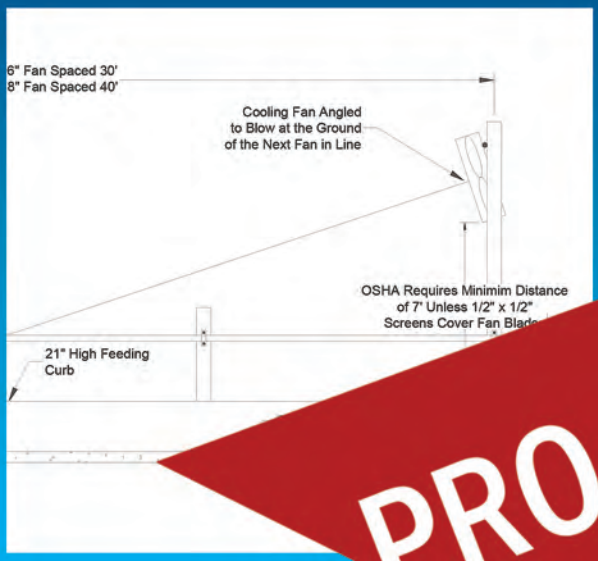
THE MANAGER

APRIL 2017



PRO-DAIRY

Cornell University

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The Manager insert prepared by PRO-DAIRY specialists appears in *DairyBusiness&HolsteinWorld* four times a year. PRO-DAIRY supports growth of the New York Dairy industry through education and research and was founded in 1988 as a joint venture of the New York State Department of Agriculture and Markets, Cornell University's College of Agriculture and Life Science, and Northeast agriservice organizations.

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THE MANAGER Leading The Way To Profit Through People APRIL 2017

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PRO-DAIRY shares research through education to enhance management

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PRO-DAIRY's mission is focused on research and education. Throughout the year PRO-DAIRY organizes and supports educational programs, and PRO-DAIRY specialists serve as guest speakers. This issue of *The Manager* highlights speakers and topics from the statewide 2017 Winter Dairy Management meetings, with a focus on lameness, and the March 2017 Cow Comfort Conference held in Syracuse, NY.

PRO-DAIRY Dairy Herd Health and Management Specialist Rob Lynch, DVM kicks off the lameness articles, with a focus on locomotion scoring and record keeping as key to lameness prevention. Larry Chase, Professor Emeritus, Dairy Nutrition at Cornell University links nutrition and lameness. Lindsay Ferlito, Cornell Cooperative Extension North Country Regional Ag Specialist, who also coordinated the Cow Comfort Conference, shares research about the impact of bedding on lameness and cow comfort.

Cow Comfort Conference speaker Heather Dann, Research Scientist, Miner Institute, suggests inclusion of occupational and sensory enrichment on farms, like what are provided to zoo animals. "Modest investments in housing or changes in cow management routines can pay large dividends in greater cow health and performance." Kimberely Morrill, North Country Regional Ag Specialist, and Cow Comfort conference organizer, provides an update on National FARM Program changes that went into effect in January.

This Manager issue from PRO-DAIRY focused on management.

Also included are timely updates for spring planting, including advice on how to use corn silage hybrid trials results, co-authored by Joe Lawrence, Cornell PRO-DAIRY Forage Systems Specialist, who with his hire, re-started Cornell's corn silage hybrid trials. Another article highlights research that shows soil organic matter only increased in trial plots with high rates of composted manure. With warm weather on the way, PRO-DAIRY Senior Extension Specialist Curt Gooch co-authors an article on key considerations in fan cooling.

PRO-DAIRY Senior Extension Specialist Karl Czymmek provides an issues updates for NYS CAFO farms and briefly summarizes the Clean Water Act and the Environmental Conservation Law permits.

Davis Valley Farm LLC, Eagle, NY is profiled for their construction of manure storage and implementation of nutrient management plan practices, partially funded through multiple grant awards, including from the Dairy Acceleration Program.

Julie Berry (jrb7@cornell.edu) is Communications Manager and edits The Manager for PRO-DAIRY.

Save the date!

Herd Health and Nutrition Conference

prodairy.cals.cornell.edu/conferences/

Presented by PRO-DAIRY and Northeast Agribusiness & Feed Alliance

The Herd Health and Nutrition Conference provides an opportunity for dairy producers, veterinarians, feed industry representatives and agriservice personnel to increase their knowledge of current herd health and nutrition management techniques while interacting with other professionals.

April 12, 2017 at the Holiday Inn, Liverpool/Syracuse, NY

Enhanced Management

By Heather Dann

Managing the environment to maximize cow comfort

Cow comfort is critical to dairying successfully as it impacts a cow's overall wellbeing, health, and productivity. It is often thought of as a function of the cow's management environment, which considers both the physical (e.g. housing) and social (e.g interactions with cows and people) aspects of the environment. Essentially, cow comfort or environmental enrichment, as zoos refer to it, aims to provide a physically and mentally enriching environment. When done properly, environmental enrichment on-farm or at the zoo can improve biological functioning, such as productivity, health, and reproductive success. It can also allow animals to cope with stress and frustration associated with housing and management practices, increase natural behaviors, and promote a positive affective state.

Environmental enrichment… Not just for zoos.

A cow needs time to be a cow and practice natural behaviors that support her physiological and psychological needs. In a 24-hour period, a cow spends about half of the time resting, a third of the time ruminating, and a sixth of the time feeding and drinking. That only leaves a couple of hours to milk the cow and do any other management tasks, like health or reproductive checks. Interestingly, resting is the cow's most valued behavior as it takes precedence over eating and social behaviors when opportunities to perform those behaviors are restricted. Resting has many benefits for the cow through physiological effects that decrease stress and lameness, increase milk production, and ultimately increase the length of time a cow remains in the herd. Resting, measured by lying time, is an opportunity for most farms as many farms fail to have their cows achieve 12 hours of rest per day.

There are a number of ways that we can disturb the time budget of our lactating cows. They include: excessive time outside the pen primarily due to milking, uncomfortable stalls, overcrowding and excessive competition for valued resources, inadequate feed availability, comingling first lactation cows with older cows, and poor heat stress abatement. We can support the time budget (i.e. natural behaviors) of cows by focusing on the five categories of environmental enrichment used by many zoos: social, physical, nutritional, occupational, and sensory.

Currently, cow comfort focuses primarily on the social and physical categories. Future improvements in cow comfort are likely to include aspect of occupational and sensory enrichment.

Social – Provide access to other cows and humans. Keep cows in stable groups to meet their social needs. Regroup cows as pairs or groups later in the day or evening to minimize fighting. House first lactation cows separately from mature cows. Optimize the stocking density to minimize negative cow to cow interactions. Treat cows kindly.

Physical – Provide clean, comfortable housing. Use heat abatement strategies. Avoid overcrowding that limits access to resting and feeding areas. Provide access to secluded areas for sick and calving cows.

Nutritional – Provide quality feed that is consistently available. Achieve this by delivering feed more than once daily, pushing up feed throughout the day, especially in the first two hours after feed delivery, and avoiding overcrowding.

Occupational – Provide cows with the ability to exercise. In zoos, cognitive enrichment, or task solving is encouraged. Currently, this aspect of environmental enrichment is not implemented purposely on dairies. However, many of us have experienced the smart cow that opens a gate or unlocks headlocks.

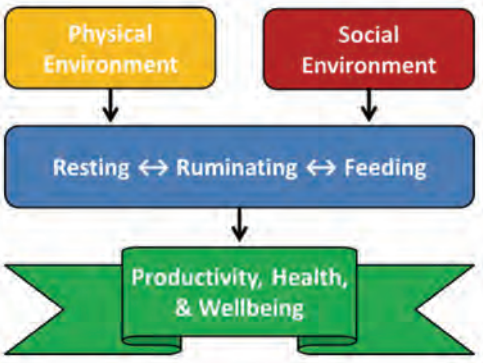
Sensory – Provide stimulus to trigger one or more of the senses (e.g. auditory, visual, olfactory, and tactile). Provide a grooming brush. Minimize high-pitch sounds. Play music while milking to calm workers and cows.

