The William H. Miner Agricultural Research Institute March 2020

FARM REPORT

In This Issue:

FROM THE PRESIDENT'S DESK: SUMMER'S COMING

Spring officially arrives this month, and so it's time for me to write the annual reminder to think ahead to summer heat – well before it actually hits. As temperatures slowly rise through April and May, our thoughts should turn to fans and sprinklers more than ice and snow.

The months of March and April are the time to make sure that all is in good working order before the first episode of heat stress occurs. Research consistently tells us that effectively cooling cows, even in northern regions of the U.S., will add to the farm's bottom line. You rarely see a cow barn in the northern U.S. with no cooling capacity, but it's still far too common for farmers to underestimate the negative effects of episodic hot and humid weather that we routinely experience in New York state.

The most significant negative effect of heat stress is the increase in core body temperature that leads to prolonged standing in an effort to cool off. High-producing dairy cows can become heat stressed at a temperature-humidity index (THI) of only 68. At this THI humans still feel comfortable, but the cow does not. Their greater sensitivity to heat stress is due largely to the metabolic heat output associated with higher milk production. Wisconsin researchers observed that, as THI increased from 56 to only 74, lying time decreased by 3 hours per day while standing in the alley increased by 2 hours. Although a THI between 56 and 74 seems fairly mild, the severity of loss in resting is considerable. Three hours less resting time translates into lost milk, greater lameness, and lower feed intake.

Ordinarily the comfort of the resting surface, or competition for the resting space, determines whether a tired cow will lie down. But, during heat stress conditions core body temperature appears to be a primary driver of whether the cow stands up or lies down. Cornell researchers found that cows stand up once their core body temperature reaches approximately 102.0˚F. Researchers from Arizona and Missouri confirm that cows are highly unlikely to lie down when their body temperature is above about 102˚F. So, if you want your cows to achieve their required resting time this summer, cooling is a must!

We need to bear in mind the strong relationship between resting and ruminating. A comfortable cow will perform over 90% of her daily rumination while lying down. A cow ruminating while lying down secretes more saliva and does a better job of buffering the rumen. Effective cow cooling will boost rumination as it enhances lying time. At Miner Institute we observed about 1 hour per day less rumination time for cows exposed to minimal heat stress abatement versus the recommended fans and sprinklers over the feed bunk and stalls.

Resting is the cow's most highly prized behavior, and heat abatement encourages your cows to lie down and ruminate. For a healthy, profitable herd it is hard to beat that behavioral combination: resting and ruminating. Even in northern climates, heat abatement pays!

— Rick Grant
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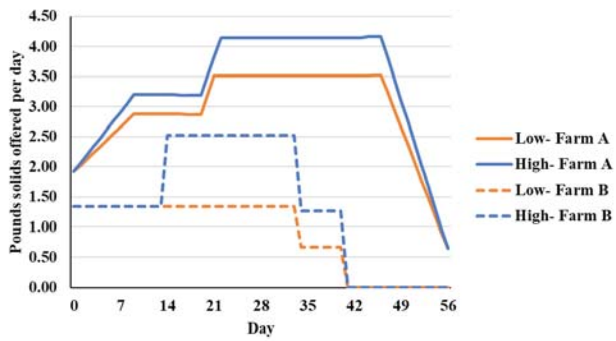
ON-FARM WINTER CALF FEEDING STUDY CONDUCTED IN NORTHERN NEW YORK

I believe that the last time we saw temperatures above the lower end of the thermoneutral zone (59°F) of the young calf was almost five months ago in September. While I hope this will change soon, we're still well within the time of the year (at least in Northern New York), where we have to be mindful of meeting the maintenance requirements of the young calf. Dairy calves have limited body fat reserves and only modest insulation from their hair coat. As a result, the thermoneutral zone (temperature range where extra energy is not needed to maintain body temperature) of a calf under 3 weeks of age is between 59°F and 77°F. Below the lower end of the thermoneutral zone, additional energy is needed to maintain body temperature, and the calf will experience cold stress. Therefore, to maintain body temperature, the calf must either consume more energy or use what limited body reserves it has to meet this requirement. This



prioritization of nutrients will always go first to maintenance (thermal regulation, immune, and stress responses). Only after maintenance has been met will the additional nutrients available go toward the growth of the calf.

