ANIMAL SCIENCE FACTS

PUBLICATION NUMBER

Extension Animal Husbandry

ANS 03-001 B

Department of Animal Science

A Ten-point Plan for Winter Feeding Beef Cows

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This publication is devised to help cattle producers improve winter feeding management to ensure adequate husbandry of wintered beef brood cows. As cattle producers, we need to optimize performance of our animals, as they provide a part of our livelihood. At the same time we have a moral obligation to provide a level of care that minimizes or prevents suffering in these animals due to malnutrition. Although a low proportion of people are involved in production agriculture, farmers and consumers alike benefit from improved animal husbandry.

Some producers are totally unaware of proper feeding management for cows during winter, while most others would benefit from fine tuning their management program. Our aim is to provide a reminder that proper feeding is essential for good animal husbandry, and to outline a recommended winter feeding management program. Reducing feeding and other costs where possible is an appropriate strategy to improve the profitability of beef production, but underfeeding animals is not a recommended way to reduce cost.

Here is a basic plan 10-Point Plan for wintering beef cows, and detailed descriptions of each point follow.

1. Analyze hay for feeding value and develop a supplementation program to meet energy, protein and mineral requirements.
2. Keep hay or adequate pasture available for cows at all times.
3. Record body condition scores on cows.
4. Make sure there is enough feed on hand for the winter season to feed the number of cattle on the farm.
5. Separate heifers, thin cows and old cows from the main cow herd for feeding purposes and separate lactating cows from dry cows.
6. Re-group the cattle during the winter as needed so that cattle that get thin can be fed separately.
7. Cull chronically thin cattle, old cows, and cattle with dental or health problems.
8. Adjust rations as calving season approaches to provide more energy and protein.
9. Provide minerals at all times based on requirements for the local area.
10. Provide adequate shelter from wet or cold weather.

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Point 1. Analyze hay for feeding value.

It is fitting that we first deal with feed analysis. Most cattle producers are aware that feed is their largest cost, and that yearly feed bills usually exceed other costs. Feed analysis is set up for measuring the major nutrients, such as energy, protein, major minerals, and micro-nutrients, such as selenium, copper, and zinc. Once feeds are analyzed, the second part of a supplementation program is ration balancing. Beef cows require energy, protein, and other nutrients every day in order to meet nutritional requirements of each particular phase of the life cycle. Nutritional needs of a lactating cow are greatly increased over those of a dry, pregnant cow. Ration balancing takes these life cycle phases into account as well as other factors such as season of the year, weight of the cow, and additional needs of old cows or growing heifers.

When purchasing hay, analysis at the time of purchase will give the cattle producer an idea of how much the hay is worth, and amount and type of supplement that might be needed. Visual evaluation of hay is important, but is not adequate to accurately determine nutritional value. Hay with a green color may appear more nutritious than it really is based on analysis. Also, hay that lacks a green color actually might have adequate levels of nutrients.

Diets with adequate energy and protein are important to prevent malnutrition. Nearly all cases of severe malnutrition are due to a combined shortage of energy and protein. When energy is in short supply, "protein supplements" fed to cattle are expensive and may be counter productive. Adequate energy, in the form of high quality forage, or grain or high energy by-product, is required convert crude protein in cattle rations to useable protein in the rumen of the cow. Protein blocks and lick tanks are often unsuccessful as supplements because such products often supply excessive crude protein without supplying adequate energy to the ration.

Generally, in the Southeastern US, forages are adequate or nearly adequate in protein, but deficient in energy for lactating cows. However, typical southern forages fed in adequate amounts often will meet both the energy and protein needs of dry cows.

Mineral analysis is another crucial step in feed testing. Mineral requirements of cattle on summer pasture differ from cattle on winter rations, and requirements of a nursing cow differ from those of a cow in late gestation. In the Southeastern US, copper, selenium, and zinc deficiencies are common. Magnesium deficiency is also common in winter, especially when cattle are fed low quality hay. Mineral supplementation is discussed in more detail under Point 9.

Once the quality of hay is known, then the producer can plan to feed lower quality hay to dry cows and plan to feed better quality hay as winter progresses and/or calving nears. Higher quality hay should be used to feed older, thinner, lactating, or young growing cattle.