With continued volatility in feed and milk prices, we need to sharpen our focus on the consistent cow and economic benefits of improved cow comfort. Modest investments in housing or changes in cow management routines can pay large dividends in greater cow health and performance. ❐

Typical time budget of cows in confinement housing
(R. Grant, Miner Institute)

Activity	Hours per Day
Resting (lying)	10 to 14
Eating	3 to 5
Drinking	0.5
Ruminating (standing or lying)	7 to 10
Interactions, grooming, standing	2 to 3
Milking (outside of pen)	2.5 to 3.5

Cow comfort is a function of the cow's management environment.



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ENHANCED MANAGEMENT

By Rob Lynch

Lameness recording for enhanced management

Lameness continues to be an important issue for the US dairy industry, as it negatively impacts animal welfare and the farm's bottom line. In 2009 Bicalho and collaborators estimated the prevalence of lameness in NYS dairy cattle within their first 70 days in milk (defined as the percent of cows with a locomotion score of >3 on a 5-point scale) are between 27% and 54%. Cha et al. (2010) estimated that the average cost of sole ulcers, digital dermatitis, and foot rot is $216, $133, and $121 respectively **(Figure 1)**. These costs come from treatment, lost milk production, decreased reproductive efficiency, and an increased risk of culling. Booth et al. (2004) analyzed the effect lameness had on cull rate and observed that cows that became lame during the first half of their lactation were up to twice as likely to leave the herd than nonlame cows. Lameness in dairy cattle is the industry's leading welfare issue because the condition is highly prevalent and affected animals show obvious signs of pain and suffering. Although we know good lameness control is crucial to a dairy's success, many producers underestimate how much lameness is in the herd. A problem is difficult to manage effectively if you do not know its extent. Lameness health events tend to be inconsistently entered into on-farm software, if recorded at all. Routine hoof trimming is a common management practice on dairies that makes significant improvements in cattle welfare. Unfortunately, many farms do not have a good system in place to consistently capture and review the trimmer's findings. Even if management reviews trimming reports and lameness records, they are only seeing the most severely affected cows. Routine screening through locomotion scoring by trained individuals provides a better understanding of current lameness incidence in the herd. Early detection through this screening can make lameness problems easier to correct, and can minimize animal suffering and economic impact.

Routine locomotion scoring, and meaningful hoof lesion findings, allow managers to monitor lameness issues.

Capturing Lameness Events: Turning all the visits cows make to the trimming chute into useful information is a challenge. Partial and inaccurate hoof lesion observations have little value to herd managers. Making sense of crinkled, manure-stained, hand-written receipts is a frustrating exercise as well. Without much more effort, the investment made in routine hoof trimming can be maximized if the results are recorded and communicated consistently. Many farms do this well, but if this does not describe what you do, consider adjusting your procedures. The Zinpro Corporation and the International Lameness Committee have developed a naming convention and recording procedures to improve accuracy and utility of lameness findings. By using 14 single-letter abbreviations **(Figure 2)** and 14 distinct claw zones **(Table 1)**, trimmers can communicate their findings efficiently and with greater accuracy.

Locomotion Scoring: Observer generated scoring systems assessing posture and gait abnormalities in dairy cattle have been around for more than 20 years and are proven effective to identify lameness issues in dairy herds. Even though we know locomotion scoring helps lameness management, few herds have incorporated regular herd scoring protocols into their management programs. Perhaps this is due to the expense associated with locomotion scoring. Since

Figure 1: Cost of Different Types of Lameness in Dairy Cows
Calculated by Dynamic Programing. Cha, et al, Prev. Vet. Med., 2010.

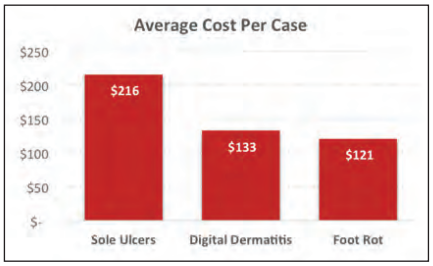


Figure 2: Dairy Claw Lesion Zones *(Zinpro Corporation and the International Lameness Committee).*

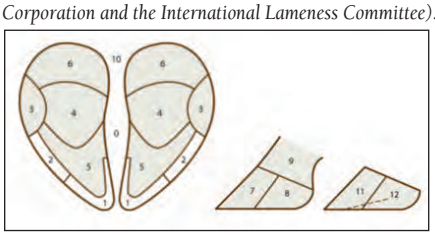
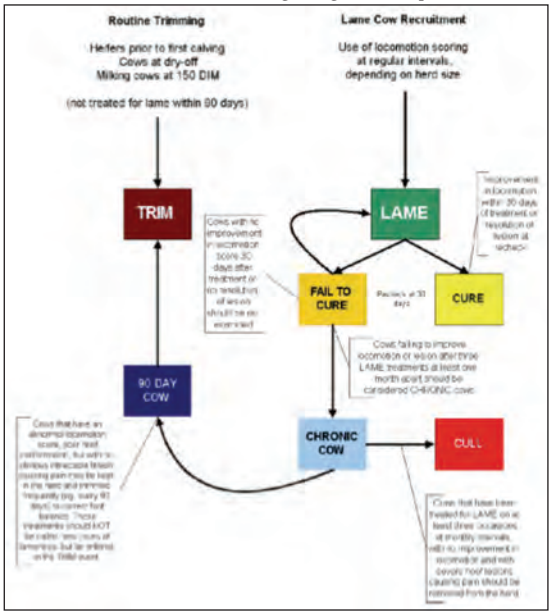


Table 1: Dairy Claw Lesion Abbreviations
(Zinpro Corporation and the International Lameness Committee).

Claw Lesion	Abbreviation
Digital Dermatitis	D
Heel Erosion	E
Interdigital Dermatitis	I
Foot Rot, Foul or Phlegmon	F
White Line Lesion	W
Sole Ulcer	U
Sole Hemorrhage	H
Toe Ulcer	T
Corkscrew Claw	C
Horizontal Fissure or Hardship Groove	G
Vertical Fissure	V
Axial Fissure	X
Interdigital Hyperplasia	K
Thin Sole	Z

this procedure cannot be multitasked with other chores, it will take some labor hours to accomplish good locomotion scoring. Consider this an investment since the money spent to score for lameness will be paid back when lame cows are identified and dealt with sooner, thereby reducing lost production and culling risk. Ideally, all cows should be scored monthly. It can be done all at once or broken up by pen and spread out over several days. The New York State Cattle Health Assurance Program (NYSCHAP) provides guidance based on the 5-point scoring system developed by Sprecher et al. (1997). Cows scoring a two should be noted, and if three or greater, directly examined for hoof lesions. Another obstacle to routine locomotion scoring is concern that doing it incorrectly will lead to useless results. Scoring cows when they are freely moving on a non-slippery flat surface is challenging. Cows should not be scored while being moved to the parlor for milking. Also, make sure you are seeing all the cows. Lame cows typically bring up the back of the pack, so the observer needs to watch the entire group, not just the first half of the pen leaving the parlor. If the observer is walking through pens, he/she should keep in mind that lame cows will be reluctant to walk around freely and therefore may be overlooked. There are many great training resources available to help observers with their scoring. The most useful are recorded videos of each locomotion score.

Figure 3: Lameness Management Flow Chart
(Nigel Cook and David Rhoda, University of Wisconsin-Madison. A Record Guide to Lameness Monitoring Using Dairycomp 305).



