Wintering cows in the northeast requires careful attention to nutrition, nutrient and manure management, and health. This publication focuses on these three topics for producers that house cattle during the winter.

Introduction

While management practices of raising cattle over winter months vary, most include some form of shelter and housing. Many producers confine the beef cow herd continuously when animals cannot graze, to mitigate the damage to pasture lands caused by foot traffic in congregation areas. In addition to the land management benefits, there are some reproductive, time management, and nutritional benefits to wintering cows in confinement. This publication focuses on confinement facilities, feeding options, herd health, and environmental considerations for producers that house cattle during the winter.

Confinement Facility Considerations

Confinement for beef cattle can be defined as a barn or sacrifice lot. Typically, a sacrifice lot will be an area that cows are confined in to prevent overgrazing or damage to pasture. One challenge with using a sacrifice lot within a pasture is that heavy animal traffic during non-growing seasons can cause muddy, less sanitary conditions for the cows, especially entering spring calving season. Mud can contain pathogens that cause health issues in cows and calves. If muddy areas are not contained, then nutrient runoff will cause water pollution problems. Furthermore, soil compaction will challenge the establishment of desired pasture vegetation later in the season. For these reasons, it is recommended that cows are confined indoors or on outdoor lots that have been designated as sacrifice lots through the packing of crushed limestone or some other material to improve the surface. By using indoor or managed lots, pasture grasses and soil profiles can be protected, and manure nutrients remain properly contained.

In addition, some may justify adding a video monitoring system to the inside of the barn to be able to check cows at anytime from anywhere. The system would pay for itself quickly if calves can be saved from dystocia in a timely manner. Live calves can also be monitored more easily and closely for colostrum intake. During the winter breeding season for fall calving herds, cows that are kept in a well-ventilated, cool environment will display more signs of heat for better timing of artificial insemination, thus, increased pregnancy rates (Hurnik et al., 1975). The video system could double over as a heat detection tool while working fields or at an off-farm job. If cows remain in confinement through synchronization, those cows would be near a chute/handling system at time of breeding allowing for less stress on the cows and, potentially, increasing conception rates (Lucy, 2019).

Indoor confinement locations can vary from a retrofitted, existing barn or a new construction project specifically for wintering beef cows. The first consideration that should be acknowledged is the amount of pen and bunk space available. Ideally, mature beef cows need 35 to 50 ft² of pen space per head and 24 to 30 linear inches of bunk space per head (FASS, 2020). Penn State Extension has a fact sheet entitled Beef Cow Pen and Bunk Spacing Requirement where you can learn more.
Feeding Options

While beef cows in confinement can be fed a balanced diet, or total mixed ration (TMR), consisting of different on-farm feed ingredients, such as corn and soybeans, most beef cattle producers choose to simplify cow diets. In many cases, simply putting a bale of hay out with a location for free-choice minerals and a location for water will meet the needs of the mature beef cow. Pricing for feed commodities used in sample diets are listed in Table 1. Table 2 provides some example diets for comparison purposes. While the feeding and feed management strategies will vary greatly from farm to farm, this table details 4 potential diets to meet the energy and protein requirements of beef cows (7 to 9 months post calving). These diets range in ingredients to fit a number of scenarios. Thus, diet 1 represents a more traditional, hay-based cow diet. Diet 2 would be one example of how to meet a mature beef cow’s needs using straw. Diet 3 assumes a poor forage year and makes recommendations for feeding corn. And, finally, diet 4 is one example of how corn silage may be used to feed mature cows. The daily intake varies greatly between these diets and should be noted. Feed more or less than is recommended will result in weight gain or loss to the cows.

All the aforementioned examples are presented as TMR, but these diets could be hand-fed as individual components. One advantage of feeding a TMR is that cows will have a more consistent intake of vitamins and minerals. Some cattle that are on free-choice mineral may not visit the mineral station (Bowman and Sowel, 1997), which can result in cows not consuming the mineral. Thus, although a TMR requires more time to feed than a bale and a free-choice mineral supplement, cattle can be target-fed the correct amount of protein, energy, vitamins, and minerals that they need. Consistent and accurate vitamin and mineral consumption will prevent deficiencies and diseases.

