



Spruce Haven Dairy's Managing Member Applies Whole Farm Nutrient Balance Beyond the Farm

Doug Young, Managing Member of Spruce Haven Dairy Farm and Research Center in Union Springs, New York, uses his Whole Farm Nutrient Mass Balance as an environmental performance measure. Young has applied what he's learned to influence change on his farm and at the national and international level. He and several other farmers started looking for ways to reduce environmental impacts by forming Ag Waste Solutions in the early 1990s. This effort was in response to pending EPA regulations of nutrient applications on farmland followed by monitoring of atmospheric ammonia emissions.

Young stated, "We invested in this company because we recognized that we had a problem and we needed to advocate for ourselves by seeking solutions to meet environmental criteria and be able to stay in business. It's been a 15 year journey that's involved me in projects with people from around the globe."



Spruce Haven Dairy Farm and Research Center in Union Springs, New York, where the whole farm nutrient mass balance assessment is used as an evaluation tool for production and sustainability while searching for technical solutions to better manage nutrients.

While looking for technical solutions to better manage nutrients, the group also

realized they needed a way to measure results. They found this as early participants in the Cornell Nutrient Management Spear Program's (NMSP) Whole Farm Nutrient Mass Balance (NMB) project led by NMSP director, Associate Professor Dr. Quirine Ketterings, and coordinated by Research Support Specialist Caroline Rasmussen. The NMB calculates nutrient use efficiency by estimating nutrients imported to the farm, subtracting those exported and quantifying remaining nutrients to be managed. Several years ago the NMB evolved into a software calculator providing critical efficiency measures such as pounds of remaining N, P and K per tillable acre, per acre receiving manure, and per cwt. of milk sold.

Young explained, "When nitrogen, phosphorus and potassium aren't efficiently managed, those are precious resources we are losing from the farm. The regulatory view is with an eye to their pollutant potential, but we can meet that concern with an economic objective."

Young commented about the NMB's impacts on the nutrient efficiency of Spruce Haven's 1800 cows and 3100 acres. "Over the years we've been involved in this program we've maintained milk production at a stable level while significantly reducing the P and K in our purchased feed. We've also lowered ration protein levels by routinely applying the Cornell Net Carbohydrate and Protein System model to our feed program, meaning less N imported to the farm so there's less manure N to manage in the farm's nutrient cycle. Improving management of manure nutrients has also significantly decreased our fertilizer purchases."

Diagnostic data generated by Spruce Haven's NMB shows pounds of N remaining on the farm per acre receiving manure dropping from 253 to 147 from 2007 to 2011. Phosphorus also shows a strong downward trend, dropping from 26 lbs of P per acre remaining in 2007 to 15 in 2011.

Young noted his plans to further enhance the farm's nutrient efficiency. "In order to

become sustainable in terms of nutrient use, including carbon sequestration, we need to move to zone-tillage, and cut back further on fertilizer inputs by applying any needed nutrients as liquids during the growing season at the critical time for the crop.”

The latest technology to achieve in-season application of manure nutrients is the use of a spray boom. Young expects to use the first prototype of this equipment at Spruce Haven farm in 2013. The spray boom is one technical element of the broader picture for animal agriculture’s sustainability that Young remains actively involved in shaping.

Young was selected to serve on the Dairy Working Group of the Sustainable Agricultural Initiative Platform (SAI Platform), created by and comprised of international food companies and established in 2003. International cooperation is a hallmark of the group’s plans, with a Global Dairy Agenda for Action signed in 2009 during the World Dairy Summit in Berlin. Young commented, “We’ve got representatives from several of the world’s largest corporations at the table on this initiative.”

Young’s enthusiasm for initiatives that incorporate NMB concepts into agricultural practices is tempered only by his knowledge of the human barriers to management change. He noted, “A challenge of getting nutrient efficiency concepts applied as a routine part of farm management is how to convince farmers that NMB figures are real. We have to translate the data to daily cropping and feeding practices.”

“Farm Smart” is a package of benchmarking and decision support tools under development that aims to achieve that translation. It is funded by the Innovation Center for US Dairy®, a group comprised of 30 producer organizations, dairy product processors and manufacturers. The package includes, among other components, a calculator that provides a snapshot of an operations’ environmental footprint. The tools allow a farm to evaluate its greenhouse gas production and water and energy use and

compare them to regional and national averages. It also generates ideas for a farm to improve energy efficiency and reduce operating costs. Young has been involved with Farm Smart since its outset, and believes it could help achieve a high level of nutrient efficiency around the globe. He said, “The idea is to have it fully integrate all the biological systems on a farm so that the manager could run a scenario through the model and determine the impact it will have on each component area of the farm. The data output should help in making informed decisions regarding investments in change.”

Ketterings and Karl Czymmek of Cornell’s PRODAIRY program are on the technical working group for the project. Ketterings commented, “The Farm Smart program has great potential, especially when the NMB concepts become an integral part. Our many years of work with the NMB give us confidence that it can be applied across states, regions and countries”.

Young commented on the challenge of developing Farm Smart. “We need to establish metrics for measuring sustainability. This hasn’t been done before and it’s a huge undertaking to get sound figures with all the variables involved in nature’s systems. The science behind the model has to be valid globally.”

Given his dedicated collaboration with people from around the world, Young is sure to be part of achieving nutrient management solutions of significance to agriculture’s future.

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To learn about and participate in the statewide whole farm nutrient mass balance project, check out the NMB website: <http://nmisp.cals.cornell.edu/projects/massbalance.html>.



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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://nmisp.cals.cornell.edu>) or contact Quirine Ketterings at qmk2@cornell.edu or (607) 255-3061.