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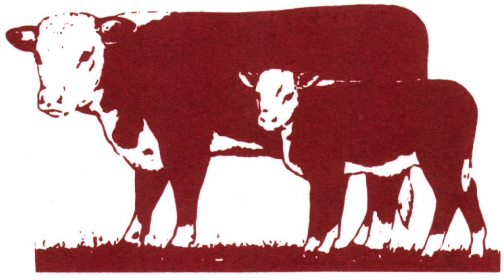

MICHIGAN BEEF PRODUCTION

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Feeding Corn Silage to Beef Cow Herds

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Generally speaking, corn silage as a feed for beef cow herds has the following characteristics:

1. Corn silage is fed to cows primarily for its energy content, not for its protein, minerals or vitamins.
2. Because of its relatively high energy value it must usually be limit-fed to mature dry beef cows. If not, they will become too fat and the cost of wintering them will be too expensive.
3. The energy content of corn silage is ideal for developing young stock, and for meeting the needs of the lactating cow.
4. Crude protein content is considered marginal for the mature dry cow and inadequate for other classes and ages of beef cattle.
5. Corn silage is variable in its content of calcium, phosphorus and certain other minerals. Therefore, it should not be considered a dependable source of mineral elements.
6. High-quality, properly stored corn silage is relatively high in vitamin A activity. However, low-quality, poorly fermented corn silage is not a dependable source of vitamin A for cow herds.

There is abundant evidence showing that no other crop rivals corn silage in energy yield per acre on fertile land that is well-adapted to corn production. Therefore, in southern lower Michigan and other Corn Belt states, corn silage is a viable option as a feed for beef cow herds if the machinery and facilities for growing, harvesting, storing and feeding it are already an integral part of the overall farm enterprise.

However, starting from scratch and making an initial investment of this magnitude for the sole purpose of feeding silage to a beef cow herd is highly questionable unless part or all of the following conditions are met: (1) The cow herd should be well above average in size. In the United States, average herd size is under 50 cows. (2) The land and growing season should be adapted to generating high corn silage yields. (3) Cattle prices should be on the rising side of the beef cycle so that opportunity exists for recovering the initial investment in a reasonable period of time. (4) The genetic make-up of the herd should be of a kind that can make maximum use of a high energy feed such as corn silage. (5) Feeding out the calf crop should be considered as a possible marketing alternative. (6) Purebred herds must usually be kept in better condition than commercial herds, which makes a corn silage program more feasible for them. (7) Treating the silage with an NPN compound should be considered as a means of reducing supplemental protein costs, especially in those years when soybean meal is high-priced.

In many areas of the country, beef cows are kept on less valuable land that is marginal in its ability to produce anything but grass for ruminants. Gearing up for corn silage production in such areas is either impossible, or impractical at best. In other regions, such as northern Michigan, the growing season is short, which makes corn production a risky proposition. However, recent development of higher-yielding early-maturing hybrids may make corn silage more feasible in such areas.

Meeting Nutrient Requirements with Corn Silage Diets

Following is a discussion of the nutrient requirements of various classes of beef cattle, and corn silage-based rations to meet these requirements. In all cases, a salt-mineral mix should be provided on a free-choice basis so as to make up for the mineral deficiencies in corn silage. If silage quality is low, supplemental vitamin A should either be fed or injected. Vitamin A injections last for 90 to 100 days. From 1 to 3 million IU should be injected intramuscularly. If you are in doubt about the nutrient content of your silage, contact your local extension office about submitting a sample for analysis.

1,100-lb. Mature Dry Pregnant Cows, Mid-Pregnancy

Most beef cows in the Northern states calve in late winter or spring, from approximately February 15 to May 15, although a few herds drop their calves as early as January. This generally means that beef cows are bred in May, June and July. Their calves are weaned in the fall and mid-pregnancy co-incides with the early part of the winter feeding period—November, December, January. During this time, the nutrient requirements of the breeding herd reach their low point. The average mature cow in good condition simply needs to maintain her weight and the fat cow can even lose some weight. The thin cow, however, should gain some weight. The following minimum daily allowances will maintain the weight of an 1,100-lb. mature pregnant cow in average condition:

TDN (total digestible nutrients): 8.6 lbs.
Crude Protein: 1.0 lb.
Calcium: 13 grams
Phosphorus: 13 grams
Vitamin A: 20,000 IU

A daily corn silage dry matter (DM) intake of 12.3 lb. will provide approximately 8.6 lb. of TDN (assuming a TDN value of 70% for high quality corn silage). If the silage averages 30% DM, daily allowance of fresh silage should be 41 lb.; for 35% DM silage, 35 lb.; for 40% DM silage, 31 lb.

