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The Manager

JULY 2019

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What are treatment costs associated with calfhood illness? pg.

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FOCUS: CALF & HEIFER RAISING

INSIDE

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Avoid summer struggles with calves

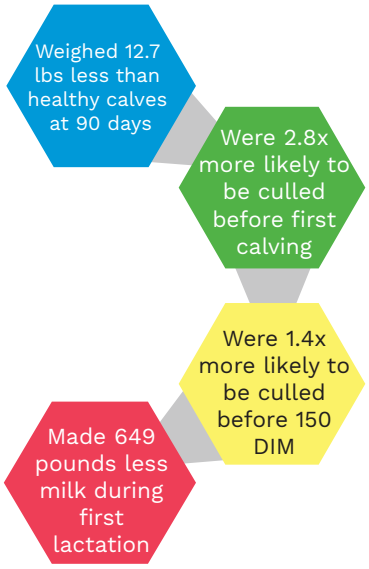
by Margret Quaassdorff

Successful management of calves is all about the details that add up to create a healthy, profitable member of the milking herd. Beyond excessive heat, summer weather provides an environment that can challenge our calves with increased humidity, favorable conditions for pests and pathogens, and a higher incidence of disease due to these factors. In the summer, heat stress causes immune system depression in calves. In addition, calves born to heat-stressed dams absorb fewer antibodies, leading to higher rates of failed passive transfer of immunity. According to the DCHA Gold Standard performance goals, your calf program should strive to have a treatment rate of less than 10 percent of calves for pneumonia, and less than 15 percent of calves for scours with an overall survival rate of greater than 97 percent for calves up to weaning age.

Calf scours, or diarrhea, is not a single disease, but a clinical sign associated with several disease pathogens and/or flaws in feed management practices. Causes could be bacterial, viral, protozoan or nutritional. Dehydration is the real danger here and can quickly overtake calves in the summer. Morbidity of respiratory disease is increased caused by both bacterial and viral pathogens when stressed calves are in hot, moist, poorly ventilated conditions.

FIGURE 1

Calves that had pneumonia before 70 days vs healthy calves



PREVENTION IS KEY TO SUCCESS

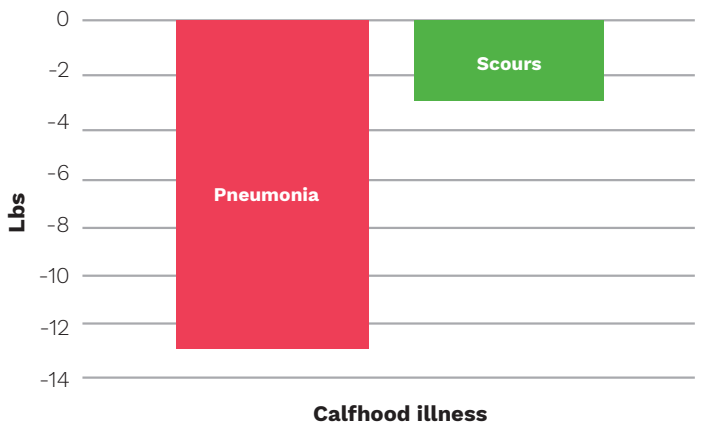
Consider the following to help your calves stay upbeat in the summer heat and to prevent costly diseases from holding back your future herd from its genetic potential.

Colostrum. Timely feeding of adequate amounts of clean, high-quality colostrum will ensure that calves are receiving the best chance to develop immunity against pathogens. It is advantageous to offer calves a second feeding of colostrum, and it may be beneficial to incorporate extra IgGs in the follow-up colostrum feeding to promote gut integrity.

Keep feedings consistent. Check total solids of mixed milk replacer or whole milk. If your farm struggles with

FIGURE 2

Lost growth potential of sick vs healthy calves at 90 days of age



consistency in mixing, or are feeding higher percentages of solids (closer to 15 percent), consider feeding a higher volume of mixed milk replacer, but keep the solids around 12.5 percent. Adding another milk feeding can be advantageous as calf starter intakes tend to come down, but the need for energy to grow and to cool the calf is still there. To gain efficiency and maintain hydration, some nutritionists also recommend amino acid balanced diets for calves to reduce the amount of excess nitrogen needed to be excreted in the urine.

Water. Keep fresh water in front of calves at all times, and wash pails when they become contaminated with feces, grain, flies, etc. When water is available, calves consume more starter, grow faster, and scour fewer days (Kertz, 1984). In addition, calves drink more when water is warm (60 to 65°F) compared to when it is offered cold (Huuskonen et al., 2010). Healthy calves under heat stress will drink between 6 and 12 quarts (3 gallons) of water daily just to maintain normal hydration, while sick and scouring calves may require up to 20 quarts (5 gallons) to maintain hydration. In a calf behavior study (Lowe et al., 2019), when calves were experiencing an outbreak of Salmonella, number of visits to the water trough did not increase, but visit duration increased before clinical signs of disease appeared.

Reaction time. Quickly identify and rapidly rehydrate calves that develop scours. According to an article by calf specialist Sam Leadley of Attica Veterinary Clinic, mild scouring could increase fluid losses by 1 quart per day or more, with a severely scouring calf losing 8 quarts (2 gallons)! Two or three times daily feeding of warm electrolytes (in a bottle if the calf is not capable of drinking out of a pail) mixed according to label, as well as IV and SQ lactated ringers, are good strategies to minimize the impact of dehydration caused by scours.

Cleanliness. Maintain excellent hygiene for feeding equipment and the calf environment, including proper ventilation for air quality and humidity control.

Equipment. Bacteria thrive in warm, moist climates, and they use nutrients left on dirty equipment to grow and reproduce. Double-check spouts, hoses and nipples on all feeding equipment, and change or clean often. Perform a pasteurizer microbial audit if you suspect bacterial contamination. Properly diluted chlorine dioxide may be sprayed on equipment pre-feeding to help reduce pathogen exposure.

Environment. Flies can spread E. coli and Salmonella directly from calf to calf via fecal-oral contact. To reduce fly-hospitable conditions, minimize spilling of starter, water and milk around feeding areas, and keep weeds and grass short surrounding calf and heifer areas. Other methods to reduce fly populations include feed additives, sprays, baits and traps. Aluminum-based aerosol spray bandage works well to speed healing and keep flies out of fresh disbudding wounds (Huebner et al., 2017). Sand bedding is a better option than straw in the summer as it allows more airflow in hutches, and it allows for better heat dissipation from the calf. Keep it clean and well-drained as any moist bedding can harbor pathogens and attract flies. Extra care should also be taken to clean and sanitize hutches and pens between calves/calf groups.