Tracking Lameness Incidence: Several groups of cows need hoof attention. These include the nonlame cows that need routine trimming, usually twice each lactation. These cows should not be counted among the lame, but it is critical that management systems identify them so they don't miss out on important trims. Second are the new cases of lameness that need to be attended to right away. This is the group that lets us know when there is a true change in the herd's lameness incidence. Some of these cows will need re-evaluation or follow-up care due to the nature of their condition. The lameness management program should ensure they make it back to the trimmer in a timely manner. And then there are the chronically lame who require more attention and more frequent visits to the trimmer. The cows requiring repeated treatments are important to monitor to make sure treatment protocols are working, but should not be included when tracking herd lameness incidence. Cook and Rhoda at the University of Wisconsin School of Veterinary Medicine describe a lameness management plan that helps deal with these different groups of cows **(Figure 3)**. Since some lame cows receive antibiotics as part of a treatment protocol, it is critical to have a system in place to prevent milk and meat drug residues. Tying the trimmer's findings to the farm's established treatment protocols helps mitigate this risk. It is essential that everyone responsible for treating cows, including non-farm employees doing hoof trimming, is trained to follow the farm's established treatment protocols.

Trimming Triage: Time is limited on the dairy and this tends to limit how many cows can visit the trimmer on any particular day. With that in mind, managers can set up their trim list in order of urgency. Newly lame cows should take priority over the routine trim cows and sort lists can be set up to put cows in order of priority. If increasing numbers of new lame cows are making it difficult for the trimmer to get to the routine trims in a timely manner, your management system should alert you to adjust the trimming schedule accordingly.

Lameness Manager: Dairycomp 305's Lameness Manager feature helps organize trimming and lameness events. After a simple installation and ITEM setup, trimming lists can be generated, lameness findings can be easily captured (it works with Pocket Trimmer and certain licenses of Pocket CowCard) and matched to farm protocols. Cows that need follow-up can be flagged for re-examination, wrap removal, etc. When lameness findings are entered into software consistently, lameness incidence can easily be analyzed. Some important questions managers can answer using Lameness Manager include:

- Has there been a significant increase in certain types of hoof lesions suggesting a need to review the farm's lameness prevention plan?
- Is the farm keeping up with routine trimming or are cows going too long between trims?
- Are current lameness treatment protocols working?

Conclusion: Consistent communication of routine locomotion scoring results, combined with meaningful hoof lesion findings from the trim chute, will provide herd managers with the information needed to monitor for lameness issues. Significant changes in either of these two monitors will signal management to investigate breakdowns in lameness prevention programs. ❐

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Enhanced Management

By Lindsay Ferlito

The impact of bedding on cow comfort and lameness

Understanding just how much impact good quality bedding has on cows can help producers better manage their bedding to reduce lameness and improve cow comfort. Providing a comfortable stall base is one of the easiest ways to have a positive impact on cow comfort. Cows housed on deep-bedded stalls, compared to other types, such as mattresses, mats or waterbeds, have lower overall and less severe lameness, fewer overall and less severe hock injuries, higher lying time, especially for lame cows (see figure), lower SCC, and higher milk production. Data from a 2009 survey of Minnesota freestall herds found that dairies with sand bedding had almost a 4,000 pound higher DHIA Rolling Herd Average than those without sand. Additionally, Nigel Cook, Professor, Food Animal Production Medicine, University of Wisconsin-Madison, School of Veterinary Medicine, found using deep-bed sand can reduce culling rates. Feet and leg issues (aka lameness) are a top cause of involuntary culling in the US, so by reducing lameness with deep-beds, involuntary culling can be reduced too.

Deep-beds improve comfort and reduce lameness, but all stalls must have clean, dry and ample bedding.

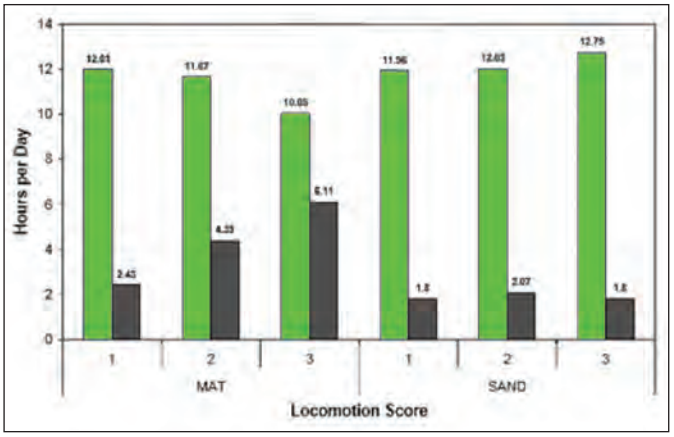
Deep-beds deliver these benefits because they provide a large amount of bedding for the cow, and because it reduces her chances of rubbing or hitting a hard stall surface. Deep-beds are not always a possibility, and mattresses can be a good option if enough bedding is used.

A study of tie-stall cows on mattresses found that for every one inch increase in compressibility of shavings, lying time was increased by 15 to 23 minutes. Moreover, a recent study in Canada found the odds of lameness were lower when there was >2 cm of bedding in the stalls. It's hard to keep bedding on a mattress for very long, so fresh bedding should be added regularly (every other day) to maintain coverage.

To get the full benefit out of a deep-bed (or well-bedded mattress), the bedding must be good quality and maintained. One study tracked the level and depth of sand in deep-beds for 10 days after bedding was added. The change in depth of sand was largest the day after bedding was added, and over time the stall became more concave. For every one inch drop in sand below the level of the curb, lying time was reduced by 28 minutes per day. Additionally, lying time is significantly reduced on wet, compared to dry sawdust, especially when the bedding dry matter drops below 60%. Dairies with more contaminated and dirty stalls are associated with higher severe lameness. Cows really do want clean, dry, ample bedding.

Sand is referred to as the gold standard bedding for cow comfort, as it is usually soft and pliable, has good drainage, little organic matter, and provides good traction. Ultimately, however, good cow comfort can be achieved with many different types of bedding if they're managed well. What tends to be most important is if the bedding is soft, clean, dry, and if there enough of it in the stall. It's imperative to choose a bedding material that you can manage and that your manure system and facilities can handle.

Overall, deep-beds provide better cow comfort and reduce the risk of lameness. But all stalls must be maintained and managed to provide cows with a comfortable place to rest with clean, dry, and ample bedding. ❐



Data from Dr. Nigel Cook, University of Wisconsin-Madison. The chart shows time lying down in stall (grey), and time standing up in stall (black), on mattress (MAT), and deep-bed sand (SAND) herds, for cows with locomotion scores 1 (sound), 2 (slightly lame), and 3 (severely lame).

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ENHANCED MANAGEMENT

By Larry Chase

Nutrition management and lameness in dairy cattle – Many pieces to the puzzle

Lameness in dairy cattle is an expensive and multi-faceted herd health problem. One contributing factor is the nutrition and nutrition management program on the farm. The primary relationship between nutrition and lameness is related to the type and consistency of rumen fermentation. A key factor is rumen pH and acidosis. As the number of hours below a pH of 5.8 increase, the risk of acidosis goes up. The risk of lameness increases as acidosis becomes prevalent.

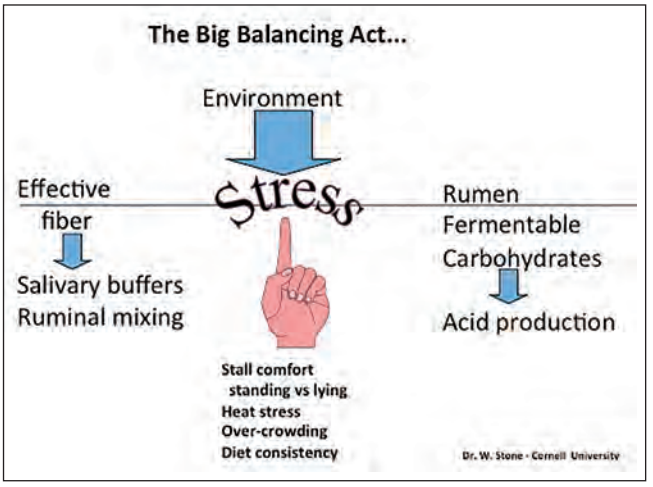
The relationship between nutrition and lameness is related to the type and consistency of rumen fermentation.