The final essential nutrient is water, an often overlooked resource. None of the other nutrients can be used by the cow without adequate supplies of clean, fresh water. Water should be available at all times and should be easily accessed by the cattle. Water should also be kept free of ice cover so cattle have easy access to it.

Point 2. Keep hay or adequate pasture available for cows at all times.

In most situations where cows are fed forage-based diets, adequate hay or pasture should be available for cattle daily. This is especially true during colder months when temperatures are low enough that cattle need to use both body reserves and dietary energy to stay warm. Cattle with full rumens will be able to generate heat for energy and warmth that cattle with empty rumens can't. When average pasture height is greater than 2 to 4 inches (depending on the forage type), cows can get at least a maintenance level of intake from grazing. When pasture is shorter than 2 inches, cows are unable to consume enough dry matter, and hay needs to be a major component of the diet.

Generally, if cattle are lactating during winter, cattle producers may need to feed supplemental energy in the form of grain or a byproduct such as whole cottonseed. Dry cows should be fed hay only if it is at least medium quality (8% crude protein and 55% TDN).

Weather is a major consideration when feeding cattle in winter. Though uncommon, excess mud or ice may prevent access of tractors to hay storage areas. In these cases, if a cattle producer is unprepared, cattle may go for 1 or 2 days without feed, and may lose body condition rapidly. Feeding enough hay for 3 days just before a predicted storm can prevent the stress of trying to get to the cows when roads are impassable. Also, storing some round bales on the edge of the pasture behind an electric wire will be of great help if it is impossible to move hay to the cows.

Some producers feed just enough round bales daily so that cows will eat it completely by the next day. This reduces hay wastage, but may lead to "round bale syndrome" whereby least competitive cows slowly starve while "boss" cows thrive because they get first access to the hay and eat more than their share. This can be avoided by feeding enough hay for two or more days at a time, or by rolling out hay so all cattle can eat at the same time. When most folks used square bales, they were typically spread out more than is usually done when feeding round bales, and all cows could eat at once. Keeping feed available for cattle and observing eating behavior will help avoid hungry cows.

Point 3. Record body condition scores on cows.

Determining body condition (energy reserves) of a cow can be done using a visual scoring system based on a scale of 1 to 9. Cows with a score of "1" are emaciated, weak, and close to death, and cows with a score of "9" are extremely obese, representing the most unhealthy extremes. Weighing cattle is not always practical and is not required for body condition scoring and the technique is applicable to all breeds of beef cattle.

Producers should aim to have most cows in the range of scores 5 to 7. A score of 5 is moderate body condition, and is when the last 2 to 3 ribs are visible and little fat is evident in the brisket or around the tail head. A score of 7 is fleshy body condition, and the brisket and tail head have considerable fat deposition and the back has a flattened appearance. A score of 6 is intermediate between the descriptions of a 5 and a 7. Heifers should calve in a body condition score of 6 to 7 in order to breed back early in the breeding season, while mature cows should be at least a score of 5.

There is about a 50- to 75-pound range between each condition score for a typical beef cow, depending on her frame size. A change of 50 to 75 pounds takes time for a cow to gain, and it is best for her to be at least moderate condition (score 5) before she calves. High quality forage or an energy supplement is required if cows are thin (condition 4 or less) at weaning and a body condition score of 5 to 7 is the goal at next calving. Management techniques to improve feeding efficiency to improve body condition include early weaning of calves, shelter from wind and rain, and prevention of muddy conditions.

Body condition scoring of cows should be done at 2-month intervals during winter, and more often during extremely cold or damp conditions. Each producer should develop an "eye" for body condition so that average condition of the herd, and presence of any cattle less than a score of 5, can be noted each time the herd is checked. Long winter hair coats can make it more difficult to visually score cows. Working cattle through a chute periodically will allow palpation of the backbone and ribs to more accurately determine body condition score. Recording condition scores can then help guide needed adjustments to the feeding program.

In most herds, a few cows are likely to be below ideal body condition, and management practices presented herein should be considered to remedy that situation. However, if average body condition score of the herd is 3

or lower, and there are many individual cows with scores of 2 or lower, then the feeding program is very inadequate and could be considered to be inhumane.

