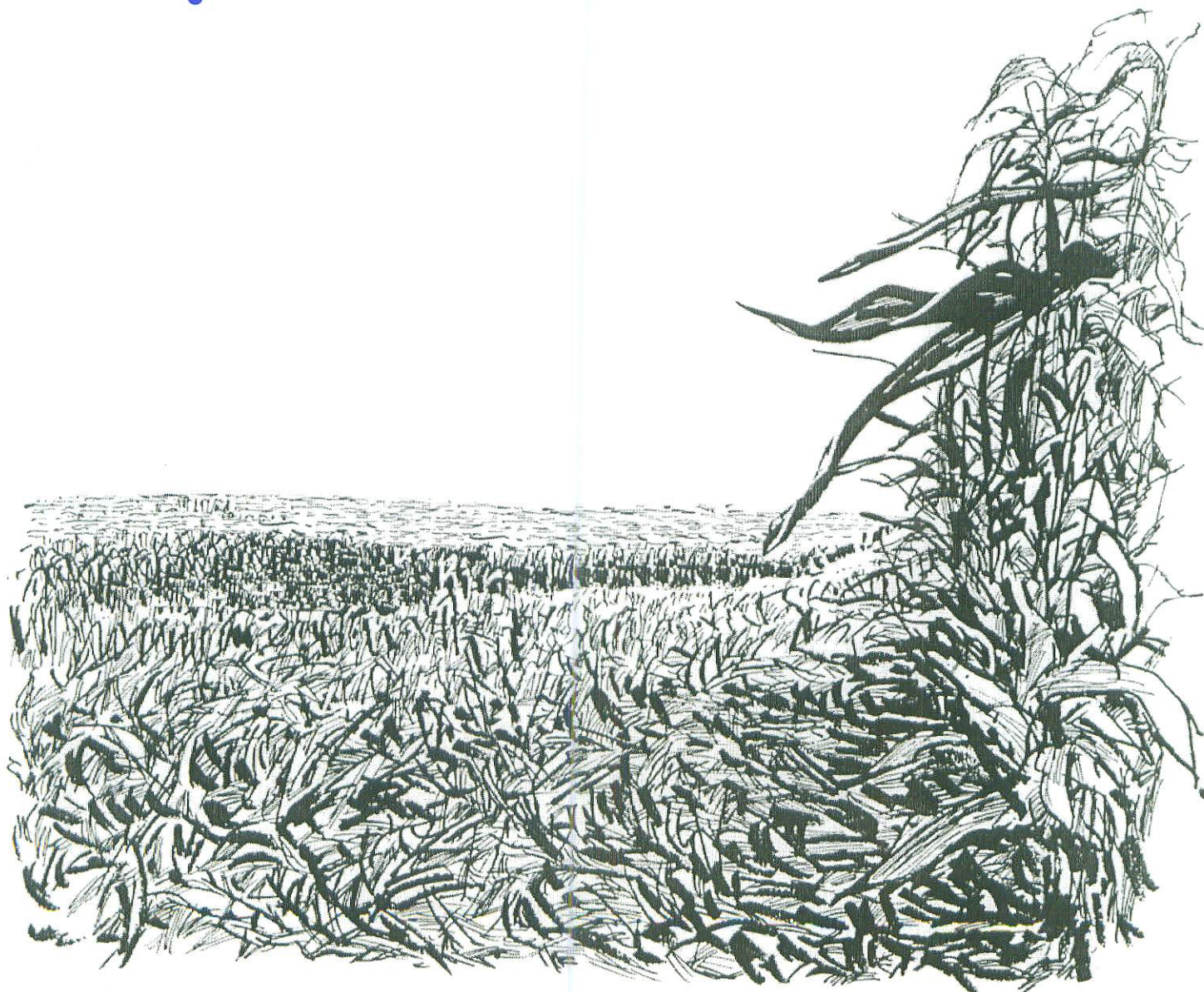


# Nutritional Evaluation of Grazed Kansas Corn and Sorghum Crop Residues



# **Nutritional Evaluation of Kansas Crop Residues for Extending the Grazing Season**

## **Kansas Forage Task Force Complementary Forages Committee**

### **Summary**

The K-State Research and Extension Forage Task Force conducted a statewide demonstration project in cooperation with County Extension Agents to evaluate the nutritional value of crop residues for assisting Kansas livestock producers reduce their dependence on harvested forages. During the 1997/98 winter, crop residue samples from twenty-two grazed and non-grazed corn and sorghum residue fields across Kansas were collected every two weeks. Over the entire state, corn residue averaged about three tons of total dry matter per acre. Additionally, the leaf fraction (attached and unattached) constituted about 60% of residue dry matter. Unattached leaves represented 85% of the total leaf dry matter collected. Yield estimates for sorghum residue averaged over two tons per acre. The stem component represented 55 to 60% of the total dry matter collected from the sorghum residue sites. There was almost a 1:1 ratio of unattached:attached leaf dry matter measured. The results of this demonstration reinforces the known fact that crop residues can provide a tremendous opportunity for reducing beef production costs. However, beef producers must be aware of the variable feeding value of crop residues and must exploit their use before the nutritional requirements of the spring-calving beef herd increases during the latter stages of pregnancy.

### **Introduction**

The results of several recent University findings have determined that livestock producers intent on surviving into the 21<sup>st</sup> century must emphasize the utilization of grazed forages and crop residues vs. harvested feeds in order to reduce the overall costs of production. According to Kansas Farm Facts (1997), Kansas ranks 1<sup>st</sup> nationally for grain sorghum and wheat production and is ranked 9<sup>th</sup> for corn produced. These rankings are represented by 11.7 million acres of wheat, 5.1 million acres of corn and sorghum and 2.5 million acres of soybeans annually planted in Kansas.

Tillage and fertilization practices and varietal selection technologies have changed dramatically since the 1970's when the vast majority of crop residue work was conducted by Midwest universities. Moreover, harvesting equipment manufactured today are much more efficient; consequently dropped grain is less in many cases. Furthermore, many operations have increased their specialization towards either livestock or crops. This evolutionary change has widened the communication link between the grain farmer and the livestock producer. All of these factors, coupled with the fact that the beef cow population in general has changed in terms of mature size and level of milk production over the past 20 years suggests that crop residues should be re-evaluated as a grazing resource for improving production efficiency. The overall objectives of this statewide demonstration project was to determine the effects of grazing and the

environment on crop residue quality and yield and evaluate how crop residues fit into today's beef cow and yearling grazing programs for reducing beef production costs.

## **Materials and Methods**

Twenty one County Extension Agents from across the state (Figure 1) identified a progressive livestock producer willing to participate in the study. At the onset of the grazing season, approximately one-half acre was secluded from active grazing to evaluate the effects of weathering on residue nutrient content. In most cases, the duration for each county grazing period was dependent on the length of time the livestock grazed the residue field.

For each 2 week sampling period, the residue in the grazed and non-grazed areas were collected from four different areas of the residue field in either 8 or 12 foot row lengths and separated into attached leaves (manually removed from stem), unattached leaves and stems (harvested above the brace root). After each sampling period, the collected samples were hung outdoors under cover and from the rafters to allow the crop residue samples to air dry and prevent rodent infestation.

During the spring of 1998, all sub-samples from each plant part and sampling period were individually weighed in order to estimate pounds of dry matter per acre and ground through a lawn chipper. The replicated samples were composited and sent to a commercial forage testing laboratory for nutrient analysis of dry matter and crude protein content. In addition, neutral detergent fiber (NDF) and acid detergent fiber (ADF) levels was determined from all samples in order to derive a crude estimate of feeding value (TDN).

To arrive at district averages, data from individual counties were composited by crop residue type. Only counties with multiple sampling periods were included in this compilation. However, the tabulated results and the agronomy and animal science inputs from all participating individual counties has been compiled and can be found in the appendix of this report.

## **Results and Discussion**

### **Corn Residue**

Previous research has demonstrated residue yield and nutrient content are directly linked to grain yield, fertility, harvest date, conditions at harvest in addition to duration and initiation of grazing date. Table 1 illustrates the west district average for corn residue dry matter present in the grazed and non-grazed paddock by plant part and month. There was approximately 1,000 pounds difference in total dry matter between the grazed and non-grazed samples in the western district.

Corn residue yield in the west averaged almost 3 tons of total dry matter per acre. This value was almost consistent with the estimate determined from the central area (Table 3) and considerably higher (3.0 vs 1.9 tons) than the amount collected from northeast Kansas (Table 5). Corn leaves (attached and unattached) constituted about 60% of residue dry matter. In this study,



unattached leaves represented almost 85% of the total leaf dry matter weight and 50% of the total plant dry matter collected. These observations are consistent with earlier reports citing the vulnerability of corn residue to snow cover and wastage from trampling.

Total residue dry matter crude protein content ranged from 3.70% in the west to 5.0% in the northeast. From November through December there was no apparent decline in corn residue crude protein content from area to area. As one would suspect, crude protein content was higher in the leaf fraction relative to the stem. The TDN content of the leaf fractions (unattached and attached) ranged from 48 to 51% throughout the state and was higher than the stem at all locations as well (Tables 2, 4 and 6).

### **Sorghum Residue**

The sorghum residue dry matter yield estimate for central Kansas averaged about 2.4 tons per acre (Table 7) and is consistent with previous research reporting lower residue dry matter yields per acre for sorghum vs corn. There was less dry matter remaining in the grazed vs non-grazed paddocks. The stem component represented 55 to 60% of the total dry matter collected from the grazed and ungrazed sorghum residue sampling locations. In the grazed paddocks, it appeared that percentage of stem (expressed as a percent of total dry matter) increased and leaf fractions declined as month of year progressed when expressed as a percentage of total dry matter remaining. There was almost a 1:1 ratio of unattached:attached leaf dry matter measured. In contrast to corn, almost 55% of the sorghum leaves are attached.

Previous research has consistently shown residue nutrient content is highest at harvest and decreases over a 6 to 8 week period (see attached Nebraska Extension Bulletin). Overall, the crude protein and TDN content of the sorghum residues sampled in this study was higher than the corn residue. Total sorghum residue dry matter crude protein content in the central area averaged 5.6% and 6.8% for the grazed and ungrazed paddocks, respectively. It appeared crude protein was higher for all plant fractions in the non-grazed vs the grazed paddocks. As opposed to the distinct TDN differences which existed between corn stem and leaf fractions, there appeared to be only minor differences noted between sorghum stem and leaf fractions (Table 8). It appears that the crude protein and TDN values obtained from the collected samples are comparable to values from other published reports.

### **How do crop residues fit into a total grazing program?**

The carrying capacity of crop residues can encompass a wide range of values (AUM/acre) because of fertility level, influence of the amount and type of grain and residue left in the field, method of pasturing and, most importantly, weather conditions. Highly variable growing and environmental conditions encountered across the state was undoubtedly responsible for the large range in pounds of dry matter yield calculated per acre. As indicated earlier in the report, total residue tonnage for sorghum and corn residue averaged two and three tons per acre or 2 and 3 AUM's, respectively when accounting for a 40% peak utilization rate. Using more cattle for shorter periods of time will achieve a greater grazing capacity because of less selective grazing. Consequently, cattle will consume more lower quality material and thus, trample less, especially

during inclement weather.

While initial feed value can vary between crop residue types, previously conducted research has demonstrated crop residue nutrient content is highest at harvest and decreases over a 6 to 8 week period. Calving time in relation to peak crop residue availability (9/15 through 11/15) has a direct bearing on the value of crop residues for attaining mature cow or heifer crude protein and energy demands. The upper values of the ranges indicated above (6% crude protein; 50% TDN and 8% crude protein and 55% TDN for corn and sorghum residue, respectfully) were fitted into the K-State Balancer program to evaluate the value of either crop residue for mature cows or first-calf heifers at various stages of pregnancy or lactation to illustrate where crop residues ideally fit into a year-round grazing system.