Feeding beef cows a TMR, while not all that common, allows the producer to make more dynamic decisions. The producer can capitalize on the opportunity cost of selling hay or other feed commodities and purchasing a cheaper feed commodity. Diets 3 and 4 are examples of alternative cow diets, which rely on corn or corn silage as a base. Both diets would likely require restricting cow intake to avoid increased weight gain. Numerous protein products are available, and the diet could easily be adjusted to that specific product. For example, diet 2 uses feed-grade urea to provide rumen degradable nitrogen that microbes can convert to protein for the cow whereas diets 3 and 4 use soybeans, common in many operations. These diets could also use dried distiller’s grains with solubles (DDGS) from the ethanol industry for protein rather than urea or soybeans.

Table 3 shows the economic evaluation of the diets provided. Limit-feeding a corn-based diet to cows often results in cost savings, particularly if the price of hay increases to $205/T or $220/T because forage supply is limited (see footnote). However, limit-feeding corn means the cows will clean up a ration in short order and additional considerations should be given to bunk space and managing boss cows. See Consider Corn-Based Diets as Alternative to Hay for Beef Cows for more information.

<table>
<thead>
<tr>
<th>Feed Ingredient</th>
<th>Pricing, $/as-fed ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn a</td>
<td>$200.00</td>
</tr>
<tr>
<td>Wheat Straw b</td>
<td>$125.00</td>
</tr>
<tr>
<td>Corn Silage c</td>
<td>$60.00</td>
</tr>
<tr>
<td>Orchardgrass Hay b</td>
<td>$140.00</td>
</tr>
<tr>
<td>Whole Soybeans b</td>
<td>$330.00</td>
</tr>
<tr>
<td>Urea d</td>
<td>$500.00</td>
</tr>
<tr>
<td>Limestone d</td>
<td>$238.00</td>
</tr>
<tr>
<td>Mineral d</td>
<td>$700.00</td>
</tr>
</tbody>
</table>

Table 1: Price considerations for feed commodities

a Corn prices represent a $5.60 bu price. b Estimated. C Priced at 9 times the cost of a bushel of corn on as as-fed basis. d Southcentral PA local mill prices.

As – Fed Basis
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Diet 1</th>
<th>Diet 2</th>
<th>Diet 3</th>
<th>Diet 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>As-fed inclusion, lbs./hd</td>
<td>0.00</td>
<td>4.09</td>
<td>10.83</td>
<td>1.68</td>
</tr>
<tr>
<td>Corn</td>
<td>0.00</td>
<td>0.00</td>
<td>0.81</td>
<td>1.59</td>
</tr>
<tr>
<td>Soybeans</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Dried Distiller’s Grains with Solubles</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Corn Silage</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>39.31</td>
</tr>
<tr>
<td>Orchardgrass Hay</td>
<td>25.97</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Wheat Straw</td>
<td>0.00</td>
<td>21.70</td>
<td>4.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Urea</td>
<td>0.00</td>
<td>0.24</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Limestone</td>
<td>0.00</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>Vitamin and Mineral</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>Total Intake, lbs./hd</td>
<td>26.21</td>
<td>26.27</td>
<td>16.93</td>
<td>47.82</td>
</tr>
<tr>
<td>Total digestible nutrient (TDN), % (DM basis)</td>
<td>55.6</td>
<td>54.6</td>
<td>74.7</td>
<td>69.8</td>
</tr>
<tr>
<td>Crude protein, % (DM basis)</td>
<td>11.88</td>
<td>8.29</td>
<td>9.06</td>
<td>10.47</td>
</tr>
<tr>
<td>Ca:P</td>
<td>1.8</td>
<td>1.7</td>
<td>2.0</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Table 2: Rations for late lactation cows, 1200 lbs.

<table>
<thead>
<tr>
<th>Diet Number</th>
<th>Feeding Period Cost a</th>
<th>Avg Cost/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 b</td>
<td>$228.26</td>
<td>$1.90</td>
</tr>
<tr>
<td>2</td>
<td>$229.76</td>
<td>$1.91</td>
</tr>
<tr>
<td>3</td>
<td>$189.95</td>
<td>$1.58</td>
</tr>
<tr>
<td>4</td>
<td>$238.64</td>
<td>$1.99</td>
</tr>
</tbody>
</table>

Table 3: Average cost per day for a 1200 lbs. late lactation beef cow.

a Diets were formulated for a 1200 lbs. beef cow with costs calculated using predicted intake from Table 2 for 120 days. b If hay price increases to $205/T, the feeding period costs increase to $329.56. If hay price increases to $220/T, the feeding period cost increases to $352.93

**Herd Health**

Wintering beef cows in confinement can bring both challenges and opportunities to cow and calf health. When installing/constructing a confinement facility for beef animals, the first step in optimizing animal health is to establish safe handling facilities. Handling facilities will allow for better management of cow health while keeping workers safe. It is a good idea to consult with veterinarians or local extension professionals for advice on which handling equipment may work best at a farm, since these professionals can draw on experience from other farms they work with.