Ventilation. Proper ventilation and air exchange reduces humidity in calf barns to a point where it is difficult for pathogens to flourish. You may have to increase the number of air exchanges in your calf facility due to increased drinking and respiration of calves in warm weather.

LONG-TERM ECONOMIC IMPACT OF CALFHOOD DISEASES

It is important to understand that the cost associated with bovine respiratory disease and severe scours goes beyond treatment and labor costs at onset of each disease. In a 2017 study by Dunn et al., calves that were found via ultrasound to have suffered from respiratory disease before weaning went on to have a 1,155-pound decrease in first-lactation milk production. In another study, scouring calves treated with antibiotics gave 1,086 pounds less milk during their first lactation than those not treated (Soberon et al., 2012). With a milk price of $16.50/cwt, you can see how potential lost to early disease can add up down the road. Make sure to keep accurate records of disease and treatments for each calf to help you make culling decisions to keep the best animals in your milking herd. ▮

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Dry cow cooling also brings offspring benefits

by Rob Lynch, DVM

FIGURE 1

List of supplemental cooling priorities, from highest to lowest

1. Holding pen
2. Maternity pen
3. Pre-fresh cow pen
4. Lactating pens
5. Hospital pen
6. Processing areas
7. Travel lanes

From Tom Baily, "Mechanics of Heat Abatement," Elanco, 2012

FIGURE 2

Heat abatement elements

Shade

- Solid or 90% blocking shade cloth

Fan power

- 800-900 cfm per headlock/feedspace
- 800-900 cfm per stall

Water

- Drinking: 3' to 4' accessible linear water space per cow, no further than 80' from any cow, min 2 locations per pen
- Feedline soakers: 0.33 gallons per cow per cycle

Time

- Sprinklers should wet back and then stop to allow time for water to evaporate prior to next cycle
- Increase cycle frequency as temp rises

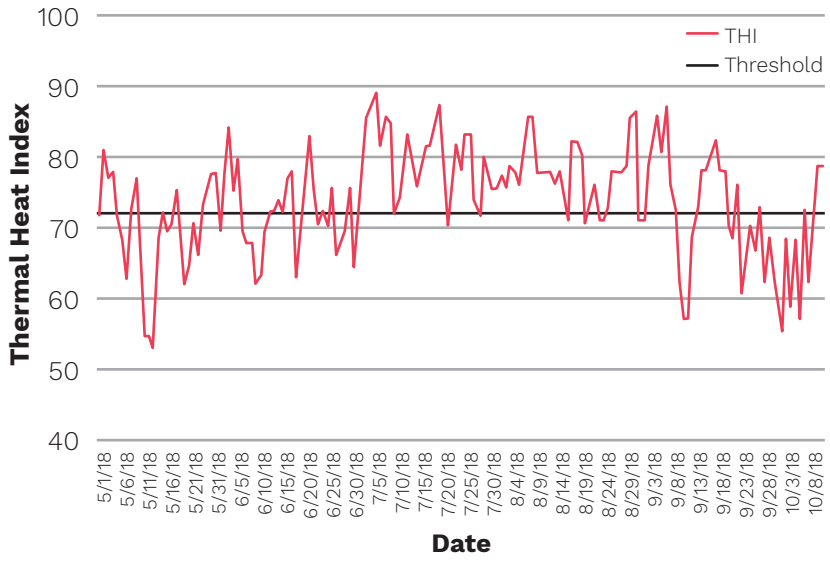
From Tom Baily, "Mechanics of Heat Abatement," Elanco, 2012

The dairy industry has known for years how important it is to provide supplemental cooling to dry cows (Figure 1). A 2016 study by Ferreira, et al. estimated New York dairy cows that experience heat stress during their dry period lose about 387 pounds of milk in their subsequent lactation. In 2018, Central New York experienced about 86 days of temperature and relative humidity high enough to cause significant heat stress in dairy cows (Chart 1). Unfortunately, many dry cow barns still have insufficient heat abatement strategies, and those farms will feel the economic impact. If a cow spends part of her dry period heat-stressed, not only will her next lactation performance decline, so will the performance of her calf, according to recent research.

Researchers from the University of Florida and University of Georgia published multiple studies showing heat stressed dry cows give birth to lighter calves when compared to cooled dry cows (Chart 2). They also found calves that experienced heat stress in utero absorbed colostral antibodies less efficiently than calves born from cooled dry cows (Chart 3). To evaluate cell mediated immune function, these researchers measured peripheral blood mononuclear cell (PMNC) proliferation in the calves (Chart 4). The ability to generate immune cells, like these mononuclear cells, is an important part of a good immune response. PMNC proliferation was significantly lower in the calves that experienced heat stress in utero compared to calves born from dry cows cooled during their dry period. Heifers cooled in utero later went on to conceive younger and required fewer services than heifers that experienced heat stress in utero (Chart 5 and 6). Performance benefits continued into the first

CHART 1

Daily Thermal Heat Index (THI) in Central NY Summer 2018. THI combines dry bulb temperature and relative humidity. Dairy cattle experience significant heat stress when THI exceeds 72 (black line), Central New York experienced 82 days that exceeded THI of 72 in 2018.



lactation. Heifers cooled in utero made significantly more milk and were more likely to complete the lactation compared to the heifers that experienced heat stress in utero (Chart 7 and 8).

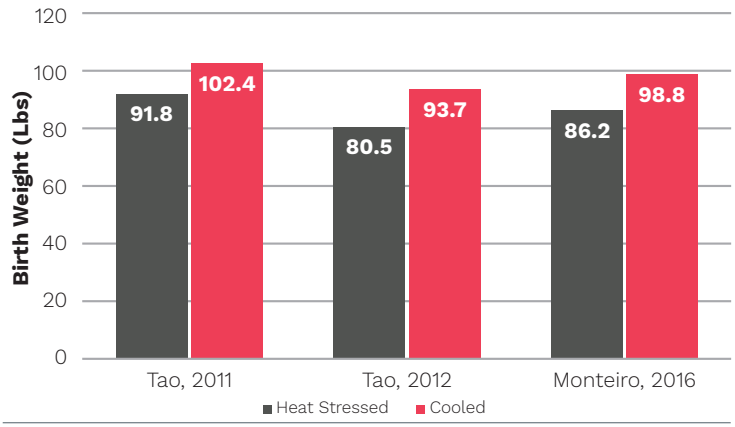
With all of these dry cow cooling benefits, is the heat abatement strategy in your dry cow barn sufficient? As the days start getting warmer, count some dry cow breathing rates. Cows breathing faster than 65 breaths per minute are likely experiencing heat stress.