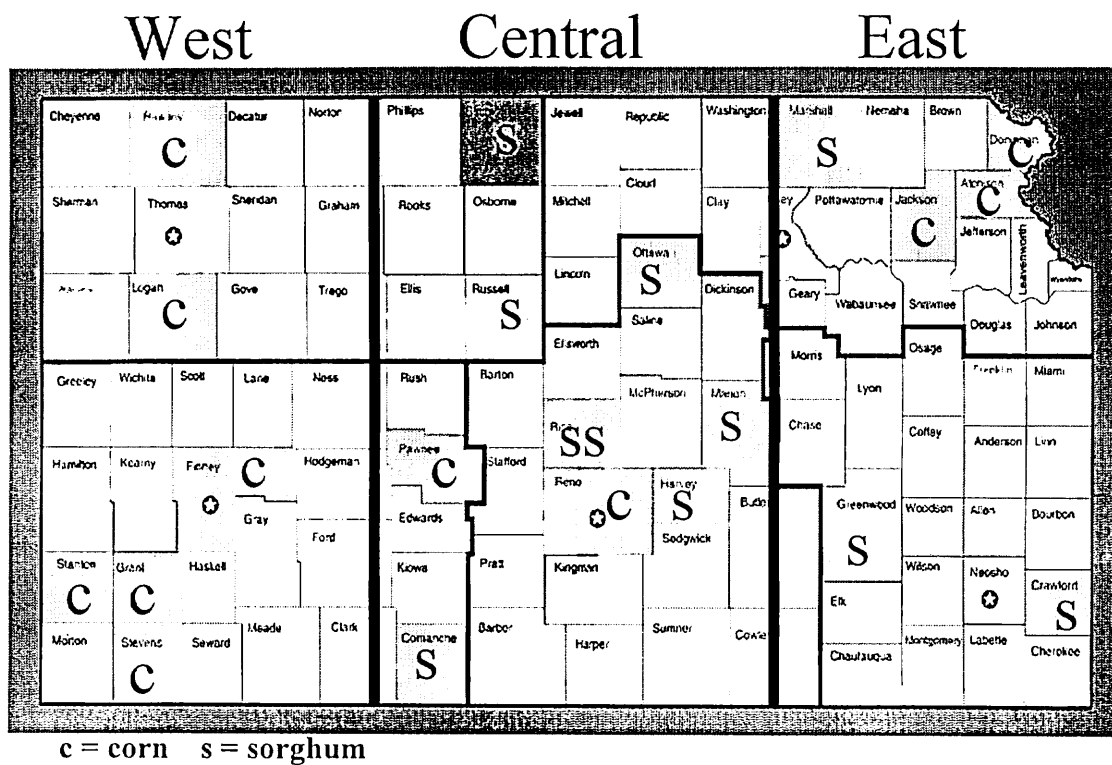
Previously conducted research indicates non-lactating beef cows can be maintained primarily on crop residues (corn and sorghum) from weaning until mid-pregnancy with a minimum of protein supplementation. For example, an 1150 lb cow in the middle third of gestation consuming corn residue will require only .2 lb supplemental crude protein daily to satisfy requirements. However, the energy and protein demands of third trimester pregnancy will result in a loss of approximately ½ pound live weight per day if no crude protein is made available (supplemental crude protein needs = .4 lb daily). Alternatively, sorghum residue under the same two scenarios discussed above could result in a potential live weight gain of .56 lb/day during the middle third of pregnancy and no weight loss during the last trimester (calculated supplemental crude protein needs = .1 lb/day). If cattle are forced to graze crop residues during lactation, the crude protein and energy requirements of the lactating beef cow will exceed the feeding value of either crop residue. **Indirectly, this suggests calving dates earlier than February 1<sup>st</sup> are not compatible with crop residue utilization when considering uncertain environmental winter conditions and the likely decline in residue quality as grazing season progresses.**

## Summary

For a variety of reasons, many beef producers do not capitalize on the availability of crop residues in Kansas for reducing production costs. Crop residues trap desperately needed winter moisture and reduce erosion but present a problem when attempting to minimize tillage. Lack of shelter, appropriate fencing, availability of stock water and concern of soil compaction are additional reasons why livestock producers may elect not to utilize crop residues. An attached paper by Dr. Taylor discusses the minimal effects crop residue grazing has on soil compaction.

The beef cow's penchant for converting forage to a nutritious food for human use should be the cornerstone or basis from which all management decisions are formed. Meeting cow/calf performance goals for growth, reproduction, replacement rates and market weight are important, yet beef producers must also recognize that cost control is a vital component of the survival quotient as well. Feed costs represent the cow/calf producer's single largest annual expense, amounting to 50 to 70% of the total cost of maintaining a beef cow. When coupled with environmental variability, feed cost control represents a moving target that can only be bullseyed with appropriate planning and evaluation of existing options.

Figure 1. Location of crop residue collection sites by crop type and cropping district



**Table 1. West - Corn Stalks**

***Grazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.
	per acre		per acre		per acre		per acre	
Nov	4098	4.44	342	4.85	3,970	3.43	8,410	3.98
Dec	2924	4.25	342	4.59	3,204	3.54	6,470	3.92
Average	3,159	4.29	342	4.64	3,357	3.52	6,858	3.93

***Ungrazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.
	per acre		per acre		per acre		per acre	
Nov	2,170	4.50	418	4.10	1,542	3.70	4,130	4.16
Dec	3,066	5.00	544	5.10	2,766	4.00	6,376	4.57
Average	2,887	4.90	519	4.90	2,521	3.94	5,927	4.49

**Table 2. West - Corn Stalks**

***Grazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	49.8	77.1	50	50.4	77.2	49	56.9	77.5	44
Dec	51.7	77.5	48	48.8	77.0	50	57.7	79.4	43
Average	51.3	77.4	48	49.1	77.0	50	57.5	79.0	43

***Ungrazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	49.6	81.4	50	46.7	81.0	52	60.6	79.1	41
Dec	51.7	76.5	48	50.0	76.7	49	58.5	78.7	42
Average	51.3	77.5	48	49.3	77.6	50	58.9	78.8	42



**Table 3. Central - Corn Stalks**

***Grazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.
	per acre		per acre		per acre		per acre	
Nov	2826	4.41	556	5.61	1,698	4.54	5,080	4.58
Dec	2133	5.15	190	6.14	3,003	3.16	5,326	4.06
Average	2,306	4.97	282	6.01	2,677	3.51	5,265	4.19

***Ungrazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.	Lbs. DM	% C.P.
	per acre		per acre		per acre		per acre	
Nov	2,303	4.41	435	6.00	1,941	3.33	4,679	4.11
Dec	2,024	5.01	133	5.70	3,444	4.04	5,601	4.43
Average	2,117	4.81	234	5.80	2,943	3.80	5,294	4.32

**Table 4. Central - Corn Stalks**

***Grazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Oct	46.0	79.2	53	47.0	80.5	52	57.6	82.4	43
Nov	55.9	79.6	45	51.0	74.8	49	54.8	74.6	46
Dec	51.5	75.8	48	52.8	74.0	47	60.6	78.8	41
Average	51.3	77.2	48	51.3	75.5	48	58.8	78.7	42

***Ungrazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Oct	46.5	80.8	52	48.7	77.6	50	54.2	77.8	46
Nov	52.2	78.9	48	48.2	75.6	51	59.3	79.0	42
Dec	54.3	76.0	46	53.5	75.2	47	59.1	79.1	42
Average	51.8	77.9	48	51.0	75.9	49	57.9	78.8	43

**Table 5. Northeast - Corn Stalks**

***Grazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM		Lbs. DM		Lbs. DM		Lbs. DM	
	per acre	% C.P.	per acre	% C.P.	per acre	% C.P.	per acre	% C.P.
Nov	2,126	5.09	439	4.90	1,332	4.68	3,897	4.93
Dec	1,938	5.22	395	5.20	1,369	4.20	3,702	4.84
Average	2,063	5.13	424	5.00	1,344	4.52	3,832	4.90

***Ungrazed***

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM		Lbs. DM		Lbs. DM		Lbs. DM	
	per acre	% C.P.	per acre	% C.P.	per acre	% C.P.	per acre	% C.P.
Nov	2,109	6.00	635	4.70	1,511	4.40	4,255	5.24
Dec	2,047	5.74	526	4.92	1,075	3.88	3,648	5.07
Average	2,068	5.83	562	4.85	1,220	4.05	3,850	5.13

**Table 6. Northeast - Corn Stalks**

**Grazed**

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	47.5	74.8	53	48.1	77.0	51	56.1	79.3	45
Dec	48.1	75.5	51	55.3	76.3	45	57.6	81.9	43
Average	47.7	75.0	52	50.5	76.8	49	56.6	80.2	44

**Ungrazed**

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	48.0	70.9	51	48.0	80.7	51	55.9	79.7	45
Dec	48.5	72.3	51	48.4	77.3	51	55.3	80.3	45
Average	48.3	72	51	48.2	79	51	55.6	80	45

**Table 7. Central - Sorghum Stalks****Grazed**

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.
Nov	1172	6.02	1301	6.64	3,391	4.31	5,864	5.17
Dec	431	7.03	1004	7.64	2,669	5.10	4,104	5.92
Jan	195	9.71	1330	9.38	2,842	5.22	4,367	6.69
Feb	290	6.78	792	6.24	2,276	4.25	3,358	4.94
Average	626	7.10	1,129	7.35	2,885	4.69	4,640	5.62

**Ungrazed**

Month	Unattached		Attached		Stem		Total Plant	
	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.	Lbs. DM per acre	% C.P.
Nov	1,311	7.83	1471	8.34	3,176	4.94	5,958	6.42
Dec	468	8.53	1362	7.30	3,259	4.72	5,089	5.76
Jan	1,101	9.91	1379	11.23	2,142	6.15	4,622	8.56
Feb	244	9.94	1341	11.72	1,783	5.26	3,368	8.17
Average	821	8.70	1,401	9.01	2,812	5.08	5,034	6.81

**Table 8. Central - Sorghum Stalks*****Grazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	46.1	67.6	53	43.4	63.8	55	46.5	69.3	52
Dec	47.4	64.9	52	47.0	64.2	52	49.7	71.2	50
Jan	46	56.8	53	44.5	63.8	54	50.9	70.6	49
Feb	46.3	56.7	52	49.9	63.7	50	52.9	72.4	47
Average	46.4	62.3	52.1	45.7	63.9	53	49.5	70.6	50

***Ungrazed***

Month	Unattached			Attached			Stem		
	ADF	NDF	TDN	ADF	NDF	TDN	ADF	NDF	TDN
Nov	45.4	67.5	53	40.3	61.5	57	46.3	68.4	52
Dec	47.1	63.0	52	46.1	65.7	53	50.3	70.5	49
Jan	44.5	58.3	54	43.8	59.9	54	48.6	66.2	51
Feb	43.7	59.7	54	43.3	58.5	55	50.4	73.5	49
Average	45.5	63.5	53.1	43.1	62.1	55	48.6	69.7	51



**Value of Crop Residues**  
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In 1997 Kansas Agricultural Statistics Service reported 3,500,000 acres of sorghum and 1,640,000 acres of corn harvested in the state. Beef cows, bulls, and replacements numbered 1,794,000 head during this same year. There are ample acres of crop residues available in most of the state areas to provide a significant source of livestock feed for a portion of the year.