The first step is to develop a ration with a balance of fiber and rumen fermentable carbohydrates. The challenge is that the target varies depending on a number of factors, such as those in **Figure 1**. As a result, we see a range of values successfully used in healthy high producing herds. The following are starting points for formulation guidelines:

- Ration NDF = 28 – 35% (about 75% or more from forage).
- Forage NDF = minimum of 0.9% of body weight.
- Physically effective NDF (peNDF) = Minimum of 22% for an average rumen pH of 6.
- Starch = 20 - 30%.
- Sugar = 4 – 8%.

The second step is related to feeding and feeding management considerations.

- Use ash corrected NDF values. If high ash forages are used in the ration, total NDF will be overestimated if ash correction is not used. Most forage labs can provide ash corrected NDF values.
- Consider starch fermentability. As starch fermentability increases, more carbohydrate is digested in the rumen and more acid is produced. About 75 - 80% of the starch in the ration should be fermented in the rumen. Buffers should be added to high starch and highly fermentable starch rations.
- Monitor forage dry matters and adjust the amounts of forage added to the TMR to maintain constant pounds of forage dry matter in the ration. Not doing this can alter the NDF to starch.
- Check the particle size of the TMR to make sure particle size is not reduced during the mixing process. This can be done by making a one cow mix and mixing it with a fork or shovel. Check the particle size of this mix versus the mix made in the TMR mixer. Overmixing can reduce particle size in auger type mixers.
- Check the consistency of the TMR delivered along the length of the feed bunk. Does the feed look "similar" along the length of the bunk? The Penn State Particle Separator could also be used to quantify this.
- Look at the feed refusals! Do they appear sorted with only long, coarse particles? If so, the ration consumed may be different in NDF and starch than formulated for and could alter rumen fermentation.
- Encourage more uniform feed consumption. Frequent feed pushups will help. Recent work indicates that pushing feed up in the first one to two hours after feeding may be beneficial.
- Does the ration mixed and delivered match the ration formulated? TMR analysis may be a tool assess this.
- Overcrowding – This can change meal patterns and meal size, may lower rumen pH, and can increase the risk of acidosis. This may be a larger problem in mixed parity pens. First lactation cows may be at higher risk of acidosis in this situation.
- Transition rations – Be careful not to make large and rapid changes in ration starch content between the pre-calving and fresh cow rations. A guideline is to have the difference in starch content of these rations be 10% different.
- Think like a rumen bug – What can you do to provide the most consistent ration and feeding system to minimize variation in the rumen environment? ❐



Larry E. Chase, PhD, (lec7@cornell.edu) is a Professor Emeritus, Dairy Nutrition, at Cornell University.

ENHANCED MANAGEMENT

By Curt Gooch amd Dan McFarland

Key considerations in fan cooling

Keeping cows comfortable and healthy is essential to sustain production of high quality, high volume milk. Elevated air temperatures and humidity, intense solar radiation, and/or little or no natural air movement contribute to stressful conditions for dairy cows. Effects are seen in reduced milk production, decreased feed efficiency, reduced conception rates, and compromised growth rates of neonatal calves. Losses combine to cause huge economic impacts, even in the Northeast.

Maximize benefits from cooling fans by targeting high airflow rates at cow level in beneficial areas of the barn.

While the economic nature of the dairy business does not allow the capital and operating base to house cows in environments that totally mitigate the effects of heat stress, the effects of heat stress can be significantly reduced. A heat stress abatement system: ensures all cows always have free access to clean, fresh water; provides shade from the sun's solar energy; increases barn ventilation (air exchange) rate; provides air speed directly on cows in strategic locations; increases evaporative heat loss by intermittently soaking cows' hair coats; and adjusts feed ration composition. Focus is on two general areas in fan cooling: 1. attributes of fans and 2. installation and maintenance of fans.

There are many considerations for each area:

Locating Fans: Provide targeted air speeds in areas where cows perform beneficial activities. Fans should be strategically located over cow feeding, resting, and watering areas, and in the milking center holding area. In freestall barns, this means rows of fans should be centered over feeding cows and over cows lying in each row of freestalls (**Figure 1**). Fans not centered over feeding or resting cows can result in significant air flow in nonproductive areas. Cows may stand in these areas during stressful conditions to increase heat loss.

Figure 1. Lateral positioning of cooling fans over feeding and lying cows in a freestall barn.

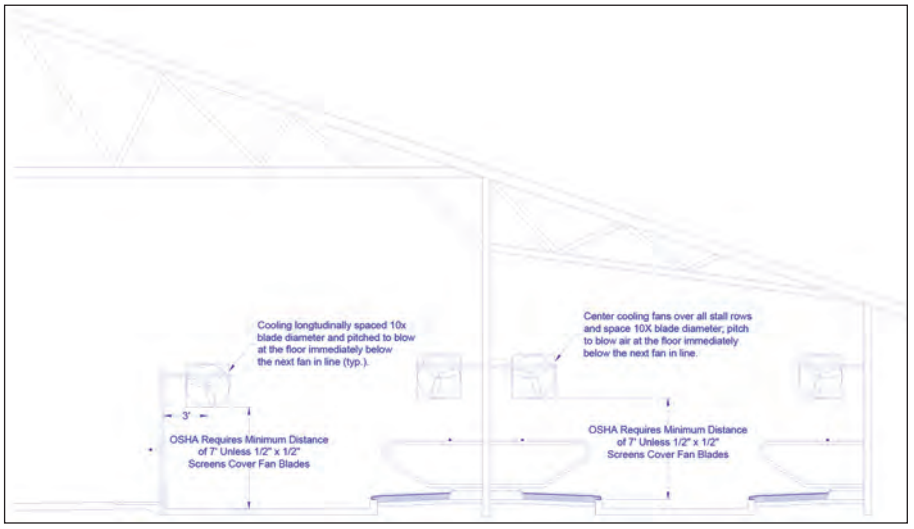
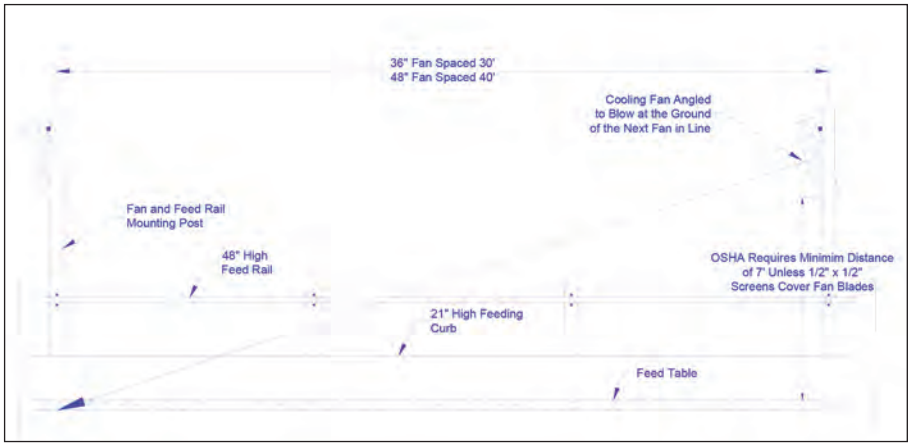


Figure 2. Longitudinal positioning of cooling fans over feeding cows in a freestall barn.



Target Air Speed at Cow Level: Research shows that target air speed over cows' bodies should be 400 to 600 fpm. Most fans marketed to cool cows easily exceed this velocity, even at many feet away. However, cows are like boulders in a river; water flow in the river is impacted by the boulders and air flow in a barn is impacted by cows. Moving air that strikes a cow is slowed down and its flow direction is changed.