Many of the same strategies used for milking cows can be used for the dry cows. Four elements impact heat abatement: shade, fan power, water and time (Figure 2). Air flow from circulating fans should cross over the backs of all cows at between 4 to 6 miles per hour. Feedline soakers can be used to wet cows to the skin and

Continued on page 6

CHART 2

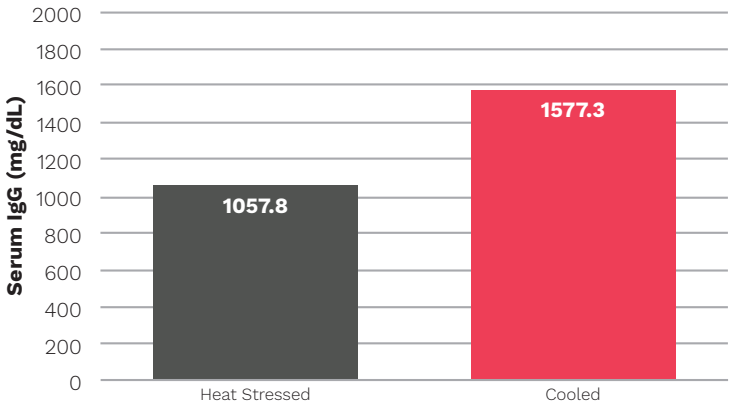
Offspring birth weight comparison of heat stressed vs. cooled dried cows.



Tao, et al., 2012.

CHART 3

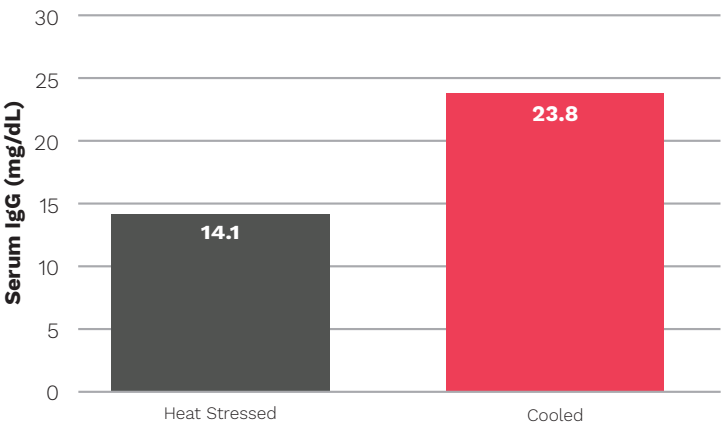
Serum IgG Concentration (mg/dL) comparison of in utero heat stressed vs. cooled calves.



Tao, et al., 2012.

CHART 4

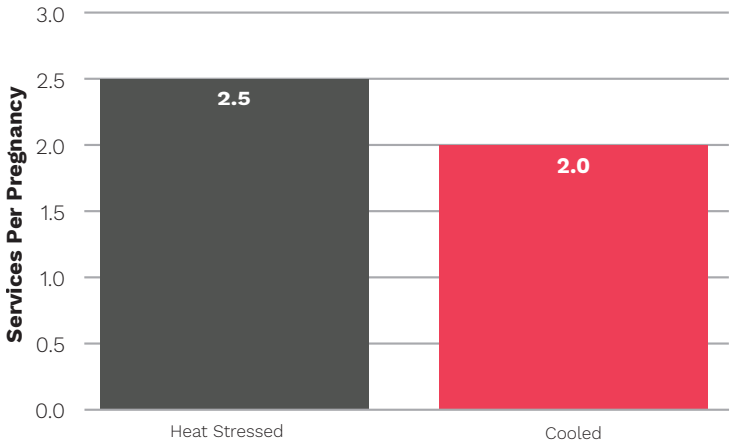
Evaluation of cell mediated immune function as measured by peripheral blood mononuclear cell (PBMC) proliferation comparing calves that experienced in utero heat stress to cooled calves, measured as a stimulation index.



Tao, et al., 2012.

CHART 5

Services per conception comparison of heifers who experienced heat stress in utero vs. those provided cooling.



Monteiro, et al., 2016.

CALF & HEIFER RAISING

Dry cow cooling also brings offspring benefits, cont'd from page 5

cycle off to allow time for the water to evaporate. Make sure drinking water access is sufficient in your dry cow pens. Each cow should have 3 to 4 feet of accessible linear water access. Each pen should have at least two water sources. This helps subordinate cows access water when a boss cow camps out in front of a water trough.

By providing a good heat abatement strategy to the dry cows they'll perform better for you and so will their calves. ▮

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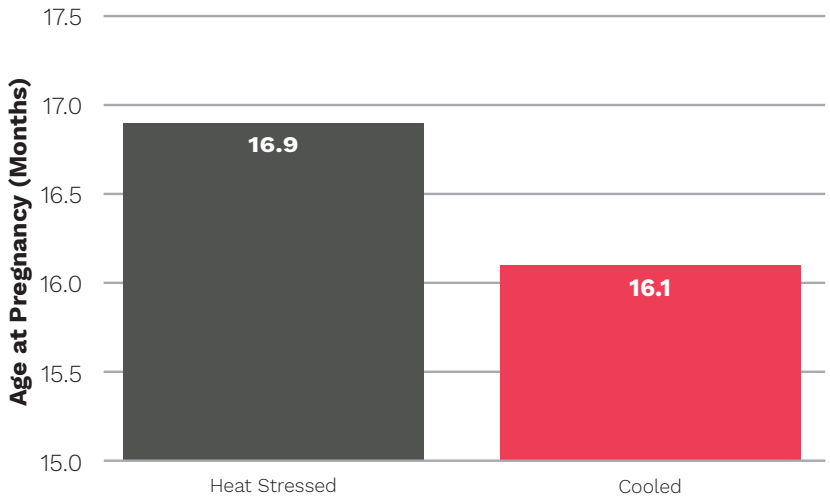
CHART 6

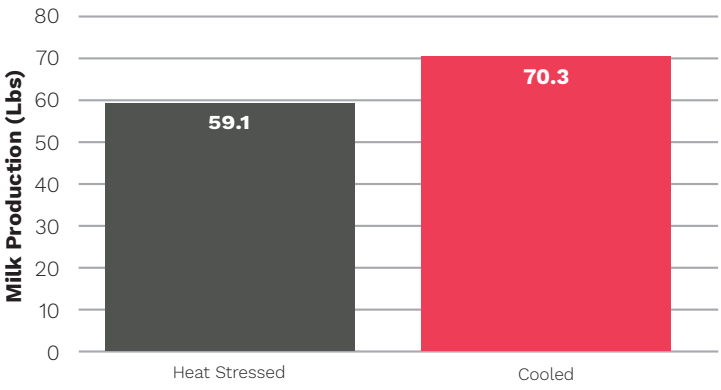
Age at pregnancy (months) comparison of heifers who experienced heat stress in utero vs. those provided cooling.