During the colder parts of the year, there are several ways to increase the energy provided by the diet. These include increasing the amount of solids either by increasing solid concentration, increasing the volume offered per day; or increasing the energy density with different nutrient formulations, either by different milk replacer formulations or by adding fat and protein sources to whole milk.

Last winter (January to April of 2019) we conducted a study funded by the Northern New York Agricultural Development Program which evaluated different calf feeding practices to help meet nutritional requirements in cold temperatures. Two area farms implemented two different feeding rates (20 calves per feeding rate) that were specific to their farm. The aim was to influence the amount of nutrients the calves were consuming to help meet the requirements of the calf under cold temperatures. Growth and health of the calves were monitored through eight weeks of age. During the study, the average temperature was 26-30°F on both farms. Farm A housed calves in groups in

See **CALF STUDY**, Page 3

NOW ENROLLING HERDS IN NEW NNYADP CALF RESEARCH PROJECT!

"Determining the Enteropathogen Causing Neonatal Diarrhea and Associating it with Antibiotic use on Northern New York Dairy Farms"

Calf scours can be caused by a variety of pathogens including bacteria, viruses, and parasites. However, only bacterial diarrhea will respond to antibiotics, so the goal of this research is to identify the main pathogens causing diarrhea in the North Country (Clinton, Essex, Franklin, Jefferson, Lewis, and St. Lawrence counties) and relate it back to antibiotic use on these herds. In order to accomplish this, we will need to collect fecal samples from diarrheic calves prior to them being treated with antibiotics. The overall objective of this project is to determine if there is an opportunity to reduce antibiotic use on NNY dairy farms, and to better understand how to manage diarrheic calves.

How can you help? If you have calves with scours on your farm AND you plan to treat them with antibiotics AND you want to participate in this project, please contact the following:

Casey Havekes (all counties) 315-955-2059
Lindsay Ferlito (all counties) 607-592-0290
Sarah Morrison (Clinton County) 518-846-7121, ext. 105

Cornell Cooperative Extension
North Country Regional Ag Team

THE DEVIL IS IN THE DETAILS

Editorial comment

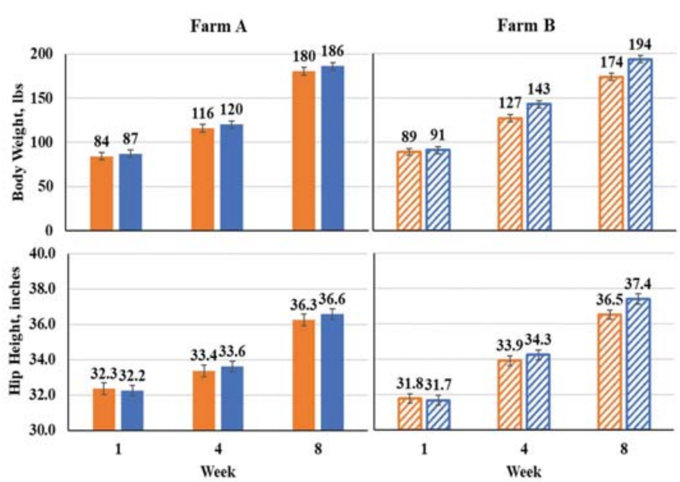
Headlines in several agricultural publications and e-newsletters noted the largest annual decline in history in Wisconsin dairy herds. "America's Dairyland" lost over 800 herds in 2019, or 10% of its total. In the last decade the state lost 44% of its dairy herds. While this is a very big deal to many of the (former) owners of those 800 dairy herds, the impact on the Wisconsin dairy industry is tempered by the continued trend to fewer but larger dairy farms. Wisconsin milk cow numbers have held up well in recent years, last year declining by only 0.5%. Average herd size ten years ago was about 100 cows; now it's 170. But total milk production in the state has soared and is now approximately 20% higher than it was a decade ago.

So, is the Wisconsin dairy industry getting smaller, is it stable, or is it getting larger? It depends on which statistic you look at, and we haven't considered economics in the this brief discussion. While there are economies of size, bigger isn't always better. Unless management improves, the farmer who's losing money with 200 cows might lose twice as much with 400 cows.

— E.T.

CALF STUDY, Continued from Page 2

a non-heated barn with natural and positive pressure tube ventilation. Calves on Farm A were fed a milk replacer (23% CP; 22% fat) at 15% solids with a maximum feeding level of either 11.6 or 13.6 quarts per day by an auto-feeder. Calves on Farm B were housed in hutches and fed twice per day. Calves on Farm B were fed whole saleable milk with a maximum feeding level of either 4.8 or 8.9 quarts per day with additional milk balancer (25% CP, 10% fat) included at 0.06 pounds per quart in buckets twice daily. The total amount of solids offered on each farm and feeding rate is shown in the figure above.