Fan Spacing within a Row of Fans: Cooling fans need to have a good 'throw,' meaning airflow should be maintained a good distance away from a fan. This implies that air must be expelled in a fairly tight cone. Fans in rows spaced longitudinally about 10 blade diameters (30' for 3' diameter fan, 40' for 4' diameter fan) maintain effective velocity when blowing on cows. The fans can easily move air further, but the initial cows cooled by the fan discharge air sufficiently interrupt the flow so cows further away do not benefit.

Fan Mounting Height and Safety: Operating fans can be dangerous to cows and workers. In recognition of this, OSHA section 1910.212(a)(5) states: "When the periphery of the blades of a fan is less than seven feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half inch."

For optimum cow cooling, the lowest point of the fan blade (6 o'clock) should be no more than 7' above the floor or the working level (freestall base). Fans along the feed

bunk or over the stalls may need to be mounted higher than 7' to provide required clearance for stall bedding delivery or manure gathering/removal equipment. In this case, mount fans just high enough to provide the necessary clearance.

Fans Mounting Angle: Fans should be tilted from the vertical so they are aimed at the bottom of the next fan down the line as shown in **Figure 2**. The higher the fan is mounted above the floor, the greater the angle from vertical needed.

Fan Maintenance: Developing and implementing a regular maintenance schedule goes a long way to sustain fan operation when cows need it the most. Suggested maintenance includes: regular examination of belts and belt replacement on belt-drive fans; quick repair of bent or broken fan blades and fan housings; cleaning of fan blades and housings before dirt sufficiently accumulates; and intermittent monitoring of thermostats and cleaning of sensors.

If I cannot afford to install all fans, where should I start? Order of importance when incrementally installing fans includes: 1. Calving area; 2. Close up dry cows; 3. Holding area; 4. Milking area; 5. Fresh cows; 6. High producers; and 7. Low producers.

Priority of fan locations when incrementally installed in a lactating cow barn is: 1. Over the inner rows of stalls; 2. Over the feed alley; and 3. Over the outer row of stalls.

Return on Investment: Calculating the net return on investment for a heat stress mitigation system is not easily accomplished. Consider some of the effects of heat stress: depressed appetite, slug feeding - acidosis, laminitis, decreased nutrient absorption, reproductive problems, compromised unborn calf growth, future milk production, and calving difficulties.

It is difficult to put a complete economic value on heat stress effects, but it should be given consideration. When cows continue to lie down because of air movement at cow lying level, and continue to produce pre-environmental stress levels of milk, this is sustained production. Dr. Rick Grant, President, Miner Institute, showed that an hour of cow lying time means about 2.5 to 3.5 lbs. of milk per cow for every hour over 10 hours of lying time. So, if the fan cooling system contributes to sustained cow lying time and milk production, the economic impacts of cooling fans can be evaluated from a milk production-only perspective. ❐

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Fan attributes

Size: Any size fan providing target air speed at cow level is much better than a possible alternative of no cooling fans at all. Key considerations to maximize cow level cooling are: blade diameter, motor size, and target air speed. In general, 3' diameter fans with a 1/2-hp motor meet the goals. Fans are closer together (due to the 10 blade diameter rule) and cows are less likely to affect the fan's discharge airflow pattern and speed. Thus they have a better chance of providing the target air velocity on more cows than less, but larger fans, do. Larger fans require ¾-hp or larger electrical motors and cost more to operate than 3' fans with ½-hp motors. Four-foot diameter fans may be a good choice when barns are overstocked so the wider 'swath' of air movement will impact cows that are not able to lie down or make it to the feed bunk.

Electrical Supply: If the farm has three-phase power, in almost all cases it is best to purchase fans with three-phase motors. Three-phase motors last longer and are generally more efficient than single phase motors. And, in cases where a "soft start" may be needed due to electrical service size limitations, three-phase fans can more easily be started than single phase motors.

Belt-drive or Direct-drive: In most cases, direct-drive fans are preferred for fan cooling cows primarily because the desired performance of these fans is more easily maintained over extended use periods than belt-driven fans. Belt-drive fans have excellent airflow capacities and operate with comparatively little noise when first installed. However, their performance falls off with time as the belts wear. Producers who are committed to regular fan maintenance can choose either fan.

Performance: Contrary to barn ventilation fans that provide barn air exchange, where fan efficiency (fan air output per unit of energy input (cfm/Watt)) is an important consideration, cow cooling fans are harder to evaluate as the goal is air speed at cow level. An ideal efficiency measure for cooling fans is beneficial area covered at the meaningful velocity per Watt (sq. ft./Watt). In this case, beneficial area is an area in the barn where cows are productive, i.e. lying in stalls, at the feed bunk, and at the water stations. Fan shrouds assist in focusing air velocity and therefore improve performance. Fans with ½-hp motors can have good cow cooling performance. Selection of energy efficient motors is also an important consideration with cooling fans. If it is good under some static pressure, it will be better at 0" of sp. OSHA requires that fans be covered with a guard that has openings no larger than one-half (1/2) inch. While guards are required for safety, they also are notorious for accumulating debris that significantly affects performance. If fans are not cleaned at least a few times during a summer, it is likely better to mount them so the guards are not required under OSHA.

Controls: Fans are best controlled by a dedicated fan controller or by an overall barn environmental management controller. Automated controllers, with proper settings selected, will provide cows with cooling air when they needed it, and turn the fans off when they don't. Since the East, especially the Northeast, is subject to significant swings in daytime/nighttime temperatures, it is important to consider a controller that makes decisions based on accumulated heat loading a cow may have experienced over a given period of time. Controllers that merely make decisions based on instantaneous barn air temperature only will result in cooling fans turned off before the cows are cooled on many summer days. A Time Integrated Variable (TIV) controller will make control decisions based on duration of cow heat stress and instantaneous barn air temperature, and therefore, is a very appropriate control technology for fan cooling. Consider setting the threshold temperature for fans to come on at 65 to 70°F and adjust to a lower temperature if cows show signs of heat stress, including labored or excessive breathing and/or standing in stalls when they are otherwise laying down.

ENHANCED MANAGEMENT

By Kimberley Morrill

National FARM Program and Version 3.0 changes

Farmers Assuring Responsible Management, FARM, demonstrates dairy farmers ongoing commitment to the highest standards and shows consumers that what farmers are doing is what's right for the cows. Created by the National Milk Producers Federation (NMPF), with support from Dairy Management Inc. (DMI), the National Dairy FARM Program raises the bar for the entire industry, and creates a culture of continuous improvement. Over 82 cooperatives and processors, representing nearly 98% of the US milk supply, currently participate in the National FARM Program.

The National Dairy FARM Version 3.0 changes went into effect on January 1, 2017 and includes two phases.

How does FARM work? The National Dairy FARM Program helps establish on-farm, best management practices through the use of the FARM Animal Care Reference Manual. These guidelines continually evolve to represent the latest research on quality animal care. The Manual, corresponding training videos, and producer resources detail the highest animal care standards, including animal health, from birth to end of life; facilities and housing; nutrition; equipment and milking procedures; and transportation and animal handling.

The National Dairy FARM Program is reviewed every three years by the technical writing group. This group reviews feedback from current evaluators and producers, including recent research to update the FARM Program guidelines and Manual. During the most recent review, changes were made to multiple chapters of the Manual and phase one and two priority areas were identified. The National Dairy FARM Version 3.0 changes went into effect on January 1, 2017.

Phase One Priority Areas include:

■ Veterinarian Client Patient Relationship (VCPR)

• Official form signed by Veterinarian of Record, and dairy farm owner. This must be reviewed and signed on an annual basis.

■ Dairy Cattle Care Ethics and Training Agreement signed annually by all employees with animal care responsibilities indicating they: received training in stockmanship AND areas of responsibility; will not abuse animals; and will report any abuse witnessed.

■ No tail docking after January 1, 2017.

