Extension FactSheet

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Using Corn for Livestock Grazing

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Why Graze Corn?

As livestock producers try to reduce their cost of production, many look at ways to reduce their feed cost. Feed costs have been identified as the largest single cost of livestock production, making up 50 to 70% of the total cost of production. To reduce feed cost, producers are exploring options to extend the grazing season. Typically, corn *(Zea mays* L.) is grown and harvested by livestock producers for either grain or silage. But corn is a grass, a very tall grass, and the grazing of standing corn can be a viable alternative forage in some operations.

Corn provides several options to livestock producers. As an annual, it is extremely flexible as to when it can be grazed. It has been used successfully during the summer, fall, and even winter. Using livestock to graze corn reduces the need for investment in harvest and feeding equipment. With the potential to produce more than 10 tons of forage dry matter to the acre, few annual crops can compare to corn in terms of dry-matter (DM) yield per acre and cost per pound of gain.

Figure 1. Grazing cattle on corn offers livestock producers a way to reduce their production costs. Because corn is a grass, it offers a viable alternative as a forage source.

What Corn Can I Graze?

Any corn hybrid can be grazed. If the field is only intended for grazing and not grain production, then the selection should be narrowed to hybrids bred for silage or grazing. These have been bred for high forage yields, high digestibility, low fiber levels, and high fiber digestibility. Hybrid selection should start with identifying a group of hybrids that are adapted to the area in terms of days to maturity, disease and insect resistance, drought tolerance, and tonnage.

How Should I Grow Corn That Will Be Grazed?

Corn, being a warm-season annual grass, can be planted as it would be for grain or delayed as producers would for corn silage. Most corn in Ohio is planted early May to early June, but corn planted for grazing can be planted up to July 1. Early planting will produce more dry matter per acre than later-planted corn. See the *Ohio Agronomy Guide*, Bulletin 472, and *Corn Silage Production, Management, and Feeding*, North Central Regional Publication 574, for more information on producing corn.

Table 1. Corn Silage Nutrient Composition (Dry Matter Basis).

	Immature < 25% DM	Normal 32-38% DM	Mature > 40% DM
Total Digestible Nutrients (TDN) %	65.6	68.8	65.4
Crude Protein (CP) %	9.7	8.8	8.5
Neutral Detergent Fiber (NDF) %	54.1	45.0	44.5
Acid Detergent Fiber (ADF) %	34.1	28.1	27.5
Calcium %	0.29	0.28	0.27
Phosphorus %	0.24	0.26	0.25

Source: NRC Nutrient Requirements of Dairy Cattle. 2001.

When planting corn no-till or into a sod field, a planter box seed treatment should be used to control wire worms, seed corn maggots, and other corn insects. Care should be given to the types and amounts of herbicide used when planting grazing corn. Since this corn is to be grazed, there is usually no need for applications of post-emergent herbicides. Early-season weed control can be achieved with preemergence or pre-plant incorporations of herbicides. Late-season weed control may not be an issue since this can be accomplished by the grazing animal. The current edition of the *Weed Control Guide for Ohio Field Crops*, Bulletin 789, contains a listing of grazing restrictions for different corn herbicides. Check current labels for grazing, harvest, and replanting restrictions prior to herbicide use.

Where Does Corn Fit in a Grazing System?

Standing corn has the nutritive composition to meet the requirements for many categories of livestock (Table 1). Stocker cattle, beef heifers, and cows have excellent weight gains grazing corn. Dairy farmers have utilized corn, through grazing, to feed dairy cows and dairy heifers for breeding. Sheep, goats, and swine have all been used to graze corn successfully.

From the animal's nutritional standpoint, grazing immature corn is similar to grazing other summer annual forages. The big difference comes when the plant reaches maturity. As seen in Figure 2, with corn, the loss in the feed value of the forage (leaves and stalk) is compensated by the grain produced. This is different from other forages where the feed value declines once the plant reaches maturity. The main decision for graziers is deciding when additional forage is needed in their systems.

Most of our pasture grasses are cool-season grasses that have reduced growth rates or go dormant during the hot summer months of late June through early September. Traditionally, producers have planted grazing corn as they would for corn silage, planting corn in May or early June and grazing it 70 to 90 days following planting. Harvesting corn by grazing may take place from 30 to 100 or more days following planting.

Local producers have had success grazing sheep early on grazing corn when corn plants are 18 inches tall or less. They rotate the sheep quickly to protect the growing point (3 to 4 inches above the ground) and rotate back into the corn later in the summer.

