

Grazing Cornstalks

A Decision Support Tool to Evaluate the Economics

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Grazing cornstalks is widely practiced in Nebraska and is a good use of a valuable resource. For the majority of corn fields in Nebraska, grazing is a sustainable, recommended practice and has the potential to increase net returns. In fact, on highly productive no-till fields, where too much residue accumulates, grazing increases subsequent yield in addition to generating income from the cattle.

Even though grazing is common, even more acres could be grazed. One survey found only about 25 percent of the available cornstalks produced in the state are grazed. High feed costs, conversion of pasture land to crop production, and economic factors favorable to increasing the size of the cow herd in the state are all reasons to increase the amount of cornstalks grazed.

This decision support tool (Excel® spreadsheet) has been developed to help producers with the decision whether or not to graze cornstalks. The tool is designed to estimate the costs and returns associated with grazing cornstalks. This publication serves as a guide for using the spreadsheet and gives some background information on processes affected by grazing.

This tool was designed to be helpful to producers across the state. Because conditions vary widely, not all features of the tool will be applicable in every instance. If a particular feature does not apply to your situation, just leave that segment blank.

This tool is similar to one designed to evaluate the economics of baling cornstalks called *Baling Corn Residue — A Decision Support Tool to Evaluate the Economics* (EC711). Grazing and baling are very different in some ways but similar in others. It will be helpful to read that publication even if you are only planning to graze rather than bale your cornstalks because it explains many relevant concepts in greater detail. The information in the following sections corresponds to the numbered sheets in the decision support tool. Sheets 2 through 4 calculate income (or reduced costs) generated from grazing. Sheets 5 through 9 calculate costs. Sheet 10 provides a place for income and costs that are assigned a set amount per field then calculates the bottom line.

Sheet 1 — Inputs

In this part of the spreadsheet you enter values used in more than one place. You only have to enter them



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once then they will be used automatically in the other places where needed.

The appropriate number of grazing days depends on the corn grain yield as well as the weight and number of cattle. Setting the number of grazing days such that 50 percent of the leaves and husks are consumed by the cattle is the recommended stocking rate for productive corn fields in Nebraska (see *Grazing Crop Residues with Beef Cattle*, EC278). This results in a little less than 20 percent of the total residue being consumed by the cattle. This decision support tool automatically calculates the appropriate number of grazing days based on the field size, grain yield, animal weight, and herd size entered. This automatically calculated value is intended to serve as a recommendation. Sometimes cattle will remain on the field for a different number of days than the automatically calculated value. If that's the case, enter the actual number of grazing days.

- Enter the current corn price.
- Enter the field size.
- Enter the field grain yield.
- Enter the average weight of the cattle.
- Enter the herd size.
- Enter the actual number of days the cattle will remain on the field.

Grazing

Revenue generated by the owner/manager of the cornstalks depends on whether they also own or manage cattle. If the owner/manager of the cornfield does not have cattle, one of the benefits associated with grazing is the rental income. If the owner/manager of the cornfield also owns or manages the cattle, one of the benefits is reduced feed costs. This decision support tool uses separate sheets for each situation. If you own/manage both the cornstalks and the cattle, use sheet 2. If you own/manage only the cornstalks and will rent the field to a second party, use sheet 3. Use only sheet 2 or sheet 3; do not enter information into both sheets.

Sheet 2 — Feed Cost Savings

Use this sheet if you own/manage both the cornstalks and the cattle. This sheet calculates the cost savings over the next least expensive feed option, after accounting for expenses.

- Enter costs associated with transportation, care, and supervision.
 - Transport distance is entered as the one-way distance and is automatically doubled in the calculations.
- Additional costs, such as supplying supplemental feed and water, are included in the “Other Costs” section. If care and supervision are provided while also delivering supplemental feed or water, do not include those visits in the “Cost of Care and Supervision” section. In other words, do not double count the same trip in both sections.
- Enter the cost of the next least expensive feed option compared to grazing the cornstalks.