According to Dairy Calf and Heifer Gold Standards, calf body weight gain in the first 56 days of life should be double their birthweight with a gain of 4-5 inches of hip height. On Farm A, at 8 weeks of age calves on both feeding rates achieved this goal of doubling birthweight. Overall hip height gain was not different between feeding rates for Farm A, with gains of 3.9 and 4.3 inches on the lower and higher feeding rates, respectively.

On Farm B, calves fed the lower feeding rate did not meet the goal of doubling their birthweight, gaining only 84.8 lbs by 8 weeks of age. However, calves fed the higher feeding rate, gained 102.8 lbs, therefore achieving this goal. Calves on both feeding rates on Farm B also met the goal for height gain with an average of 4.7 and 5.7 in. for the lower and higher feeding rate, respectively.

The aim of this project was to implement a feasible increase in nutrients within each farm system to observe changes in growth during the winter. Each farm had different housing systems and feeding rates, so all comparisons should be made within each farm and not between farms. Calves fed both feeding rates on Farm A consumed higher levels of solids daily, but body weight, average daily gain, and hip height did not differ between feeding rates. On Farm B, calves were offered much lower total solids per day on the lower feeding rate. Therefore, by increasing the amount offered per day, the calves responded quite clearly with increased body weight, average daily gain, and hip height. Overall, it appeared that calves responded to increased nutrients through milk or milk replacer, particularly in the first 4 weeks when intake of starter was likely lower and calves are more sensitive to lower temperatures. This study shows that there are many feasible ways to change feeding management during winter months to help meet maintenance requirements of the calf and also support industry growth standards.

— Sarah Morrison
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CULTURE, IN A DIFFERENT CONTEXT: BENEFITS OF ON-FARM MASTITIS CULTURE

No, I'm not recycling articles. Last month I focused on workplace culture and its importance within organizations. This month I'll discuss a different kind of culture, one that may help you save time, money, and milk on your farm. Maybe next month it'll be cultured foods. Or museums. Now taking suggestions for "culture" articles, because I'm officially out of ideas.

Recently, our herd health manager Dr. Tobey and I combined our skills to instate the practice of on-farm mastitis culture to better manage and treat mastitis cases as they arise. This isn't a new tactic; many farms have adopted this procedure as a means to reduce antibiotic use, milk withholding times and the amount of discarded milk by being able to target and selectively treat mastitis cases based on pathogen. In fact, studies from the Journal of Dairy Science found that farms that made selective treatment decisions using on-farm mastitis culture results had the potential to reduce antibiotic use by 50%. With on-farm culture there's no need to send milk samples to a lab. Rather than waiting several days, results can be available in 18-24 hours, allowing you to know how and what to treat in a much more timely and cost-effective fashion. Considering that the cost to treat one mastitis case can be up to $400, and discarded milk up to $100 per infected cow/year, having this valuable information at your fingertips will save you from unnecessary or ineffective antibiotic treatments. Many mastitis cases (such as those caused by Gram-negative bacteria) won't benefit from antibiotic treatment, so knowing when not to give an antibiotic means that money can stay in your pocket.

Growth of mastitis-causing bacteria on blood agar (left side of plate).

The information that can be gathered from on-farm mastitis culture results is broader than just how and what to treat. For example, knowing what common bacteria are causing mastitis on your farm can also allow you to refocus management and control strategies to help mitigate infection rates. Keeping track of cows with certain infections will help you be aware of their future susceptibility. Culturing samples from cows at both dry-off and during the fresh period can provide you with valuable insight on how to better manage and treat infections during these critical times. For example, culturing samples from cows with certain somatic cell count levels could determine if they would benefit from dry cow therapy, thus reducing the need for the blanket approach to antimicrobial treatment. As most cases of clinical mastitis that occur within two weeks of calving are from infections acquired during the dry period, knowing the cause of these infections can help you better direct dry-off therapies. Implementing this practice can not only be beneficial to your milk check, but also to the overall health and management of your herd.