If a Phase One Priority Area is not met during a farm's official FARM evaluation, this will create a Mandatory Corrective Action Plan (MCAP). A MCAP is a written plan agreed upon between the dairy producer and FARM second Party Evaluator and/or Veterinarian of Record that outlines necessary steps to comply with Priority One Animal Care Standards. Such MCAP requires re-evaluation not to exceed one year's time. Failure to complete the MCAP may result in a Notice of Removal from the FARM program.

Phase Two Priority Areas include:

■ Herd Health Plan, which includes written protocols for: newborn and milk-fed dairy calves; pain management; non-ambulatory animal management; euthanasia; and access and availability of proper feed and clean water.

■ Animal observations by evaluator – Only a percentage of the herd (cows and heifers) will be scored. This is based on herd size.

• Lameness: Less than 5% of lactating cows score a 3 (score of 1 to 3).

• Body Condition: Less than 1% of the dairy herd has a body condition score < 2 on a 5 point scale.

• Hock/Knee: Less than 5% of the dairy herd has a hock or knee score of 3 (on a 3 point scale).

If Phase Two Priority Areas are not met, this creates a Continuous Improvement Plan (CIP). A CIP is a written document that is developed by the farm owner, their evaluator and any other trusted advisors. It identifies area(s) for improvement in animal care. It specifies actions to make the improvement and includes a suggested timeline for completion. All CIPs must be addressed within a three-year time frame, or prior to the next FARM evaluation.

Preparing for evaluation: Resources are available on the National FARM website at www.nationaldairyfarm.com. These include templates for herd health plans and written protocols, templates for employee training, and animal care documentation. Along with templates, the website contains a self-assessment checklist, the FARM Animal Care Manual and training videos.

For questions about the FARM program contact myself, Emily Yeiser Stepp at NMPF, or your milk co-op field representative. ❐

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Enhanced Management

By Julie Berry

Farm uses grants to construct manure storage

A concrete drive-in manure storage was constructed at the 270 milking-cow Davis Valley Farm LLC, Eagle, NY with a convergence of funding from the Dairy Acceleration Program (DAP), Environmental Quality Incentives Program (EQIP) through USDA-NRCS, and NYS Agricultural Nonpoint Source Program funds through their local Soil and Water Conservation District.

The farm was purchased in 1979 by James. Jr. Davis and his wife Cynthia. Son James Davis III and his wife Amanda are also now partners. The farm family has applied for grant funding over many consecutive years, and put in place zone tillage, buffer strips and other conservation practices that gained points in the application process. In 2016 everything aligned. In July 2016 they broke ground and completed their project in November. They are now entering their first spring with manure storage of this capacity.

Careful planning and implementation of conservation practices positions farm for the future.

"They have utilized the resources of DAP for engineering a new waste storage and transfer system. Harvest NY helped formulate ideas prior to the engineering phase and EQIP and NYS Agricultural Nonpoint funds were used for the build. They have also completed a business plan and are looking to update it to look toward expansion in the coming year. They are a farm that does an excellent job with a number of things," says Joan Petzen, Acting Executive Director, Cornell Cooperative Extension of Wyoming County.

The farm family previously cut hay in 40-acre batches throughout the summer to coordinate with manure application. Now they can time spreading around weather conditions and concentrate on spreading when growing plants need the nutrients. The family is also focused on improving neighbor relations by not being forced to apply manure during unfavorable conditions for odor. "We used to spread every week. We tried to spread twice a week as we never wanted to get caught with a break down. This allows us to store and utilize nutrients when and where we should be putting them down and to avoid winter spreading. We've been trying to figure out ways to fund this on our own. It's hard to make this kind of investment, but as a whole it makes our farm more valuable. Now our challenge is getting all of the manure out," says Davis III.

The family initially received DAP funding for financial planning and evaluated expanding the farm and adding robotic milking machines. DAP is an initiative of Governor Cuomo in partnership with the NYS Department of Agriculture and Markets and the NYS Department of Environmental Conservation designed to enhance profitability of NY dairy farms while maintaining a commitment to environmentally responsible dairy farming. After analysis, the family decided to hold off because of low milk prices. "We've always done this in-house because we're good with numbers. DAP exposed me to the financial advisor and now I see and understand the benefits. It allowed us to project our revenues. Expansion with the current milk prices is hard. We want to do a project once and do it right," says Davis III. The farm family is planning to go through the financial analysis process again, to re-evaluate robots and their options.

They also used DAP funding for engineering and environmental structure design for the manure storage. "DAP covered a big share of the engineering," says Davis III. DAP also funds a portion of the design of a combination of practices, and they added a concrete apron in front of the storage to collect any manure that may drop while loading tankers. The Davis family had done pre-construction planning, so prior to the grant awards they knew the best site on the farm. Tim Terry, Regional Farm Strategic Planning Specialist, Harvest NY Team, had surveyed the site, located underground lines, and provided the engineer with a scaled plan. "It expedited the whole project and is helpful to identify actual costs," says Terry. "We proactively pre-plan."

Having that level of planning present in an application likely contributed to their success, says Petzen. On-farm projects to address water quality concerns can be proposed for cost-share funding from the NYS Agricultural Nonpoint Source Program through Soil and Water Conservation Districts during annual funding rounds. The Program, which has run annually since 1994, is competitive and oversubscribed, often with around $40 million in applications submitted and $13 to $15 million available to fund the highest ranking projects for water quality, says Greg Albrecht, CNMP Specialist/AEM Program Coordinator with the NYS Dept. of Ag & Markets. For more information on funding opportunities, contact your local District office, USDA-NRCS office, and Cornell Cooperative Extension office for their respective programs. DAP is online at: https://prodairy.cals.cornell.edu/dairy-acceleration. ❐

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Enhanced Management

By Karl Czymmek

NYS issues 4th generation CAFO permit

NYS first issued a CAFO Permit in 1999 at the request of the dairy and livestock industry. This request came after a federal court case in the early 1990's found that a well-managed dairy farm had discharged manure to waters of the United States without a permit, in violation of the Clean Water Act. Given that NYS did not have a CAFO permit available for farms, the industry organized and approached the NYS Department of Environmental Conservation to develop one. Since the first permit was issued, the NYS DEC has received permit related input through the CAFO Work Group, consisting of various agricultural and environmental stakeholders, as well as staff from other state and federal agencies, and Cornell, as the state's land grant institution. The Work Group has provided an important line of communication and played a strong role in helping the NY dairy and livestock industry achieve the highest compliance level of any newly regulated industry that NYS DEC oversees.

Managers should evaluate how to be best positioned to meet the possibility of a faster rate of change ahead.

Even so, each new round of permits has brought new changes, and this round also includes several significant updates. NYS offers two permits: one under the federal Clean Water Act, and the other under NYS Environmental Conservation Law (ECL).

The Clean Water Act permit (CWA) requires that the production area (essentially the farmstead) is designed and managed to prevent discharge of polluted water up to the 25 year/24 hour storm event (generally around five inches of rain in a 24 hour period in NYS). The new CWA permit institutes a public participation process and requires submission of an annual nutrient management plan.

The ECL permit calls for no discharge of polluted water from the production area up to a 100 year storm (approximately 5.5 to 6.5 inches of rain, depending on the location). One key new requirement is that the farm and planner must identify wet weather standard operating procedures that will be implemented if a 25/24 storm or greater is expected.

Since inception, both permits have required implementation of a comprehensive nutrient management plan developed by a third party certified planner. This includes soil erosion assessment and control, soil tests at least every three years, and that all manure sources be tested at least annually, along with field by field manure application rates, setbacks from wells and waterways, and other BMPs as specified.