Handouts that detail the body condition scores (with photographs) are usually available at local offices of the Cooperative Extension Service. Further details about body condition scoring can be seen at the following web site provided by the University of Florida: http://edis.ifas.ufl.edu/AN001

Point 4. Make sure there is enough feed on hand for the winter season to feed the number of cattle on the farm.

Autumn is the time to inventory hay and pasture assets for use during winter. At that time, grain or byproducts like cottonseed can be purchased as needed. Projected needs of cattle during the winter months should be addressed. Planning should consider all reasonable contingencies, in order to prevent feed shortages and potential starvation.

The first step is to make sure that the amount of hay on hand is adequate. In order to do this, you must be able to estimate weights of bales, because cows have feed requirements in pounds, not bales. Guessing weights is very difficult, so find some way to weigh a sample of bales in each lot of hay. Eventually, by guessing weights and then weighing hay, better estimates will result, reducing the need to actually weigh bales.

In order to have a reasonable idea of the amount of hay and supplement to have in the inventory, energy and protein values of the feed on hand should be based on the feed analysis. Once hay inventory and quality is known, extra hay can be bought if needed and you can plan for an appropriate protein and energy supplement. It is important to remember that hay is always less expensive and generally higher in quality if purchased in the fall as compared to emergency purchases in the dead of winter.

It is advisable to have on hand about 25% more hay than is required for the winter. The extra hay will come in handy in case of severe weather or a late spring. Major snowstorms are rare, but we frequently have muddy conditions that require extra energy supplementation for the cattle. It is actually important to have hay left over, because we can have early spring and summer droughts, and cattle producers with a “drought preparedness” hay supply will have an edge.

Hay should be stored under a shelter or covered with plastic although many producers still store hay outside. It is important to estimate spoilage on the outside-stored hay if bale “weight” was estimated during fall, and then to reduce the weight expected at feeding time. Generally, outside storage will result in about 25% loss of hay, while plastic storage will result in about 10% loss and barn storage about 5% loss. If you have all three types of storage, plan to use the outside hay first, plastic-covered hay second, and reserve any barn-stored hay for late in the season, or for carryover. Because the highest cow requirements are often in late winter after calving and onset of lactation, better quality hay is best kept in barn storage.

A number of simple calculations are useful for determining the amount of hay and supplement needed over the winter. Number of cattle to be fed is the most obvious variable to consider followed by the body condition score of cows as discussed earlier. Thin cattle require extra feed during winter, so if they are not at least a body condition score 5, increase the amount of feed needed by 10%.

The next factor to consider is the number of days that harvested feed will be necessary. Pasture supply will be hard to predict because of variable fall growing conditions and possible snow or ice which can damage standing forages. In general, historical information is useful for when hay feeding usually starts in the fall and ends in the spring and those times can be adjusted to allow leeway for more severe winters. If pasture can be used longer than expected then you will end the winter with feed left over.

The most significant consideration for winter feeding of cattle should be the stage of the production cycle that cows are in. In North Carolina, many herds calve in fall, while some also calve in late winter and early spring. Therefore, a producer may have cows in early to mid-lactation during the winter, or the producer's cows may be dry and gestating. Generally, for cows in adequate body condition the lowest nutritional requirements are during the dry period, and for spring-calving cows that would be in the winter. A dry cow can maintain herself and produce a healthy calf on about 2.25% of body weight of low to medium quality dry hay. Fall calving cows are lactating and also rebreeding during winter and need a much higher plane of nutrition. They would need at least 2.5% of body weight of higher quality hay, plus in many cases 2 to 5 lbs of an energy supplement (with at least 14% protein). In practice, it is good to give the cow all the hay she will eat, and then supplement as needed to maintain a body condition score of at least 5.

Unfortunately, many herds calve year-round, and this reduces the efficiency of winter feeding. Basically, a year-round calving herd must be fed like all the cows are lactating, so some cows will be in better body condition than they need to be.

Consideration must also be given to waste of hay during feeding. When round bales are unrolled on dry pasture, loss is near 10%, similar to losses with hay rings and hay trailers. When round bales are put out without using a feeder of some kind, then waste could be as much as 50% in some cases. If a feeder is not available to reduce losses, an alternative is to unroll hay (either down a hill, or using unrolling equipment) if it is practical from a labor standpoint and if conditions are not extremely muddy.

