In 1997 McMahon’s E-Z Acres was entering its second year of operation in a new dairy facility. In December 1995 we had moved our approximately 450 total cows into a new 6 row free-stall, intended to eventually house 500 milking cows. A new double 14 parallel parlor was built at the same time. This represented a consolidation of the herd, rather than an expansion, from 4 ageing tie-stall barns with all their accompanying inefficiencies and limitations to a modern free-stall operation. Primarily for bio-security reasons, the intent was to grow the herd to capacity from within, something the farm had always been easily able to do. In 1997 we averaged 515 cows. Milk shipped per cow that year was 20,162 lbs. (2X, no BST).

As we neared our third year in the new barn, several issues of concern for the dairy were emerging. First, we were already aware that our farm was located in an environmentally sensitive area. More than half of our tillable land lies over a sole-source aquifer that feeds the well for the village of Homer as well as many individual wells in the outlying town. In addition, our land borders about 90% of one the of the nine naturally stocked brown trout streams in New York. Only 10 – 14 days manure storage existed in the center collection pit of the new barn and we were committed to year-round, almost daily manure spreading. As a new, highly visible facility, we were the first to be looked at when any neighborhood problem which might be related to animal agriculture arose – whether it be odor, an off-tasting well or an overgrowth of algae in the trout stream. And although we had not heard the term “CAFO” yet we knew that the bar was going to be raised for us in terms of nutrient management.

Second, we were concerned that land we were currently running was insufficient to provide enough forage to support herd growth to capacity. Forage inventory was just sufficient, but the amount of homegrown forage in the diet was only about 43%. Forage quality was an area needing improvement. Bunk space built for 400 cows in 1993 was inadequate and bunk losses seemed high as the bunks crowned twice as high as the walls. Purchased feed costs ($5.22/cwt in 97) were as a result significantly higher than similar farms in the DFBS and were eroding the bottom line.

Concurrently, we were beginning to experience production and herd health problems that we had not dealt with in the old tie-stall environment. After an encouraging first year, milk per cow was now stagnant at about 68 lbs per cow in the tank - the forerunner of a downward trend. Increasing foot problems, infertility and metabolic diseases (RPs, DAs, ketosis and fatty liver) would drive the cull rate to 44 and 42% for 1997 and 98 respectively, making dealing with herd growth a problem we didn’t
really have to worry about. In fact, despite the purchase of an additional 100 cow herd in 1997, at the end of 1998 we had averaged only 18 cows over the previous year.

THE BEGINNING OF OUR INVOLVEMENT WITH THE CUNMPS

When we were approached in early 1997 to participate as a case-study farm for the Cornell University Nutrient Management System (CuNMPS), we readily agreed, with the thought we would gain an advantage in dealing with our environmental issues and the regulations that were said to be coming. This did indeed occur, but our participation also yielded many other unanticipated benefits. The practices of “precision farming” which aim to increase nutrient recycling within the farm boundaries led to management changes and improvements in every enterprise of the dairy. The resulting improved crop yields, better quality homegrown forage, decreased losses and waste in the silage bunks and feedbunks, healthier cows and increased milk production have greatly improved both the environmental and economic sustainability of the business.

PLANNING AND IMPLEMENTATION

FIELD CROPS

Cropping practices were the first area to undergo a major overhaul. More poorly drained, sloping hillside land which previously had been made to grow corn or legumes with generally disappointing results was rotated into intensively managed grass (IMG) – on our farm, reed canary and orchard grass. Good early results with 60 acres of IMG in 1997 (yield of 17 tons/acres, as chopped) gave us confidence to continue to increase IMG acreage to a total of 260 acres in 2002. With improved tonnage yields – in every case better than corn silage grown on the same ground – forage inventory concerns were lessened. The IMGs also serve as a voracious “sink” for liquid manure (thus N) throughout the summer, unlike alfalfa that often seems to be hurt rather than helped by summer manure application. 95% of the IMGs originally seeded remain and continue to produce excellent yields. This has slowed down rotation on the hills and speeded up rotations on the good valley flats. Alfalfa (which is now grown only where it stands the best chance of success) is plowed down after the fourth year so overall stand quality is better.

