



Managing Farm Nutrient Efficiencies: EZ Acres Journey

By Lisa Fields

About 20 years ago the Whole Farm Nutrient Management (WFNM) concept was developed by Dr. Danny Fox, Professor (now emeritus) in Cornell University's Department of Animal Science and Stuart Klausner, former Senior Extension Associate in the Department of Crop and Soil Sciences. The concept views a farm's component areas of crops, animals and their products as an integrated cycle. The nutrient cycle concept is applied to developing a whole farm nutrient management plan (NMP) to maximize nutrient efficiency for profitability while meeting federal and state environmental guidelines. The NMP is widely applied on dairy and livestock farms throughout the U.S., and is required for concentrated animal feeding operations (CAFO). During the NMP process herd rations and soil resources are evaluated for nutrient excesses and deficiencies, and areas at risk for losses to the environment are identified.

Cornell Animal and Crop and Soil Science students practice Whole Farm Nutrient Management in a class using case farms. Initiated by Fox and Klausner, the class is now led by Dr. Quirine Ketterings, Associate Professor and Director of the Nutrient Management Spear Program. In 1997 Fox was looking for a case farm for the class. Tom Tylutki, then Area Extension Dairy Specialist, asked the McMahons of E-Z Acres Farm to volunteer. The farm has a mix of soil resources and environmental concerns. The well-drained gravelly-loam fields lie over the Homer-Preble Aquifer, Cortland's drinking water source, presenting a nutrient leaching risk, with many fields adjacent to the Factory Brook trout stream. The upland fields are clay loams at risk for nutrient run-off. Mike McMahon, farm partner in charge of crop management spoke of their decision to participate. "It was a leap of faith for us to become involved with the nutrient management planning process in its infancy. We were struggling with serious herd health issues when Tom approached us. We were very frustrated and at the point where we had to reach out and try something different."



Mike McMahon of E-Z Acres, a 645 cow dairy farm in Homer, NY.

The Cornell students gathered soil and field data, crop production records and herd feeding information to develop a NMP for E-Z Acres. The farm's challenges and the solutions that transpired provided the students with the perfect example of integrating animal feeding and crop production. McMahon described how Tylutki diagnosed the root cause of the herd health issues. "Tom followed a group of our cull cows to slaughter along with those from a grazing herd. He brought back samples of the rumen walls from both herds. It was an eye-opening experience to see the lack of rumen papillae in our cows compared to the cows that were eating a high volume of grass. The impact on us was huge. We had perceived that we couldn't grow enough forages as the basis of the cows' diet, and Tom convinced us that we had to turn that around." That year, 200 acres of grass were planted to manage intensively for high quality forage.

McMahon continued, "That was a turning point for the business, but it took a good 4 years for the herd to completely regain their health. The year after we seeded the grass acreage we began to re-engineer the cows' diets with Tom at the helm, shifting from 45% forage to over 50%. We gradually increased that level, so that we now typically feed a 60% forage ration to the dairy herd, with late lactation cows fed 70% forage."

Shifting from mostly alfalfa to primarily grass forage fit the farm's upland soil resources and use of manure nutrients. Grass receives manure applications between the four to five cuttings during the growing season, when there is negligible run-off risk. McMahon added "In the initial phase of the NMP, Carl Bannon was the (Extension) Area Agronomist and he worked with us and the Cornell class to scrutinize the soil resource and manage our soil fertility differently. We began to treat the fields the way we do the cows; looking at them individually, matching crop choices to soil type and capability. We shifted from a general to a precision approach to nitrogen fertilization of the corn crop, using the PSNT (pre-sidedress nitrogen test) to determine applications."

The effectiveness of E-Z Acres nutrient management practices is reflected in numbers calculated using the annual Whole Farm Nutrient Mass Balance (NMB) software tool. Several key measures from the NMB tell the story of the farm's improvement in efficiency over time. Pounds per acre of N remaining per tillable acre receiving manure dropped from 265 in 2003 to 185 in 2008 and 158 in 2011. Similarly, phosphorus balances improved from 39 lbs remaining per acre receiving manure in 2005, to 12 lbs in 2008 and 4 lbs in 2011. Construction of a manure storage in 2006 contributed to the efficiency trend. Measures of feed nutrient efficiency reflect the efforts of Tylutki, now CEO of ration software company AMTS and minor asset holder in E-Z Acres. Purchased feed N remaining on the farm in lbs per tillable acre moved from 237 in 2003 to below 150 in 2008 and was at 115 in 2011. Purchased feed P remaining on the farm in lbs per tillable acre was at 39 in 2003, dropped consistently below 20 in 2007 and was at 13 in 2011. This high level of nutrient efficiency occurred while the herd size increased slightly from 624 to 645 cows and milk shipped per cow rose significantly from under 23,000 lbs in 2003 to over 24,000 lbs in 2011.

E-Z Acres is one of 161 NY farms who've participated in Cornell's NMB program since its

development in 2003. Collectively these farms now represent over 444 NY farm nutrient balance years in the database, providing powerful documentation of environmentally sound nutrient management practices.

Caroline Rasmussen, NMSP Research Support Specialist and coordinator of the NMB project, commented on the management behind E-Z Acres numbers. "The McMahons are committed to the goal of superb management of the cows, creating a high degree of comfort so they produce very high levels of milk. To do this profitably requires super high efficiency through integration of all the areas of the farm and everyone working well together. There's no magic bullet to this kind of success. It's a bunch of little things all being done right."

With a land base well matched to a highly effective feeding program, there are no major changes planned for the future. A slight increase in herd size of 8-9% will occur along with the building of a new barn to reduce crowding and enhance cow comfort.

Edie McMahon is in charge of the farm's bookkeeping and gathers the data each year for the NMB. She commented, "Participating in the NMB validates that we're on the right track. In the first few years we couldn't be sure if the numbers were significant or just indicators of short term conditions. Over the years we can clearly see the trends are consistent. It's gratifying to see the drop in purchased feed while increasing milk production, and the moderation of soil phosphorus levels. The NMB data show that our practices are a win-win for the environment, herd health and farm economics."

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To learn about and participate in the statewide whole farm nutrient mass balance project, check out the NMB website: <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 qmk2@cornell.edu or (607) 255-3061.