The cost of the next least expensive feed alternative minus costs associated with grazing cornstalks is the value of the cornstalks.

Sheet 3 — Rental Income

Use this sheet if you own/manage only the cornstalks and will rent the field to a second party.

- Indicate whether the field is rented by the acre or on a head-per-day basis.
- Enter the rental rate.
- Enter other costs you will incur. Do not include costs that are paid by the cattle owner.

Costs associated with grazing are subtracted from the income from renting the cornstalks to the owner/manager of the cattle.

Sheet 4 — Diseases

Corn residue insulates soil from solar radiation and delays soil warming and drying. This creates a favorable environment for the pathogens that cause seed rot and seedling blight. Many soil pathogens can survive better with more crop residue. Therefore, when cornstalks are not grazed, seed treatments are more likely to be necessary to ensure a healthy stand. Foliar, stalk, and ear pathogens will also survive over winter in corn residue. Research has shown corn residue increases the risk of foliar diseases, if a susceptible hybrid is planted.

Not everything about grazing cornstalks is helpful to preventing diseases. Corn residue increases general soil microbial diversity. This increases the natural suppression of soilborne pathogens, because beneficial microorganisms compete with pathogens for resources and

some even secrete antibiotic-like substances that harm pathogens. Overall though, residue removal is advantageous for preventing diseases in most situations.

A credit associated with decreased fungicide application or avoided yield reduction in lieu of increased fungicide needs to be counted if cornstalks are grazed. Do not enter any costs if you believe disease pressure won't be affected by grazing and you are not altering your fungicide program either way.

- Enter the expected yield increase resulting from decreased disease pressure,
- or
- Enter the cost of additional fungicide and application.

Sheet 5 — Soil Nutrients

Unlike baling, grazing does not necessarily result in the nutrients in the cornstalks being taken off the field. However, some nutrients may need to be replaced due to volatilization or poor distribution. Most of the nitrogen beef cattle consume is excreted as urea in the urine. Enzymes in the soil convert urea to ammonia which is volatile and can be lost to the atmosphere. Ammonia volatilization is affected by many factors but generally more than half of the nitrogen cattle consume from the cornstalks will be lost. If supplemental feeds are fed while the cattle are grazing, the amount of nitrogen cattle excrete increases and there may not be a net loss of nitrogen from the field. So supplemental feeds need to be factored in when deciding how much additional fertilizer will be added.

Other nutrients such as phosphorus, potassium, calcium, magnesium, and micro minerals are not volatile and are not lost from the field. However, they will be unevenly distributed across the field because cattle tend to deposit their waste near the water source or wind-breaks. If these are located on an unfarmed corner of the field, then all the nutrients contained in the cornstalks consumed by the cattle may need to be replaced.

Usually only a portion of the nutrients consumed by the cattle need to be replaced. The best way to determine how grazing is affecting soil fertility and crop nutrient needs is through a comprehensive soil testing program (soiltest.unl.edu). This is the case for all farm management programs including those with any crop residue removal as a component.

The cost of replacing these nutrients is discussed in the NebGuide *Harvesting Crop Residues* (G1846).

- Enter the concentration of each nutrient found in cornstalks. (Default values provided are from *Harvesting Crop Residues* (G1846) but can be adjusted if desired.)
- Enter the current price of each nutrient.
- Enter the percent of each nutrient you intend to replace.

Sheet 6 — Lime

Grazing does not remove elements that help neutralize soil acidity (calcium, magnesium, and potassium). They are deposited back onto the field in the manure. However, manure is not evenly distributed across the field but is concentrated near the water supply, wind-breaks or areas where the cattle congregate. Replacing these elements may or may not be an issue depending on the location within Nebraska. Western parts of the state with calcareous soils probably will not be affected. Eastern parts of the state may see an effect. A comprehensive soil testing program is the best way to determine if soil acidity is an issue and if lime is required.

