



## Cornell's Nutrient Mass Balance is a Valued Monitoring Tool for the Hardie Farm

By Lisa Fields

Cornell's Whole Farm Nutrient Mass Balance (NMB) software, a product of the Nutrient Management Spear Program (NMSP), is a truly useful management tool for farms. It also plays an important role in providing research data that illustrates NYS farms' environmental stewardship practices. In essence, the NMB reports the net of major nutrients (N, P and K) that remain on a farm after exported nutrients are subtracted from those imported onto the farm. The NMB calculator reports the balance of remaining N, P and K in several ways that provide indications of a farm's nutrient efficiency.

Caroline Rasmussen, extension support specialist with NMSP explained, "High efficiencies tend to reflect better profitability and also decreased losses of nutrients to the environment. These are expressed in measures such as relatively low pounds of N, P and K remaining on the farm per tillable acre, and on dairy farms, relatively low nutrients remaining per hundred weight of milk sold. This isn't solely achieved through high forage yields and high milk production. A farm must manage their forages extremely well to achieve the high forage diets that show up as a low nutrient balance per unit of milk sold."

One farm she's seen achieve such efficiencies is Hardie Farms, a 1100 cow Tompkins County dairy that ships close to 30,000 pounds of milk per cow and crops about 1500 acres. Rasmussen noted, "Everything clicks well on this farm and it's reflected in their NMB figures." Hardie Farms partner and crops manager, John Fleming, commented, "Three or four years ago we were feeding a diet of 52% forage. Now it's up to 58-60%, and we may eventually push that further." The increased level of homegrown forage in the diet means reduced feed grain purchases. This clearly shows in the farm's NMB diagnostics as low nutrients remaining per unit of milk sold and a high ranking for milk shipped per unit of purchased feed.



Figure 1: Hardie Farms, a 1100 cow dairy in Tompkins County, has participated in the Nutrient Mass Balance project of the Cornell Nutrient Management Spear Program for six years, allowing the farm to track changes over time.

Fleming noted that their initial interest in the Whole Farm Nutrient Mass Balance was to see how the farm compared to others in their size group. "That was our main motivation when we first participated in 2004. We viewed it as a snapshot, not realizing at the time we'd have the chance to participate for multiple years." Fleming's participation over several consecutive years took the NMB diagnostics from a snapshot to a tool that tracked the impact of changes over time.

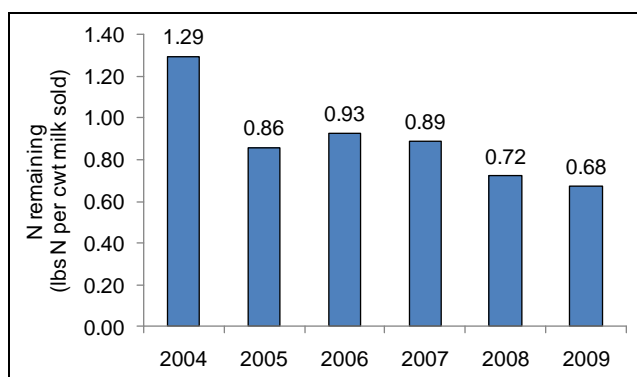


Figure 2: The nitrogen balance (lbs of N remaining per cwt milk sold) for Hardie Farms reflect changes in farm management over the years.

The herd's nutritionist, independent consultant Dan Button ensured that the NMB would be put to good use as a monitoring tool. Button works with several other large farms in the region and recognizes the correlation between NMB diagnostics and profitability and environmental stewardship practices. Fleming noted, "Dan takes a whole farm approach. If a feed change is being considered and it may impact our phosphorus balance, the potential for that is discussed as part of our decision making process."

In order to provide meaningful diagnostics, the NMB requires a high level of data accuracy. Although imported feed and milk are the major nutrient pools, all nutrient imports and exports are accounted for. Data entry screens ask for the analysis of imported fertilizer, bedding, crops and the weights of purchased animals. Manure, crops and animals that are sold are similarly detailed.

Another part of the NMB is the listing of crop acres of each type of crop grown on the farm, with dry matter yields and typical forage analyses. That information is applied to the diagnostic of feed supplied from homegrown forage, illustrating the nutrient cycle from cow to crop land and back to the cow.

Fleming described an example of how the NMB's diagnostics illustrated changes in the nutrient management of the crop program. "At one point we decided to drop far off, lower productivity acreage, and the NMB reflected this in our high efficiency rating regarding pounds of milk produced per tillable acre. As the percent forage in the diet increased along with the herd size we also increased our land base for forage production and additional manured acreage. With this change the NMB numbers showed improvement in reduced nutrients remaining per tillable acre."

Fleming described their manure application system. "The high forage diet is achieved by having top quality homegrown forages, so we need to fully utilize the nutrient value of the manure that's produced. We've shifted to direct injection at the time of spreading. This

meets our goal of odor control along with reduced fertilizer purchase, as with the injection N losses through volatilization are greatly reduced so we're capturing a higher level of nitrogen for the corn. We've also drastically reduced our phosphorus purchases, eliminating it from the starter fertilizer used on many of our corn acres. It's very gratifying to see our NMB nitrogen and phosphorus balances confirm our nutrient management achievements."

Rasmussen commented on the significance of the NMB program to water quality issues and policy. "To date 161 farms completed a total of 444 annual nutrient balances in New York State. This includes balances from 422 dairy and 22 beef farms. There is a wide range of farm businesses represented with farms milking from 24 to over 4000 cows. Annual milk production ranged from 8,000 to 30,000 lbs/cow. In addition to direct benefits to the farms, the farms contribute to documentation of changes in mass balances over time across all farms. Lower balances imply fewer nutrients are available for loss to the environment and being able to show improvements over time is critical for policy development in the state."

The NMSP team holds meetings each year for participants to view the compiled results from all farms. This opportunity for group discussion helps some of the numbers come to life as the practices behind them are described by the farmers. Fleming commented, "Any time you can interact with other motivated producers you have the opportunity to learn something."

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To learn about and participate in the statewide whole farm nutrient mass balance project, check out the NMB website of the Cornell Nutrient Management Spear Program: <http://nmsp.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://nmsp.cals.cornell.edu>) or contact Quirine Ketterings at [qm2@cornell.edu](mailto:qm2@cornell.edu) or (607) 255-3061.