In addition to handling facilities, flooring and ventilation are other aspects of facility design that can significantly impact animal health. The choice of flooring for a beef confinement facility will affect both hoof health and biosecurity. In terms of hoof health, few studies have evaluated differences between dirt-base and concrete-base bedded pack. Though concrete could cause greater hoof wear than a dirt floor, with adequate bedding, both bases can work well for beef cow facilities. Research has demonstrated that fully or partially slatted flooring can be associated with negative hoof issues (Magrin et al., 2020; Brscic et al., 2015). From a biosecurity standpoint, a concrete base has a clear advantage because the bedding can be removed, and the concrete underneath is thoroughly cleaned. Most of this benefit to the concrete-base is afforded to the calf as pens are typically cleaned when cows are out on pasture for the summer, providing a clean environment for the next winter and the next crop of calves housed in confinement.
Another aspect of housing design is to assure there is adequate ventilation, especially in cold weather. Poor ventilation increases the risk of respiratory disease for cattle housed indoors. Risk increases if barns are closed to keep animals warm during cold weather. With reduced air flow rates, bacterial counts in the air increase, which may not be problematic for adult cattle but does contribute to increased rates of respiratory disease for calves housed indoors (Lago et al., 2006).

Though confinement can pose challenges in terms of animal health, it does provide opportunities to optimize preventative programs to help improve animal health. As cows come off pasture in the fall, they likely harbor parasites in their intestinal tract. These parasites reduce feed efficiency and can slow weight gain in growing animals (Florez-Perez et al., 2019). When in confinement, cattle are unlikely to acquire new parasites, so deworming cattle at the time of entry to confinement can provide a parasite-free winter, improving feed efficiency and animal health. Veterinarians are likely to take fecal samples to determine which parasites are present to determine the best deworming product and administration timing for the herd.

Another opportunity of confinement, particularly with farms that include handling facilities, is the optimization of vaccine program. Which vaccines to give and when will depend on several factors, including time of cattle entry into confinement facilities for the winter, whether or not indoor calving is expected, how and when cows will be bred, biosecurity risk of the herd, and disease issues already known to be present. As there is no single vaccine protocol that works for every farm, the herd veterinarian is the best resource to help build a program that will work best for a specific operation. Vaccines included in a protocol will likely fall into one of three major categories: reproductive vaccines, respiratory vaccines, and vaccines to benefit the calf.

Reproductive vaccines are designed to prevent diseases that may cause embryonic loss or abortions in cattle. These vaccines are ideally timed before breeding to assure that cows are protected during the breeding season and into pregnancy to best protect the fetus. Veterinarians can provide details for vaccine administration timing that provides optimum protection to cattle based on farm breeding management.

Respiratory vaccines are considered a core vaccine for all cattle. They protect against a variety of viral respiratory pathogens, with the option to add protection against bacterial pathogens if needed for the operation. These vaccines are particularly important in confined herds that bring in outside animals, especially those from sale barns. In beef cows, these vaccines are not only important to protect cows, but they also help booster the antibodies that will go into colostrum, therefore, they protect the calf, too.

The final category of vaccines to consider are those that are designed specifically to protect the calf. These most often protect against scours in the calf. They work by increasing antibodies in the cow against scours pathogens that impact calves. As the cow produces colostrum, these antibodies will be included in the colostrum, providing protection to the calf early in life. Cows begin to produce colostrum prior to calving, so we typically aim to booster these vaccines about 5 weeks prior to calving so that cows reach peak antibody production during colostrum production. The herd vet should be consulted for how to best time these products to maximize the benefits to the calf.