Following is an example of how to roughly estimate hay needs as an initial way of checking the adequacy of your hay inventory:

1) Expected feeding period……90 days.
2) Expected cow numbers…….25 head.
3) Expected cow weight in moderate condition……1100 pounds.
4) Expected cow intake……2.5% of body weight.
5) Expected cow intake in lbs……0.025 x 1100 = 27.5 pounds.
6) Expected total hay intake……..27.5 lbs/cow x 25 cows x 90 days = 61,875 pounds.
7) Hay offered increased by 10% to account some for waste…… 61,875 x 1.1 = 68,063 pounds.
8) Total hay needed (increased by a 25% safety factor)…85,079 pounds
9) Planning for winter feeding is very important and late summer or fall is the time to start. Once winter sets in, many opportunities for inexpensive hay and supplement purchases are gone and it can be very stressful for cows and producers to be out of feed during winter.

Point 5. Separate heifers, thin cows, and old cows from the main cow herd for feeding purposes and separate lactating cows from dry cows.

In most beef herds, grouping cows might seem to be a waste of effort and space. However, thin, old, or small cows and heifers compete poorly for feed with younger and more aggressive cows. Most cases of severe malnutrition come from these weaker animals.

Yearling heifers should be grouped together for feeding because they are still growing. Heifers should be about 65% of their mature weight at breeding and about 85% of their mature weight at first calving. For instance, an animal that will eventually weigh 1000 pounds as a mature cow should weigh about 650 pounds at breeding time as a yearling heifer. This animal will (or should) gain 200 pounds (in order to weigh about 850 pounds at calving time) in addition to approximately 130 pounds in the reproductive tract for a calf with a 65-pound birth weight. As a result of the high nutritional requirements needed to achieve these target weight changes, a heifer may lose condition and be underdeveloped at calving if not fed separately from mature cows.

Contrary to some persistent beliefs, calving difficulty is not reduced when feed to the heifers is reduced. As a matter of fact, underfed, poorly grown heifers have a higher incidence of dystocia (calving difficulty), even though their calves might be a few pounds lighter than from well-fed animals. Protein and energy deficiencies in heifer or cow diets may lead to small, weak calves. These calves are weaker because they are under developed and have low body fat stores. This condition, known as "weak calf syndrome" is often fatal, especially for calves born in inclement weather.

Thin and old cows should be culled if they cannot maintain their weight after separation and proper feeding. Keeping thin or old cows, or cows with missing or worn teeth, without feeding them enough to maintain body condition is inhumane. Without separate feeding it is easy to miss real causes (poor teeth or poor health) of poor body condition in these animals. If a cow is in poor condition merely because she does not compete well, separate winter-feeding is one solution that may allow us to keep such a cow for a few additional years. Thin and old cows can be fed with heifers in small herds. For large herds, however, dietary requirements of heifers and mature cows differ such that feeding thin and old cows separately from heifers makes good economic sense.

The final important consideration in grouping strategies is separation of nursing cows from pregnant cows. This allows for closer attention to nursing cows, as they need increased quality and quantities of feed. In addition, separation of nursing cow-calf pairs to clean areas away from the rest of the herd helps minimize calf exposure to disease pathogens carried by older cows. Also, if an outbreak of disease does occur in calves, having the youngest calves in an area that is not contaminated by older calves can reduce losses in the calf crop.

Point 6. Re-group cattle during winter as needed so that those cattle that become thin can be fed separately.

Groups based on age, pregnancy status, and body condition scores need to be reevaluated as winter progresses. Re-grouping is as important as the initial grouping, and will help keep the cows in adequate body condition. Ability to judge the health and body condition of the cows comes with experience but regardless of level of expertise, reassessment of body condition after a few weeks on winter feed is a good practice. Some cattle, especially those with higher milk production, will lose more weight during winter than others. If serious health problems are not present, re-grouping and placing these cows into a group getting a higher level of nutrition may be all that is necessary.