If images of sterile, sophisticated labs with white-coated scientists and expensive equipment are coming to mind, don't panic! On-farm mastitis culture is an affordable and simple undertaking, requiring minimal equipment and just a little bit of time. All you will need is a milk sample, agar plates, sterile sampling loops or swabs, and a tabletop-sized incubator in a clean room as far away from farm traffic as possible. The cost of supplies (not including the incubator) averages about $3 per sample, which is more cost-effective than sending samples to a lab. There are many online resources available for instruction on how to aseptically procure a milk sample and perform streak plating, and these are easy tasks to teach to staff. There are also many media plate options, such as the one pictured below. Some of these plates are selective for certain Gram-negative and Gram-positive organisms, so a straightforward "growth" or "no-growth" approach can be used for identification. If you have the skills, or can enlist the help of your veterinarian, more detailed bacterial identification can also be performed. More information can be provided by your veterinarian or co-op on how to start an on-farm culture program of your own.

— *Cari Reynolds*
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RESEARCH UPDATE: WATER QUALITY IN ALFALFA-GRASS RUNOFF PLOTS

Miner Institute has conducted a number of edge-of-field research projects over the years, but the majority of these trials have been in fields managed as corn for silage. Differences in crop growth and nutrient removal characteristics, continuous ground cover, absence of tillage, timing and method (typically not incorporated) of manure applications are among the primary differences often observed in these systems. Therefore, the impact of tile drainage on nutrient transport from fields with perennial cover may be substantially different than in row crop fields with perennial cover. With funding from the Northern New York Agricultural Development Program (NNYADP), we just completed the second year of monitoring phosphorus (P), nitrogen (N), and sediment in surface runoff and tile drainage from four 0.25-acre research plots which were transitioned to an alfalfa-grass mixture in the spring of 2018 after five years of corn silage production. In order to give each topic the attention it deserves, I'll focus on P dynamics here, and return to N in a future article.

Following corn silage harvest in 2017, 8,000 gal/A of liquid dairy manure was broadcast and incorporated the same day with a disk harrow. Plots were disk harrowed prior to planting a 60/40 mixture of alfalfa and cool season grasses on May 10, 2018. No starter fertilizer or manure was applied in 2018 following the farm's typical management for a first-year alfalfa-grass field. The plots were harvested on July 28, 2018 and September 4, 2018 for hay crop silage. In 2019, broadcast applications of 4,500 gal/ac of liquid dairy manure followed both first and second cut harvest for hay crop silage on July 9 and September 9.

The experimental site received average and above average precipitation in 2018 (29.2 inches) and 2019 (36.7 inches), respectively, relative to the 30-year Clinton County average (30.5 inches). The increased precipitation in 2019 was reflected in greater rates of total runoff from the plots than in 2018. The average total runoff from the plots (surface + tile) was 11.2 inches in 2019 as compared to 5.6 inches in 2018. The partitioning of runoff between hydrologic pathways was also different in 2019, with the tiles generating significantly more runoff volume than surface runoff.

Mean runoff and exported P and sediment loads from the runoff plots.

Year	Pathway	Runoff	SRP	Total P	TSS
		in	-------------	lb/ac	-------------
2018	Surface	2.30	**0.360**	**0.494**	10.55
2018	Tile	3.34	**0.006**	**0.021**	5.08
2018	Total	5.64	0.366	0.515	15.63
2019	Surface	**1.01**	0.016	0.040	**5.81**
2019	Tile	**10.19**	0.058	0.156	**22.72**
2019	Total	11.20	0.075	0.196	28.53

* Means highlighted in bold text are significantly different at $P \leq 0.10$.

A combined mean (surface + tile) of 0.20 lb/ac of total P was exported from the runoff plots in 2019. This was 62% less than in 2018, despite the plots generating approximately twice as much runoff. Only 0.08 lb/ac of soluble reactive P (SRP; bioavailable P) was lost in 2019, 85% less than was exported in 2018. The primary transport pathway of P differed between the two years, with tile drainage responsible for 80% of total P losses in 2019. This is not surprising given the low occurrence of surface runoff. However, the total P concentrations in surface runoff were consistently higher than tile drainage in both 2018 and 2019. Therefore, the reduction in surface runoff due to the enhanced subsurface drainage rates in the 2019 nongrowing season may have contributed to the reduction in overall total P losses.