Monteiro, et al., 2016.

CHART 7

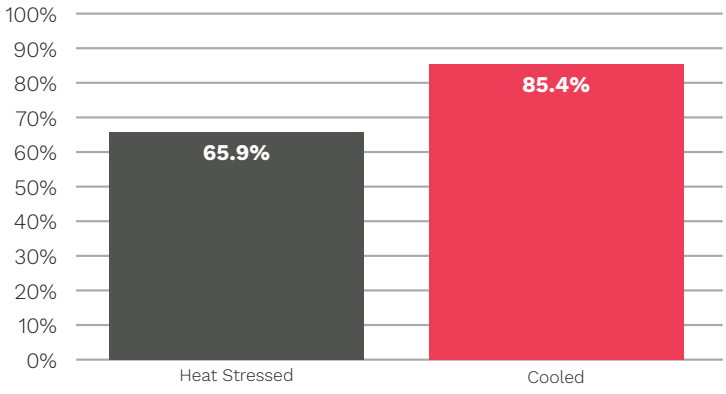
Milk production (lbs/cow/day) comparison of cows in their first lactation who experienced heat stress in utero vs. those provided cooling.



Dahl, et al., 2016.

CHART 8

Proportion of primiparous cows completing first lactation comparing those who experienced heat stress in utero vs. those provided cooling.



Dahl, et al., 2016.

Calf health treatment protocols, compliance and economic impact: Northern New York research results

by Kimberley Morrill

Throughout 2018, the Northern NY Extension educator team conducted research to determine protocol compliance for calfhood illnesses on Northern New York dairy farms, determine the treatment cost associated with calfhood illness and to bring awareness to antibiotic stewardship to increase consumer confidence in our food supply.

Farms were selected based on three criteria:

1 Having written youngstock treatment protocols for respiratory and scours

2 Having written or electronic youngstock treatment records that include: animal ID, reason for treatment, date of treatment, drug used and dosage

3 Allowing access to protocols and treatment records

Treatment protocols were collected from all participating farms to compare to actual treatment records and determine if an animal was treated per protocol. Animals were classified as not on protocol for the following reasons: if the drug listed on the treatment record did not match the drug listed on the written farm protocol, if the treatment was not provided for the full duration as written on the protocol, and if the correct dosage of the drug was not provided.

Treatment records (paper and/or electronic) were collected from all farms. Records were reviewed for protocol compliance, to evaluate the total number and percentage of youngstock treated per farm, the number and percentage of pre-weaned heifers treated per farm, and the number of times an individual animal was treated over the eight-month period of the study (January 1 to October 31, 2018). During the review of records, events were standardized to "respiratory, scours, navel, metaphylaxis and other." Other included: bloat, joint-ill, pink eye, ear infection and arthritis. If multiple treatments were provided to the animal for the same bout of illness, it was considered one event (i.e., a five-day treatment for a navel infection = one event).

To standardize the treatment price across participating farms, costs were determined for each treatment based off the purchase price from Valley Veterinary Supply. A cost of individual treatment, and total treatment cost per calf was then calculated. It is important to note that only drug cost was included in the calculation of cost.

Continued on page 8

TABLE 1

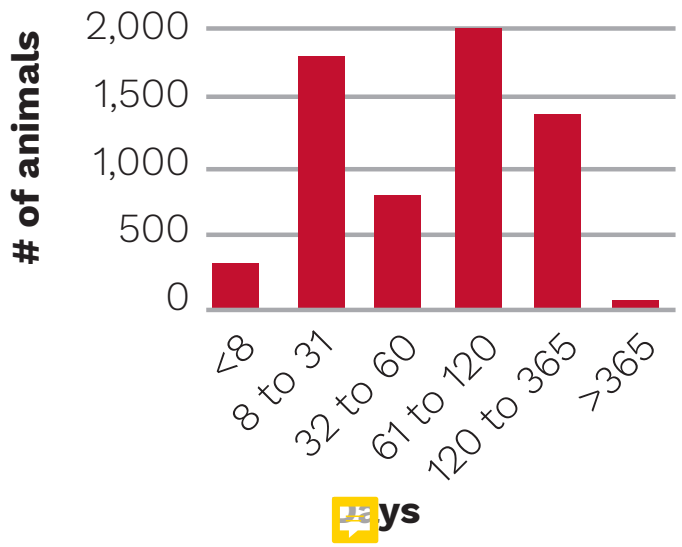
Average age (days) at onset of event by illness type

Illness	n	Mean	SD	Low	High
Pneumonia	4304	82.76	65.12	0	626
Scours	471	13.05	10.52	0	104
Metaphylaxis	823	73.24	20.34	0	112
Navel	365	12.19	12.19	3	73
Other[1]	278	209	73.95	93	444
Overall	6241	77.74	67.76	0	626

[1]Other includes: bloat, joint-ill, pink eye, ear infection, and arthritis.

FIGURE 1

Age at treatment



CALF & HEIFER RAISING

Calf health treatment protocols, compliance and economic impact, *cont'd from page 7*

A total of 6,255 treatment records, from 2,618 non-lactating heifers were collected from eight Northern New York dairy farms between January 1 and August 31, 2018. Average herd size was 1,836 mature cows with a range of 709 to 3,240. Average size of the heifer herd was 2,056 with a range from 810 to 3,006. In total, this study represents approximately 14,391 non-lactating animals. Average herd size reported in this study is greater than many Northern New York herds. This is because all small farms that were contacted to participate in the study did not reach at least one of the three criteria.

