to insure both economic and environmental sustainability. As the only unit in the USDA Agricultural Research Service with the mission of improving forage use by dairy cattle, the USDFRC strives to be creative in finding ways to leverage research resources, and proactive in communicating the importance of dairy forage research.

As a way to further these goals, the USDFRC recently completed a National Dairy Forage Road Map. This road map documents many of the challenges currently facing the dairy forage industry and describes research approaches to these challenges. As updated research goals are placed on this map, there is a concerted effort to find research partners (universities, other ARS units, industry) who can leverage the work of the USDFRC and help provide the dairy forage industry with additional research outcomes in a timely manner.

The Structure & Goals for the Road Map

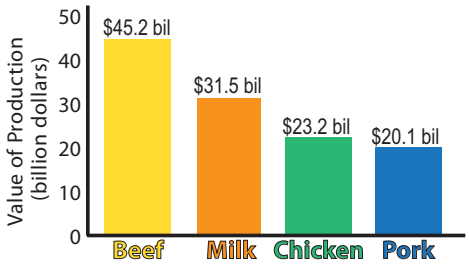
The National Dairy Forage Road Map is based on the road map that the nation's dairy and forage producers follow. They plant seeds, grow a crop, and harvest/store the crop for feeding to livestock, for sale to other livestock producers, or for sale as a bioenergy feedstock. The key to making the farm system both economically and environmentally sustainable is to keep nutrients from being lost along the way – to capture more nutrients for growing crops and feeding animals that produce milk and meat. Most of the research at the USDFRC is directly or indirectly aimed at making more efficient use of nutrients.

Forage crops rank third in the U.S. for both acres harvested and value of product.



Source: USDA NASS, 2012

Milk ranks second in the U.S. for value of production among animal food products.



Source: USDA NASS, 2011

With a destination of more economically and environmentally sustainable dairy forage farm systems, forages and dairy cows are the vehicles. Based on past, current, and future USDFRC research, six main highways have been identified as routes to the final destination:

1. **Modify plants to improve nutrient availability**. Increase yield and persistence. Increase cell wall digestibility. Improve protein utilization.
2. **Develop new cropping & pasture systems.** Improve use of forages as companion crops. Reduce number of cuttings per season. Develop alternative forage systems for special uses. Improve pasture forage plants & management. Improve understanding and use of inoculants.
3. **Improve harvest & storage systems.** Separate leaf and stem fractions at harvest. Develop techniques to increase silage density and reduce losses. Limit spontaneous heating in hay packages.
4. **Improve nutrient utilization by cows.** Improve understanding of rumen microbes. Improve forage protein utilization in rations. Optimize diets to utilize more forage and increase conversion of feed to milk. Understand effects of non-fiber carbohydrates on digestibility/utilization of fiber and protein. Reduce cost and carbon footprint of raising replacement heifers. Develop rapid techniques of feed analysis for on-farm use to reduce diet variability. Develop a more accurate system to functionally characterize value of forage fiber to cow.

5. **Reduce nutrient escape to environment.** Develop strategies to minimize emissions of ammonia and greenhouse gases. Evaluate new manure application technologies. Develop alternative cropping systems that open more opportunities for manure application. Identify fate of pathogens in manure systems.
6. **Develop new bioenergy & bioproduct uses.** Develop improved forages for bioenergy/bioproduct uses. Use anaerobic fermentation to create VFAs for bioproducts and biofuels. Develop ways to create new products from alfalfa leaves.

To view the full report, visit the USDFRC web site at: www.ars.usda.gov/mwa/madison/dfrc.

The Paradigm Shifts

Here are some of the changes that have prompted the USDFRC to create a Road Map that will help plan for the future:

1. Increased competition for corn that has driven up grain prices for dairy producers who will have to rely more heavily on forages.
2. Increased milk production in dairy cattle that has changed the way diets are formulated.
3. New scientific methods that allow for new research.
4. Increased interest in the environmental impact and carbon footprint of dairy farming.
5. Recent and pending retirements of some USDFRC scientists.
6. An aging research farm at Prairie du Sac, WI.

Figure 1. The main goal of the National Dairy Forage Road Map is to reduce the loss of nutrients in dairy forage farm systems for improved economic and environmental sustainability.