If the 12.3 lb. of corn silage DM averages 8% in crude protein (CP), daily intake of CP will be 0.98 lb., which barely meets the requirement. If the silage analyzes significantly lower than 8%, some form of supplemental CP should be provided.

Normally, 12.3 lb. of corn silage DM will provide at least 15 gm. calcium and 13 gm. phosphorus, which meets the requirements listed above. However, as mentioned before, a calcium-phosphorus source such as bonemeal or dicalcium phosphate should be offered free-choice so as to be absolutely safe.

Unless the corn silage is of poor quality, it will meet the vitamin A requirement of 20,000 IU per day.

1,100-lb. Mature Dry Pregnant Cows Late Pregnancy

During the last 60 to 90 days of pregnancy, the brood cow should be on a slightly rising plane of nutrition. The minimum daily requirements for the 1,100-lb. cow in average condition during late pregnancy are:

TDN: 10.0 lb.
Crude protein: 1.1 lb.
Calcium: 15 grams
Phosphorus: 15 grams
Vitamin A: 24,000 IU

To meet her energy requirement, 14.3 lb. of corn silage DM should be fed. Fresh silage intake would be 48 lb. for 30% DM silage, 41 lb. for 35% DM, or 36 lb. for 40% DM silage.

An allowance of 14.3 lb. of corn silage DM would supply about 1.15 lb. crude protein, 18 gm. calcium and 15 gm. phosphorus, which would barely meet the cow's requirements for these nutrients.

Coming 2-Year-Old Pregnant Heifers

The nutrition of the 2-year-old heifer is critical because she is still growing while developing a fetus and undergoing the stress of her first lactation. She should be fed to gain about 1.0 lb. per day during the last 120 days of pregnancy. Her minimum daily nutrient requirements are as follows:

TDN: 10.0 lb.
Crude protein: 1.5 lb.
Calcium: 16 grams
Phosphorus: 16 grams
Vitamin A: 25,000 IU

The following levels of corn silage will meet the pregnant heifers' minimum daily TDN requirement: 48 lb. at 30% DM, 41 lb. at 35% DM, or 36 lb. at 40% DM. These silage levels will furnish approximately 14.3 lb. of dry matter, which will in turn provide 10.0 lb. of TDN if one assumes a TDN level of 70% in the silage dry matter. This amount of silage dry matter will provide about 1.15 lb. crude protein, 18 gm. calcium, and 15 gm. phosphorus. Therefore, 0.35 lb. of supplemental crude protein must be fed daily. This would be equivalent to about 0.8 lb. of 44% CP soybean meal or 3 lb. of 12% CP mixed legume-grass hay.

Weaned Heifer Calves

Heifer calves wintered for their first time should gain 1.0 to 1.5 lb. per day from weaning in the fall until they go to the breeding pasture the following spring. An average of 1.25 lb. per day is a reasonable goal for which to strive. This rate of development should permit them to be bred at 14 to 15 months of age so that they will calve for the first time at 2 years. Large-framed, later-maturing exotic crossbred heifers should probably gain closer to 1.5 lb. per day. The approximate daily requirements for wintering the heifer calf are as follows:

TDN: 9.5 lb.
Crude protein: 1.5 lb.
Calcium: 17 grams
Phosphorus: 15 grams
Vitamin A: 15,000 IU

A level of 13.6 lb. of corn silage dry matter will be needed to meet her TDN needs. This would be equivalent to the following daily allowances: 45 lb. at 30% DM, 39 lb. at 35% DM, or 34 lb. at 40% DM. This level of corn silage dry matter will furnish approximately 1.1 lb. crude protein, 17 gm. calcium and 14 gm. phosphorus. This falls 0.4 lb. short of the crude protein requirement, which would be equivalent to about 1.0 lb. of soybean meal. As with all other age groups of cattle, a salt-mineral mix should be offered free-choice and supplemental vitamin A provided if silage quality is questionable.

