IOWA STATE UNIVERSITY
University Extension

Grazing Corn Residue

using resources and reducing costs

Byron Leu, Joe Sellers, and Dan Loy, beef specialists
Iowa Beef Center, Iowa State University Extension

Introduction

Grazing corn residue is a management system that makes "cents" to many Iowa beef cow-calf producers. This process involves grazing the corn residue left behind after harvest—namely the stalk, leaf, husk and cob, as well as downed ears. Through this system, producers can utilize available forage resources while reducing stored feed costs and respective operating costs.

According to the Iowa State University 2000-2004 Summary of the Beef Cow Business Record Final Report, feed costs for Iowa producers are typically projected to be in the area of 60% of the total cost per cow in the herd. Producers that have their cattle graze corn residue in their operation have the opportunity to significantly reduce stored feed costs during the late fall to early winter timeframe.

The 2000-2004 ISU report also tells us that Iowa producers grazed 1.9 ac of corn residue annually at a projected cost of $0.07 per day per 1,000 lbs of body weight—a significant cost reduction when compared to pasture grazing ($0.41 for 1,000 lbs of body weight) or stored feed costs. This data strongly supports that grazing corn residue is an important management approach that can extend the grazing season and reduce stored feed costs in beef cow operations.

Still, challenges exist for many producers hoping to make use of this management tool. Examples of limitations include an inconvenient field location, a lack of fencing, limited or no water supply, concerns regarding compaction, and residue compliance. In spite of these obstacles, grazing corn residue can be an important part of many producers' operations, and it's a practice worth implementing as it can greatly impact the operation's "bottom line" by lowering its total annual feed cost.

Table 1: Estimated cornstalk residue yield

Corn yield (bu/ac)	Residue yield (T/ac)
>120	4.0-5.0
90-120	3.5-4.5
60-90	2.5-3.5
30-60	2.0-3.0
< 30	1.0-2.5

Table 2: Corn Residue Components

Corn residue	% Moisture	% of Residue (D.M. basis)
Stalk	70-75	50
Leaf	20-25	20
Cob	50-55	20
Husk	45-50	10

FORAGE QUANTITY AND QUALITY

Iowa has an abundance of crop residue available for late fall and winter grazing. Following the harvesting process, approximately 50% of the weight of the total corn plant remains in the stalk, leaf, cob, and husk components. Dr. Jim Russell, professor in animal science at Iowa State University, developed the projections shown in Table 1 to assist with estimating residue yield.

Another method reported by Samples and McCutcheon (2002) suggests that for each bushel of shelled corn produced per acre, 50 lbs of residue is also produced. For example, an acre yielding 120 bu of shelled corn per acre will produce approximately 6,000 lbs of corn residue. Both of these methods can be useful in determining approximate quantities of forage available in harvested fields.Myers and Underwood (1992) reported the plant components and dry matter percentages of typical corn residue shown in Table 2.

Nutrient composition of corn residue varies significantly—especially as the grazing season progresses. According to the 1996 book *Nutrient Requirements of Beef Cattle*, the nutrient composition of crop residue early in the post-harvest grazing season is as follows (in percentages):

Total Digestible Nutrients (TDN)	65.85
Crude Protein	6.5
Neutral Detergent Fiber	65
Calcium	0.62
Phosphorus	0.09

Cattle from both the treatment and control groups in the supplementation demonstration grazed on cornstalks for the seven-week winter study.

Depending on weather conditions, fields grazed shortly after harvest are higher in nutrient content than those grazed sixty days or later after harvest. The greatest loss of nutrients appears in the husk and leaf. As expected, wet and humid conditions increase the rate of decomposition and weathering. Livestock will selectively eat dropped ears and grain first, then the husk and leaves, followed by the cobs and stalks. Due to this process, nutritional content tends to be high (65-70% TDN and 6-7% crude protein) at the start of the grazing period as compared to a potentially low nutritional level (40% TDN and 5% crude protein) at the end of the grazing period (Wright and Tjardes 2004).

GRAZING MANAGEMENT OPTIONS

The majority of Iowa beef producers initiate corn residue grazing soon after harvest. Samples and McCutcheon (2002) suggest that, under positive weather conditions, 1 ac of corn residue can provide sixty days of grazing for a 1,000-lb animal (sixty animal-unit grazing days).

