Impacts of Cornell's Nutrient Mass Balance Diagnostic Tool: An Industry Perspective

By Lisa Fields

How do you convince farmers to use an unfamiliar management tool you believe has great value? Show them the benefits! Jack Van Almelo, Operations Manager for Dairy One and Agricultural Consulting Services (ACS) approached six farm clients about the benefits of the Cornell Nutrient Mass Balance (NMB) whole farm analysis tool.

The Cornell NMB calculates the balance of nutrients remaining on a farm to be managed after exports, such as milk, crops, animals and manure are subtracted from purchased inputs of feed, fertilizer, animals and bedding. The NMB diagnostic summary report shows the balances of nitrogen (N), phosphorus (P) and potassium (K) per acre and per hundredweight of milk shipped.

Van Almelo said, "The NMB is unique in that it's a gross measure. Producers and advisors have traditionally used measures that are on a micro level, such as soil and forage analyses and herd reports that indicate the productive status of the individual resource. Advisors often help producers achieve goals for these areas of the farm, such as adjustments in soil fertility levels, forage quality, or a herd's reproductive status. The holistic view of the NMB offers a completely different perspective. It gets you to shift your gaze to the big picture."

"The challenge in getting farms to see the value of the NMB is relating those gross balance measures of N, P and K per acre and per hundredweight to current cropping, feeding and herd management practices. Connecting those practices to the NMB numbers can bring revelations, giving power to the data," Van Almelo noted.

"Completing a meaningful NMB involves delving into records to get details from accounting, herd, feed, and crop data," he added. "The farms I approached were concerned about the amount of time it would take, whether the information could be viewed and misinterpreted by those outside of the farm and advisor team, and the accuracy of the information. To get them to participate, it had to be worth their time."

To deliver the greatest benefit from the NMB process to those farms, Van Almelo worked with Professor Quirine Ketterings, leader of Cornell's Nutrient Management Spear Program, who directs the NMB initiative. Ketterings, Sebastian Cela, post-doctoral Associate with the program, and Van Almelo met with each farm's staff and advisor team to discuss their NMB diagnostic report.

Ketterings explained, "Team meetings allow us to evaluate the numbers and to have meaningful discussions about the benchmarks in the diagnostic report. We discuss what the numbers mean, how they could be explained by current practices, and what opportunities there might be for management changes to improve nutrient use efficiency."

Ketterings added, "In the report the farmers receive, they can see their diagnostics in relation to peers and see if they fall within feasible balances that were set based on New York farm data. Feasible mass balances are balances expressed in per acre and per hundredweight of milk produced. A farm that meets the feasible balances is operating in the *optimum operational zone*."

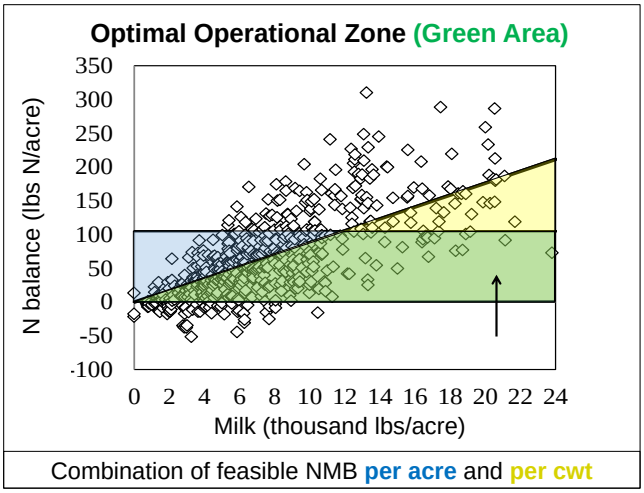

Figure 1: Optimal operational zone for nitrogen management based on 102 New York dairy farms

The feasible balances shown in Table 1 and the optimum operational zone shown in Figure 1 (the example is for nitrogen) were determined based on the data of 102 New York dairy farms.

Table 1: Feasible balances for New York dairy farms.

Nutrient	lbs/acre	lbs/cwt milk
Nitrogen	>0 and ≤105	>0 and ≤0.88
Phosphorus	>0 and ≤12	>0 and ≤0.11
Potassium	>0 and ≤37	>0 and ≤0.30

Ketterings explained, "Data trends from farms with long-term NMB records show that well-managed farms can operate within the optimum operational zone over time. The power of the data is that they were generated by New York dairy farms. When we say feasible, it's because farms in New York have shown they can do it!"

The meetings generated enthusiasm from Van Almelo's participants. One producer stated, "Immediately it makes you think of things in a different light. In contrast to our usual view of analyzing feed programs and feed costs in detail, it makes you look at the big picture of your whole farm." A response to the diagnostic report of the feasibility range and optimum operational zone was, "It's probably the best number we have right now to measure our nutrient management practices. After a few more years the information will change. We'll see trends, and the effect of our changes on the mass balance feasibility numbers."

One of the farmer participants offered a broader view. He said "The NMB has the potential to document what farms are doing to help the environment and water quality."

Ketterings confirmed this, noting, "Because more than 600 farm balances were completed over the past decade, we have been able to document that New York dairy farms have greatly improved their soil phosphorus balance over time and that allows us to maintain good soil test P levels to support crop production without excessive soil P accumulation. This also means that less phosphorus is available for runoff. That's a huge accomplishment, and a "good news story" for the New York dairy industry."

Van Almelo is enthused about making the NMB assessment easier for farmers to complete. He explained, "We've linked the NMB with Field and Crop Software that farms can run on their own. The work that Quirine and her team have done to make the NMB diagnostic report come to life is a huge help in building farmer interest to apply it to management decisions."

The future of NMB application is a promising one in Van Almelo's view. "I see the potential to shift this tool from a retrospective one to a planning function, just as we do with ration balancing software where you can see the effect of changes in particular feed components on the total ration. Why not make the NMB a tool that can be used to run scenarios? An example is determining the optimal number of cows under particular nutrient management choices that are realistic for the farm to undertake."

In summary, Van Almelo said, "A tool like this that gives a big picture snapshot, yet can be used to monitor specific areas of the farm and tie everything together is extremely valuable. It's great because trends can be seen that are the outcome of particular management decisions. I see a bright future for the NMB to have positive impacts on farms as the industry expands its use."

(September 17, 2015)

To learn about the New York On-Farm Research Partnership and/or participate in trials, see: http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/index.html. We welcome farmers and farm advisors to work join the program and help us set research priorities!

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