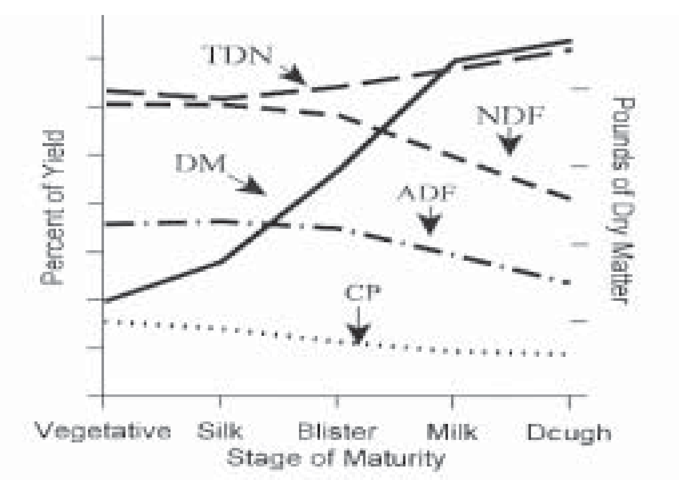

Figure 2. Expected quality trends of corn as affected by maturity. Adapted from Baldridge. 2000.

Corn can also be grazed during that mid-summer slump that occurs when the temperatures are hot and/or the moisture is short, which usually occurs in late July and early August. This late summer to early fall grazing allows them to stockpile their perennial pastures for late fall/early winter grazing.

Corn may also be grazed extremely late in the season, providing needed energy and shelter during the fall and winter months. Typically, the corn plant loses some leaves, and stalks begin to break down as the seasons progress. This causes a loss in digestible nutrients and protein. However, the remaining stalks, leaves, and grain are still excellent supplental feed for over-wintering beef cows, stockers, and growing animals.

Depending on the type of livestock used, producers may have to supplement to compensate for lower protein levels. Standing mature corn has been successfully utilized for finishing hogs. One-hundred-twenty-five-pound pigs at a stocking rate of 12 to 16 per acre can produce 1,500 to 2,000 pounds of pork.

How Do You Graze Corn?

In most instances, corn is strip-grazed, and livestock are allowed only enough forage for two to three days by utilizing an electrified temporary fence. The fence should have a minimum of two strands with temporary posts placed about 30 feet apart. At least two strands are recommended to prevent livestock from reaching through or over the fence and to prevent the fence from grounding out if a corn stalk falls over the fence. For the fence row, corn rows are typically mashed down with a four-wheeler, and the fence is placed in the middle of the swath.

The height of the corn needs to be evaluated when setting up the fence. Livestock can knock the corn down as they move through the paddock. This could short out the fence and make controlling the livestock difficult. Allow enough room so that falling corn stalks cannot reach the fence.

To aid in controlling livestock, corn could be planted perpendicular to the grazing line so that the animals can move into the row easily to minimize trampling. The four-wheeler is then driven across the rows rather than up and down the rows. The livestock should be given a grazing area that allows the livestock to efficiently clean up the grazed corn without excessive trampling. A good fence energizer that is adequately grounded is a requirement to prevent livestock from crossing the line and trampling and wasting corn in the rest of the field.

Livestock generally clean up the grazing area well. Monitor the field for wastage. If the livestock are not cleaning up the area being grazed, including the corn stalks, too much feed is being allotted, and the grazing area should be reduced. Livestock commonly prefer to graze the leaves and grain first, leaving the corn stalks for last.

If grazing is started before the corn is mature, then the size of the area needs to be adjusted each time the fence is moved. As the corn matures, there will be more dry matter per unit area each day, so the grazed area needs to be reduced each time the fence is moved.

Figure 3. In most instances, corn is strip-grazed. An electrified temporary fence allows livestock only enough forage for two to three days.

Some producers utilize the standing corn as a green chop. They mow down rows with a silage chopper or brush hog leaving the forage on the ground. Enough corn is cut for a few days of feeding, and a fence is placed to protect the standing corn. They cite greater stalk utilization and ease of controlling the livestock as benefits. However, using corn in this way greatly increases equipment needs and cost.

How Much Corn Do I Need?

The rumen of beef and dairy animals develops at around 400 to 500 pounds. Cattle smaller than 400 pounds should not be fed grazing corn extensively until their rumen is fully developed. A fully functioning ruminant animal will consume 2.5 to 3.0% of its body weight in dry-matter feed per day. So a 1,000-pound beef cow will consume 2.5 to 3.0% of her body weight or about 25 to 30 pounds of dry-matter feed per day.

Determining the Daily Grazing Area Needed

Assume that you have a 30-cow beef herd with an average weight of 1,000 pounds each. How large a grazing area do they need daily? Assume a mature corn field with 12,000 pounds of dry matter per acre, 75% grazing efficiency, 12% protein, and 24,000 plants per acre. A typical corn field will yield 20 tons of wet corn silage at 70% moisture (30% dry matter) or 12,000 pounds of dry matter.