Mature cows in the middle trimester of gestation that are in desirable body condition typically maintain their body weight and may gain up to 1 lb per head daily (Samples and McCutcheon 2002). As the grain component is consumed and availability of husks and leaves declines, protein supplementation may be needed to maintain body condition. Fall calving cows may need protein and energy supplementation depending on body condition and milk potential.

Because corn residue is generally low in a number of minerals as well as vitamin A, it is recommended that a well balanced mineral and vitamin mix be provided free choice—especially vitamin A and salt (Wright and Tjardes 2004).

Strip grazing can be used to extend grazing time and at the same time make the quality of the diet more uniform. By limiting the grazing area, cows are forced to consume both the high- and low-quality components of the residue.

CORN RESIDUE MANAGEMENT CONCERNS

Producers face several concerns when managing a cornstalk grazing system. Corn spills and excessive ear drop can lead to digestive disturbances such as acidosis and founder due to the potential of grain overload. Adapting cows to grain supplementation for ten to fourteen days before turning into harvested cornfields can minimize this concern. Another method is to limit the daily cornstalk grazing time and supplement with hay/forage.

Weather conditions can greatly impact the success of corn residue grazing. Mud can reduce the availability of this residue forage resource, therefore reducing both quantity as well as quality of the plant components. Ice can also disrupt grazing patterns by hampering residue availability and limiting livestock movement. Strip grazing can minimize the negative impacts of these weather events by limiting the grazing area affected by mud or ice conditions.

Another issue can be nitrate toxicity—especially during drought conditions. The highest level of nitrate concentration in the corn plant is in the lowest part (18-24 in) of the stalk. This area is typically the last to be grazed by cattle. Therefore, the potential for nitrate issues is unlikely.

Soil compaction can also be a concern. Recent research from the Iowa State University Leopold Center for Sustainable Agriculture (Busby et al. 2004) suggests that compaction is not an issue once the ground is frozen. Prior to freezing, there is potential for slight reduction in yield for no-till soybeans, although there was no difference in soybean yield in conventionally tillage systems.

SUPPLEMENTATION ALTERNATIVES

As previously mentioned, corn residue during the initial part of the grazing period is adequate for mature, pregnant cows. However, as grain, husk, and leaves are selectively grazed, protein supplementation to improve forage utilization and digestibility may be necessary. To determine if supplementation is necessary, observe the manure. If little or no corn is visible, protein supplementation should be considered. Sources include alfalfa, corn gluten feed, distillers' grains, oilseed meals, and commercial protein supplements. As a rule of thumb, 0.5 to 1 lb per head per day of all-natural supplement should be acceptable (Wright and Tjardes 2004).

Table 3: Cost Comparison of Control and Treatment Cows

	Control Group	Treatment Group
hay fed/cow	(261 lb) $13.07	(133 lb) $6.65
+ DDG fed/cow	–	(188 lb) $12.88
= total	$13.07	$19.53
+ projected feed cost to regain condition	$25.28	–
TOTAL COST=	**$38.25**	**$19.53**

ISU Supplementation Demonstration

Funding from the Leopold Center for Sustainable Agriculture and the Iowa Beef Center was used to conduct a cornstalk grazing demonstration in Mahaska County in Iowa from December 2008 to January 2009. The purpose of this demonstration was to compare continuous corn residue grazing without grain/co-product supplementation to strip-grazed cornstalks with distillers' dry grain (DDG) supplementation. The treatment group—thirty spring calving Angus-based cows—was provided approximately 10 ac of cornstalks each week for seven weeks (forty-nine days). Dakota Gold Bran was provided at 5-6 lbs per head per day from Day 17 through Day 49. The control group— thirty spring calving Angus-based cows—was provided 60+ ac of cornstalks without grain or co-product supplementation. Both the control and treatment groups were fed grass-legume hay for twelve of the forty-nine test days due to ice conditions. Body condition scores were evaluated at the beginning and end of the demonstration.