A partial budget analysis can help landowners and livestock owners determine the value of crop residues. Ultimately, the market may determine the price to be paid or charged for the use of crop residues. If an area has an overabundance of residues available and not many livestock to utilize the residues, then the market price paid may be significantly less than the economic value of the residues as a feed source. Where there are large numbers of livestock and fewer acres of available residues the price paid will likely be nearer to their economic value. Livestock owners will not pay more for residues than the cost of equal quality alternative feeds.

Consider the following three perspectives in placing a value on crop residues: 1) using your own residues for your own livestock 2) selling your crop residues to a neighbor who has livestock and 3) buying residue forages from a neighbor for your own livestock. An analysis of these three perspectives will yield a range of values for crop residues. The market price will fall within this range if all parties to the transaction are informed and making logical decisions.

The primary objective of the landowner who owns the crop residues is to derive some income from their sale. The primary objective of the livestock owner is to utilize the crop residues if their use is a cost effective alternative to some other feed source. Both parties should consider the direct and indirect costs and revenues involved in the practice. In order to systematically evaluate any such practice the use of a "partial budget" is often recommended. A partial budget evaluates the benefits and costs of a specific practice, placing dollar values on benefits and costs. Additional factors may be noted by not valued.

***Explanatory Partial Budget***  
***(Practice to be evaluated)***

Benefits	Costs
•Added revenue	•Added costs
•Reduced costs	•Reduced revenue
•Total benefits	•Total costs

Benefits - Costs = Net benefit of the practice

Other factors pertaining to the practice which  
may involve unknown benefits or costs: (factors)

Formally, agricultural producers evaluate many practices with these techniques, although they may not write down the benefits and costs and the other factors to consider. Having a partial budget framework helps ensure that you consider the important factors involved with a proposed practice change.

Now consider the three perspectives mentioned above in a partial budget analysis of using crop residues for livestock. The analysis for the producer using his own residues for his own livestock is below.

***Partial Budget for Using Crop Residues–  
1 acre of my residues for each of my cows***

Benefits	Costs
<ul style="list-style-type: none"> <li>•Value of feed saved 30 days @ 22 #/day @ \$45/ton = \$14.85</li> <li>•Save \$3 per acre shredding/tilling stalks</li> <li>•Total Benefits = \$17.85</li> </ul>	<ul style="list-style-type: none"> <li>•Fence stalk field: \$5 per acre</li> <li>•Costs for water: water available at field - no cost.</li> <li>•Added tillage at local custom rate/acre: \$6.50</li> <li>•Total Costs = \$11.50</li> </ul>

The analysis shows that grazing your own residues with your own livestock has a net benefit of  
 $\$17.85 - 11.50 = \$6.35/\text{acre}$ .

Other factors: weather risks, extra labor checking livestock, and others.

What about the perspective of the landowner who wants to sell his residue to someone with livestock? The partial budget analysis below evaluates the benefits and costs.

***Partial Budget for Selling Crop Residues  
to a Neighbor with Livestock - per acre basis***

Benefits	Costs
<ul style="list-style-type: none"> <li>•Rental payment for residues: \$6.50</li> <li>•Save \$3 per acre shredding stalks</li> <li>•Total Benefits =\$9.50 In this example the net benefits total \$3 per acre.</li> </ul>	<ul style="list-style-type: none"> <li>•Add tillage at local custom rate per acre: (\$6.50 per acre)</li> <li>•Total Cost= \$6.50</li> </ul>

Factors to consider: delayed fall tillage, possible wet weather compaction, loss of residues, and others.

In this example, if the local market is \$6.50 per acre for residues, the landowner with residues to sell can have a \$3 per acre benefit if everything works out as planned. Any offer of greater than \$3.50 per acre would result in some positive benefit for the owner of the residues. However, the other factors may outweigh the lower net benefits from lower offers for residue grazing. Some crop producers elect to not sell residues because of these other factors.

Now consider the perspective of the livestock owner who would like to rent residues to reduce feed costs. The partial budget analysis of this perspective is found below.

***Partial Budget for Renting Crop Residues  
for my cowherd - 160 acres of stalks***

Benefits	Costs
<ul style="list-style-type: none"> <li>•Value of feed saved: 30 days @ 22 # /day @ \$45 /ton =\$14.85</li> <li>•Total benefits=\$14.85</li> </ul>	<ul style="list-style-type: none"> <li>•Put up electric fence \$5 / acre</li> <li>•Haul water 7 miles every other day: 15 trips @\$ .45/mile and 2 hours labor @ \$10/hour = \$2.46/acre</li> <li>•Total costs =\$7.46</li> </ul>

Net benefits of using residues = \$7.39 per acre.

Factors to consider: livestock are away from headquarters feeding area; weather risks; problems with water system; extra wear on equipment hauling water, decline in residue feed quality as season progresses, lack of livestock shelter, and others.

Any offer for residues of less than \$7.39 per acre benefits the livestock producer. However, because of the other factors, the livestock owner may offer something less than the value of the net benefits in order to profit from the practice.

Looking at the residue owner's perspective one sees that they need at least \$3.51 per acre in rent payments to have a positive net benefit to selling residues. The livestock owner can pay no more than \$7.39 per acre before he chooses to feed hay rather than rent crop residues. Somewhere in the middle there is a market where both parties gain some benefit from the practice and the agreed upon terms of the transaction.

Using crop residues is one way in which livestock producers can reduce feed costs as long as they know what the residues are worth as feedstuffs and as long as the associated costs of using the residues are controlled. Larger fields of residues are used more efficiently than smaller ones due to the costs of fencing and providing water for the livestock. Crop producers who may wish to sell their residue fields for grazing should evaluate the costs and risks of compaction controls.

If both parties to a transaction are well informed, then the likelihood of a satisfactory agreement being reached is greatly increased. Simple evaluation tools like the partial budget can help ensure that important factors are considered.

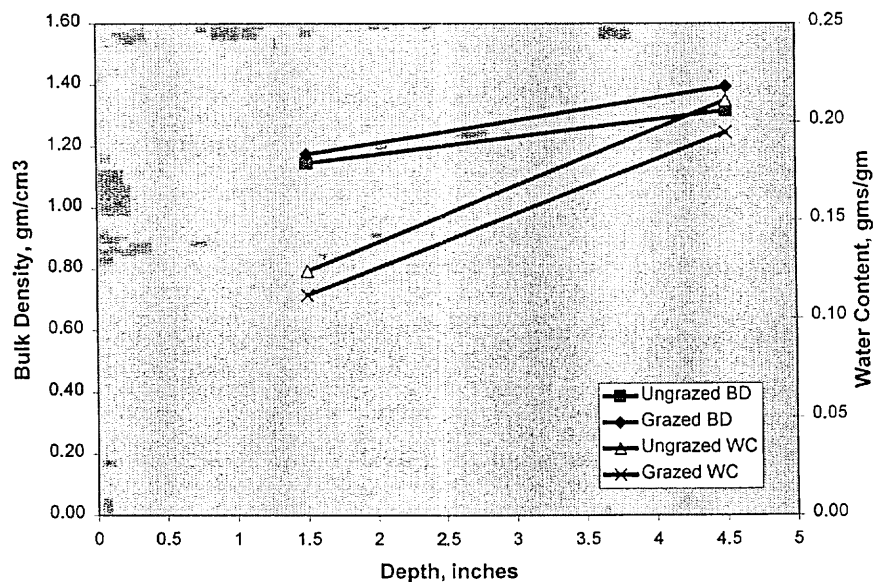
# The Effect of Grazing on Crop Residue and Soil Bulk Density

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Bulk density samples were taken from a field of milo stubble in Smith County. The samples were taken at depths of 0-3 and 3-6 inches. Samples were 7.5 cm in diameter. Seven locations were sampled each from down the old rows and between the rows with two depths at each location. This was done on a field that had been grazed and a similar field that had not been grazed. Soil samples were composited for each field (grazed and ungrazed) for textural analysis. Those results are shown in table 1. There was no statistical difference between bulk density or water content for samples taken between or on the rows. There was a difference between bulk density and water content for depth ( $p < 0.05$ ) and treatment ( $p < 0.05$ ). Figure 1 shows the bulk density and water content for the grazed and ungrazed treatments at each depth. Bulk density was greater for the grazed treatment at both depths and the deeper sample. Water content was greater in the ungrazed treatment at both depths. Water content was also greater for the six-inch sample.

**Table 1.** Textural analysis of soil samples from Smith County.

Treatment	Sand %	Silt %	Clay %
Grazed	24	58	18
Ungrazed	24	64	12



**Figure 1.** Bulk density (BD) and water content (WC) for grazed and ungrazed treatments at two depths for the Smith county site.

Residue measurements and bulk density samples were taken from a field in Rice County that had grazed and ungrazed treatments. The field was tilled with a chisel plow equipped with 22" sweeps on 18" centers prior to taking bulk density samples. Tillage depth was approximately three inches. Six bulk density samples were taken in the row for each treatment. Residue was measured using the line-transect method. Four lines were placed in each treatment and two observers read each line.

There was an interaction between bulk density and sample depth at this site. There was no difference between bulk density for the two treatments. The tillage prior to bulk density sampling made it difficult to define the two depths and likely contributed to the variability in the data.

There was no statistical difference in the percent residue values read by each observer. There was a difference for the residue remaining after the tillage operation for the treatments ( $p < 0.05$ ). The grazed area had 16.4% residue cover, while the ungrazed area had 22.3% residue cover.



## ***Agronomy Inputs***

**Producer Name:** David Hubert

**County:** Logan

**Residue Type:** Corn Stalk

**Variety/Hybrid:** ICI Garst 8543 IT ICI Garst 8541 IT

**Date Planted:** 05/03/97

**Fertilization** 1996

1997

**Rates:**

30 P<sub>2</sub>O<sub>5</sub> 145 NH<sub>3</sub>

**Sources:**

P<sub>2</sub>O<sub>5</sub> 32-0-0

**Time:**

**Manure:**

**Herbicide** 1996

1997

**Kind & Rate:**

Lightning

**Timing:**

3 leaf

**Row Spacing:** 30"

**Harvest Date:** 10/14/97

**Lodging?** Minimal

**Soil Type:** Silt Loam Ka

**Yield:** 194

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** March 20, 1997

**Rip:**

**Sweep:**

**Other:** Disked March 15 & 21st; Spring toothed & harrowed May 2nd

---

## ***Animal Sciences Inputs***

**Producer Name:** David Hubert

**County:** Logan

**Date Animals placed on residue study area:** January 15, 1997

**Approximate size of animal (weight):** 1450 lbs

**Date animals removed from residue study area:** 2/20/98

**Size of residue study area (acres):** 115

**Type of supplemental feeds:** 20% all natural protein blocks

**Class of Animal:** Cows

**Number of animals on residue study area:** 112

**Location of water from residue study area:** ½ mile from circle.

**Lease Rate:** \$0.25/hd/day

**Please note condition of lease**

Fence & Water: Renter

**Estimated Precipitation during grazing period:** 1-3 Inches

## *Agronomy Inputs*

**Producer Name:** Lance Leebrick

**County:** Rawlins

**Residue Type:** Corn

**Variety/Hybrid:** NC 4616

**Date Planted:** 05/02/97

**Fertilization** 1996

1997

**Rates:**

60 lbs NH<sub>3</sub>; 20 lbs P<sub>2</sub>O<sub>5</sub>

**Sources:**

**Time:**

At planting

**Manure:** No

No

**Herbicide** 1996

1997

**Kind & Rate:**

1/2 lb Atrazine; 16 oz Roundup Ultra; 2 pts Dual; 4 oz Banvel;  
1/2 lb 24D

**Timing:**

One month prior to planting

**Row Spacing:** 30"

**Harvest Date:** 10/28/97

**Lodging?** ? **Soil Type:** Keith

**Yield:** Mid 90's (92)

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** No till

**Rip:**

**Sweep:**

**Other:** Fall 1997 herbicides just after wheat ( end of July). 12 oz Round up, 1 lb atrazine; 4 oz Banvel; 12 oz. Gramoxan; 8/20.