If you decide additional liming is necessary:

- Enter the amount of lime needed
- Enter the cost per ton of lime.
- Enter the cost of applying the lime to the field.

Water Conservation

Surface residue decreases the loss of water from soil by decreasing evaporation and runoff, and increases snow trapping in the winter. When residue is removed or destroyed (trampled) by cattle, less remains on the soil surface. The potential impact of decreased soil water as a consequence of grazing cornstalks depends on several factors. For example, water conservation is less critical in eastern Nebraska because precipitation is more abundant. Please review *Baling Corn Residue — A Decision Support Tool to Evaluate the Economics* (EC711) and *Tillage and Crop Residue Affect Irrigation Requirements* (G2000) for more detail.

Good measurements of water loss from the soil as a consequence of grazing do not exist. However, research measuring water loss resulting from other methods of residue removal may be informative. A four-year study at North Platte showed 2.5-5.0 inches/year less water available to a crop when residue was completely removed (bare soil) compared to leaving all the residue in place.

Other studies have shown similar results. Grazing leaves much more residue on the field than was the case in these studies; therefore, a much lower decrease in available water would be expected. As an example, using the North Platte data as a guide, it would be reasonable to assume 1 inch less soil water as a result of grazing. Thus, for irrigated crops, effective irrigation would have to be increased by 1 inch compared to not grazing.

In some instances, adding an additional inch of water is not an option. In a deficit irrigation (e.g., irrigation allocations prevent producers from fully irrigating) or nonirrigated (i.e., rainfed/dryland) situation not grazing the residue would be expected to increase crop yield by the same amount as a 1-inch increase in effective precipitation.

This decision support tool uses separate sheets for fully irrigated and deficit irrigated or nonirrigated fields. Use sheet 7 if your field is fully irrigated and sheet 8 if your field is a deficit-irrigated or nonirrigated field. Use only sheet 7 or sheet 8; do not enter information into both sheets.

Sheet 7 — Irrigation Water Pumping

Use this sheet if your field is fully irrigated. More irrigation water may need to be pumped when water is lost due to removal of residue on the field by grazing. This would translate into extra pumping cost. For example, a crop requiring 13 inches of irrigation water when no residue is removed may require 14 inches of irrigation to achieve the same yield when the previous year's cornstalks were grazed. Please refer to *Baling Corn Residue — A Decision Support Tool to Evaluate the Economics* (EC711) for additional information on using this section.

- Enter the amount of additional water pumped.
- Enter the pumping lift and pressure.
- Enter the energy source and pump performance rating.
 - Choose from five energy sources.
- Enter the cost of energy.

Sheet 8 — Deficit Irrigation

Use this sheet if your field is deficit irrigated or not irrigated. In a deficit-irrigation or nonirrigated situation, the cost of water loss due to grazing may come in the form of lower yields. This is because crops in a field with more surface residue experience less water stress when water is limiting. However, the closer to full irrigation, the

smaller the yield difference will be. Please refer to *Baling Corn Residue — A Decision Support Tool to Evaluate the Economics* (EC 711) for more information on this section.

- Enter the expected yield reduction.

Sheet 9 — Weeds

Yield losses due to weeds competing with a corn crop are well-documented. Retaining crop residue on the soil surface, as opposed to removing it by grazing, could suppress the germination, emergence, and growth of certain weeds.

If grazing necessitates additional tillage operations or the number (or rate) of herbicide applications, the additional costs need to be counted. Also, if no action is taken to suppress weed competition, a yield reduction could occur.

- Enter the expected yield reduction if additional weeds are not controlled.
- or
- Enter the cost of additional herbicide and application. (The costs listed in the spreadsheet are from EC872, *2012 Nebraska Crop Budgets*).
- or
- Enter the cost of additional tillage.

One major weed dramatically impacted by grazing is volunteer corn. Cattle preferentially select grain remaining in the field after harvest and therefore reduce volunteer corn. Credit for a reduction in volunteer corn is addressed in sheet 10, not in sheet 9.