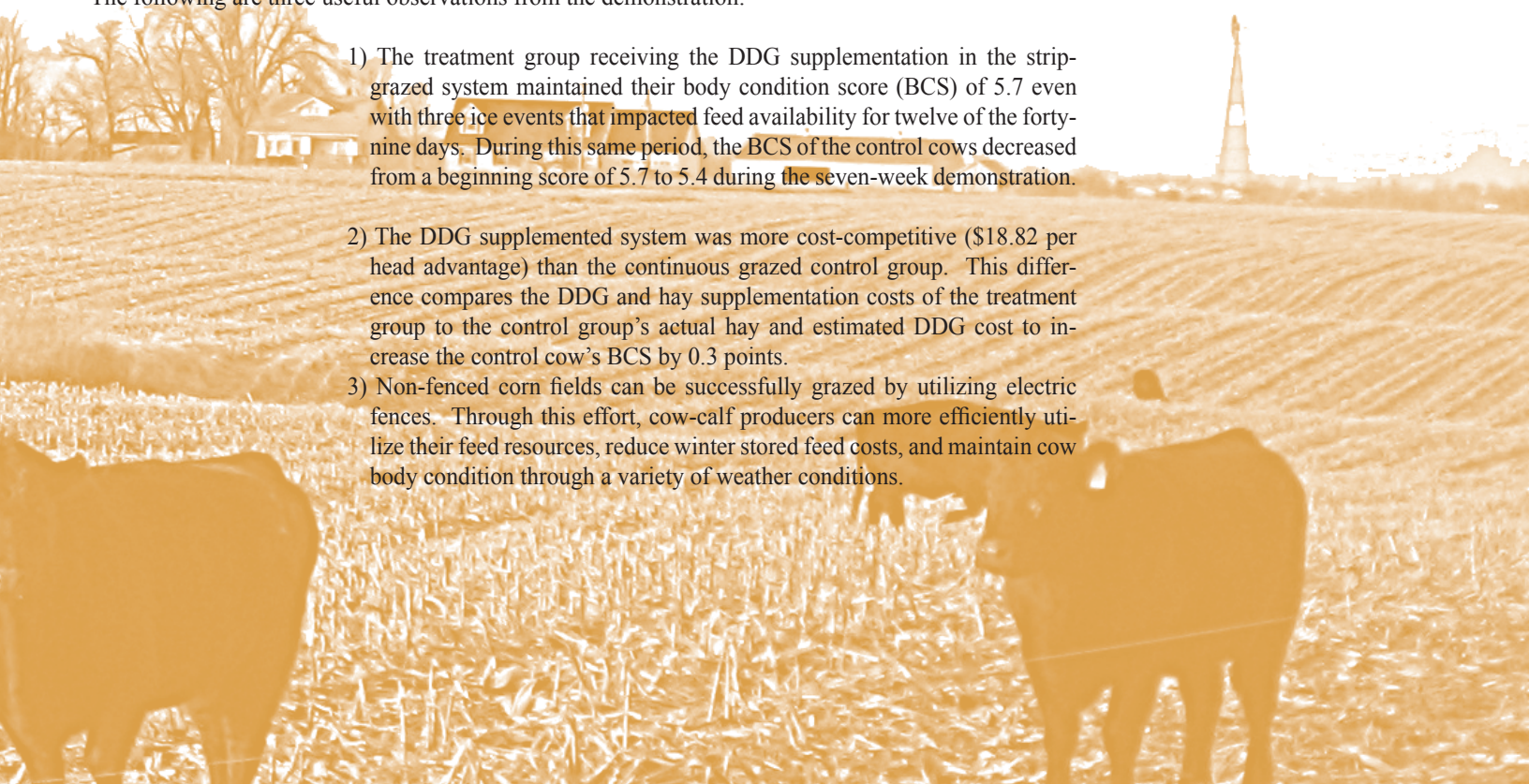
WHAT WE LEARNED

The following are three useful observations from the demonstration:

1) The treatment group receiving the DDG supplementation in the strip-grazed system maintained their body condition score (BCS) of 5.7 even with three ice events that impacted feed availability for twelve of the forty-nine days. During this same period, the BCS of the control cows decreased from a beginning score of 5.7 to 5.4 during the seven-week demonstration.

