Cornell Releases Study on Reducing the Carbon Footprint of Dairy Farm

Modern dairy practices can dramatically reduce the carbon footprint of farms according to a study featured in the latest edition of the Proceedings of the National Academy of Sciences.

The study, "The Environmental Impact of Recombinant Bovine Somatotropin (rbST) use in Dairy Production," demonstrated that use of rbST reduces the carbon footprint of milk production. rbST is a FDA-approved, proven-safe biotechnology that increases milk production and allows cows to use nutrients more efficiently by diluting out maintenance feed requirements over more units of milk. This allows the same amount of milk to be produced with fewer cows and feed resources, which improves environmental sustainability and reduces natural resources demand and the potential for water acidification, algae growth and global warming.

"Environmental sustainability is an important consideration in agricultural production, with emphasis placed upon meeting human food requirements while mitigating environmental impact. The present study demonstrates that use of rbST markedly improves the efficiency of milk production and mitigates environmental parameters including eutrophication and acidification, greenhouse gas emissions and fossil fuel use," wrote the study's authors. The authors of this life cycle assessment study include Cornell University Liberty Hyde Bailey professor Dale Bauman (corresponding author), Cornell University Post-Doctoral Research Associates Jude Capper (lead author) and Euridice Castandena-Gutierrez, and Monsanto scientist and Cornell alumnus Roger Cady.

As the global population reaches nine billion people in the first half of the 21st century, the food supply required over the next 40 years will approximately equal the total amount of food produced throughout the history of humankind. US milk production will have to increase to 5.62 billion gallons by 2040 to meet USDA dietary recommendations for three 8 ounce-glasses of milk per person each day. The most sustainable way to increase US milk production is to improve production per cow, and assess total population environmental impact per unit of milk produced.

The study design included three models to predict the environmental impact of using rbST. The first model examined the impact of increased productive efficiency of individual cows in a producer's herd. The second model examined industry-scale adoption of one rbST-supplemented cows, a number equal to approximately 15 percent of the current US dairy herd. The third model examined the environmental impact of achieving future increases in the future US milk supply required to meet projected population growth and recently published USDA Dietary Guidelines using conventional, conventional with rbST, or organic, production systems.

Increasing milk production efficiency reduces the feed required per unit of milk by diluting the fixed maintenance feed requirements over more units of milk. This means less manure is produced per unit of milk, and the amount of nitrogen and phosphorus that could potentially run off into waterways is reduced. The carbon footprint will also decrease when the same milk can be produced with fewer animals and less crop production.

“The total reduction in the carbon footprint conferred by rbST supplementation of one million dairy cows is equivalent to removing approximately 400,000 family cars from the road, or planting 300 million trees.”

Increased milk production efficiency also decreases the energy needed from fossil fuels and electricity required for cropping and milk production.

“The savings in gasoline alone would be sufficient to power approximately 1,550 passenger cars, each traveling an average of 12,500 miles. Further, the total fossil fuel and electricity savings would provide sufficient annual heat and electricity for approximately 16,000 and 15,000 households, respectively.”

More cows are needed to meet projected dietary demand, but with technologies and husbandry practices that increase productive efficiency, that need can be greatly reduced. The authors report that 8 percent fewer cows are needed in an rbST-supplemented population, whereas organic production systems would require a 25 percent increase to meet future production targets.

Results of the study clearly demonstrate that rbST is a biotechnology product that represents a valuable management tool for use in dairy production to increase productive efficiency, reduce the carbon footprint and improve agricultural sustainability.

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