In addition to the differences in drainage characteristics between 2018 and 2019, there were other factors that likely contributed to the reduction in exported total P in 2019. The majority of P losses in 2018 occurred during the fallow period between corn harvest in 2017 and the alfalfa-grass seeding in May 2018. There was also a late fall manure application in 2017. Bare soil and manure applications in the nongrowing season are both known to increase the risk of erosion and P losses as there are high rates of runoff and no growing crop to uptake and immobilize the manure nutrients. There were no manure applications during 2018, continuous ground cover following stand establishment, and manure applications synchronized with crop uptake (following 1st and 2nd cuts) in 2019, all factors which decrease the risk of offsite P transport and ultimately lead to the very low rate of P loss experienced in 2019.

— Laura Klaiber
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TIMELINESS

"This life's hard, but it's harder if you're stupid." This pithy comment as been widely attributed to John Wayne because it's something you'd expect The Duke to have said (though he didn't). The comment was first made by a character in a 1970 novel by the late George V. Higgins, but occasionally it might apply to farmers, some who seem to be their own worst enemies. I've ranted before about timeliness — actually the lack of it — but this won't stop me from doing so again.

The continuing cost/price squeeze in the dairy industry puts extra emphasis on farm activities that cost the same regardless of when they're done, but when done in a timely manner often result in lower input cost, higher yields or better forage quality. Following are three examples, none of which should surprise you.

- Lime application. "Lime needs time." Ag lime is crushed limestone: Emphasis on "stone". Only part of ag lime is immediately available, so if you need more than a ton or two per acre you should spread it well in advance of planting a sensitive crop like alfalfa. Unlike fertilizer, the price of lime changes little within the growing season or year-to-year, so there's no reason to postpone lime applications.
- Farm supply orders. We discussed this in a late 2019 Farm Report article referring to crop seeds, but early order discounts are often available for other farm supply inputs as well. Same stuff at a lower cost: This is the same as "free money", isn't it?
- Timely planting and harvest. It doesn't cost any more to drag a corn planter across the field in May than it does in June, or to mow first cut alfalfa when it's in the bud stage vs. when it's in bloom. And timeliness of harvest pays not just for alfalfa: Research has found that delaying first cut grass harvest by only 5 days past the ideal stage of maturity reduces potential milk income by over $24,000 per 100 cows. How much would milk prices have to change to impact your annual milk check by $24,000 per 100 cows? Just sayin'…

— Ev Thomas
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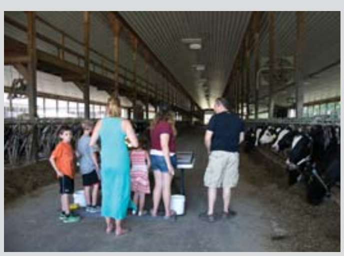
MARK YOUR CALENDARS!
MINER INSTITUTE IS HAVING AN OPEN HOUSE
SATURDAY, AUG. 8, 2020
12 - 4 pm

free, family-friendly event

- displays and games
- wagon rides
- equine demonstrations
- learn about a modern dairy farm

SOIL ANALYSIS VS. TISSUE ANALYSIS

We came across some interesting data in the January newsletter from A&L Canada, a large agricultural analytical laboratory. Here's a partial summary of its 2019 analytical data:

Nutrient	Soil analysis, % testing low	Tissue analysis, % testing low
Phosphorus	44	33
Sulfur	83	33
Boron	62	46

While in many cases the soil and tissue analyses represent different fields, the above data is based on a very large number of samples so while it's not "research" we think the results are meaningful. Note that for all three nutrients, soil analysis wasn't a reliable indicator of plant uptake of the particular nutrient. The numbers are fairly close for phosphorus and boron, neither which are mobile in the soil — particularly phosphorus. But soil analysis would appear to be a very poor predictor of eventual sulfur plant content: Over 80% of soil samples tested low in sulfur but only 33% of tissue levels indicated a potential deficiency for this nutrient.

There's a good reason for this: Sulfur is quite mobile in the soil, and precipitation readily leaches it below the root zone. Therefore, you should pay little attention to soil sulfur analyses, especially for samples submitted in the fall — which is when a lot of soil samples are submitted. Since some of the sulfur present in the fall leaches out long before spring crops begin to use it, you might think that the % of low tissue S analyses would be more than fall soil analysis would predict. But soil sampling for sulfur is simply an unreliable predictor of plant root uptake. Period.

This is important because soil sulfur levels are declining due to much lower sulfate content in precipitation, which used to be a major source of plant S. We're seeing more frequent responses to S fertilization, but these decisions should be based on plant analysis, with plant samples taken at the recommended growth stage and plant part.