Although the ease of access to handling facilities can bring benefits to both cow and calf health, calving in confinement poses several challenges in keeping calves healthy. One of the greatest challenges of calving in confinement is protecting calves from scours. Veterinarians can provide details for vaccine administration timing that provides optimum protection to cattle based on farm breeding management.

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Although the ease of access to handling facilities can bring benefits to both cow and calf health, calving in confinement poses several challenges in keeping calves healthy. One of the greatest challenges of calving in confinement is protecting calves from scours. Though there are multiple pathogens that cause scours, many impact calves early in life and can quickly become deadly without prompt treatment. Scours vaccines given to the cow protect against some, but not all, scours pathogens. They are a great tool, but they cannot be the only practice to prevent scours. The true cornerstone to calf health is colostrum consumption, which can provide protection against pathogens beyond those targeted in vaccines. Calves should be up and nursing soon after birth so that they get plenty of colostrum. When preparing for calving season, it is essential to have a good quality colostrum replacer on hand in case a calf does not get up to nurse quickly after birth. Though these products are expensive, they have a long shelf life and can be a lifesaver for a weak calf.

In addition to assuring calves get adequate colostrum, sanitation is another critical aspect of calving in confinement. Once cows begin calving in confinement, frequent cleaning is imperative to prevent the spread of scours pathogens. Moving sick calves out of the barn and into isolation can also help prevent the spread of disease. One sick calf can quickly infect an entire barn. For example, a calf with diarrhea caused by cryptosporidium, a parasite that spreads by ingestion of eggs called oocysts, can shed over 35 billion oocysts in just 6 days (Nydam et al., 2001). A healthy calf can become sick from ingesting as few as 25 of those oocysts (Zambriski, et al., 2013). By removing sick calves from the main barn and keeping bedding areas clean and dry, transmission of pathogens, like cryptosporidium, is minimized.

Overall, wintering beef cows in confinement brings both opportunities and challenges in animals health. Good facility planning and designing can improve both hoof and respiratory health. Working with veterinarians and industry experts from the very beginning can assure a safe, effective handling facility that will allow for a comprehensive herd health protocol to optimize the health of both cows and calves.
Environmental Management

Good winter management of cattle involves nutrient management and environmental considerations. Retention of nitrogen (N) and phosphorus (P), found in urine and feces, protects water quality, and saves the valuable nutrients for use during the growing season by pasture or crop plants.

Management goals to maintain herd health and retain manure nutrients can go together. Proper bedding practices keep cows healthy and dry by minimizing manure on the animals. When dry bedding areas are maintained, the carbon-based bedding material can help to hold N and P in place for later land application of solid manure. Moisture addition to bedding can be limited by controlling precipitation and spilled drinking water that enters the manure system. Routine monitoring and maintenance of drinking water systems can prevent water from entering the manure, which can also make handling the manure easier. Keep ‘clean water clean’ through the prevention of precipitation and snowmelt from running onto housing structures or lots. Remember that additional management steps may be necessary when watering system components are subject to freezing temperatures.

Storing manure until field conditions are favorable for application can provide agronomic, economic, and environmental advantages. Bedding systems often serve to store manure in solid form until it can be land-applied under the guidance of a Manure Management Plan. Manure should be routinely collected from other confinement areas, whether under roof or not. Collected manure should be stacked at a location where water does not run onto the stack and water that does leave the stack does not enter waterways. Storage and stacking requirements for Pennsylvania can be found in the Manure Management Plan and by exploring Penn State’s website that contains information on how a producer can write their own plan.

Some beef, and most dairy, operations manage manure in liquid or slurry forms. These farms typically have designed manure storage or containment systems that require routine monitoring and occasional maintenance. One important winter management aspect begins at the end of summer because producers should empty storage areas and apply manure to assure that ample manure storage capacity is available through the winter. In the mid-Atlantic and northeast regions, producers should plan for spring weather that will inhibit or delay manure removal and application until mid-April. All manure applications should be conducted under the guidance of a nutrient or manure management plan.