1,100-lb. Lactating Cows, Average Milking Ability

After her calf is born, the cow's nutrient requirements are significantly increased. An average British cow (Angus, Hereford, etc.) will produce about 10 to 12 lb. of milk in early lactation. In order for the average 1,100-lb. cow to produce this level of milk and get back in shape for the breeding season, the following minimum daily requirements must be met:

TDN: 12 lb.
Crude protein: 2.0 lb.
Calcium: 27 grams
Phosphorus: 27 grams
Vitamin A: 24,000 IU

To meet her TDN requirement, she will need 17.1 lb. of corn silage dry matter. This can be provided by the following levels of intake: 57 lb. at 30% DM, 49 lb. at 35% DM, or 43 lb. at 40% DM. This level of dry matter intake will furnish about 1.35 lb. crude protein, 22 gm. calcium, and 18 gm. phosphorus. The crude protein level falls 0.65 lb. short of her requirements, which is equivalent to about 1½ lb. of soybean meal or 5½ lb. of 12% CP mixed hay.

1,100-lb. Lactating Cows, Superior Milking Ability

If the cow is an above average milker she should receive the following minimum requirements:

TDN: 15 lb.
Crude protein: 2.8 lb.
Calcium: 39 grams
Phosphorus: 37 grams
Vitamin A: 38,000 IU

This cow needs 21.4 lb. of corn silage dry matter to met her TDN requirement. This is provided by the following silage levels: 71 lb. at 30% DM, 61 lb. at 35% DM, or 54 lb. at 40% DM. An intake of 21.4 silage DM will furnish approximately 1.7 lb. crude protein, 27 gm. calcium, and 22 gm. phosphorus. This falls 1.1 lb. short of her crude protein requirement, which could be met by supplementing with 2½ lb. soybean meal equivalent or 9 lb. 12% CP mixed hay. It is also very important to provide a salt-mineral mix at all times, because the lactating cow's mineral requirements are 2- to 3-fold those of the dry cow.

Mature Herd Sires

In order to get back in shape for the coming breeding season, the mature herd sire requires the following:

TDN: 16.5 lb.
Crude protein: 2.4 lb.
Calcium: 23 grams
Phosphorus: 23 grams
Vitamin A: 48,000 IU

His energy requirements are about the same as that of a heavy milking lactating cow, and can be met by feeding 23.5 lb. of corn silage dry matter. The levels of fresh silage needed to provide this much dry matter vary from 59 to 78 lb. depending upon moisture. A silage DM intake of 23.5 lb. falls 0.5 lb. short of the mature bull's crude protein requirement. This is equivalent to 1.2 lb. soybean meal or 4 lb. mixed hay.

Young Herd Sires (Yearlings and 2-Yr.-Olds)

Because he is still growing and developing, the young bull's nutrient requirements are just as high as those of the mature bull even though he is smaller in body size. They are essentially the same as those listed above for the mature bull:

TDN: 16.5 lb.
Crude protein: 2.4 lb.
Calcium: 23 grams
Phosphorus: 23 grams
Vitamin A: 48,000 IU

TABLE 1. WINTER BEEF BUDGET FOR A 100-COW BEEF HERD USING CORN SILAGE AS THE ENERGY SOURCE.