---

## *Animal Sciences Inputs*

**Producer Name:** Lance Leebrick

**County:** Rawlins

**Date Animals placed on residue study area:**

**Approximate size of animal (weight):**

**Date animals removed from residue study area:**

**Size of residue study area (acres):**

**Type of supplemental feeds:**

**Class of Animal:** \_

**Number of animals on residue study area:**

**Location of water from residue study area:**

**Lease Rate:** \_

**Please note condition of lease**

Not grazed

**Estimated Precipitation during grazing period:**

## Logan County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre	Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem			Unattached Leaves	Attached Leaves	Stem	
2/13/98	27.5	25.3	47.2	15492	1/23/98	60.2	15.8	24	11365
					2/13/98	51.4	18.1	30.5	19487

### % Crude Protein

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
2/13/98	3.99	3.17	3.17	1/23/98	5.34	4.62	5.94
				2/13/98	5.83	4.09	3.41

### % NDF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
2/13/98	64.2	73.4	71.7	1/23/98	69.3	77.0	69.0
				2/13/98	69.2	77.6	80.4

### % ADF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
2/13/98	47.9	45.6	47.7	1/23/98	45.1	46.6	48.2
				2/13/98	46.7	46.7	55.3

## Rawlins County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
3/25/98	54.1	18.8	30.5	3315

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
3/25/98	5.83	4.09	3.41

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
3/25/98	73.0	79.2	82.9

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
3/25/98	51.6	48.6	54.5

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem

## *Agronomy Inputs*

**Producer Name:** Don F. Krug

**County:** Russell

**Residue Type:** Milo Stubs

**Variety/Hybrid:** DeKalb 39Y

**Date Planted:** 6/2/97

**Fertilization** 1996

1997

**Rates:**

60 lbs N; 25 lbs P; 18-20-0 formula

**Sources:**

Anhydrous

**Time:**

Late May

**Manure:**

None

**Herbicide** 1996

1997

**Kind & Rate:**

LandMaster DB

**Timing:**

7/18/97

Atrazine

Pre-plant

**Row Spacing:** 10"

**Harvest Date:** 10/23/97

**Lodging?** No

**Soil Type:** Loam

**Yield:** 80 bushels

**Previously Grazed:** yes

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** Undercut twice

**Rip:**

**Sweep:**

**Other:** Field cultivate once.

---

## *Animal Sciences Inputs*

**Producer Name:** Don F. Krug

**County:** Russell

**Date Animals placed on residue study area:** 10/30/97

**Approximate size of animal (weight):** 900

**Date animals removed from residue study area:** 1/10/98

**Size of residue study area (acres):** 28

**Type of supplemental feeds:** Free choice cane hay 7 lbs/day milo - SBM (12% CP)

**Class of Animal:** cows/ calf ( 2 yr heifers)

**Number of animals on residue study area:** 29

**Location of water from residue study area:** Adjoining Pasture

**Lease Rate:** Owned ground

Please note condition of lease

**Estimated Precipitation during grazing period:** 3-5 Inches

## ***Russell County - Sorghum Stalks***

### ***% Dry Matter per acre (Expressed as percent of total)***

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/13/97	39.6	14.5	46	6827
11/26/97	32.8	21.8	45.4	9391
12/15/97	23.2	15.1	61.7	4901

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
10/30/97	19.2	30.4	50.3	7274
11/13/97	21.8	24.1	54	4063
11/26/97	29	19.4	51.6	8867
12/15/97	89.8	88.6	85.2	4991

### ***% Crude Protein***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/13/97	5.17	6.95	6.01
11/26/97	4.81	10.72	6.36
12/15/97	5.11	6.31	5.32

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/30/97	7.12	10.13	6.08
11/13/97	10.61	11.44	6.38
11/26/97	8.07	6.29	4.86
12/15/97	9.4	8.95	7.28

### ***% NDF***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/13/97	76.2	65.5	67.1
11/26/97	73.2	55.3	70.0
12/15/97	68.8	64.1	70.2

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/30/97	73.1	57.5	65.6
11/13/97	61.0	53.6	67.8
11/26/97	68.4	66.8	67.5
12/15/97	65.5	63.2	70.4

### ***% ADF***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/13/97	48.6	43.5	43.2
11/26/97	49.8	36.8	46.1
12/15/97	46.4	48.6	47.1

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/30/97	47.2	38.4	41.5
11/13/97	44.2	35.4	45.5
11/26/97	45.9	44.7	47.0
12/15/97	47.2	45.2	46.4



## *Agronomy Inputs*

**Producer Name:** Gary Gerstentorn

**County:** Smith

**Residue Type:** Wheat Stubble

**Variety/Hybrid:** Pioneer 8505 Golden acres- Hardy

**Date Planted:** 06/02/97

**Fertilization**

**1996**

**Rates:** 70lb NH<sub>3</sub>; 30lb P<sub>2</sub>O<sub>5</sub>  
**Sources:** NH<sub>3</sub> + Dry 11-52-0  
**Time:** August  
**Manure:** -----

**1997**

70lb NH<sub>3</sub>  
NH<sub>3</sub>  
May

**Herbicide**

**1996**

**Kind & Rate:** Landmaster, Atrazine  
**Timing:** July 19

**1997**

Atrazine crop oil - July; Ramrod Atrazine  
May 19

**Row Spacing:** 20"    **Harvest Date:** October 5-6    **Lodging?** No    **Soil Type:** Clay    **Yield:** 78 Bu per Acre    **Previously Grazed:** No

**Previous tillage type(please describe. How many times and when? In 1996 or 1997?):**

**Chisel:** V blade NH<sub>3</sub> in spring of 1997

**Rip:**

**Sweep:**

**Other:** Chemical after 1996 wheat harvest. Disk and field cultivator before Ramrod-Atrazine planted with double disc drill. Airplane spray atrazine crop oil.

---

## *Animal Sciences Inputs*

**Producer Name:** Gary Gerstentorn

**County:** Smith

**Date Animals placed on residue study area:** 10/27/97

**Class of Animal:** Cows

**Approximate size of animal (weight):** 1000 lbs

**Number of animals on residue study area:** 21 + 5 on 11/6/97

**Date animals removed from residue study area (acres):** November 6, 1998

**Location of water from residue study area:** At farmstead

**Size of residue study area ( acres):** 33 grazed, 25 ungrazed

**Adjacent pasture.**

**Type of supplemental feeds:** mineral-loose; trace mineral block

**Lease Rate:** ?

**Please note condition of lease**

**Estimated Precipitation during grazing period:**    3.5 inches rain before entering

## Smith County

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre	Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem			Unattache Leaves	Attached Leaves	Stem	
11/24/97	35.2	12.8	52	4609	11/11/97	39	17.5	43.5	4127
					11/24/97	49.5	12.9	37.6	5036

### % Crude Protein

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattache Leaves	Attached Leaves	Stem
11/24/97	4.56	5.38	4.95	11/11/97	4.49	7.16	5.16
				11/24/97	4.34	7.43	5.66

### %NDF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattache Leaves	Attached Leaves	Stem
11/24/97	72.7	66.7	65.6	11/11/97	71.7	57.3	64.3
				11/24/97	75.5	55.9	68.5

### % ADF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattache Leaves	Attached Leaves	Stem
11/24/97	50.3	49.1	46.1	11/11/97	51.3	38.2	43.4
				11/24/97	53.4	39.6	49.0

## *Agronomy Inputs*

**Producer Name:** Darroll Miller

**County:** Comanche

**Residue Type:** Sorghum

**Variety/Hybrid:** Cargill 737

**Date Planted:** 05/25/97

**Fertilization** 1996

1997

17-14-0 125 lbs rate

**Rates:**

**Sources:**

**Time:** Preplant

**Manure:** No

**Herbicide** 1996

1997

1.5 pts Dual

**Kind & Rate:**

**Timing:**

**Row Spacing:** 30" **Harvest Date:** 10/20/97 **Lodging?** No **Soil Type:** ? **Yield:** 60 bushels **Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** No till - followed sorghum

**Rip:**

**Sweep:**

**Other:**

---

## *Animal Sciences Inputs*

**Producer Name:** Darrol Miller

**County:** Comanche

**Date Animals placed on residue study area:** 11/28/97

**Approximate size of animal (weight):** 725 lbs.

**Date animals removed from residue study area:** 1/4/98

**Size of residue area (acres):** 140

**Type of supplemental feeds:** None

**Class of Animal:** Stockers

**Number of animals on residue study area:** 300

**Location of water from residue study area:** 20 acre

Grass trap adjacent to midfield.

**Lease Rate:** owned acreage

Please note condition of lease

**Estimated Precipitation during grazing period:** 1-3 inches

## Comanche County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
1/3/98	52	5.9	42.1	2407
1/28/98	62.9	4.7	32.5	1947

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/24/98	30.8	17.1	52.1	2679
1/3/98	29	19.9	51.1	3019
1/28/98	58.4	9.7	32	4517

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/3/98	3.24	3.95	2.67
1/28/98	3.41	3.12	1.8

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/24/97	3.31	3.78	2.01
1/3/98	3.65	4.06	2.22
1/28/98	3.48	3.76	2.2

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/3/98	78.8	72.0	76.5
1/28/98	72.9	70.6	80.4

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/24/98	76.4	68.6	73.5
1/3/98	76.6	69.6	75.3
1/28/98	77.7	69.7	78.1

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/3/98	53.1	51.8	52.2
1/28/98	55.2	53.9	53.1

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/24/98	52.4	48.0	50.9
1/3/98	51.5	49.8	52.2
1/28/98	53.9	49.8	55.0

## *Agronomy Inputs*

**Producer Name:** Triangle H Grain & cattle

**County:** Finney

**Residue Type:** Corn

**Variety/Hybrid:** 3162 Pioneer

**Date Planted:** 05/16/97

**Fertilization**

**1996**

**1997**

**Rates:** 133.5 lb; 60.4lb  
**Sources:** 11-52-0;NH<sub>3</sub>  
**Time:** For graze out wheat 8/96  
**Manure:** None

220.6 lb  
NH<sub>3</sub>  
5/1/97  
None

**Herbicide**

**1996**

**1997**

**Kind & Rate:** Atrazine 1.6 pt  
**Timing:** 5/16/97

Prowl 2.4 pt  
5/29/97

**Row Spacing:** 30"

**Harvest Date:** 110 A High moisture 10-3-97; 20A Dry corn 10-16-97

**Lodging?** Slight **Soil Type:** Sandy Loam

**Yield:** 214.96

**Previously Grazed:** Grazed wheat off prior to planting 97 corn.

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** Chisel with NH<sub>3</sub> 3-97  
**Rip:** Inner row rip at cultivation 6-97  
**Sweep:**  
**Other:** Disc 3-97 JD Finisher 5-16-97

---

## *Animal Sciences Inputs*

**Producer Name:** Triangle H Grain & Cattle

**County:** Finney

**Date Animals placed on residue study area:** December 1, 1997

**Class of Animal:** Cows

**Approximate size of animal (weight):** 1300 lbs

**Number of animals on residue study area:** 238

**Date animals removed from residue study area (acres):** 12-17-97

**Location of water from residue study area:** East side

**Size of residue study area (acres):** 130

**Lease Rate:** \$.15/cow/day

**Type of supplemental feeds:** 2lb/hd/day alfalfa hay round bales - 6

**Please note condition of lease**

\$.15/day for residue; \$.20/day to cover fence, water, mineral and care = \$.35/day plus supplemental feed

