



## Nutrient Mass Balance Tool Helps Table Rock Farm Achieve Their Goals

By Lisa Fields

At Table Rock Farm, team meetings to review annual progress toward goals are welcome events. Located in Wyoming County, NY, the 1050 cow dairy is co-owned by Willard and Maureen DeGolyer, their daughter, Meghan Hauser, and Willard’s uncle Calvin. The farm management team includes the owners, the nutritionist, crop advisor, and crop and herd managers. “Reviewing what we accomplished and planning how we’ll achieve next year’s goals are part of the excitement of farming for a living,” DeGolyer said.

Table Rock team’s progressive outlook is reflected in their on-farm research partnerships with Cornell University staff. One example is their participation in the Cornell Nutrient Management Spear Program’s (NMSP) Nutrient Mass Balance (NMB) project since 2005. The NMB software calculator reports the balance between nutrients imported onto the farm and those exported through milk, crops and manure. Results are reported as pounds of nitrogen, phosphorus and potassium remaining per acre of tillable land and per hundredweight of milk shipped.

Hauser, who compiles the data for the NMB noted, “Initially, gathering the data needed to complete the NMB was a bit challenging. We found our NMB results interesting but weren’t sure at first how to apply them to management decisions. After a few years we saw the impacts of feed and cropping changes on the NMB results, with the numbers showing trends in progress toward our nutrient management goals.”

Quirine Ketterings, who leads the NMSP, described the application of the NMB as a nutrient management tool. “The diagnostic reports show where there are opportunities to improve profitability, and indicate risk level of nutrient losses to the environment. Ideally, farm teams examine the results and come up with strategies to gain nutrient efficiency that fit management goals. When farms like Table Rock include us in those meetings, it helps us to improve the NMB reports so they’re more

useful to farm managers. We gain a lot of insight from being part of their planning and goal setting for the next year.”

“The NMB database has grown to over 600 farms, with some longer term records of 8 to 10 years,” explained Sebastian Cela, Postdoctoral Associate with the NMSP. Those longer term participants show a trend of gaining nutrient efficiency, improving mass balances over time while maintaining or increasing milk production. Most significant is reduced nutrient imports from purchased feed.” Hauser emphasized the value to Table Rock of increasing participation across the state. “With enough farms in the database that are similar in size and cropping program to ours, we can make valid comparisons. It helps us to see what can be achieved and gives us a good sense of where we stand in our goal to be as nutrient efficient as is possible.”

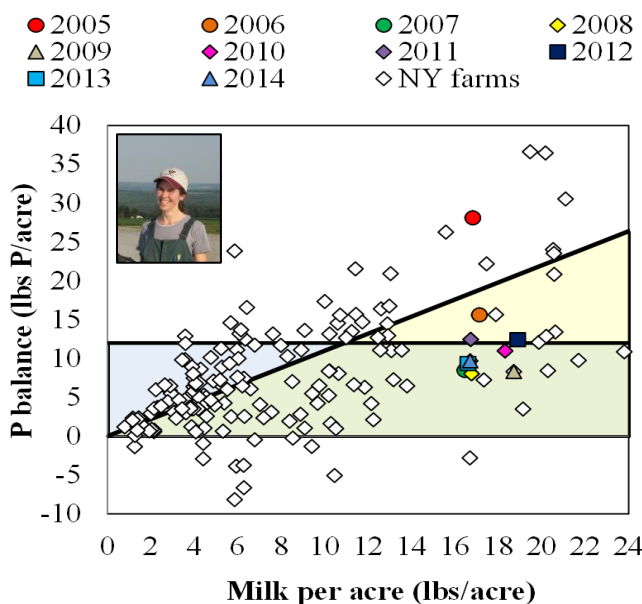


Figure 1: Meghan Hauser of Table Rock Farm in Castile, NY, has participated in the whole farm nutrient mass balance project since 2005. In the past five years, the farm balances for nitrogen, phosphorus (shown here) and potassium have consistently been in the Optimum Operational Zone (green area) while milk production has increased.

Cela said, "We wanted to provide NMB participants with guidelines that better defined a desirable whole farm nutrient balance so farmers had a target to aim for. Analyses of the data enabled us to develop benchmark numbers reflecting "feasible mass balances" for New York dairies. Those benchmarks are 105 lbs of N, 12 lbs of P, and 37 lbs of K remaining on the farm per tillable acre and  $\leq 0.88$  lbs N,  $\leq 0.11$  lbs P, and  $\leq 0.30$  lbs K per hundredweight of milk shipped. The NMB generates a diagnostic report for each farm, showing how they compare in several specific areas of nutrient export, import and within-farm nutrient cycling. We can show a farm where it is operating compared to the "Optimum Operational Zone", where it meets both the feasible balances per acre and per hundredweight. This helps managers focus in on feed and crop specifics and discuss whether it's an anomaly for that year or an area to target for management changes."

Table Rock Farm's nutrient trends over the years illustrate good progress toward their goals (Fig 2). Specific examples from the 2014 NMB are high milk production, high crop yields, and 67% homegrown forages. John Zmich, the farm's nutritionist, commented, "I can see feeding program changes such as adjusting the percentage of protein fed reflected in the NMB numbers. Looking at those numbers every year has encouraged us to employ more precise feeding methods, which in turn have led to increased milk production and a better mass nutrient balance."

DeGolyer stressed the positive impacts on nutrient efficiency of crop changes resulting from on-farm research. "The nitrogen rate study we participated in through NMSP convinced us to drop starter fertilizer in our corn crop and we also adopted wide-swathing of our haylage to mow, swath and chop all in one day. That improved forage quality so we can feed more of it in the ration. Both of these practices helped our bottom line and reduced nutrient imports, which shows in the NMB." Record-keeping is the heart of a meaningful

NMB, and having a system in place can make the completion process smooth. Hauser said, "I created a spreadsheet several years ago that has all the items I need for the NMB and feed information to it routinely throughout the year. For example, within our accounting program, bedding and purchased feed data are gathered, including loads and tons used, and that's automatically compiled at year end for the NMB program. My spreadsheet has the data fields for the NMB, so at a glance I can remind myself of what I need before I sit down to complete it. It also keeps information I had to calculate in past years, such as converting loads or yards of sawdust to tons, so I don't have to duplicate that effort."

Hauser emphasized the big return Table Rock realizes from their time investment in using the NMB tool. "When we share the information with the whole farm team it sparks useful and important conversations about our farm's philosophy and practical applications to concrete practices such as manure application, crop sales and purchases." She added, "Reviewing the NMB with Sebastian and the team this year made us keenly aware of how a relatively small decision, such as our sale of 770 tons of corn silage, can have a measurable, desired impact and tip the nutrient balance."

To sum up the farm's nutrient management approach, DeGolyer offered an analogy. "When you fill your car's gas tank, you can't expect 100% efficiency. The same holds true for nutrients applied on the farm, but until the NMB we didn't have a tool to show us what's possible."

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



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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://nm-sp.cals.cornell.edu>) or contact Quirine Ketterings at [qm2@cornell.edu](mailto:qm2@cornell.edu) or (607) 255-3061.