2) The DDG supplemented system was more cost-competitive ($18.82 per head advantage) than the continuous grazed control group. This difference compares the DDG and hay supplementation costs of the treatment group to the control group's actual hay and estimated DDG cost to increase the control cow's BCS by 0.3 points.

3) Non-fenced corn fields can be successfully grazed by utilizing electric fences. Through this effort, cow-calf producers can more efficiently utilize their feed resources, reduce winter stored feed costs, and maintain cow body condition through a variety of weather conditions.



Summary

Controlling feed costs is imperative for cow-calf producers to remain cost-competitive. During fall and early winter, these projected costs can be significantly reduced by utilizing cornstalks. By effectively grazing corn residues, Iowa cow-calf producers have the opportunity to extend the grazing season and reduce winter feed costs. The ISU supplementation demonstration suggests the strip-grazed system was a more effective way of utilizing corn residue over a system which allows cattle to have uncontrolled access to an entire field, provided appropriate supplementation is used. The DDG supplemented system was more cost-competitive than the continuous grazed control group when considering the costs to regain lost body condition in the controls.

References

Rasby, R. and R. Selley. 1992. Grazing Crop Residues. Cooperative Extension. University of Nebraska-Lincoln. G92-1116-A.
National Research Council. 1996. Nutrient Requirements of Beef Cattle. Seventh Rev. Ed. Washington D.C.: National Academy Press.
Busby, D., Russell, J., Karlen, D., Secor, L., Peterson, B., Olsen, C., and Shouse, S. 2004. Winter Grazing of Corn Residues: Effects on soil properties and subsequent crop yields from a corn-soybean crop rotation. Leopold Center Progress Report. Volume 13, page 25.
Samples, D., and McCutcheon, J. 2002. Grazing Corn Residue. Ag and Natural Resources Fact Sheet ANR-10-02. Ohio State University Extension.
Myers, D. and Underwood, J. 1992. Harvesting Corn Residue. Agronomy Fact Sheet 003-92. Ohio State University Extension.
Rasby, R., Selley, R., and Klopfenstein, T. 1998. Grazing Crop Residues. Nebraska Cooperative Extension. EC 98-278-B.
Lehmkuhler, J. 2003. Grazing Corn Stalk Residue to Reduce Forage Inputs. University of Wisconsin Extension Service Publication.
Lardy, G. 2007. Grazing Corn Residues Makes Cents. North Dakota State University Extension Service news release.
Russell, J., D. Strohbehn, and S. Barnhart. 2002. Making Extended Grazing Work in Iowa. IBC-23. Iowa State University Extension.
Strohbehn, D., Ruble, M., and Morrical, D. 2007. Use of Distillers Grains in Beef Cows Grazing Cornstalks—A Demonstration Project. Iowa State University Animal Industry Report 2007. A.S. Leaflet R2188.
Wright, C. and Tjardes, K. 2004. Grazing Corn Stalks. South Dakota State University Extension Service. Extension Extra. ExEx2044.
2000-2004 Summary. Beef Cow Business Record Final Report. Iowa Beef Center. Iowa State University Extension Service

Study Partners

Funding for the ISU supplementation demonstration was made possible by a grant from the Leopold Center for Sustainable Agriculture and additional support from the Iowa Beef Center, both of Iowa State University.

Iowa Beef Center

The Iowa Beef Center at Iowa State University in Ames, Iowa, serves as the university's extension program to cattle producers. Our center is comprised of a dedicated group of faculty and staff from the College of Agriculture and Life Sciences, the College of Veterinary Medicine and Iowa State University Extension. We work together to develop and deliver the latest in research-based information to improve the profitability and vitality of Iowa's beef industry.

At the Iowa Beef Center, we strive to be the No. 1 source "For all things beef."

Leopold Center for Sustainable Agriculture

The Leopold Center for Sustainable Agriculture is a research center at Iowa State University with programs in three initiatives: Marketing and Food Systems, Ecology, and Policy. The Center was created by the Iowa legislature to develop profitable farming systems that conserve natural resources and is supported by state appropriations and from fees on nitrogen fertilizer and pesticides. For more information, contact the Leopold Center by phone, (515) 294-3711, email leocenter@iastate.edu, or on the Web, www.leopold.iastate.edu.

August 2009

IBC09-02