**Estimated Precipitation during grazing period:** less than 1 inch

## Finney County - Corn Stalks

% Dry Matter per acre (Expressed as percent of total)

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
11/21/97	48.7	4.1	47.2	8409					
12/12/97	29.6	3.8	66.6	5591					

% Crude Protein

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/21/97	4.44	4.85	3.43				
12/12/97	3.78	4.66	3.19				

% NDF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/21/97	77.1	77.2	77.5				
12/12/97	77.0	71.8	81.6				

% ADF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/21/97	49.8	50.4	56.9				
12/12/97	54.8	53.5	61.2				



## *Agronomy Inputs*

**Producer Name:** Jerald Phelps

**County:** Grant

**Residue Type:** Corn

**Variety/Hybrid:**

**Date Planted:**

**Fertilization** 1996

1997

**Rates:**

**Sources:**

**Time:**

**Manure:**

**Herbicide** 1996

1997

**Kind & Rate:**

**Timing:**

**Row Spacing:**

**Harvest Date:**

**Lodging?**

**Soil Type:**

**Yield:**

**Previously Grazed:**

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:**

**Rip:**

**Sweep:**

**Other:**

---

## *Animal Sciences Inputs*

**Producer Name:** Jerald Phelps

**County:** Grant

**Date Animals placed on residue study area:** 11/22/97

**Approximate size of animal (weight):** 1050-1100 lbs

**Date animals removed from residue study area (acres):** 1/12/98

**Size of residue study area (acres):** 125 acre circle

**Type of supplemental feeds:** Bale during snow; Cake every other day for last 2 months

**Class of Animal:** Cows

**Number of animals on residue study area:** 89

**Location of water from residue study area:** NW corner

**Lease Rate:** \$.25 /hd/day

**Please note condition of lease**

No care provided

**Estimated Precipitation during grazing period:** 3-5 inches ( wet snow)

## Grant County - Corn Stalks

% Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre	Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem			Unattached Leaves	Attached Leaves	Stem	
12/15/97	62.9	11.6	25.5	10026	11/18/97	62.6	5.7	31.7	9964
					12/15/97	58.6	11.4	30	7544

% Crude Protein

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/15/97	3.95	4.14	3.08	11/18/97	4.41	4.28	3.88
				12/15/97	4.37	3.99	3.57

% NDF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/15/97	75.2	76.8	80.2	11/18/97	68.1	75.4	75.9
				12/15/97	73.7	78.6	80.0

% ADF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/15/97	50.9	49.4	61.1	11/18/97	44.3	50.9	54.4
				12/15/97	50.4	49.9	59.2

## *Agronomy Inputs*

*Producer Name:* Gordon Schartz

*County:* Pawnee

*Residue Type:* Corn

*Variety/Hybrid:* Pioneer 3162 JR

*Date Planted:* 04/29/97

*Fertilization* 1996

1997

*Rates:*

225 NH<sub>3</sub>; 150 Anhydrous

*Sources:*

*Time:*

*Manure:*

*Herbicide* 1996

1997

*Kind & Rate:*

Bicep II

*Timing:*

*Row Spacing:* 30" *Harvest Date:* October 1, 1997 *Lodging?* No *Soil Type:* Sandy Loam *Yield:* 190 *Previously Grazed:* No

*Previous tillage type(please describe. How many times and when? In 1996 or 1997?):*

*Chisel:* No till from soybeans

*Rip:*

*Sweep:*

*Other:*

---

## *Animal Sciences Inputs*

*Producer Name:* Skip Baker

*County:* Pawnee

*Date Animals placed on residue study area:* October 15, 1997

*Class of Animal:* cow/calf

*Approximate size of animal (weight):* 1100

*Number of animals on residue study area:* 50 Pairs

*Date animals removed from residue study area:* 12/15/97

*Location of water from residue study area:* Size of

*Size of residue study area (acres):* 60

Adjourning corner

*Type of supplemental feeds:* none

*Lease Rate:* \$7.50 acre

*Please note condition of lease*

Corn producer provides nothing but land. Half circle was grazed marked difference in volunteer on grazed side this spring.

*Estimated Precipitation during grazing period:* 1-3 inches

## ***Pawnee County - Corn Stalks***

### ***% Dry Matter per acre (Expressed as percent of total)***

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
10/22/97	41.2	19.2	39.6	7144
11/18/97	55.6	10.9	33.4	5080

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
10/22/97	45.3	14	40.7	7312
11/18/97	49.2	9.3	41.5	4679

### ***% Crude Protein***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	4.59	4.75	2.99
11/18/97	4.41	5.61	4.54

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	3.89	5.72	4.07
11/18/97	4.41	6	3.33

### ***% NDF***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	79.2	80.5	82.4
11/18/97	79.6	74.8	74.6

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	80.8	77.6	77.8
11/18/97	78.9	75.6	79.0

### ***% ADF***

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	46.0	47.0	57.6
11/18/97	55.9	51.0	54.8

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
10/22/97	46.5	48.7	54.2
11/18/97	52.2	48.2	59.3

## ***Agronomy Inputs***

**Producer Name:** M&G Farms

**County:** Stanton

**Residue Type:** Corn stover

**Variety/Hybrid:** Pioneer 3162

**Date Planted:** 04/18/97

**Fertilization**

**1996**

**Rates:**

Fall: 170lb NH<sub>3</sub>; November/Spring/June: 45lb P<sub>2</sub>O<sub>5</sub>; 2lb Zn

**Sources:**

Anhydrous - liquid

**Time:**

**Manure:**

None

**Herbicide**

**1996**

**Kind & Rate:**

**Timing:**

None

**1997**

Basis Gold

Post Emergence

**Row Spacing:** 30"

**Harvest Date:** 10-8-97 **Lodging?** 1-2%

**Soil Type:** UA -RM

**Yield:** 230

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** With anhydrous application Fall 96 8 to 10" deep.

**Rip:** No

**Sweep:** No

**Other:** Disced 2x fall Nov-Dec; Field cultivator spring 97 ahead of planter.

---

## ***Animal Sciences Inputs***

**Producer Name:** M&G Farms

**County:** Stanton

**Date Animals placed on residue study area:** 11-30-97

**Approximate size of animal (weight):** 597

**Date animals removed from residue study area:** 12/20/97

**residue study area (acres):** 125

**Type of supplemental feeds:** Corn silage; Corn; Protein supplement

**Class of Animal:** stocker

**Number of animals on residue study area:** 180

**Location of water from residue study area:** Size of Northcentral

**Lease Rate:** \$1.5/cwt/month

**Please note condition of lease**

No care

**Estimated Precipitation during grazing period:** 3-5 Inches

## Stanton County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/16/97	54.2	4.2	41.6	3650

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/28/97	49.4	8.7	41.9	4875
12/16/97	58.3	3.4	38.3	4460

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	3.45	4.73	2.95

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/28/97	3.31	3.3	2.42
12/16/97	3.35	4.68	3.58

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	79.0	76.0	85.1

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/28/97	81.4	81.0	7907.0
12/16/97	78.3	75.2	79.6

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	50.7	47.4	62.0

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/28/97	49.6	46.7	60.6
12/16/97	52.6	51.9	63.7

## *Agronomy Inputs*

**Producer Name:** Alan Sullivan

**County:** Stevens

**Residue Type:** Corn stalks

**Variety/Hybrid:** Pioneer 3223

**Date Planted:** May 5, 1997

**Fertilization**

**1996**

**Rates:**

Dryland crop in 1996

**Sources:**

**Time:**

**Manure:**

**1997**

280NH<sub>3</sub> and 40 P<sub>2</sub>O<sub>5</sub>

Majority NH<sub>3</sub>; some liquid 25 lb through sprinkler

April, Side dress in June

None

**Herbicide**

**1996**

**Kind & Rate:**

**Timing:**

**1997**

Bicep Lite 2.5 qt.

Pre-emerge

**Row Spacing:** 30"

**Harvest Date:** October 20

**Lodging?** Yes

**Soil Type:** Rich field loam

**Yield:** 216

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** NH<sub>3</sub> knifed in

**Rip:** DMI Ripper - February

**Sweep:**

**Other:** Disc one time- planted

---

## *Animal Sciences Inputs*

**Producer Name:** Alan Sullivan

**County:** Stevens

**Date Animals placed on residue study area:** November 19, 1997

**Approximate size of animal (weight):** Cows 1100 lbs/ calves 400-450 lbs

**Date animals removed from residue study area:** 1/16/98

**Size of residue study area (acres):** 120

**Type of supplemental feeds:** Moormans mineral - Forage buster

**Class of Animal:** Cow/calf

**Number of animals on residue study area:** 51 cows;  
30 calves

**Location of water from residue study area:** NW  
corner of grazed area.

**Lease Rate:** Framer is owner of cattle and tenant on  
corn ground

Please note condition of lease

**Estimated Precipitation during grazing period:** 1-3 inches

## Stevens County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/1/97	49.2	6.7	44.1	8644
12/16/97	47.5	5.4	47.1	7999
1/15/98	46.7	6.8	46.5	8038

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/17/97	47.8	9.6	42.6	10467
12/1/97	49.6	8.4	42	9378
12/16/97	46.2	10.3	43.5	9913
1/15/98	281.6	8.9	44.9	9334

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/1/97	5.24	4.29	3.52
12/16/97	4.52	4.67	4.5
1/15/98	5.11	4.96	4.36

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/17/97	5.33	4.5	4.27
12/1/97	4.92	4.88	4.07
12/16/97	5.32	6.42	4.02
1/15/98	5.46	5.95	4.26

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/1/97	75.6	80.1	80.9
12/16/97	78.3	80.0	70.2
1/15/98	76.2	77.2	78.2

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/17/97	75.4	79.9	82.3
12/1/97	78.2	77.8	80.8
12/16/97	75.7	75.3	74.6
1/15/98	72.3	74.0	76.1

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/1/97	51.4	47.3	57.7
12/16/97	50.1	47.2	50.0
1/15/98	52.0	4902.0	56.8

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/17/97	48.8	48.0	57.6
12/1/97	50.4	49.2	56.8
12/16/97	53.2	48.9	54.3
1/15/98	52.8	49.6	54.1



## *Agronomy Inputs*

**Producer Name:** Jim Schwarz

**County:** Harvey

**Residue Type:** Milo stalks

**Variety/Hybrid:** Pioneer 8699

**Date Planted:** 6/20/97

**Fertilization**

**1996**

**Rates:** 75 lbs.

**Sources:** Anhydrous

**Time:** May

**Manure:** None

**1997**

75 lbs; 40 lbs

Anhydrous; 10-34-0 May; with planter

**Herbicide**

**1996**

**Kind & Rate:**

**Timing:**

**1997**

Daul and MiloPro; 1.5 pint

with planter

**Row Spacing:** 30"

**Harvest Date:** 11/10/97

**Lodging?** No

**Soil Type:** Carwile find sandy loam

**Yield:** 78

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:**

**Rip:**

**Sweep:**

**Other:**

---

## *Animal Sciences Inputs*

**Producer Name:** Jim Schwarz

**County:** Harvey

**Date Animals placed on residue study area:** 12/29/97

**Approximate size of animal (weight):** 1300

**Date animals removed from residue study area:** 3/15/98

**Size of residue study area (acres):** 120

**Type of supplemental feeds:** Little alfalfa

**Class of Animal:** Cows

**Number of animals on residue study area:** 80

**Location of water from residue study area:** ---

**Lease Rate:** ----

**Please note condition of lease**

**Estimated Precipitation during grazing period:** 1 to 3 inches

## Harvey County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
1/12/98		9.1	90.9	1295
1/26/98		36.1	63.9	1588
2/11/98		3.9	96.1	1004