			30% DM Corn silage			Soybean Meal Equivalent				
	No. Head	No. Days	Lb/head per day	Herd Total for Winter, T	Total/Cow Unit, T	Lb./Head per Day	Herd Total for Winter/lb.	Total/Cow Unit, lb.	Herd Total Salt-Min/lb.	Salt-Min./ Cow Unit/lb.
Pregnant mature cows	80	120	45	216.0	2.16	—	—	—	1,440	14.4
Lactating mature cows	80	60	70	168.0	1.68	2.0	9,600	96.0	720	7.2
Pregnant 2-yr.-old heifers	20	120	50	60.0	0.60	0.8	1,920	19.2	360	3.6
Lactating 2-yr.-old heifers	20	60	70	42.0	0.42	2.0	2,400	24.0	180	1.8
Open yearling heifers	25	180	45	101.0	0.10	1.0	4,500	45.0	675	6.8
Mature herd sires	3	180	80	21.6	0.22	1.2	648	7.6	81	0.8
Young herd sire	1	180	80	7.2	0.07	1.2	216	3.6	27	0.3
TOTAL	---	---	—	615.8	6.15	—	19,284	192.8	3,483	34.8

Corn Silage Budget for a 100-cow Beef Herd

Table 1 is an estimated feed budget for wintering a 100-cow beef herd on a corn silage-based diet. In developing this budget, the following assumptions are made: (1) a total winter feeding period of 180 days; (2) the herd is lactating during the last 60 days of the winter feeding period; (3) half of the cows are average milkers, half are heavy milkers; (4) 25 open yearlings are kept as herd replacements; (5) the pregnant herd consists of 80 mature cows and 20 coming 2-year-olds; (6) average consumption of a free-choice salt-mineral mix is assumed to be 0.15 lb. per head per day.

As shown in Table 1, it takes about 6.1 T. of corn silage per cow unit to winter a herd consisting of 100 producing cows, 25 yearling replacement heifers and 4 herd sires for 180 days. In addition, it takes about 200 lb. of soybean meal equivalent and 35 lb. of a salt-mineral mix. Assuming the herd goes to pasture for the remaining months, it would take an additional 3,580 lb. of salt-mineral mix or about 36 lb. per producing cow to maintain the entire herd for one year.

NPN as Supplemental Crude Protein

Non-protein nitrogen (NPN) compounds such as urea, ammonia, etc. are usually more economical sources of crude protein than natural sources such as soybean meal. NPN is particularly well utilized on corn silage based diets. Therefore, treating the silage with NPN or feeding a supplement formulated with NPN as the major contributor of crude protein is often a recommended practice.

When treating silage with NPN, care must be taken to apply the correct amount. If in doubt, submit several representative samples of treated silage for crude protein analysis to be certain that the desired level of treament is attained. Generally, the silage should be treated so that the dry matter contains at least 10.5% crude protein.

Free-choice lick tank supplements are a convenient and popular means of supplementing cow herds. However, over-consumption is sometimes a problem, which can result in undue expense. Therefore, lick tanks should be watched closely for signs of over-consumption. They should be placed well away from the water source.

Effect of Cold Stress on Winter Feed Requirements

The nutrient requirements and feed allowances presented above are valid for environmental temperatures that fall within the normal comfort zone for cattle of 30° to 80°F. When the wind chill factor falls below 30°F, energy requirements increase accordingly. Extremely low temperatures combined with wind can increase winter feed requirements by 20 to 60%. As a rule of thumb, every 10° drop in wind chill factor below 30°F increases the daily TDN requirement by about 10%. One or two days of cold stress are little cause for concern, but during extended periods of cold winter weather, the corn silage allowances listed previously should be increased by at least 20%. Thin cattle and those with sparse haircoats require even more energy than fleshy cattle to maintain their body weight in cold weather.

Other Considerations in Feeding Corn Silage

How to Feed Silage

Although some producers feed corn silage to their cows on the ground, it is generally not an advisable practice because of the wasteage involved and because it is difficult for the cattle to avoid consuming manure and other filth, especially if the silage is limit-fed. Ideally, silage should be fed in bunks or through a feeding fence placed at the end of a bunker silo. A feeding fence has the advantage of saving labor but the

disadvantage of being difficult to effectively control consumption. A 14-foot portable bunk may be constructed from 2-inch lumber at a cost of approximately $150. A 100-cow herd would require approximately 10 of these bunks in order to have enough feeding space for all cows, heifers and bulls. Mature cattle need about 30 inches, yearlings 24 inches, and calves 18 inches of linear bunk space per head if they are to all eat at one time. For plans on constructing bunks, consult the Beef Housing and Equipment Handbook (MWPS-6), which may be purchased through your local extension office.