A total of 5,732 (91.59 percent) of treatments were given to non-lactating heifers, according to the written on-farm protocol. Compliance across herds ranged from 73.58 to 100 percent. Protocol compliance was similar across treatment events and ranged from 90.03 percent compliance for pneumonia to 100 percent compliance for treatments categorized in other. Compliance to treatment protocols was very high in this study. It's important to note that the farm that had 100 percent compliance was recording all events and treatments in Dairy Comp 305, and there were no written records. This observation study only compared records to protocols. We did not evaluate how accurate the records were on the farm (i.e., did the treatment record match what was actually provided to the calf?). It is also important to note that three farms did not report any treatment events for calves less than 31 days of age.

Average age of treatment was 77 days of age (range = 0 to 626; Table 1). The largest number of calves were treated between eight to 31 days, primarily scours, and 61 to 120, primarily scours (Figure 1). Only 14 heifers were treated after 365 days of age, nine for pneumonia and five for "other." Treatment of navel infections occurred early in life, with an average of 12.19 days of age, but ranging from three to 73 days (Table 5). Scour treatments occurred within the first few months of life, with an average age of 13.05 days of age, but ranged from 0 to 104 days.

Average treatment cost per event was $8.08 per animal, with a range of $0.09 to $34.28. Average total cost of treatment(s) per animal over the eight-month period was $18.17, with a range of $0.20 to $129.10. Average event treatment cost ranged from $1.12 for scours ($0.35 to 29.12) and navel infections ($0.20 to $29.12), to $9.08 for pneumonia ($ 0.09 to $34.28) and $9.57 for metaphylaxis ($0.489 to $9.79). It is important to note that for treatment cost we only evaluated the cost of the drug that was administered. We did not include costs associated with labor, supplies (needle, syringe, IV tube, etc.), lost future milk production, increased cost of heifer rearing related to losses in feed efficiency, growth rates, as well as costs related to developing carrier animals and risk of relapse.

Calves that received treatment were treated an average of 2.19 times over the eight-month period with a range of one to nine times.

CONCLUSION

The two greatest challenges with this project were identifying, and subsequently enrolling, farms that had written calf treatment protocols, and accurate calf treatment records that included: ID, date of treatment, reason treated, drug administered and dosage. Many farms did not have written calf treatment protocols. For those that did, many either did not keep calf treatment records or kept very minimal records that didn't include necessary information. This is concerning from both an animal welfare and food safety standpoint. Without written treatment protocols, an employee may not know how to identify and properly treat an animal based on the symptoms observed. They may wait until another employee or manager is present. If the herdsman who normally treats calves is on vacation, the calf is left to suffer for the time being. This is an unacceptable practice and can easily be avoided. Written protocols should identify what to look for in the calf and the course of treatment. This should include what antibiotic should be given (if any), the dosage, where to administer the shot, how often the shot should be given and the withdrawal time. The treatment protocol should also include who the employee contact should be if there is a question. If only certain people are allowed to treat animals, all employees should know who they are and how to contact them. Without written treatment records, it's unknown as to what animal was treated. This can lead to an animal accidently being sent to slaughter with a residue. While the two aforementioned points are concerning, this study does demonstrate that with both written treatment protocols and written treatment records, protocol compliance is high. ▮

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Your cows' diet shouldn't be 'Like a box of chocolates': How to know what they're gonna get

by Kristan Reed

WHAT'S IN THE BOX?

Forrest Gump's momma always said, "Life is like a box of chocolates, you never know what you're gonna get." In a way, feeding cows is the same. You never really know the true composition of the feeds and diet that make it to the bunk or what makes it into each cow. However, with some discerning choices in purchased feeds and appropriate sampling protocols, you can significantly reduce the uncertainty in diet composition and reduce the risk of under- or overfeeding a certain nutrient.

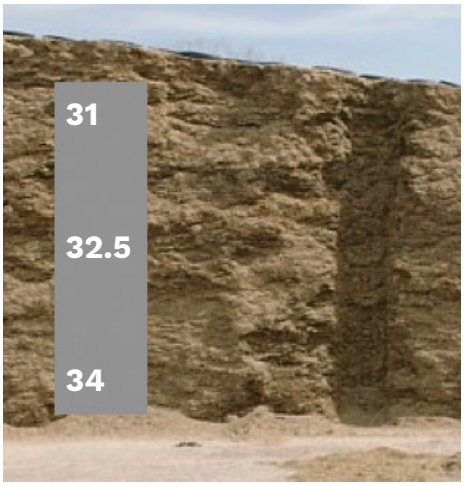
Many factors affect a plant's dry matter (DM), crude protein (CP) or neutral detergent fiber (NDF) content, including differences in plant genetics, the soil in which it is grown, fertilizer application rates and methods, and the weather. A feed's nutrient composition can also be influenced by harvest, processing and storage methods. In addition to all these identifiable causes of variation, there is also some degree of random, or unidentifiable variation. Finally, when we try to determine the composition of a feed through testing, we also introduce some 'observer variability' in how we select the feed sample and the lab methods used to analyze the feed composition. Knowing how much each feed is expected to vary, and how much of that variation is due to identifiable, observational, and random causes, will help establish how often that feed needs to be sampled, how to sample it and how to use the results of the feed sample in ration formulation.

A general idea of the total variation in a feed's nutrient content can be gained from the standard deviations (SD) in feed composition tables like the NRC (2001) or the CNCPS feed library

Continued on page 10

FIGURE 1

When sampling silage, be sure to mix feed from the top, middle, and bottom of the silage pile. a) Average DM (percent) of the top, middle and bottom thirds of a corn silage pile. b) Recommended sampling protocol is to mix silage from different locations, divide the mixed sample into quarters, then keep one quarter to send to the lab.



A

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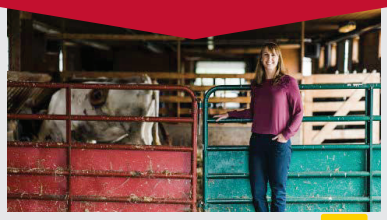
GET TO KNOW KRISTAN REED



Kristan Reed joined Cornell in fall 2018 as assistant professor, Northeast Agribusiness and Feed Alliance Partners Sesquicentennial Fellow in Dairy Cattle Biology, Department of Animal Science.

She is creating an open-source model that looks at the farm, from crops to cows, as a whole system. The model simulates flows of carbon, nitrogen and phosphorus to identify how to improve farm production efficiency and minimize environmental impacts. She will also develop online courses in dairy nutrition and farm nutrient management at Cornell.