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/29/97		23.7	76.3	2884
1/12/98		25.2	74.8	2012
1/26/98		28.3	71.7	1526
2/11/98		19.7	80.3	1532

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/12/98		6.09	3.47
1/26/98		5.06	2.84
2/11/98		6.58	3.06

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/29/97		7.43	3.56
1/12/98		7.41	3.7
1/26/98		9.33	4.16
2/11/98		7.18	3.04

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/12/98		72.1	80.8
1/26/98		71.7	80.6
2/11/98		69.8	78.0

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/29/97		68.5	77.6
1/12/98		69.2	78.7
1/26/98		67.6	77.8
2/11/98		65.7	77.3

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
1/12/98		48.2	52.0
1/26/98		50.6	54.2
2/11/98		50.5	54.2

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/29/97		48.9	52.3
1/12/98		47.6	52.5
1/26/98		43.9	53.0
2/11/98		47.1	55.1

## *Agronomy Inputs*

**Producer Name:** Nelson Wiebe

**County:** Marion

**Residue Type:** Grain Sorghum

**Variety/Hybrid:** NC + 7R37E

**Date Planted:** 6/11/97

**Fertilization**

**1996**

**Rates:** 130-0-0

**Sources:** Anhydrous Ammonia

**Time:** April 1996

**Manure:**

**1997**

130-35-0; 10-34-0

Anhydrous ammonia

End of May 1997

**Herbicide**

**1996**

**Kind & Rate:** 1 lb. Atrazine; 1 lb 2,4-D

**Timing:** May 19, 1996

**1997**

.5 gal Bicep; .17 gal Attrex

June 14, 1997

**Row Spacing:** 30"

**Harvest Date:** 10/18/97

**Lodging?** No

**Soil Type:** Lancaster

**Yield:** 110 bushels/acre

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** Fall 1995; some of this field was chiseled in early winter 1997 and the same part was disked in May 1997.

**Rip:**

**Sweep:**

**Other:** Anhydrous ammonia applied in spring 1996; field cultivated once in the spring of 1996 prior to 1996 planting; field was cultivated twice in the spg.

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## *Animal Sciences Inputs*

**Producer Name:** Nelson Wiebe

**County:** Marion

**Date Animals placed on residue study area:** 11/8/97

**Approximate size of animal (weight):** 1100 lbs

**Date animals removed from residue study area:** 12/6/97

**Size of residue study area (acres):** 34.8

**Type of supplemental feeds:** +3200 lbs of 16% CP Alfalfa hay; 100 lbs free choice mineral.

**Class of Animal:** Spring Calving Cows

**Number of animals on residue study area:** 54

**Location of water from residue study area:** SW corner of field.

**Lease Rate:**     

**Please note condition of lease**

Cow herd owner provided all the care to the cows. The field was located in McPherson County but the producer lives in Marion County.

**Estimated Precipitation during grazing period:** 1-3 inches

## Marion County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/26/97	16.9	8	75.2	3371
12/15/97	13.7	13.4	72.8	3549

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/12/97	2.5	28.4	69.2	3672
11/26/97	10.8	31.5	57.7	5203
12/15/97	13.4	28.7	57.9	4894

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/26/97	9.16	6.12	4.07
12/15/97	5.88	4.72	3.04

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/12/97	7.95	8.04	3.93
11/26/97	10.53	9.89	4.34
12/15/97	9.49	7.19	4.77

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/26/97	61.6	66.6	72.0
12/15/97	59.9	67.5	74.1

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/12/97	62.5	61.1	70.0
11/26/97	59.5	58.7	71.4
12/15/97	60.7	67.5	66.5

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/26/97	42.9	44.6	48.3
12/15/97	49.5	50.5	54.5

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/12/97	43.6	42.0	49.8
11/26/97	37.7	36.5	48.2
12/15/97	45.9	45.9	48.8

## *Agronomy Inputs*

**Producer Name:** Steve Rupert

**County:** Ottawa

**Residue Type:** Grain Sorghum

**Variety/Hybrid:** Triumph TR481

**Date Planted:** 05/20/97

**Fertilization**

**1996**

**Rates:** 50 Lbs liquid N  
**Sources:** 5 lbs NH<sub>3</sub>; 26 lbs P<sub>2</sub>O<sub>5</sub> dry at planting  
**Time:** preplant  
**Manure:** NA

**1997**

50lb NH<sub>3</sub>  
Liquid  
Preplant  
NA

**Herbicide**

**1996**

**Kind & Rate:** Amber 28 oz.  
**Timing:** February 1996

**1997**

Landmaster & Bicep  
Preplant

**Row Spacing:** 30"    **Harvest Date:** 10/8/97    **Lodging?** No    **Soil Type:** Crete silt loam, Geary silt loam    **Yield:** 75    **Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** Grain sorghum was no-tilled.

**Rip:**

**Sweep:**

**Other:**

---

## *Animal Sciences Inputs*

**Producer Name:** Steve Rupert

**County:** Ottawa

**Date Animals placed on residue study area:** 11/5/97

**Class of Animal:** Stocker

**Approximate size of animal (weight):** 660 lbs

**Number of animals on residue study area:** 108

**Date animals removed from residue study area:** 12/16/97

**Location of water from residue study area:** SW

**Size of residue study area (acres):** 139

**Side of field**

**Type of supplemental feeds:** silage; 4# alfalfa

**Lease Rate:** \_\_\_\_\_

Please note condition of lease

**Estimated Precipitation during grazing period:**    1-3 inches

## Ottawa County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
11/26/97	5.3	27.6	67.1	5261	11/12/97	4.6	30.2	65.2	6665
12/8/97		26.3	73.7	4348	11/26/97	6.7	28.1	65.2	6474
12/23/97	6.2	26.6	67.2	4514	12/8/97	0	30.5	69.5	6194
					12/23/97	3.6	23.6	72.8	6001

### % Crude Protein

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/26/97	4.46	4.58	3.13	11/12/97	4.58	3.45	2.35
12/8/97		3.36	1.98	11/26/97	7.36	8.5	5.98
12/23/97	4.6	3.58	3.26	12/8/97		5.66	2.78
				12/23/97	5.64	4.09	2.5

### % NDF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/26/97	64.3	68.4	65.8	11/12/97	67.6	66.2	70.7
12/8/97		70.0	72.2	11/26/97	66.4	63.5	64.7
12/23/97	69.0	70.2	75.4	12/8/97		67.9	72.7
				12/23/97	63.4	66.0	75.8

### % ADF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/26/97	45.0	49.7	44.4	11/12/97	47.0	43.8	47.4
12/8/97		46.2	50.8	11/26/97	44.9	39.0	44.4
12/23/97	47.7	49.8	51.6	12/8/97		47.4	54.3
				12/23/97	46.8	49.8	53.9

## ***Agronomy Inputs***

**Producer Name:** Don Blank

**County:** Reno

**Residue Type:** Corn stubble

**Variety/Hybrid:** Pioneer 3223 3162

**Date Planted:** 04/23/97

**Fertilization** 1996

1997

**Rates:**

220 lbs NH<sub>3</sub>, 30lbs-K; 20lbs P<sub>2</sub>O<sub>5</sub>

**Sources:**

P&K 10-34-0 0-0-60; 32% liquid N

**Time:**

dry preplant; NH<sub>3</sub> split every 2 weeks up to tassel

**Manure:**

None

**Herbicide** 1996

1997

**Kind & Rate:**

1lb atrazine; 1.5 pint Dual

**Timing:**

Premerge

**Row Spacing:** 30" **Harvest Date:** 10/10/97 **Lodging?** 1 spot on South edge **Soil Type:** Sandy Loam **Yield:** 207 B **Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:**

**Rip:**

**Sweep:**

**Other:** Disc starting in April; Chisel, Disc, plant

---

## ***Animal Sciences Inputs***

**Producer Name:** Don Blank

**County:** Reno

**Date Animals placed on residue study area:** 12/2/97

**Class of Animal:** Cow/calf

**Approximate size of animal (weight):** 1050

**Number of animals on residue study area:** 91 + 6 bulls

**Date animals removed from residue study area:** 1/24/98

**Location of water from residue study area:** corner

**Size of residue study area (acres):** 126

**Lease Rate:** \_\_\_\_\_

**Type of supplemental feeds:** crabgrass/wheat straw last 10 days;  
40% liquid protein last 2 weeks

**Please note condition of lease**

Didn't think the cattle cleaned it up as well as in past. Seemed to clean up 3162 much better than the 3223.

**Estimated Precipitation during grazing period:** 3-5 Inches

## Reno County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/16/97	42.6	2.2	55.2	5862
12/30/97	30.1	1.5	68.4	4127

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/2/97	44.4	6.3	49.2	5991
12/16/97	39.0	2.4	58.6	6572
12/30/97	32.0	2.4	65.6	4632

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	5.87	5.97	3.51
12/30/97	6.16	6.6	2.58

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	3.42	5.86	3.39
12/16/97	5.07	6.18	3.51
12/30/97	4.94	5.22	4.57

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	75.7	75.6	81.3
12/30/97	75.7	73.3	82.3

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	75.9	73.2	72.6
12/16/97	75.9	74.3	77.9
12/30/97	76.0	76.1	80.3

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/16/97	50.8	55.4	65.6
12/30/97	52.1	51.3	60.8

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	51.7	51.6	55.4
12/16/97	55.4	53.4	58.6
12/30/97	53.2	53.7	59.6



## *Agronomy Inputs*

**Producer Name:** Bryan Hollinger

**County:** Rice

**Residue Type:** Milo stalks

**Variety/Hybrid:** NC+ 371

**Date Planted:** June 5, 1997

**Fertilization**

**1996**

**Rates:** fallow

**Sources:** fallow

**Time:** fallow

**Manure:** fallow

**Herbicide**

**1996**

**Kind & Rate:** fallow

**Timing:** fallow

**1997**

50lb; 20lb

Liquid NH<sub>3</sub>; P<sub>2</sub>O<sub>5</sub>

at planting

None

**1997**

1.8 Bicep

Before planting

**Row Spacing:** 30"

**Harvest Date:** 10/20/97

**Lodging?** No

**Soil Type:** Sandy Loam

**Yield:** 78

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** May 10

**Rip:**

**Sweep:** Fallowmaster - June 3

**Other:** Disc April 20.

---

## *Animal Sciences Inputs*

**Producer Name:** Bryan Hollinger

**County:** Rice

**Date Animals placed on residue study area:** January 6, 1998

**Approximate size of animal (weight):** 1100

**Date animals removed from residue study area:** 3/20/98

**Size of residue study area (acres):** 58

**Type of supplemental feeds:** Alfalfa Hay - Straw hay

**Class of Animal:** Cows (Bred)

**Number of animals on residue study area:** 31 head

**Location of water from residue study area:** Southend

**Lease Rate:** Owned land

Please note condition of lease

**Estimated Precipitation during grazing period:**

## ***Rice County (Hollinger) - Sorghum Stalks***

### ***% Dry Matter per acre (Expressed as percent of total)***

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
2/5/98	8.9	27.7	63.4	3702	1/21/98	1	30.9	68.1	5540
2/19/98	7.6	20.9	71.4	3454	2/5/98	3.4	36.7	59.8	3363
3/5/98	1.7	11.3	87	4097	2/19/98	5.3	42.3	52.3	2999
					3/5/98	5.0	32.4	62.6	3232

### ***% Crude Protein***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
2/5/98	7.27	6.11	3.63	1/21/98	8.12	8.72	3.57
2/19/98	6.3	4.85	3.11	2/5/98	10.29	11.36	4.95
3/5/98	10.99	11.96	6	2/19/98	10.57	12.4	5.2
				3/5/98	6.01	5.15	2.79