On the field side, both permits prohibit manure application when soils are saturated, either wet or frozen. The frozen saturated condition is also called "concrete frost," where soil pores fill with water from rain or snowmelt, followed closely by subfreezing weather. This prohibition means that all NYS CAFO's will need to store manure during these field conditions. Further, both permits identify winter spreading conditions when an assessment must be made and additional care is required if manure will be applied. The farm must follow "Revised Winter and Wet Weather Manure Spreading Guidelines to Reduce Water Contamination Risk" when there is more than four inches of snow on the ground, significant ice on the soil surface or in the snowpack, or if frost is more than four inches deep. The guidelines are online: http://nmsp.cals.cornell.edu/publications/files/WinterSpreadingGuidelines2015.pdf. This document identifies additional high risk conditions when manure should not be applied except in an emergency, such as risk of manure storage overflow. Permitted farms that expect to apply manure in the winter are required to develop a winter spreading plan, including identification of fields for emergency applications, evaluate soil and general field conditions, as well as weather forecast before application, and make adjustments to rate per acre, total spread quantity, setbacks, monitor tile outlets, and incorporate or inject manure where appropriate.

Another key change relates to specific steps for identification of at-risk groundwater areas and implementation of protective practices. The permits refer to 2004 groundwater protection guidelines as well as special guidelines for karst areas of Genesee County, NY. Three categories of soil types are identified as potentially risky. Farm plans need to determine if those soils are present and if so, identify additional practices to protect wells and groundwater.

In February, producers and planners learned about the permit from DEC officials and other educators through training sessions offered around the state that were organized by the Northeast Dairy Producers Association and NY Farm Bureau. By late spring, farm managers will need to decide which permit best meets their situation, and notify DEC of the decision by submitting a notice of intent to comply. More information is online at: www.dec.ny.gov/permits/6285.html.

Across NYS and the US, many dairy farms have made significant adjustments to manure management practices in the last 15 years. Increasingly there are signals that consumers and the retail chain may have as much or more to say about our farm practices than governmental regulations. Managers should evaluate how to be best positioned to meet the possibility of a faster rate of change ahead. ❐

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ENHANCED MANAGEMENT

By Joe Lawrence, Thomas Overton, Allison Lawton, and Margaret Smith

How to use corn silage hybrid trial results

A number of independent Corn Silage Hybrid Testing Programs, including the New York (NY) Corn Silage Hybrid Trials, offer valuable information on hybrid performance. But what if the hybrids you're looking at are not found in individual trials? Hybrids in the trials are a subset, and on the surface may seem limited in their usefulness. However, the results can offer a wealth of information beyond the ranking of participating hybrids.

Just looking at the top performing hybrids from a single year, while interesting, has limited value.

In fact, just looking at the top performing hybrids from a single year, while interesting, has limited value. Trial data for an individual hybrid is most useful with multiple locations and multiple years to understand how the hybrid performs across a wide range of conditions. This level of data can be hard to come by in the independent trials but may be available from seed companies.

In the absence of data on a specific hybrid, independent trials offer the opportunity to study how participating hybrids performed relative to their peers at each location, which characteristics, among the participating hybrids, resulted in the most consistent performance, and the expected range in results for important values, such as starch content and fiber digestibility.

With this information, you are equipped to ask individual companies for data on these important characteristics and values in their hybrids. While the specific hybrid may not be in the trial, a company should have information on other hybrids that share the same lineage or have similar performance to a hybrid that exhibited desirable characteristics in the trials.

Comparing to the Location Mean: The mean for a location is the average value of the measured parameter (yield or % starch). Since several localized factors, such as weather and soil type, influence the performance of the hybrids at a particular location, studying the absolute values (yield per acre, % starch or fiber digestibility) is not suggested. It is much more helpful to study the trial mean and compare hybrid performance relative to this mean to gain a better understanding of how it performed under the conditions at that location.

Whole Plant Dry Matter (DM) Considerations: In any testing program, the goal is to harvest all hybrids as close to the same stage of maturity (whole plant DM) as possible. In practice it is recognized that there will be variation in DM at harvest. Yields are corrected to a uniform DM for reporting. They are generally reported at 35% DM. However, it is also important to acknowledge the effect of DM on forage quality. It is recommended to only compare the forage quality results of hybrids that are within three percentage points of DM to each other.

Impact of Location: When data for multiple locations within the same trial are available or data on the same hybrids grown under slightly different management in other testing programs are available, it can be very useful to understand the effects that weather patterns, planting dates, seeding rates and other differences can have on the hybrid. This insight helps to address questions regarding the ability of a hybrid to perform consistently across conditions or if there are specific conditions where it performs best that match the conditions typical of your farm. Again, utilizing company data in conjunction with other trials can be very powerful for this.

It is also important to note that differences in growing conditions does not just impact yield, it can have large impacts on forage quality. While we commonly look at important factors such as whole plant dry matter and starch content, the effect of growing conditions on fiber digestibility was very apparent.

Fiber Digestibility: In recent years several advances in ruminant nutrition have increased our understanding of fiber digestibility, how this drives how much a cow will eat and the implications on her potential to produce milk. The measurement of undigested neutral detergent fiber (uNDF) is being reported by more hybrid testing programs and was an integral piece of data in the new approach to predicting potential milk yields in the NY Corn Silage

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Enhanced Management

By Amir Sadeghpour, Sarah Hetrick, Karl Czymmek, Gregory Godwin, and Quirine Ketterings

How does managing phosphorus with reduced manure rates affect soil nitrate and organic matter?

Reducing manure application rate to prevent build-up of soil phosphorus (P) is a common nutrient management practice where P levels are very high. This overall reduction in nutrient application presents a challenge to meet most or all of corn crop nitrogen (N) needs with manure. Immediate incorporation of spring applied manure to conserve the ammonia-N that's lost with surface applications can help. Over time, how do reduced rates of manure, with or without tillage incorporation, affect soil fertility and health, especially soil nitrogen and organic matter?

Soil Organic Matter only increased in the trial plots with high rates of composted manure.

To address this, a five year study set up in 2001 in Aurora, NY used high and low rates of spring applied liquid dairy manure and composted dairy manure solids on a Lima silt loam field with 3.5% organic matter. The crop history was long-term corn harvested for grain with no manure. During the five years of the study, corn silage was the sole crop. Changes in soil nitrate and organic matter were evaluated for each manure source and application rate, in control plots with no inputs, and in plots with no manure where inorganic fertilizer was applied to meet crop needs.

Field study treatments: The study had six treatments and five replications: (1) low rate of composted dairy solids (P-based; 20 tons/acre), (2) high rate of composted dairy solids (N-based; 32 tons/acre), (3) low rate of liquid dairy manure with immediate (within one hour) tillage incorporation (P-based; 7,000 gals/acre), (4) high rate of liquid dairy manure application (N-based; about 20,000 gals/acre), (5) zero N as a control (0 lbs N/acre) and (6) side-dress inorganic N (urea ammonium nitrate) at the recommended rate of 100 lbs N/acre. For field preparation, each plot was chisel-plowed, disked, and rolled with a cultimulcher. The low rate manure plots were chisel-plowed twice. The first pass was to incorporate manure directly after application. Corn for silage was planted and harvested in the crop years 2001 through 2005.

What did we find? Soil Organic Matter **(SOM, Figure1)**: After five years, only one treatment yielded an increase from the original 3.5% SOM. In the plots with high rates of composted manure SOM increased to 3.9%. The low rate of composted manure did not impact SOM, nor did the high rate of liquid dairy manure. However, the low rate of liquid manure with tillage-incorporation resulted in an 11% decrease in SOM to 3.1%. The inorganic N plots (no manure or compost applied) showed an 18% decrease in SOM, dropping from 3.5 to 2.87%.

Soil Nitrate **(Figure 2)**: Soil cores from 0 - 8 inch depth were collected at three different time periods to evaluate end-of-season

Fig. 1: Soil organic matter. Treatments were HC: high rate of compost; LC: low rate of compost; HM: high rate of manure; LM: low rate of manure; N0: zero N control; and N100: 100 lbs sidedressed N/acre. This figure compares SOM in April 2006 with SOM in April 2001 for each fertility treatment.