Heavy parasite loads in cattle can waste feed resources. Parasites, particularly sucking and biting lice cause loss of condition through blood loss as well as loss of hair, which increases feed energy required to maintain body temperature. Mid-winter re-grouping of cattle is an excellent time to examine for lice in the herd. Stomach worms are another common cause of disease and loss of body condition in cows that should be considered. A local veterinarian or your extension agent are good sources of information about animal health, parasite control, and other management considerations.

Feed management of heifers is especially critical in the last 60 days before calving. Re-grouping of these younger animals will allow them to be more carefully fed for growth requirements and for early colostrum production for newborn calves. Proper heifer nutrition can increase colostrum and milk production, which are critical for health and growth of calves. Heifers can also be observed more closely through calving if they are separated from mature cows.

Point 7. Cull chronically thin cattle, old cows, and cows with teeth or health problems.

One of the most important concepts in food animal production is that a good culling program enhances profit. Income from cull cows is significant on cow/calf farms, accounting for 15 to 20% of gross income. Appropriate preemptive culling may also prevent suffering in aged or otherwise debilitated cows. The trick is to

cull a cow near the end of her productive life, but before she loses potential value as a beef animal.

Obviously, by removing potentially problem cattle from the herd, the cattle owner can avoid many problems and be able to concentrate on animals that will respond to management. With profitability in mind, older or weaker cows that remain in the herd may fail to calve or likely will raise calves that are lighter and less valuable than other calves. Such cows require more labor and could result in high veterinary costs and/or death loss as they become weaker and more susceptible to disease. Old, arthritic, and/or crippled cows cannot move about to graze as efficiently as the younger stock. They also have trouble competing with the younger and stronger cows at the round bale feeder or feed bunk.

Cattle with worn or missing front, lower incisor teeth graze less efficiently and are usually the thinnest cows in the herd. Condition of incisor teeth is easily checked annually when cattle are restrained in a headgate. Culling cows when their teeth start to show advanced wear will result in getting a good price for them. Waiting to cull cows until teeth are severely worn or missing can result in gaunt, weak cows with much lower value as meat animals. Chronically thin cows, which remain thin during time of adequate feed availability also may have other hidden illnesses or physical problems that have not been diagnosed. Such cows should be examined by the veterinarian and treated, or they should be culled.

Cows that lose weight rapidly after they calve are also often liabilities. These cows may raise large calves but are often the first to become weak and thin during times of feed shortages. Thus, these animals can become a financial drain to the cattle owner. We often hear about the thin cow that has always been a “heavy milker” and “puts too much into her calf.” Such cows are subject to various problems and often do not rebreed with the rest of the herd. Cows that are “open” when pregnancy checked have no chance of raising a calf to cover the winter feed bill. If adequate replacement heifers are available, cows that lose condition rapidly after calving may need to be culled, and certainly should be culled if they fail to rebreed.

Point 8. Re-adjust rations as calving season approaches to provide more energy and protein to pregnant cows and heifers.

As cows enter the late stages of pregnancy and begin to calve, dietary adjustments must be made to keep up with changing nutritional requirements. In the last 8 to 10 weeks of pregnancy, increased protein and energy are required by the growing calf fetus, which gains 2/3 of its birth weight in the three months before birth. Then, when cows calve, they need another increase in protein and energy intake to support milk production. As these events often occur in winter, cold, wet weather can further increase requirements.

A high percentage of cattle that fail to breed are open due to nutritional problems. When nutritionists and/or veterinarians investigate beef herds with many open cows, they often find the problem began a year earlier when diets of heifers or young cows in late pregnancy were not adjusted properly. In records from such herds, cows nursing their first or second calves are often the most severely affected, and account for most of the open cows in the group. These younger cows had incubated growing fetuses and started lactations while still needing to grow. In order to be most profitable, cows should calve the first time as 2-year olds at 85% of their adult body weight, and have second calves a year later at 95% of their mature body weight. As a result, young cows still have growth requirements that can conflict with their lactation and re-breeding requirements. Unfortunately, younger cows also are usually among the most timid cattle in the herd.