Reed received her B.S. in animal science from Cornell University in 2007 and her Ph.D. in animal biology from the University of California, Davis in 2016. She has also been a postdoctoral scholar with USDA-ARS U.S. Dairy Forage Research Center, Madison, WI and served in the Peace Corps in Lesotho.

Photos provided by Allison Usavage

Your cows' diet shouldn't be 'Like a box of chocolates', cont'd from page 9

(e.g. Table 1, select feeds from NRC 2001 feed tables). In these tables, the mean is a measure of the average while the SD is a measure of the variability. One way to interpret the SD is that, for a normally distributed variable (which we assume for most feeds), 68 percent of samples will fall within one SD of the mean and 95 percent of the samples will fall within two SD of the mean. In the case of dry corn grain, listed in Table 1, 68 percent of corn grain CP samples are expected to fall between 8.1 to 10.7 percent. In comparison to blood meal whose CP content has a SD of 8.3, the variability in corn grain CP content is quite low. An easy way to reduce variation in composition of the final diet is to limit the inclusion rate of feeds with high variability. However, this is not always practical, so below are some more guidelines to help manage different groups of feeds.

PURCHASED FEEDS WITH LOW TRUE VARIATION

Feeds like corn grain, soybean meal and cottonseed listed in section one of Table 2 have relatively low identifiable and random variability. This means that if you sample a recently delivered truckload of corn gluten feed, a large portion of the deviation from the mean is likely due to observational variability. Because of this, it is often better to rely on averaged estimates from national, regional or distributor feed tables rather than taking your own samples. If you do sample feeds in this category, save the results of previous samples and use the updated average of all samples instead of discarding previous information and using a single sample value.

PURCHASED FEEDS WITH MODERATE TO HIGH TRUE VARIATION

Byproducts like potato peels, distillers' grains and blood meal listed in section two of Table 2 tend to have high levels of variation. For these feeds, true identifiable and random variation is high in comparison to the observational variation, so using your own sampling data significantly improves your knowledge of their nutrient composition. Regular sampling of feeds in this category is recommended. However, the choice to average current results with previous data depends on your ability to identify a factor that would cause the composition to change. Because you don't likely know the growing conditions, plant variety or processing methods of byproduct feeds, identifiable causes of variation are limited to the supplier, distributor and delivery batch or truckload. Updating the average composition with a sample from each newly delivered batch is recommended for these types of feeds until you have reason to believe there has been a change in the supply chain, in which case you should toss the old values and begin the process of averaging new values as they come in again. Changing feed mills is one example of when to begin a new average, but communication with your distributor can help you identify if they've changed their supplier or have reason to believe there is a significant shift in the composition of a certain product.

FARM-GROWN FEEDS

Silages, hays and high-moisture corn have high levels of identifiable, random and observational variation, so managing these feeds can be challenging. Like feeds in the previous section, a well-designed sampling protocol can improve the accuracy of nutrient delivery. Identifiable causes of variation for farm-grown feeds might be the crop hybrid, field or harvest date. Finding ways to separate your inventory by these factors will help you know when you are starting a new batch of feed and should begin a new sample average and reduce the

TABLE 1

List of some common feeds and the mean and standard deviation of their nutrient composition

Feed	DM		CP		NDF	
	Mean	SD	Mean	SD	Mean	SD
Shelled corn grain	88.8	3.73	9.0	1.5	10.0	2.9
Wheat midds	90.6	2.1	18.5	1.92	31.3	5.9
Soybean meal	90.6	2.6	51.0	4.8	13.6	5.5
Canola meal	91.8	3.6	39.5	3.8	30.5	3.9
Dried distillers grains	89.0	5.7	31.4	4.3	34.0	4.6
Wet distillers grains	35.2	14.9	30.4	8.5	32.1	8.6
Blood meal	90.2	2.7	99.9	6.5	1.7	1.1
Alfalfa silage	40.2	11.6	21.6	3.0	44.1	5.8
Corn silage	33.3	7.8	8.3	1.1	43.5	5.9
Grass silage	38.3	14.3	15.3	4.0	57.6	7.2

Adapted from the Dairy One Feed Composition Library (https://dairyone.com/analytical-services/feed-and-forage/feed-composition-library/).

TABLE 2

Recommendations for sampling groups of feeds based on their type and amount of variation

Feed group	Example feeds	Sampling recommendation
1. Overall low degree of variability in purchased feed	Dry corn grain Soybean meal Dry corn gluten feed Canola meal Whole cottonseed	Often better to use feed table values. If using your own data, use values averaged over time.
2. Moderate to high variability in purchased feed	Dried distillers' grain Wet distillers' grain Wet corn gluten feed Wet brewer's grain	Regular sampling of feeds is recommended. Increase sampling frequency if variability is high. Use values averaged over time until an identifiable change in supply occurs.
3. High variability in farm grown feed	Grain silage Alfalfa silage Grass silage Hay High moisture corn	Take two or more samples every 5-30 days using recommended sampling protocols. Use values averaged over time until a change in inventory occurs.

Adapted from St-Pierre and Weiss (2015).

identifiable causes of variation. How often you should sample each batch depends on many factors, including milk price, the number of cows you're feeding and the degree of random variation in that feed. Normand St-Pierre while at Ohio State University published results of a renewal reward process model to determine the optimal sampling schedule (St-Pierre and Cobanov, 2007). They found that for small farms with less than 100 cows, the industry standard of sampling every 30 days is sufficient. However, as the number of cows increased, so did the optimal sampling frequency, which leveled off around a suggested sample every five days for farms with more than 300 cows.

Sampling method is also an important factor in the perceived variability of farm grown feeds. Sampling technique is almost as important as sampling at all. When sampling the face of a bunker silo it is important to include silage from the top, middle and bottom, as well as both sides of the silo. However, DO NOT grab a sample by hand directly from the face of the silo as this is extremely dangerous and can cause severe injury and even death. It is best to wait until the silage has been defaced, and preferably mixed, before taking the sample. Depending on the rate of feedout, if the entire face of the pile isn't used each day/feeding, ensure that feed from the top, middle and bottom thirds of the silo is included on the day of sampling because DM, in particular, varies greatly from the top to bottom of the pile (Figure 1a). When taking a sample, collect handfuls from the mixed pile or from various locations from the knocked-down pile into a 5-gallon bucket, targeting a 2-pound initial sample. Next, thoroughly mix this sample by hand and dump it onto a clean, flat surface and arrange it into a circle. Divide the circle into quarters and put one of the quarters into a ziplock back to store in a cool place until it can be sent to the lab (Figure 1b). For bagged silage, be sure to collect samples across the face of the bag, and at different points along the length of the bag, starting a new average with each bag or field. Finally, due to the high amount of sampling variation, it is generally recommended to take two samples each day.