Sheet 10 — Summary

The “Summary” sheet contains a number of input cells. These are for soil conditions, volunteer corn, erosion, and other factors. Here, you have an opportunity to assign a flat dollar value per field for each of these factors. These factors may be just as important as those that have their own sheet. They do not have their own sheet because they are assigned a flat dollar value per field.

Soil Temperature, Wetness, and Planting Challenges

Cold, wet soils in the spring caused by too much residue on the soil surface may be an issue in some locations. Soils that are too wet can impair spring field operations. Cold soil temperatures may impair germination. Too much surface residue may make planting more challenging, potentially resulting in poor stands, causing yield reductions. These factors may explain why removing residue increases subsequent yield on highly

productive, no-till fields in eastern Nebraska. All of these considerations may interact with tillage practices, specific equipment, and other factors unique to each operation. Use your judgment when assigning a dollar value to these factors.

Volunteer corn

Volunteer corn is a major weed in Nebraska. Cattle seek out and preferentially consume downed ears resulting in a reduction of volunteer corn. Use your judgment to decide the value of reduced volunteer corn as a consequence of grazing.

Erosion

Erosion washes or blows the most fertile topsoil off the field and is affected by factors such as soil type, slope, tillage practice, and crop rotation. Surface residue helps control both wind and water erosion. However, it is difficult to assign a dollar value to the adverse effects grazing cornstalks may have on erosion. Erosion is not an issue on most fields even when grazing occurs. Use your experience as a guide. Your local Natural Resources Conservation Service (NRCS) office also may be able to help. NRCS conservation plans require that a minimum amount of crop residue be present to control soil erosion on highly erodible land (HEL). Producers with such land should contact their local NRCS office to review their conservation plan and discuss the potential impact of grazing on erosion. For more information on erosion, please see *Wind Erosion and Its Control* (NebGuide G1537) and *Harvesting Crop Residues* (NebGuide G1846).

- Enter the value of warmer soil temperatures in the spring.
- Enter the value of reduced soil moisture in the spring.
- Enter the value of reduced planting challenges.
- Enter the value of reduced volunteer corn.
- Enter the value of any miscellaneous items not already included.
- Enter the cost of increased soil erosion by wind.
- Enter the cost of increased soil erosion by water.
- Enter the cost of any miscellaneous items not already included.

The “Summary” sheet summarizes all the other sheets. It presents the bottom line in dollars per year. If the bottom-line dollar figure is positive, then grazing is economically advantageous. If it is negative, grazing does not make economic sense.

“What if” and Best/Worst Case Analysis

Once the value or cost of all the factors potentially affected by grazing residue have been considered, some what-if scenarios can be analyzed. What if the price of corn is \$9/bu instead of \$6/bu? Make this change in the “Inputs” sheet and observe the change in results in the “Summary” sheet. There are numerous other what-if scenarios that could be helpful to consider. Make sure to account for how each change will affect the information in each tab when doing what-if analyses.

Best case and worst case scenarios can also be considered. This may be particularly helpful in instances where accurate estimates of required inputs are not available. Enter values on each end of a realistic range (e.g., biased toward grazing in one scenario and biased against grazing in the next) and check the result on the “Summary” sheet to see how much impact it has. If the bottom line in the “Summary” sheet is positive for multiple scenarios, there is greater confidence that grazing makes economic sense. If the bottom line is positive for one scenario and negative for another, it may be worthwhile to refine the values you enter. Of course, non-economic factors should be considered before making the final decision about grazing cornstalks.

Related Publications

- *Grazing Crop Residues with Beef Cattle*, EC 278
- *Baling Corn Residue — A Decision Support Tool to Evaluate the Economics*, EC711
- *Tillage and Crop Residue Affect Irrigation Requirements*, G2000
- *Harvesting Crop Residues*, G1846
- *2012 Nebraska Crop Budgets*, EC872
- *Wind Erosion and Its Control*, G1537

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