A typical case history will illustrate the point. The owner of a herd of beef cows and heifers contacted the Rollins Laboratory of NCDA & CS because of a problem with cows becoming weak near time of calving and some late gestation cows were down and too weak to get back up. The pasture was mostly warm season grasses, so it had been lush during summer but was dry and mature during late fall and winter, when most cows were in the last trimester of pregnancy. Hay was fed during colder weather to supplement the pasture, but the hay was also very low in quality and no other supplements were fed. Calving season was due to start in early February.

By the middle of February, there were several "downer" cows. This condition, occasionally seen in North Carolina beef herds, is known as pregnancy toxemia. Several calves also died from starvation because their dams were not producing enough milk. A grain supplement was added to the ration for the cows, and as a result the second half of the calving season was more successful.

Energy and protein deficiencies can have a prolonged effect on the cow herd. Cows that calve in poor body condition do not breed back as quickly. Thus, planning for the next breeding season should begin well before the calves are born this year. In our example case, poor nutrition in late pregnancy resulted in many cows that were slow to return to estrus in the spring. As a result, cows were either open, or were bred late, making them late calvers that did not fit into the herd management program. The majority of open cows were from cows nursing their first calves, as would be predicted. These young, open cows represented a great economic loss to the owner.

A suggested feeding program to prevent this problem would be as follows: About 90 days before start of the calving season, body condition should be assessed. Mature cows less than a 5 in body condition score should be separated from cows in higher body condition and supplemented with a concentrate or whole cottonseed at 3 to 5 lb/head daily and given the highest quality forage possible. The same should be done with heifers expecting their first calves or young cows expecting their second calves but they should be supplemented if less than a 6 in body condition score. This weight gain ration should contain at least 60% TDN and 11% crude protein. For cows and heifers with initially higher body condition scores, a supplement and/or higher quality hay or pasture that meets or exceeds nutritional requirements should be provided starting about 30 days before calving.

Point 9. Provide minerals at all times for the cattle based on requirements for the local area.

Minerals are a key component of a cattle nutrition program. Forages may provide the energy and protein that a cow needs, but they are almost always deficient in one or more mineral. Minerals are divided into two categories; major minerals (including salt, calcium, phosphorus, magnesium, and potassium) and trace minerals (including zinc, copper, manganese, selenium, iodine, and cobalt).

Several recent surveys have shown that the major minerals most likely to be deficient in the eastern US are salt and magnesium. The three trace minerals most likely to be deficient across the entire country are zinc, copper, and selenium. When cows are deficient in trace minerals they appear unthrifty and in poor body condition, and when they are deficient in magnesium they can die suddenly for no obvious reason. Many cows sent to the diagnostic lab in North Carolina for necropsy are diagnosed with magnesium tetany (also called grass or winter tetany), and also often have very low selenium and copper status. In other areas of the country different minerals such as phosphorus may be deficient, so local recommendations should be used in developing mineral supplementation programs.

Traditionally, cattle producers have used trace mineralized salt blocks ("red salt"), sulfurized salt ("yellow salt") or just plain white salt as their mineral program. The problem with these supplements is that the only mineral they provide in any significant amount is salt. For example, common "red salt" contains salt and some trace minerals, but does not provide magnesium or selenium, nor adequate levels of either zinc or copper.

Because of a general risk of grass tetany on high fertility pastures in the eastern US, a "high mag" complete mineral (8 to 12% magnesium) might be used at all times unless in an area where grass tetany is rare. When tetany is rare, we still recommend that producers use a "high mag" product from 30 days before the cows calve until the end of the lush growth period in late spring. For simplicity, most producers with small herds choose to use "high mag" mineral all year.

There are many "high mag" product choices on the market. Producers should buy a product that is

labeled for consumption at 4 oz/day per cow. It should have 8% or higher magnesium, at least 0.09% copper (900 ppm, from copper sulfate or chloride), at least 0.18% zinc (1800 ppm), and at least 0.0026% selenium (26 ppm). The mineral supplement should be available at all times in a covered feeder, should be kept fresh and dry, and intake should be monitored to make sure cows consume close to the recommended amount. Cows used to salt may consume a large amount of the complete mineral supplement at first but should slow intake to near target levels after several weeks. If cows don't eat enough mineral, mixing in dry molasses or grain can encourage initial consumption. If problems with over- or under-consumption continue, check with the manufacturer for advice, or switch products.