For good nutritional management, the herd should be divided into the following groups: (1) open yearling heifers; (2) 2-year-olds, thin 3-year-olds and old thin cows; (3) the remainder of the pregnant herd; (4) herd sires.

Problems in Feeding Corn Silage

Overfeeding is a problem often encountered when corn silage is fed to mature dry cows. A level of 40 to 50 lb. does not fill them up. Consequently, they tend to act restless and dissatisfied, and there is a natural tendency on the part of producers to feed them more than is needed. As a result, they may become too fat, which is not only wasteful of feed but can also lead to calving difficulty and fertility problems.

Some cattlemen believe that feeding corn silage lowers the fertility of a cow herd. There is no research evidence to support this belief when the silage is fed at proper levels. However, overfeeding can prove to be detrimental, as mentioned above.

Corn Residue Silage

In recent years, there has been considerable interest in making silage out of corn residue, which consists of the stalks, leaves, husks, cobs, etc. after the grain has been harvested. The ensiled material is often referred to as "stalklage" or "stover silage." For best results, the following harvesting and storage procedures should be adhered to:

1. Harvest as soon as possible after grain harvest; within 2 to 3 days if possible.
2. Harvest early in season to maximize nutrient recovery.
3. Maintain moisture above 60%. Add water if necessary.
4. Chop fine. Equip forage harvester with a recutter screen or put a recutter attachment on the blower.
5. Pack well and cover silo to reduce storage losses.

Expected dry matter yields may vary from 2.0 to 3.0 T. per acre in a good corn year and from 0.5 to 2.0 T. per acre in a poor year. Over several years time, you can expect to average about 2 T. of dry matter per acre. AT 65% moisture, this would be 5.7 T. of "as fed" stalklage per acre.

There are three primary ways in which corn residue silage is harvested: (1) forage harvester with a flail pickup; (2) the "Foster" attachment for collecting husklage from the rear of a corn combine, leaving the stalks *per se* in the field; (3) the "John Deere Stalker," a row-crow attachment for forage harvesters, designed to follow after grain harvest and more efficiently gather the residue that remains.

If stover silage is properly harvested immediately following grain harvest, dry matter intake, dry matter digestibility, crude protein, calcium and phosphorus are usually higher than is the case with dry stover stacks. Daily dry matter intake for a mature cow will generally average at least 15 lb. per day and may go as high as 20 lb., depending upon the palatability of the stover silage. Estimated TDN will range from 45 to 50% on a dry matter basis. Percent of crude protein, calcium and phosphorus are approximately 5.0%, 0.35% and 0.14%, respectively, on a dry matter basis.

Because of its relatively low energy content, use of residue silage should normally be restricted to the mature dry pregnant cow. It is not recommended as the primary feedstuff for young cattle or for lactating cows unless it is fed in combination with other feedstuffs. Systems for supplementing corn stover silage are presented in Table 2, which assumes a daily dry matter consumption of 18 lb. for an 1,100-lb. dry cow. At this level of consumption, there is need for supplemental protein, phosphorus and Vitamin A. Lick tank supplements based on urea, molasses and minerals are also a possibility; however, they should be monitored to make certain that there is neither under nor over-consumption.

Consult Extension Bulletin E-1585 for detailed information on utilizing corn residue.

TABLE 2. SUPPLEMENTING CORN STOVER SILAGE FOR 1,100-LB. DRY COW

	TDN, lb.	CP, lb.	Ca, gm.	P, gm.	Vit. A, IU
Required by cow daily	8.6	1.0	13	13	20,000
Supplied by 18# silage DM[1]	9.0	0.9	29	11	0
Daily deficit	—	−0.1	—	−2	20,000
Possible supplements:[2]					
(1) 2# mixed hay	1.0	0.22	7	2	10,000
(2) 1.5# corn	1.2	0.13	0	2	1,000
(3) 1# hay + 1# corn	1.3	0.20	4	3	5,700

[1] *Assuming 50% TDN, 5.0% CP, 0.35% Ca, and 0.14% P in dry matter.*

[2] *Phosphorus and vitamin A should be furnished when supplements are inadequate.*

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