The daily pounds of dry matter required is equal to the average weight of the animals multiplied by the feeding rate as a percent of their body weight multiplied by the number of animals.

No. Cattle	x	Avg. Wt.	x	% Feeding Rate	=	Daily Pounds of Dry Matter Required
30	x	1,000	x	3.0%	=	900 Pounds of Dry Matter Required Daily

However, grazing efficiency must be considered. Animals will waste or trample some feed. Typically, 60% to 90% grazing efficiency can be achieved. Grazing efficiency increases when livestock have a shorter time to feed. Ideally, livestock should be fed only what they can consume in one day, which limits wastage due to trampling. However, feeding rates of up to three days of grazing corn at one time have been achieved with higher wastage but less labor. For the example, a 75% grazing efficiency on 900 pounds of dry matter translates to 1,200 pounds of effective dry matter needed daily.

$$\frac{\text{Daily Pounds of Dry Matter}}{\text{Percent Grazing Efficiency}} = \text{Effective Dry Matter Needed Daily}$$

$$\frac{\text{900 Pounds of Dry Matter}}{\text{75\% (0.75) Grazing Efficiency}} = \text{1,200 Pounds of Effective Dry Matter Needed Daily}$$

How large an area is required to graze 1,200 pounds of dry matter with an actual consumption of 900 pounds? Assuming a typical yield of 12,000 pounds of dry matter per acre, and 1,200 pounds required daily, the 30 head of cattle will consume about 1/10 of an acre.

$$\frac{\text{Daily Pounds of DM}}{\text{Pounds of Dry Matter per Acre}} = \text{Portion of Acre Needed to Feed Livestock}$$

$$\frac{\text{1,200 Pounds Daily}}{\text{12,000 Pounds Dry Matter Per Acre}} = \text{1/10 or 0.10 of an Acre Daily}$$

How large of an area is 1/10 or 0.1 acre? This area can be calculated based on the following formula:

Portion of Acre Needed to Feed Livestock	x	Square Feet in an Acre	=	Square Feet of Grazing Area Needed
1/10 of an acre	x	43,560 square feet in an acre	=	4,356 square feet of grazing area

Alternative Calculation

Since there was a corn population of 24,000 and 12,000 pounds of dry matter per acre, each corn plant has approximately 1/2 pound of dry matter per plant. For 900 pounds of dry matter needed daily, approximately 1,800 corn plants are needed divided by 75% effective grazing or 2,400 effective corn grazing plants needed. If there are 100 corn rows being harvested in a strip perpendicularly, about 24 corn plants from each row need to be strip grazed daily to equal 1,200 pounds of effective dry matter with 900 pounds of dry matter actually consumed by 30 cows who weigh 1,000 pounds each and consume 3% of their body weight daily.

Formula for Calculating the Number of Acres to Plant for Your Livestock

Assume that you want to feed a 30-head cow herd, weighing an average of 1,000 pounds, for 60 days in the fall. Assume 75% grazing efficiency. How many acres of corn do you need to plant?

$$\frac{\text{Daily Effective Grazing Area} \times \text{No. of Days of Feed Needed}}{\text{Square Feet in 1 Acre}} = \text{Acres of Corn}$$

$$\frac{\text{4,356 Square Feet of Effective Grazing Daily} \times \text{60 Days}}{\text{43,560 Square Feet per Acre}} = \text{6 Acres of Corn}$$

Alternative Calculation

$$\frac{\text{Effective Grazing Plants Needed Daily} \times \text{Days of Feed Needed}}{\text{Corn Pop. per Acre}} = \text{Acres of Corn}$$

$$\frac{\text{1,200 Effective Grazing Plants} \times \text{60 Days}}{\text{24,000 Plants per Acre}} = \text{6 Acres Corn}$$

Estimating Dry Matter Yield

Calculations at planting time depend on estimates as shown in the previous examples. At harvest time, dry-matter yields of corn will vary, so it is important to measure samples of the field to get actual yield estimates. Then, recalculate the daily area allowance accordingly.

To determine dry-matter yield, both total weight and moisture content must be estimated. To estimate weight, measure off row lengths that equal 1/1,000 of an acre. This distance depends on the row width (Table 2). Cut all the plants in that distance and weigh. Average the weights from four to six areas in the field. Multiply the average by 1,000 to get the weight per acre. To get dry-matter yield, the total weight must be multiplied by the percentage of dry matter (100% moisture) in the plants. There are several ways to measure moisture in plants—commercial moisture testers, microwave ovens (see *Using a Microwave Oven to Determine Forage Moisture*, AGF-004-90), and lab analysis.