### ***% NDF***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
2/5/98	58.9	63.3	72.4	1/21/98	66.4	65.5	74.5
2/19/98	56.8	63.3	74.2	2/5/98	62.9	59.0	74.7
3/5/98	59.8	61.9	70.2	2/19/98	59.4	59.5	72.1
				3/5/98	50.2	62.6	79.4

### ***% ADF***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
2/5/98	45.5	44.5	53.1	1/21/98	47.1	44.1	52.1
2/19/98	42.8	51.7	54.2	2/5/98	46.2	40.2	48.0
3/5/98	42.6	43.3	48.4	2/19/98	41.6	43.4	50.9
				3/5/98	42.0	47.5	52.9

## *Agronomy Inputs*

**Producer Name:** Knight Farms

**County:** Rice

**Residue Type:** Milo stubs

**Variety/Hybrid:** Cargill 831 (30,000 drop)

**Date Planted:** 06/02/97

**Fertilization**

**1996**

**Rates:** 50-55 ton/acre  
**Sources:** Knight feedlot  
**Time:** 8-7-97  
**Manure:** Yes

**1997**

None  
None  
None  
None

**Herbicide**

**1996**

**Kind & Rate:** 1/3 oz/A Finesse; 2 oz/A Banvel  
**Timing:** 3-27-96

**1997**

5-27-97 1.8 qt/A Bicep; 6-30-97 post spray: 3/4 pt Buctrin,  
3/4 pt Altrex; 3 oz. Banvel; 1/5 oz. Peak; 1/2 pt Cropoil 3/4#  
32-0-0

**Row Spacing:** 30"    **Harvest Date:** 10/17/97    **Lodging?** No    **Soil Type:** ?    **Yield:** 96.1 Bu/acre    **Previously Grazed:** Yes, winter 96-97

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** 6/25/96 heavy chisel; 7/5/96 light chisel  
**Rip:** 7/13/96 v Blade with N; 8/7/96 Spread manure 3.1 loads/acre approx 50-55 ton/acre  
**Sweep:** 8/7/96 deep chisel; 8/7/96 deep chisel again; 4/25/97 chisel sweep  
**Other:** 5/29/97 field cultivate; 6/2/97 plant milo; 6/13/97 rotary hoe

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## *Animal Sciences Inputs*

**Producer Name:** Knight Farms

**County:** Rice

**Date Animals placed on residue study area:** 11/18/97

**Approximate size of animal (weight):** 444

**Class of Animal:** Stocker

**Number of animals on residue study area:** 345; 39648  
**feeder days**

**Date animals removed from residue study area:** 3/26/98

**Size of residue study area (acres):** 114.4 wheat pasture; 119.7 mil stubs

**Location of water from residue study area:**       

**Type of supplemental feeds:** 16.54#/hd/day ave grower ration

**Lease Rate:** -----

Please note condition of lease

**Estimated Precipitation during grazing period:**

## ***Rice County (Knight) - Sorghum Stalks***

### ***% Dry Matter per acre (Expressed as percent of total)***

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
12/17/97	3.6	38.4	58.0	3811	12/3/97	3.0	30.5	66.5	3748
1/2/98	7.3	36.7	56.0	4067	12/17/97	8.1	35.3	56.6	3369
1/20/98	6.6	22.5	70.9	3493	1/2/98	7.3	32.8	59.9	3438
2/4/98	9.5	21.5	6.9	2919	1/20/98	33.6	28.1	38.3	5806
					2/4/98	12.2	40.6	47.3	3740

### ***Crude Protein***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
12/17/97	11.15	12.03	7.18	12/3/97	8.43	11.58	6.68
1/2/98	11.73	10.99	6.35	12/17/97	9.58	10.61	6.29
1/20/98	9.27	8.42	5.75	1/2/98	11.73	12.27	5.95
2/4/98	6.77	7.75	6.01	1/20/98	8.09	10.19	6.34
				2/4/98	8.97	11.41	5.64

### ***% NDF***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
12/17/97	56.0	60.9	68.2	12/3/97	70.8	58.3	68.0
1/2/98	53.1	61.1	67.9	12/17/97	62.4	64.0	67.1
1/20/98	51.0	64.8	69.5	1/2/98	57.0	59.3	66.0
2/4/98	54.5	64.4	70.4	1/20/98	59.5	60.5	66.5
				2/4/98	56.7	57.0	73.6

### ***%ADF***

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
12/17/97	45.5	41.9	46.8	12/3/97	48.0	44.5	48.5
1/2/98	44.1	44.8	48.3	12/17/97	48.6	42.3	47.9
1/20/98	46.8	44.6	52.2	1/2/98	42.4	41.8	47.6
2/4/98	50.7	53.6	51.5	1/20/98	46.7	45.9	49.7
				2/4/98	43.4	46.4	52.4

## ***Agronomy Inputs***

**Producer Name:** LeRoy & Doug Schrader

**County:** Atchison

**Residue Type:** Corn

**Variety/Hybrid:** DeKalb 668

**Date Planted:** 04/15/97

**Fertilization**

**1996**

**Rates:**

Soybean

**Sources:**

**Time:**

**Manure:**

**1997**

120 Lbs NH<sub>3</sub>

Anhydrous

60 10-34-0 starter; 100 lb side

None

**Herbicide**

**1996**

**Kind & Rate:**

**Timing:**

**1997**

Bicep

PRE

**Row Spacing:** 30"

**Harvest Date:** 10/15/97

**Lodging?** No

**Soil Type:** Loam

**Yield:** 100

**Previously Grazed:** Not in '97

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** No tilled; no tillage

**Rip:**

**Sweep:**

**Other:**

---

## ***Animal Sciences Inputs***

**Producer Name:** LeRoy & Doug Schrader

**County:** Atchison

**Date Animals placed on residue study area:** 10/31/97

**Approximate size of animal (weight):** 1200 lbs

**Date animals removed from residue study area:** 12/20/97

**Size of residue study area (acres):** 80

**Type of supplemental feeds:** Cows has access to brome pasture waterway and seemed to be in those areas instead of stock field

**Lease Rate:** Cash rent on corn ground

**Class of Animal:** Cows

**Number of animals on residue study area:** 18

**Location of water from residue study area:** 1/3 to

½ miles away

**Please note condition of lease**

cattle owner cares for cattle

**Estimated Precipitation during grazing period:** 3-5 inches

## Atchison County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
11/14/97	56.4	13	30.7	4136	11/1/97	52.5	8.7	38.7	3828
11/26/97	54.4	11.2	34.4	3713	11/14/97	56.8	12.1	31	3739
12/20/97	49.6	5.7	44.7	3105	11/26/97	57.1	11.1	31.8	3227
					12/20/97	45	9.2	45.8	3674

### % Crude Protein

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/14/97	4.87	4.34	4.11	11/1/97	4.22	5.88	5.76
11/26/97	5.33	3.87	4.81	11/14/97	4.93	3.4	4.04
12/20/97	5.23	5.2	3.84	11/26/97	5.18	3.56	5.09
				12/20/97	6.69	4.47	4.57

### % NDF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/14/97	73.73	78.41	81.15	11/1/97	76.35	72.79	77.66
11/26/97	75.43	79.25	75.85	11/14/97	66.95	80.42	80.13
12/20/97	72.74	72.66	82.82	11/26/97	74.77	80.92	79.2
				12/20/97	66.82	76.37	80.25

### % ADF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
11/14/97	49.2	47.69	59.78	11/1/97	48.67	46.7	57.06
11/26/97	44.58	48.05	51.8	11/14/97	49.94	48.44	56.15
12/20/97	48.36	59.44	58.33	11/26/97	46.02	47.56	55.59
				12/20/97	48.03	48.83	55.59

## *Agronomy Inputs*

**Producer Name:** Brad Holzhey

**County:** Doniphan

**Residue Type:** Corn

**Variety/Hybrid:**

**Date Planted:** 04/15/97

**Fertilization** 1996

1997

**Rates:**

180 Lb NH<sub>3</sub>

**Sources:**

**Time:**

**Manure:**

**Herbicide** 1996

1997

**Kind & Rate:**

**Timing:**

**Row Spacing:** ? **Harvest Date:** October

**Lodging?** No **Soil Type:** Loamy

**Yield:** 150

**Previously Grazed:** not in 97

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** No-till

**Rip:**

**Sweep:**

**Other:**

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## *Animal Sciences Inputs*

**Producer Name:** Brad Holzhey

**County:** Doniphan

**Date Animals placed on residue study area:** 11/15/97

**Approximate size of animal (weight):** 1200 lbs

**Date animals removed from residue study area:** 30

**Size of residue study area (acres):** 400

**Type of supplemental feeds:** None

**Class of Animal:** Cows

**Number of animals on residue study area:** 30

**Location of water from residue study area:** either side of field

**Lease Rate:** owned

Please note condition of lease

**Estimated Precipitation during grazing period:**

## Doniphan County - Corn Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/5/97	54.3	14.3	31.4	4300
1/13/98	52.4	8.4	39.2	2128

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
11/18/97	54.8	12	33.2	3914
12/5/97	53	19.3	27.7	4836
1/13/98	56.1	14.4	29.5	3648

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/5/97	5.21	5.12	4.55
1/13/98	5.47	5.55	4.03

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/18/97	5.94	5.51	4.04
12/5/97	5.28	4.85	4.23
1/13/98	5.74	4.92	3.88

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/5/97	78.2	79.9	80.9
1/13/98	77.6	78.0	83.1

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/18/97	73.8	77.6	82.7
12/5/97	77.8	78.1	80.3
1/13/98	75.0	77.7	82.7

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/5/97	47.7	51.2	56.9
1/13/98	53.7	53.2	59.4

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
11/18/97	47.5	49.9	55.9
12/5/97	48.9	48.1	54.9
1/13/98	50.1	52.2	60.9



## *Agronomy Inputs*

**Producer Name:** Mulroy Brothers

**County:** Jackson

**Residue Type:** Corn stalks

**Variety/Hybrid:** Mycogen 7250

**Date Planted:** 05/09/97

**Fertilization** 1996

**1997**

**Rates:**

21.3 G/A 32%

**Sources:**

4.5 gal 9-18-9-1

**Time:**

**Manure:**

**Herbicide** 1996

**1997**

**Kind & Rate:**

6 oz. accent, .9 qts Aatrex; 7.1 oz Banvel; Frontier .7 pts

**Timing:**

6-21-97

**Row Spacing:** 30" **Harvest Date:** 10/5/97 **Lodging?** No **Soil Type:** ?

**Yield:** 69.91

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** No till 1996 & 1997

**Rip:**

**Sweep:**

**Other:**

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## *Animal Sciences Inputs*

**Producer Name:** Mulroy Brothers

**County:** Jackson

**Date Animals placed on residue study area:** 11/8/97

**Class of Animal:** Cow/calf

**Approximate size of animal (weight):** 1100 lbs

**Number of animals on residue study area:** 23

**Date animals removed from residue study area:** 11/24/97

**Location of water from residue study area:** South in pasture

**Size of residue study area (acres):** 48.7

**Type of supplemental feeds:** \_\_\_\_\_

**Lease Rate:** owned

**Please note condition of lease**

**Estimated Precipitation during grazing period:** less than 1 inch

## ***Jackson County - Corn Stalks***

### ***% Dry Matter per acre (Expressed as percent of total)***

Date	Grazed			Total Lbs. DM/Acre	Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem			Unattached Leaves	Attached Leaves	Stem	
11/24/98				2587	11/10/97		63.6	36.4	4124
					11/24/97		38.4	61.6	3106