Silage corn varieties are carefully matched to various soil types and elevation (which varies by as much as 700 feet on this farm). Planting dates and maturities are strategically used to widen the harvest window so that the entire crop can be chopped at optimum quality. Input costs of corn return better when better ground such as the valley flat is more intensively planted to corn. Corn starter is now custom matched to average field nutrient levels with a resulting change from standard application of 200 lbs./A of 6-24-24 to 100 lbs./A of 20-20-0. PSNTs have been used to assess supplemental N needs on all second year and older corn fields since 1992 and will continue to be used.
LESSONS IN FORAGE QUALITY

Quantity is good – but quality is also crucial. Plenty of grass in the bunk is not much consolation when the protein is 11% and the NDF is greater than 60%. Hard lessons were learned about the narrowness of the harvest window, the importance of harvesting quickly, field drying time, cutting intervals and use and timing of supplemental N to insure optimum grass silage quality. Management changes were made: grass, not alfalfa, is cut first and early. Thirty-day cutting intervals for grass (35 for alfalfa) are religiously followed and supplemental N is applied to all grasses in early spring and following all but the final cutting. All this has a return – our IMG silage quality is from 2002 first cut was less than 50% NDF with second and third ranging from 50 to 57% NDF.

Meeting the goals of timely harvest meant some additional investment in both a larger capacity SP Harvester with kernel processor in 1997 and over time, additional and larger dump trucks. The expense of hiring in additional custom harvesting and hauling at peak times was also now seen to have a clear payback.

FEED STORAGE

Solving one problem often seems to create another - all this extra forage intensified the shortcomings of our existing bunk spaces. In 1997 a leachate catch system was installed for aquifer protection. By 1998 we were sufficiently convinced that losses from overfilling the corn silage bunk were significant enough to warrant using bags for additional storage. Losses from field to feedbunk were reduced overall, but on our farms, bags have not proven to be a satisfactory solution, only a bandaid until a new bunk could be built. Spoilage did occur, at times resulting in the loss of entire bags. Variability in dry matters in bags was much greater than in the bunk and the process of filling and emptying bags was a system bottleneck. We also felt fiber damage occurred during filling bags. (We had become sensitized to the issue of compromising fiber quality after 1997 when we used our new kernel processor equipped harvester to puree our corn silage crop, proving once again that you can have too much of a good thing. Another hard lesson in forage quality and the judicious use of kernel processing was learned through an entire feeding season as herd health suffered the impact.)

Because the feeding properties of grass and alfalfa silages differ, management made the decision to begin segregating storage by type, not cutting. Separating grass and alfalfa reduced ration variability, made our nutritionist’s life easier, and allowed us to target the forage to the group where returns might be optimized. An investment was made in 1999 in a pad at the back of the open-ended bunks so that we could fill and feed fermented forages simultaneously. This greatly increased feeding flexibility throughout the year by giving access to four crops of alfalfa and grass at any given time. The trend of segregating forages to maximize their feeding potential was taken a step further this year when 450 tons of BMR corn was ensiled specifically for use in the transition and fresh groups.
The use of higher quality tarps to minimize sunlight degradation of stored forages and perforated sidewalls for holding down the tarps more uniformly has become standard procedure. Bunks are covered immediately upon completion, often the same day. This task has become much less onerous and therefore more likely to be done properly with the use of sidewalls instead of whole tires.

RATIONS AND FEEDING

As the goals of more and better homegrown forage were being met the amount of forage fed in the diet was gradually increased – from 43% in 97 to 59% in 2002. In our efforts to reduce variability within the critical area of feeding a number of controls were put in place. The farm had begun using EZ Feed in 1997 so one important tool was already in hand. Over time various other measures were developed to ensure feeding consistency: Feeder performance is recorded and tracked for daily deviations in pounds fed off from a perfect zero. A daily feeder’s checklist was developed to ensure routine tasks and data collection are done consistently. Forage dry matters are checked by the feeder at least three times weekly. These are charted, along with dry matter intakes calculated for each group in the milking herd. Feedbunks are scored for the amount of refusals and adjustments are made accordingly, pen counts checked, and commodities ordered and delivered are recorded. In 2001 the move was made to new feeding software and hardware (FEEDWATCH) that allows for more timely changes and reporting, and better inventory tracking.