— *E.T.*

JOIN US FOR EQUIDAY! MARCH 14 9 am - 3 pm

Joseph C. Burke Education & Research Center at Miner Institute
586 Ridge Road, Chazy

This year's topics include subjects like biosecurity and horse health, conformation analysis, horse behavior & learning and the fashion show.

This event is FREE and open to the public.
Lunch is available for $5 per person.

ADVANCED DAIRY NUTRITION & MANAGEMENT SHORTCOURSE

The Dairy Nutrition Shortcourse and the Advanced Dairy Nutrition and Management Shortcourse are conducted in opposite years as a collaboration between Cornell University and Miner Institute with additional invited course faculty from other universities.

The Advanced Dairy Nutrition and Management Shortcourse is conducted in even calendar years at Cornell University in Ithaca, NY. This shortcourse is designed primarily for experienced nutritionists and allied industry professionals seeking a more in-depth exposure to selected topics of emerging and continued interest relating to dairy cattle nutrition and management. The course is conducted primarily in a classroom setting and provides substantial opportunities for attendees to network with each other and with course faculty in informal settings.

The next Advanced Dairy Nutrition Shortcourse will be held in June 1 - 4, 2020 at Cornell University. Information will be sent electronically in mid-April 2020 as it is available.

For More Information, contact Heather Darrow at hh96@cornell.edu.

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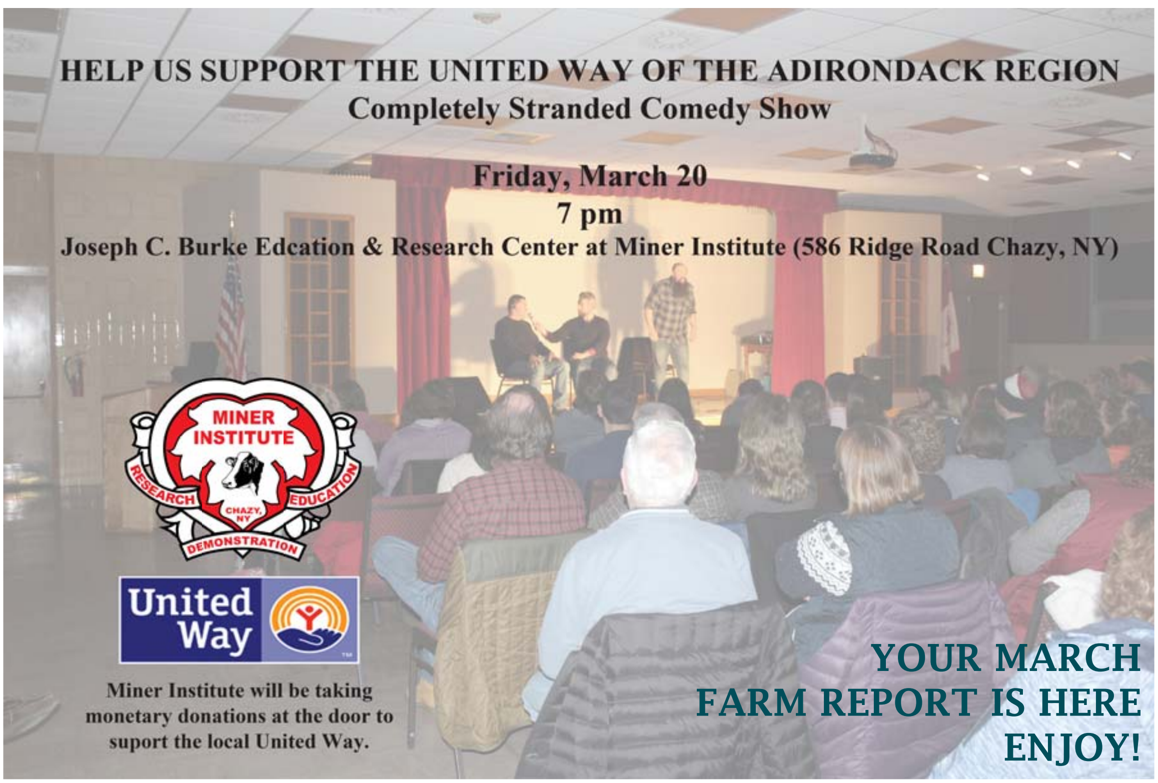

Closing Comment

Talk is cheap because the supply greatly exceeds the demand.

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