How Much Will It Cost?

Livestock feeding cost from the grazing of corn can be viewed several different ways. The most typical way is from the direct expenses needed to grow and graze the corn. As is the case with all grazing programs, determining the true value must be done on a case-by-case basis. In this example, the cost to grow and feed the corn totals $150 per acre, labor not included. If you assume that an acre will produce at least five tons of dry matter, then the cost per ton equals $30. This includes the costs of seed, fertilizer, herbicide, equipment usage, fence, water systems, and land charge.

Table 3 shows the average cost of establishing corn for grazing during three years at the Eastern Ohio Resource Development Center (EORDC), near Belle Valley, Ohio. Table 4 is an estimate of the cost incurred in harvesting the corn through grazing.

From 1988 to 1998, the 10-year average cost for baled hay was $70 per ton, which does not include the costs associated with feeding. So the savings for producers would be more than $40 a ton.

The cost of grazing corn can be broken down into cost per head per day. We know that a mature cow will consume from 2.5 to 3% of her bodyweight in dry matter each day. If that cow weighs 1,000 pounds, she would eat between 25 to 30 pounds of dry matter per day. At that rate, one ton of hay or corn would provide feed for about 66 days for that one cow. Assuming the market value of the hay is $70 per ton, then the hay would be $1.06 per head per day. The cost of the corn would be $0.45 per head per day. This equals a savings of $0.61 per head per day or 58% of the cost of feeding hay.

Are There Any Special Considerations?

Several health concerns need to be considered before selecting this option. Corn may contribute to founder or nitrate poi-

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Figure 4. A mature cow will consume from 2.5 to 3% of her bodyweight in dry matter each day. If that cow weighs 1,000 pounds, she would eat between 25 to 30 pounds of dry matter per day.

Table 2. Length of Row Required for 1/1,000 Acre at Various Row Widths.

Row Width (in.)	Length of Row for 1/1,000 A
15	34 ft. 8 in.
20	26 ft. 2 in.
28	18 ft. 8 in.
30	17 ft. 5 in.
36	14 ft. 6 in

Source: *Ohio Agronomy Guide*, Bulletin 472.

Table 3. Average Cost of Establishing Corn for Grazing at the Eastern Ohio Resource Development Center, Caldwell, Ohio, During 1997-1999.*

Expense	$/acre
Land	30
Fertilizer	41
Herbicide	8
Spraying	7
Planter Rental	12
Seed Cost	28
Total	126

* Does not include a charge for labor and management.

Table 4. Estimated Cost of Grazing Standing Corn.*

Expense	$/acre
Fencing[1]	9
Water System[2]	8
Equipment Usage[3]	7
Total	24

* Cost estimated for 10 acres; does not include labor.
[1] Using two strands poly tape, temporary posts every 30 ft., and a battery charger for perimeter and break fence, amortized for 10-year life.
[2] Temporary water system with 1-inch water line, one tank, and three risers, amortized for 10-year life.
[3] Use of four-wheeler to knock down corn.

Table 5. Level of Nitrate in Forage and Potential Effect on Animals.

Nitrate ppm (Dry Matter Basis)	Effect on Animals
< 1,000	Safe.
1,000 - 2,000	Generally safe; limit use to 50% total ration for pregnant animals.
2,000 - 3,400	Limit use to 50% total ration for non-pregnant animals; do not feed to pregnant animals.
3,400 - 4,000	Limit use to 25% total ration for non-pregnant animals.
4,000 +	Potentially Toxic – Do not feed.

Source: Eastridge, M. and Weiss, W. 1999.

soning. Founder can be prevented by gradually getting the animals used to their new diet. Initially feeding hay, limiting the amount of corn grazed, or offering alternative pasture with the corn are ways to prevent founder. High nitrate levels have been documented in drought-stressed grazing corn at EORDC. Check nitrate levels before grazing stressed corn (Table 5).

Prussic acid poisoning is associated with shattercane and johnsongrass which may be present as weeds in corn fields. If these weeds are present, then do not graze frosted fields. Wait several weeks following a killing freeze before grazing to prevent prussic acid poisoning.

Summary

Plant alternative forages for the right reasons—because you need more forage or you want to renovate a field. Do all that you can to best utilize existing perennial forages before planting an alternative annual forage. Determine when additional forage is needed and the quality and amount needed before planting alternatives. Consider the grazing behavior of the livestock species utilizing the forage and the nutritional requirements for that species. Finally, discuss the options with a member of the Integrated Forage Management Team. Contact your local Extension office for more details.

Special Thanks

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Figure 5. Consider the grazing behavior of the livestock species utilizing the forage and the nutritional requirements for that species.

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