DON'T LISTEN TO FORREST

Like the map that comes in some boxes of chocolates, you can use feed composition tables to divide your feeds into management categories like those in Table 2. Then, developing a carefully laid-out sampling protocol based on recommendations presented here and elsewhere, you will have a much better idea of what your cows are getting, and reduce the risks of under and overfeeding. ▮

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Balancing family and business in farm transfer planning

by Anna Richards

As farm ownership progresses through generations, it becomes more and more likely that owners may have one or more children or heirs that are not actively involved in the business. While this is certainly not a bad thing in terms of their individual interests and goals, it can begin to pose a unique challenge in the context of estate and succession planning. Often, the majority of an individual business owner's wealth is tied up in farm or farm-related assets. The challenge then becomes balancing the ability to pass wealth on to their family members with the ability of the business to continue to operate successfully.

ASSESS YOUR CURRENT SITUATION

The process of business succession planning involves managing three main categories: asset transfer, cash flow management and business management transfer. The first two, while complex, are fairly mechanical. The first step is to know what you're starting with. To get an accurate snapshot of your full financial picture, you'll need to prepare a balance sheet and income statement, much like you do for your business. While this seems straightforward, it's important to identify how business assets are owned, and what that means for you and your ability to transfer or liquidate them.

Owning individual business assets, like cows, equipment and land, is very different than owning LLC units or corporate stock in an entity with multiple owners. Your ability to access those assets is often limited by an operating or buy-sell agreement that dictates how and when you can get value from them. If we're talking about LLC units, remember that your capital interest (the portion of the business assets you own) and profits interest (the percentage of profits allocated to you) are not necessarily the same. Ideally, your business should hold annual meetings in which you review these legal agreements and sign a certificate of value, ensuring those ~~are~~ values readily accessible and current. Working with your accountant, attorney or business consultant to help sort out these numbers and ensure their accuracy is vital to the process.

DETERMINE YOUR GOALS

Before designing a plan to manage these assets, it's critical to understand what the goals and priorities of the senior generation are. It's difficult to chart a path if you don't know what destination you're trying to reach. Dedicate time to working through what is most important to you, knowing that it may not always be possible to achieve all goals at once, but the better you can articulate and prioritize them, the more successful you'll be in building a plan that accomplishes them. It's helpful to work with a third-party consultant to facilitate this part of the process. It's often beneficial to have them meet with each party involved individually, to understand their personal goals and concerns. This may include other business partners (both family and nonfamily) and other family members.

When talking about goals in the context of family wealth and business preservation, there are a few key questions that help identify the structural options that best fit:

- Do you want your non-farm children (or other heirs) to benefit from your business assets?
- If so, when? During the lifetime of the business or only if it ceases to operate?
- If during the business's lifetime, should the benefit they receive be guaranteed or based on the performance of the business?

Once you've identified your current situation and your goals, these questions provide a simple framework to move through some potential options.

QUESTION 1: DO YOU WANT YOUR NON-FARM HEIRS TO BENEFIT FROM YOUR BUSINESS ASSETS?

If the answer is no, then we simply look at what non-farm assets are available. Common personal assets could include cash and investments, life insurance, vacation or rental homes, personal residences or ownership in other non-farm businesses. When looking at the values of these assets, it's important to remember that equal is not necessarily equitable. The value to the recipient is affected both by the level of management the asset requires, and their ability to generate income from or to liquidate it. Life insurance is a very commonly used tool to address the non-farm heirs, as it provides a tax-free, lump-sum distribution of cash. The limitation to this asset, of course, is that it generally doesn't provide that benefit until after death.

Cash is the simplest to manage and most liquid of all assets, and can also be transferred and enjoyed during lifetime. While many farm business owners have been hesitant to take cash out of the business to accumulate outside wealth over their lifetime, business consultant John Lehr of Farm Credit East ACA encourages his farm owners to take large draws from the farm, as long as earnings are available to support them, for good reason. Besides helping to build outside investments to manage this farm-family balance in planning,

large draws help keep individual's equity from growing so large that their eventual retirement or buyout would cripple the farm. It also facilitates what he calls "cash flow conditioning". If the business is conditioned to pay out cash at these levels, when that payment turns into a retiring partner payment or equity buyout when a member retires, it isn't a shock to the system.

Personal assets such as a personal residence, vacation home, personal collections, etc., can also have significant dollar value, but may also have sentimental value and may be harder for heirs to liquidate. Rental homes or ownership in other businesses may provide some additional revenue streams, but also require more active management by the recipient.

However, if the answer to the question above is yes, we move further down the list.

QUESTION 2: DURING THE LIFETIME OF THE BUSINESS OR ONLY AT LIQUIDATION?

If the intent is for non-business heirs to benefit only if the business ceases to operate, two potential structures to consider are limited (non-voting) business interests, and a continuation trust structure. In both cases, what you're giving the heir is the right to the value of a share of the business assets if they are liquidated, but not the right to liquidate it themselves or draw capital out of the business. This allows the business to use that capital to continue to operate, without the risk of having to buy it out.

A limited business interest essentially gives the heir some capital ownership in the business, without giving them a say in how the business is run on a daily basis. They are allocated at least some share of the profits and losses, which allows this capital interest to grow over time if the business is profitable, but in this case the operating agreement would not allow for those profits to actually be distributed. Therefore having the limited member would not affect the management or cash flow of the business as long as it was operating. However, if the business were liquidated, they would receive their proportionate share of the proceeds after liabilities were paid.

A continuation trust structure works in a similar fashion, but adds an additional layer of protection. In this scenario, instead of passing business interests directly to the heir, they are placed in a trust that can continue on long after the grantor has passed away. As above, the trust still receives some portion of the profits and losses, so it continues to grow with the business, and the heir is not able to withdraw the capital. However, the interest is owned inside of a trust structure, giving some additional protections to both parties. Since the business interest is owned by the trust and not the individual, it is protected from their creditors, lawsuits, divorce proceedings, etc. They also have a representative in their interest in the form of the trustee. A trustee has a fiduciary responsibility to the heirs, meaning that they are required to act in the best interest of the eventual beneficiary. In other words, they can ensure that the business assets are not being managed in a way that intentionally takes value away from the beneficiaries.