Initially there was some skepticism that a cow could eat enough forage to meet the needs of high production. She can, but only if her rumen is healthy. As our herd struggled to recover from acidosis suffered in 1997 and 1998, milk production declined through mid 1999 and has since recovered gradually. Recovery took far longer than expected, but management was determined to “stay the course” of a high forage diet, and incremental improvements herd health were encouraging. About 1300 lbs. per cow were gained from '00 to '01 and another 900 pounds are projected to be gained in '02. Our herd average for August 2002 stood at 24,500. Cull rate has dropped steadily to a current 27% allowing internal herd growth to resume. Purchased feed costs have declined from a high of $6.56/cwt to a projected $3.45 for 2002 – which puts us in the top 20% of similar farms in the 2001 DFBS.

PRECISION FARMING

As the whole–farm approach evolved, the need for more and better data collection and the development of SOPs in areas beyond feed delivery became increasing apparent, The number of variables in dairy production are so numerous that the answer to the question “Why are the cows down two pounds today?” is rarely clearcut. Did the milker start on time or rush through milking? Or did 800 pounds of milk run down the drain? Maybe the dry matters are off, or were the group numbers wrong so not enough feed was delivered? Did the feeder get started late or maybe nobody pushed up feed? Did somebody change the ration – are we into some new forage? Did
we vaccinate? Were the sprinklers and fans turned on in the holding area? The ability to track and eliminate variables such as these is essential to determining where a problem actually lies.

In the parlor, a closed circuit TV was installed for milker training and monitoring milking routines for consistency. Investment was made in a “smart washer” for parlor equipment which monitors a number of factors pertaining to system performance and displays an alarm when deviations occur. Milker performance is charted daily for cow throughput and milk/cow/milking. Milkers must complete a checklist at beginning and end of each shift to ensure tank valves are closed, bulk tank temperatures are recorded and wash system alarms are reported. A daily milk chart is kept for tank weight/cow for everyone’s referral and notes regarding ration changes, weather or any other circumstance which might impact production are made on this chart.

An on-farm system installed in 1997 is used to monitor milk production. DHI testing was discontinued in 1998. Group and bulk tank samples are taken weekly for tracking of butterfat, crude and true protein, bacteria, SCC and MUN. These have proven very effective in the timely detection of cleanliness problems, high SCC cows, ration issues and herd response to ration changes. The use of milk deviation lists generated 2X daily has proven an invaluable tool in the timely detection of sick cows and protocols for handling cows who appear on the list have been developed. Investment was made this year in an activity monitoring system for heat detection. Heat efficiency in the months prior to installation averaged 76% - it has been over 92% in all but the hottest weeks of August.

Three cattle scales are used on the farm to weigh heifers at birth, weaning, six months, first heat, breeding, pregnancy check, pre- and post-calving to record and track rates of gain and monitor both the feeding program and herdsman performance. Accurate forage yields from the field are tracked by weighing representative loads at a truck scales nearby.

Standard Operating Procedures have been developed in the area of feed mixing and delivery, milking procedure, monitoring fresh cows, assessment of potentially sick cows appearing on the deviation list, and for treatments of various illnesses. Both top and middle management find themselves referring to the SOPS on a regular basis. SOPs for young stock from birth to first calving are near completion. SOPs are also occasionally reviewed and updated as needed.

ECONOMIC IMPACTS

The farm has participated in the Dairy Farm Business Summary (DFBS) since 1991. Benchmarking analysis has been routinely done by management since 1995. As mentioned earlier, the farm business had experienced a “triple whammy” in our first three years in the new barn – high purchased feed costs, high cull rate and falling milk production. None are good individually and in combination will have disastrous impacts on profitability. As cow numbers and production slipped from 97 to 98, debt per cow was
increasing rather than decreasing post-expansion. Cash flow coverage, even in the excellent milk price year of 1998, was .86 and indicators of profitability (rates of return to equity and all capital) in that potentially good year were far below the bottom quintile on the DFBS. In 1999 we managed to rise to the bottom quintile in these measures. For 2001 we were in the fourth decile. Even with milk prices decreasing and feed prices rising the farm is in a positive cash flow situation as of the date of this paper.

As we prepared to weather the low milk price year of 2000 in depth benchmark analysis made one thing very clear: high fixed costs demanded increased productivity per cow and increased herd size to use idle capacity but this must be done without increasing debt load. Compared to the size of improvements needed, expense reduction opportunities were limited. A rigorous budgeting process was nevertheless followed, and per cow and per cwt. targets were set. “Stretch targets” were set in the most critical areas of feed costs, hired labor and machinery costs, and were met in 2001.