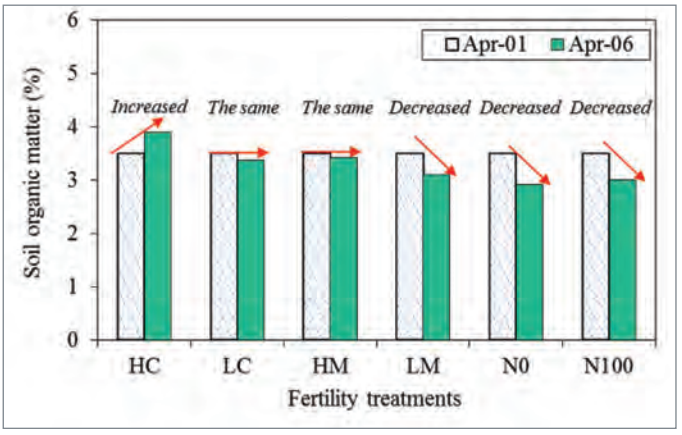
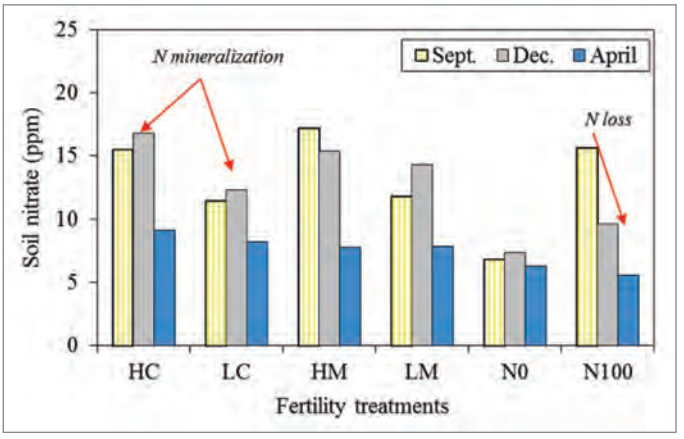


Fig. 2. Soil nitrate (0 - 8 inches) levels as influenced by fertility treatments from September to April (averaged over 2003 - 2005). Treatments were HC: high rate of compost; LC: low rate of compost; HM: high rate of manure; LM: low rate of manure; N0: a zero N control; and N100: 100 lbs sidedressed N/acre.



soil nitrate levels in each of the treatments. This was done immediately after harvest during September, in December before snowfall, and in the following April. Sampling was done in study years four, five and six (2003 - 2005) to exclude the first two years of transition from no prior manure to the inputs used in the study. Averaged over years four, five and six of the study, soil nitrate loss in the fall (from September to December) was the highest, at 38% loss in the inorganic N plots. This large decrease was attributed to N loss through leaching and/or de-nitrification. Nitrate loss of about 10% also occurred in plots that received a high rate of liquid manure. In plots that had either high or low applications of composted manure, as well as the plots that had the lower rate of liquid manure, soil nitrate increased 8% from September to December. This suggests that in these treatments, nitrate mineralization in that time period exceeded nitrate-loss.

These results show mineralization of organic N into nitrate from spring applied manure continuing from post corn harvest (September in this study) into December. The following April, soil nitrate levels were significantly lower and similar among all treatments each year, showing a "reset" of nitrate levels that reflects weather impacts on bare soil.

What Does This Mean for Managing N? When following P based manure application guidelines, capturing the N is an important management strategy to meet crop needs. Earlier work showed that P based manure management of fields with no recent manure history can limit N and contribute to reduced crop yields. Mineralized N available in the fall can be effectively captured by planting winter-hardy cover crops with rapid fall growth. This will help with the N supply for the next season's crop as well as offer the soil protective qualities of cover crops.

Organic Matter: Soil organic matter plays a vital role in nutrient cycling and in "weather proofing" soils and crops from extreme conditions, helping to reduce yield losses when weather stress occurs.

In this study levels of SOM only increased in plots with high levels of composted manure and decreased where manure was tillage incorporated or no manure was applied. These results suggest that where tillage is used, in this case, chisel and disk, applying manure during corn years without using cover crops will not improve or in some cases maintain SOM. Practices such as no till or strip till, use of winter hardy cover crops, and injection rather than tillage incorporation of manure, can help counteract organic matter losses in addition to conserving nitrogen.

Acknowledgments: Research this material is based on is supported, in part, by the National Institute of Food and Agriculture, USDA (Award 2013-68002-20525) and by Federal Formula Funds. ❐

*For questions about these results contact **Quirine Ketterings**, Professor, Cornell University Department of Animal Science, at 607-255-3061 or qmk2@cornell.edu, and/or visit the Cornell Nutrient Management Spear Program website at: nmsp.cals.cornell.edu.*

Corn Silage Hybrid Trial

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Testing Program. Results are online at scs.cals.cornell.edu/extension-outreach/field-crop-production/variety-trials#corn-silage.

Starting in 2016, the NY trials used new methods to evaluate the milk producing potential of corn silage. The Cornell Net Carbohydrate & Protein System (CNCPS) model was used to predict the expected milk yield (in pounds per day) of a typical, Northeastern high lactating ration with each of the participating corn hybrids entered into the same total ration. Again, the relative ranking of the hybrids is more useful than the absolute values, but this approach uses a much more in depth analysis to assess how each hybrid may perform in an actual ration compared to previous approaches. It is evident in the report how the uNDF content of each hybrid may affect the potential dry matter intake of the ration and the subsequent effect on projected milk yield.

Starch Content & Digestibility: Starch content is a popular number to look at and justifiably so. At the risk of excessive repetition, this is another case where it is critical to look at these values in the context of the location mean, rather than absolute values as growing conditions and stage of harvest (whole plant dry matter) can affect this value.

Starch digestibility is more challenging. We know this value changes as the silage ferments, and laboratories continue to refine their ability to accurately predict starch digestibility using NIR methods, compared to the more intensive wet chemistry laboratory testing methods. It is also recognized that results from green (unfermented) samples, as are often used in Hybrid Testing Programs, are less consistent. It is generally accepted that a hybrid with good starch digestibility before fermentation will remain incrementally better after fermentation when compared to a hybrid that starts with lower digestibility before fermentation. Inquiring with a company about their data is quite beneficial, especially if they have wet chemistry data on fermented samples. It is always best to compare results from the same laboratory. However, if the results available are from different labs, ask for data from multiple hybrids to establish the relative differences in like datasets.

Yield and Agronomic Characteristics: While yield often receives too much attention in silage hybrid selection, you do want strong hybrids that have a competitive yield and are able to handle potential stressors. Some of these stressors may be more broadly driven by weather, while others may be typical of the micro-climate you farm, such as soil drainage, air drainage (disease prevalence) or elevation-driven temperature trends.

This is another instance where rather than focusing on actual yield numbers, pooling data from multiple locations and sources and matching this with weather data from those locations will help you understand if a hybrid's performance is consistent across conditions or if it excels and falters in certain situations that may be applicable to your area. ❐

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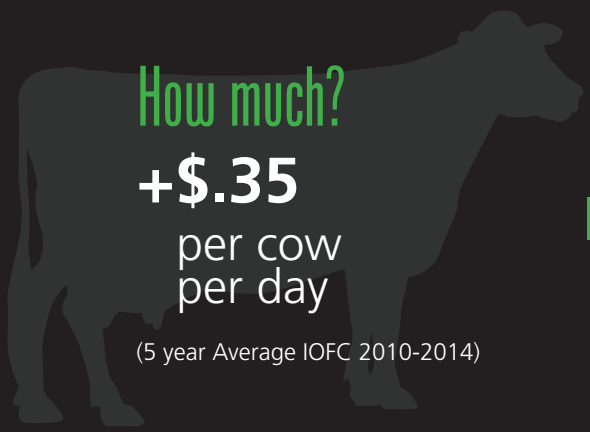

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