From the standpoint of the active managers of the business, this may mean they need to involve the trustees in some major business decisions. The tradeoff, however, is that they're able to continue to use the capital to grow and run the business. As with the simpler limited interest above, if the business is liquidated, the trust receives its share of the proceeds, which can then be distributed to the heirs, or possibly even their heirs depending on the life of the trust and the business, as directed by the trust documents. It's important to remember that a trust is an incredibly flexible tool and can be written to accomplish almost anything you want it to, within the confines of the law. This is just one specific example of the multitude of ways a trust could be written.

In both of these instances, all of the initial equity and future earnings are preserved within the business, allowing it to continue to use this capital until the business is liquidated. However, if the intent is for them to receive some benefit from the business while it is operating, there are several other options to explore, including modifying the above structures. In order to narrow them down, we ask the next question.

QUESTION 3: SHOULD THE RETURN BE RELATIVELY FIXED OR BASED ON THE PERFORMANCE OF THE BUSINESS?

If a guaranteed return is preferred, one very common way to accomplish this is through the use of land rents. In many farms, the ownership of land is already separated from the operating assets for liability purposes. Leaving land ownership to an off-farm heir provides them with the opportunity to earn regular rental income, as well as the appreciation in value of the land itself. It's important, however, to think back to your goals and priorities when determining how the ownership and

Continued on page 14

Balancing family and business in farm transfer planning, *cont'd from page 13*

lease agreements should be structured. If continuity of the business is a priority, it's crucial that the farm have security in its land-base. You may want to consider ensuring that the operating entity has first right to lease the land, a method for setting fair rental rates, first right to purchase if the heir wants to sell, and set terms for how it would be purchased to protect business cash flow.

Julie Richardson of Van Erden Richardson Law Firm PLLC works with farm businesses to develop these agreements.

> *"A right of first refusal and a first option to purchase are two different mechanisms," she said. "The right of first refusal requires that the land owner, or landlord, provide the tenant with notice of any purchase offer received from a third-party. The tenant must then match the terms of the third-party offer and may then purchase the property. In contrast, a first option to purchase puts the control in the tenant's hands and enables the tenant to decide when he would like to purchase the land. The first option to purchase language in a lease includes more details on the purchase than the right of first refusal because in this case, the tenant is not matching an offer from a third-party, but purchasing the property on their own terms. Therefore, the option to purchase in the lease agreement includes terms such as purchase price, payment terms, closing documents to be provided by seller/purchaser and closing timeframe. Inclusion of either the right of first refusal or the first option to purchase as a term of a lease agreement is always beneficial to the tenant because it allows the opportunity to purchase the land, but does not require a purchase if the tenant is unable to do so at a certain point in time. This provides some security to the tenant that the land may be available to purchase in the future, if the terms are met. It is not uncommon for a farm to have a lease agreement even when the landowner is a member of the operating entity. Even in this case, it is beneficial to include a right of first refusal or first option to purchase in that lease agreement. This helps to secure the land for the operating entity if there is a future issue between the member-landowner and the operating entity or other members. Similarly, this protects the operating entity if the member-landowner passes away leaving family members to handle this land."*

Besides these lease agreement provisions, the ownership structure of the land can also greatly impact the future management of it. Leaving land directly to multiple individuals as tenants in common may seem like the simplest method, but it can lead to significant management challenges down the road. Placing the land instead in a real estate LLC owned by the individuals provides a framework for managing lease agreements, buying and selling property, and ownership transfer.

One word of caution in managing leases within the farm and family is to be aware of unintended equity transfer. Many rents are often still determined by the cash flow needs of the rental entity, which is usually the real estate taxes, insurance, and principal and interest payments. It's important to evaluate how that compares to fair market value rent. If the two entities – the operating and the real estate – are not owned by the exact same people at the exact same percentages, and the operating entity is essentially over- or underpaying for rent, then someone is getting an unfair economic benefit at the detriment of someone else. It's best to pay rents at an agreed upon fair rent per acre, and to work carefully with your accountant to ensure that the balance of these cash flow needs are being accounted for correctly.

To add a further level of protection, the real estate LLC ownership can be placed within a trust. From a cash-flow standpoint, the operating entity would still pay rent to the LLC, and the trust could then distribute the rental proceeds to the beneficiaries. Since the assets would be owned by the trust rather than the individual, however, they would be shielded from the beneficiary's estate. Not only does this keep land values protected for estate tax purposes, but from their Medicaid and marital estates as well. This allows the land to stay in the trust for multiple generations, ensuring the operating entity has the ability to use the assets, and providing a cash flow stream to the non-farm heirs. If the farm ceased to operate, however, the trust would then be able to either rent the land to someone else, or distribute or liquidate the assets to the beneficiaries.

Another option to create a relatively stable return to the non-farm heirs without forcing the operating entity to buy out their capital is to leave them a limited interest in the operating entity as discussed above, but also incorporate a guaranteed payment for use of capital. This is essentially a payment that looks a lot like interest, a "rent" for the capital that the limited member is leaving in the business. When determining what that amount is, you may want to consider the value of the capital share, current and historical market returns (what would they get if they were able to withdraw that capital and use it somewhere else?) and historical business returns. As in the prior example, the limited member would also still have a right to their share of the proceeds if the assets were liquidated.

Finally, if the goal is for the non-farm heirs to receive a benefit during the business lifetime that's subject to the performance of the business, we can look at profit distribution and performance-based capital distributions. Allowing a limited member to withdraw their allocated share of profits each year may again seem relatively simple, but it could pose a significant cash-flow challenge to the business in years of high profit, when that capital needs to be reinvested into capital improvements or debt reduction. Instead, it may be more appropriate to create pre-determined tiers that allow the business to distribute certain dollar amounts at varying levels of profitability. The key to making this successful is to use a consistent and fair profitability metric that accounts for business growth over time. For example, profit per cow tiers or return on asset tiers may make more sense than looking at the total net profit of the business, as one would expect that dollar amount to go up over time as the business grows and may make the original tier structure obsolete.

Remember...

Business succession and personal estate planning are incredibly personal processes, and no two plans look identical. No matter what plan works best for your business and family, remember that using the right team of professionals and good communication throughout the process are key to making it successful. Individual owners have the right to use the value of their business ownership as a personal asset in estate and family wealth planning. Their business partners have the right to understand this planning and how it affects their ability to continue to operate the business. The better everyone involved understands your goals, the more successful you will be in achieving them. ▮

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