Point 10. Provide adequate shelter from wet or cold weather.

Adequate shelter refers to temporary or natural shelter. In our area, cattle should never be kept routinely in an enclosed barn. It is helpful to this discussion to introduce the concept of lower critical temperature. Critical temperature is the lowest temperature at which a cow (or any animal) does not need to expend extra energy to stay warm. Cows generate a lot of heat as they digest forages, so they can be comfortable when we feel very cold.

These are some estimated values for critical temperature for a beef cow:

Coat Description	**Critical Temperature**
Summer coat (or wet coat)	60°F
Dry fall coat	45°F
Dry winter coat	32°F
Dry heavy winter coat	19°F

As you can see, cows that are prepared for winter are well-equipped to handle lower temperatures. The criteria in this list are primarily for varying hair coats but the amount of body fat (backfat), moisture in the hair coat, and wind chill can all influence the critical temperature of cattle. Thin cattle or cows with thin or wet hair coats will need shelter and/or extra energy in the diet sooner than cattle in better condition and thicker hair coats.

As a general guideline, cows require a 1% increase in the energy in the ration for each 1°F drop in temperature below the critical temperature. Cows require a 2% energy increase for each 1°F drop in temperature during bitter cold weather or when they have a wet hair coat. Another factor that should be considered is that for every drop in temperature of 10°F below the critical temperature, there is a decrease in the digestibility of feed by 1%. During severe drops in temperature, higher quality hay, grain, whole cottonseed, or other high energy source can be used to increase the energy content of the ration.

In North Carolina, winter conditions can involve cold weather but more commonly involve moisture in the form of rain, high humidity, or occasionally snow. Common approaches for shelter in the Carolinas would be to use areas of dense woods or a hollow or other protected area for temporary shelter on wet and windy days. A man-made shelter that may be useful in fields without naturally protected areas or tree cover would be a stack of large bales strategically sited to block the north wind. Another approach is to unroll a bale of straw or low quality hay for bedding which will help break the wind and insulate cows and calves in pastures without natural windbreaks.

In wet wintry weather, cows may get mud in their hair which causes clumping and increases the critical temperature for cattle because mud (wet or dry) prevents the hair from its natural effect of shielding cattle from wind chill. Deep mud in pastures or pens also results in an extra energy requirement in order for cattle to move around. Temperatures do not often dip low enough in most of the state for mud to freeze solid and thus allow cattle more freedom of movement. Therefore, keeping cattle on pasture using extended grazing principles and rotating hay feeding areas will help prevent mud from becoming a major problem.

Grazing also results in an increased requirement for energy in the diet compared to drylot feeding. It

requires energy to move around the pasture to find feed, particularly in sparse, or short winter pastures. Also, increased wind chill may occur in open pasture. Energy costs depend on how far cattle have to walk between grazing areas, water sources, and supplemental feeding locations, and how much natural windbreak is present in the pastures.

Keep plenty of fresh water available at all times! Water supplies should be kept open when troughs, ponds or streams could be frozen and prevent the cows from drinking. Depressed water consumption will decrease the intake and digestibility of feed thus reducing the effect of otherwise high quality feed. In addition, a fatal condition known as impaction of the abomasum is occasionally seen during the most critical cold weather when water is unavailable. Cattle with access to ponds should be observed closely, and ice should be broken as necessary so that cattle do not wander out on the frozen pond surface and break through, resulting in great losses.

Summary. This publication has been written as a response to a need in the cattle industry for better attention to proper winter feeding and management. All producers can benefit from fine tuning their management, and a small but significant number of producers severely underfeed their animals each winter. By improving management and feeding practices, we hope to improve the overall husbandry of beef cattle, and to decrease concerns and complaints from the general public about the rare but conspicuous cases of malnutrition. Additional advice may be sought through the Department of Animal Science at North Carolina State University, North Carolina Cooperative Extension county offices, the College of Veterinary Medicine at North Carolina State University, Rollins Animal Disease Diagnostic Laboratory, or through local large animal veterinary practitioners. As you consider developing or improving your management skills, we urge you to contact your local veterinarian and extension agent about health and feeding programs for cattle, as they are your most valuable sources of information about herd management, feeding and disease prevention.

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