In places where cattle are housed outside, considerations for N and P retention remain critical, as does managing to assure that soil is not lost through erosion. Erosion and runoff from areas of bare ground where cattle concentrate have inherent risk for loss of dissolved and particulate pollutants. Areas where animal traffic contribute to bare soil are called Animal Concentration Areas or Heavy Use Areas, and include barnyards, feed areas, travel lanes, and stream crossings. Environmental runoff risks increase during winter months because nutrients are not being taken in by vegetation and soil infiltration can be low. For these reasons, careful management should strive to hold manure nutrients on site until they can be utilized for crop growth in the spring. Managing sacrifice areas, barnyards, lots, and pastures for nutrient and soil retention is in the best interest of producers and the environment. There are many options to improve outdoor congregation areas such as improving surfaces with stone or concrete or installing barnyard curbing to collect solid manure and direct runoff liquids in a manner that prevents water pollution. Since every cattle farm is unique, manure containment systems need to be specifically site designed. Local Natural Resource Conservation Service (NRCS) offices can provide engineered designs that meet environmental and safety requirements.

Regulations in all states aim to prevent the release of N, P, and sediments from cattle operations. Containment of these pollutants when animals are housed outdoors during the winter can come in many forms. A foundational principle in all scenarios is to minimize water addition and run-on to manured and bare surfaces, while containing and filtering runoff from these areas.

In many cases, strategic location of items such as feeders, waterers, walkways, and bedding areas can be used to congregate animals in places that limit risk of negative impact. Providing vegetative buffers between these areas and surface water is always recommended. If the water is not in a concentrated gully, downslope vegetation can slow water flow, allow water to infiltrate the soil, and help retain nutrients and eroded particles on site. Animals can be fenced away from streams. Streambank fencing can be used to establish permanent conservation areas and limit cattle access to streams. The areas immediately adjacent to streams are often marginal in long-term pasture quality because they may degrade quickly with animal traffic, so there may be little benefit of allowing continued access to these areas.

It may be possible to utilize animal behavior to strategically place manure nutrients or minimize your workload in dealing with manure. An exemplary management strategy of this concept is termed bale grazing. Bale grazing is an option for wintering cattle outdoors that requires adequate fenced pasture area and careful monitoring of stocking density. The practice rotates the placement of hay on the ground across areas of a good pasture stand away from surface waters. Most producers accomplish this by unrolling a round bale in a long row across the ground. As cattle ‘graze’ on the hay at each location, the foot traffic, and manure deposits are concentrated near the strip of hay. The next time a bale is unrolled it is not placed in the same location, rather it is moved a few feet away. Over the course of the season, bale grazing utilizes animal behavior to routinely relocate heavy foot traffic and distribute nutrients somewhat evenly across the pasture. This practice does leave some hay behind that many would view as waste. However, the hay does provide a place where cows can lay with some insulation and dryness compared to surrounding ground without the hay. The hay also helps retain nutrients that can be utilized in the summer pasture stand and adds organic matter to the soil.

Confined Winter Beef Cows
Wintertime is a great time to view operations with a critical and honest eye. It is a good idea to make these observations during, and immediately, after winter weather events such as snowmelt or runoff over frozen ground or spring rains on non-vegetated areas. Things can look their worst after animals occupy the same area for extended periods when vegetation is not growing, and soils cannot recover from concentrated traffic. Note any losses of manure nutrients or particles, water, and sediment and look upslope for contributing problem areas. Once problematic factors are understood, strategic plans can be made to implement changes to prevent future losses. Changes may be in the form of physical structures, water diversions, plans to relocate animals in the future, or items that animal behavior to place manure nutrients in a different location. Adopting this concept of continuous improvement will lead to management improvements over time.

Because of the societal importance of balancing agricultural production and environmental stewardship, cost-share funds are often available for installation of Best Management Practices like manure storages, barnyard curbing, or streambank fencing. It is always a good idea to contact local conservation and NRCS personnel who are knowledgeable about possible funding sources and have great experience with Best Management Practice installations. Tax breaks are also possible in some areas for lands that are put into permanent easement buffer programs. Accepting financial assistance can save the producer time and management expenses, provide healthier living conditions for cattle, lead to farm efficiency improvements, and retain nutrients for farm utilization.

**Winter Cattle Summary**

Confining cattle during winter months can offer advantages to managers who may be able to save time while realizing benefits in production and reproduction efficiencies when cows are sheltered in areas where rations and health can be closely controlled. This type of management can protect lands for summer forage production, allow manure storage that conserves nutrients for timely spring application, and limit risk of manure nutrient and soil loss to waterways.

**References**


Confined Winter Beef Cows

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