HERD HEALTH IMPACTS

Improvements in herd health were the underlying key to growing cow numbers without adding debt and improving milk/cow and total pounds sold. As percent of forages in the diet rose, and other quality control measures were adopted, the incidence of lameness, RPs, DAs and ketosis dropped sharply. Many of these problems took cows out of the herd in early lactation. For the period March ’98 – March ’99, the percentage of fresh cows leaving the herd in the first 30 days of lactation was 9.4%. For the first 6 months of 2002 that number is 2.8%. We are now just 25 cows below current capacity and milk production for the first 7 months of 2002 is 118% of the corresponding period of 2001. Daily fluctuations in milk/cow have gone from wild swings of 3-4 pounds or more to an average of less than one to two pounds per day. Cows recover quickly from heat stress and respond quickly to ration changes (both good and bad).

Here’s a recent example of troubleshooting, and how perspectives have changed on our dairy. During the very hot month of August, a ration change was made to supplement dwindling corn silage inventories with wet brewer’s grains (represented by the seller and calculated into the ration at 20% dry matter). Heat stress had lowered milk to 73 lbs/cow. After the change, sweltering heat continued but production rose in 3 days to over 78 lbs/cow. Rather than a cause to celebrate this was viewed as a cause for concern and raised fears of a “too hot” ration. Double checking of dry matters, including the wet brewer’s revealed that the brewer’s was much drier than originally thought, ration corrections were made, production eased back down into the 74 lb. range and potential acidosis and lameness problems were averted. After the heat wave ended the production rose slowly but surely to a new high of 80 lbs./cow, with cows eating and walking well.
CAFO

The CAFO plan for E-Z Acres was filed April 1, 2002. Much required information, such as comprehensive soil sampling and manure analysis, had already been gathered as part of the CuNMPS project. In many areas, because of CuNMPS, the farm was already in compliance. The use of IMGs on steep hillsides aided in compliance with HEL (Highly Erodible Land) requirements. Phosphorus use in fertilization and feeding had already been dropped significantly. Although use of IMGs greatly widen the window for summer manure spreading and aid in the recycling of N, the high Nitrogen Leaching Index on the valley land is a concern. The CAFO planning process clearly indicates the need for 6 month’s manure storage to address this. With the spring spreading of stored manure, the need for odor abatement will also need to be addressed in our location where we co-exist with a large suburban population.

LOOKING FORWARD

Future expansion goals include the addition of housing for an additional 350 milking cows for an eventual herd size of 1000 – 1100 cows, to max out the existing parlor with 2X milking. However, under the current CAFO plan the land base is insufficient for such growth, so the availability of land for rent or purchase will be a controlling factor. Much of the land potentially available lies in the Skaneateles Lake Watershed, another environmentally sensitive area.

Immediate management challenges include expansion of the land base, and the construction of manure storage and an odor abatement system, most likely methane digestion although emerging technologies cannot be ruled out. These will require significant capital investment. Any manure storage planned will likely be built so that at some time in the future it may be covered. Particulate air pollution from nitrogen volatilization is seen by management to be an issue on the far horizon which we will attempt to proactively meet.

CONCLUSIONS

Dairy producers must respond to governmental regulations and society’s desire for clean water and air in order to insure the long term survival of their businesses. Environmental sustainability cannot be bought at the cost of economic sustainability – systems must be developed to insure both. A whole farm approach which seeks to optimize recycling of nutrients within the farm boundary, reduce the need for imported nutrients and reduce waste can result in both environmental and economic gains. Cropping, feeding and nutrient management practices which are carefully integrated and managed for efficient use of nutrients will also yield economic benefits in every enterprise. Among these on E-Z Acres were lowered feed and fertilizer costs, improved herd health and longevity through the feeding of higher forage diets which meet the needs of high producing cows, and improved crop and milk production. Management must commit to continuous improvement in monitoring and controlling variables in every enterprise, and formulate means of timely response to production issues as “precision farming” practices are adopted. Producers who do so will be rewarded not only by an improved status as environmental stewards, but also by a more efficient and profitable dairy operation.