### ***% Crude Protein***

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
11/24/97		4.4		11/10/97		4	3.91
				11/24/97		4.51	3.95

### ***% NDF***

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
11/24/98		73.9		11/10/97		76.1	77.1
				11/24/97		73.6	76.5

### ***% ADF***

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
11/24/98		49.7		11/10/97		49.6	43.5
				11/24/97		50.8	49.7

## *Agronomy Inputs*

**Producer Name:** Dan & Mary Howell

**County:** Marshall

**Residue Type:** Milo stalks

**Variety/Hybrid:**

**Date Planted:** 05/18/98

**Fertilization**

1996

**Rates:**

Soybean

**Sources:**

**Time:**

**Manure:**

1997

90 lbs NH<sub>3</sub>; 30 lbs P<sub>2</sub>O<sub>5</sub>

Dry

Preplant

What cows left

**Herbicide**

1996

**Kind & Rate:**

**Timing:**

1997

1 1/2 lbs Atrazine

preplant

**Row Spacing:** 30"

**Harvest Date:** 10/15/97

**Lodging?** No

**Soil Type:** ?

**Yield:** 65

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** 2 field cultivations

**Rip:**

**Sweep:**

**Other:**

---

## *Animal Sciences Inputs*

**Producer Name:** Dan & Mary Howell

**County:** Marshall

**Date Animals placed on residue study area:** 11/20/97

**Approximate size of animal (weight):** 1050-1100 lbs; 100-400 lbs

**Date animals removed from residue study area:** 12/31/97

**Size of residue study area (acres):** 109 total

**Type of supplemental feeds:** oathay; suden

**Class of Animal:** Cow/calf

**Number of animals on residue study area:** 50-75

**Location of water from residue study area:** Well

At old farm site

**Lease Rate:** 60/40

**Please note condition of lease**

60/40 lease. Allows grazing. The tenant puts up electric fence. Landlord supplies water. Basically extension of crop share lease.

**Estimated Precipitation during grazing period:** 3-5 inches ( good snows in Nov & Dec.)

## Marshall County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre	Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem			Unattached Leaves	Attached Leaves	Stem	
12/31/97				980	11/24/97	45		55	4136
					12/31/97	24.4		75.6	1980

### % Crude Protein

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/31/97			2.53	11/24/97	3.04		3.07
				12/31/97	4.03		3.42

### % NDF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/31/97			72.17	11/24/97	74.42		73.67
				12/31/97	68.95		49.2

### % ADF

Date	Grazed			Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem		Unattached Leaves	Attached Leaves	Stem
12/31/97			52.27	11/24/97	54.84		50.92
				12/31/97	50.27		43.76

### *Agronomy Inputs*

**Producer Name:** Steve Murphy

**County:** Crawford

**Residue Type:** Sorghum

**Variety/Hybrid:** Pioneer 8500

**Date Planted:** 05/15/98

**Fertilization**

1996

**Rates:**

Soybeans

**Sources:**

**Time:**

**Manure:**

1997

100-50-50

UAA KCI

05/15/97

**Herbicide**

1996

**Kind & Rate:**

**Timing:**

1997

Bullet and Atrazine  
preplant

**Row Spacing:** 30"

**Harvest Date:** 10/15/97

**Lodging?** No

**Soil Type:** ?

**Yield:** 118

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** chisel; disc; field cultivate

**Rip:**

**Sweep:**

**Other:**

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### *Animal Sciences Inputs*

**Producer Name:** Steve Murphy

**County:** Crawford

**Date Animals placed on residue study area:** 10/20/97

**Approximate size of animal (weight):** 1100 Lbs; 450 lbs

**Date animals removed from residue study area:** all winter

**Size of residue study area (acres):** 32

**Type of supplemental feeds:** range cubes

**Class of Animal:** Cow/calf

**Number of animals on residue study area:** 20-20

**Location of water from residue study area:** Creek

**Lease Rate:** does not apply

Please note condition of lease

**Estimated Precipitation during grazing period:** 3-5 inches

## Crawford County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Grazed					Non-Grazed				
Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre	Date	Unattached Leaves	Attached Leaves	Stem	Total Lbs. DM/Acre
10/17/97	12.5	27.6	59.9	3565	10/17/97	9.7	24.3	66.1	4400
11/7/97	9.5	26.2	64.3	3610	11/7/97	9.5	23.9	66.6	4929
11/21/97	11.1	23.4	65.5	4424	11/21/97	14	27.2	58.8	4004

### % Crude Protein

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
10/17/97	4.56	5.65	3.43	10/17/97	5.51	8.05	3.82
11/7/97	5.01	6.57	2.99	11/7/97	5.22	6.73	2.72
11/21/97	5.01		4.29	11/21/97	4.66	5.75	3.21

### % NDF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
10/17/97	75.7	68.3	71.2	10/17/97	79.9	65.6	70.9
11/7/97	73.9	66.9	74.1	11/7/97	75.8	68.2	68.8
11/21/97	74.0		73.1	11/21/97	76.7	68.6	72.0

### % ADF

Grazed				Non-Grazed			
Date	Unattached Leaves	Attached Leaves	Stem	Date	Unattached Leaves	Attached Leaves	Stem
10/17/97	54.9	48.5	52.1	10/17/97	55.1	46.7	49.3
11/7/97	54.5	47.4	51.6	11/7/97	54.8	47.0	49.5
11/21/97	56.0		51.8	11/21/97	52.9	49.9	51.6

## ***Agronomy Inputs***

**Producer Name:** Tom Perrier

**County:** Greenwood

**Residue Type:** Milo

**Variety/Hybrid:** Hoegenpin 662

**Date Planted:** 05/12/97

**Fertilization**

**1996**

**Rates:**

Soybeans

**Sources:**

**Time:**

**Manure:**

**1997**

110 lbs NH<sub>3</sub>; 70 lbs 18-46-0

Anhydrous

04/02/97

None

**Herbicide**

**1996**

**Kind & Rate:**

**Timing:**

**1997**

2 lbs atrazine

05/05/97

**Row Spacing:** 30"

**Harvest Date:** September (late)

**Lodging?** No

**Soil Type:** Woodsen

**Yield:** 90

**Previously Grazed:** No

**Previous tillage type**(please describe. How many times and when? In 1996 or 1997?):

**Chisel:** Winter of 97; field cultivated. Anhydrous applies in April; field cultivate before planting

**Rip:**

**Sweep:**

**Other:**

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## ***Animal Sciences Inputs***

**Producer Name:** Tom Perrier

**County:** Greenwood

**Date Animals placed on residue study area:** 12/1/97

**Approximate size of animal (weight):** 1000-1100 lbs

**Date animals removed from residue study area (acres):** 01/30/98

**Size of residue study area (acres):** 27 acres milo with 19 acres grass

**Class of Animal:** Bred Heifers

**Number of animals on residue study area:** 43

**Location of water from residue study area:** East end

**Lease Rate:** \_\_\_\_\_

**Type of supplemental feeds:** 10 lbs alfalfa hay; 5 lbs ground milo

**Please note condition of lease**

**Estimated Precipitation during grazing period:** 3-5 inches

## Greenwood County - Sorghum Stalks

### % Dry Matter per acre (Expressed as percent of total)

Date	Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/2/97	35.6	14.6	49.8	2880
12/19/97	32.6	7.8	59.6	2411

Date	Non-Grazed			Total Lbs. DM/Acre
	Unattached Leaves	Attached Leaves	Stem	
12/2/97	21.2	15.9	62.9	2315
12/19/97	36.1	10.4	53.5	2407

### % Crude Protein

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	5.38	9.64	5.72
12/19/97	5.23	7.41	4.5

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	4.73	10.02	5.51
12/19/97	6.2	9.02	4.8

### % NDF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	72.7	68.6	73.0
12/19/97	73.0	68.4	76.5

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	77.6	70.0	76.5
12/19/97	74.9	69.9	77.1

### % ADF

Date	Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	49.8	47.4	54.9
12/19/97	52.9	53.5	54.8

Date	Non-Grazed		
	Unattached Leaves	Attached Leaves	Stem
12/2/97	51.4	47.3	53.9
12/19/97	52.7	49.8	57.1



# Grazing Crop Residues

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Nebraska has an abundance of crop residue available for late fall and winter grazing. However, several factors prevent the grazing of many fields, including the location of fields in relation to the cattle, the lack of shelter or appropriate fencing and water availability. Despite these limitations, residue grazing is an important resource to many cattle operations, primarily as either a winter feed resource for maintaining the breeding herd or putting weight on cull cows. Calves weaned in the fall can also be wintered on cornstalks if appropriate supplementation is used.

## Nutritional Value

*In vitro* dry matter digestibility (IVDMD) and crude protein content of different residues are shown in Table I. IVDMD, an estimate of energy, is closely related to total digestible nutrients (TDN). The terms IVDMD and TDN will be used interchangeably in this Extension Circular.

### Cornstalks

As shown in Table I, the corn cob and stalk are lowest in protein and energy, the leaf and husk are intermediate and the grain highest. Nutrient quality of a cornstalk field varies depending on whether or not the field was irrigated (Table II). In dryland corn fields, the grain, husk and leaf, cob and stalk generally equal to or greater in protein and energy content than residue components in irrigated corn fields. Although the proportions of husk and leaf and stalk differ between dryland and irrigated corn, the overall nutrient content per ton of dryland corn residue is expected to be greater. More residue, however, is left in an irrigated corn field after harvest. Research from eastern Nebraska indicates about two times more residue is left in an irrigated field (over 5,000 pounds per acre) compared to a dryland field (2,500 pounds per acre). Although the proportion of grain left in the two fields may be similar, the total amount of grain left in an irrigated field is usually much greater. While the amount of residual grain left in the field varies depending on

factors such as harvest date, lodging due to insects and disease and harvest efficiency, the average amount of grain left in the field is about 4.2 percent of the yield.

Research has shown cornstalk fields grazed shortly after harvest are higher in nutrient content than those grazed 60 days after harvest. This indicates loss of nutrients due to weathering. The greatest nutrient, primarily a loss in energy content, appears in the husk and leaf. Also, nutrient losses are greater in wet, humid areas due to increased decomposition and weathering.

### Grain Sorghum Stubble

Many of the above nutrient quality aspects apply to grain sorghum stubble; however there are at least two differences (Table I). The grain sorghum leaf is generally higher in protein than a corn leaf; however, sorghum grain is not utilized as well as corn grain. The sorghum berry's hard outer coat makes it more difficult for the animal to digest. Cattle can founder in grain sorghum fields with excessive amounts of grain left after harvest, indicating there is some utilization.

### Soybean Stubble

The TDN content of the soybean leaf, pod and stalk are low (35 percent to 41 percent; Table I). The low energy content for soybean stubble residue is likely due to the high lignin content, especially in the stalk. Lignin is an undigestible cell wall component of the plant.

## Grazing Characteristics

Weather can be the most important factor in successfully grazing crop residue. For example, snow cover can reduce or eliminate access; mud may make grazing difficult and may result in decreased animal performance and forage waste.

One Animal Unit Month (AUM) is the amount of forage required to sustain a 1,000 pound cow or



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Table I. Average percentage composition of harvested crop residues — dry matter basis.

		Percent crude protein		Percent IVDMD <sup>a</sup>	
	Percent dry matter	Range	Average	Range	Average
Corn					
Grain	73	9.5-11.2	10.2	88-95	91
Leaf	76	6.2-7.5	7.0	41-65	58
Husk	55	2.6-3.8	2.8	63-72	68
Cob	58	2.1-3.8	2.8	59-65	60
Stalk	31	3.0-5.1	3.7	45-60	51
Milo					
Grain	74	10.3-11.0	10.5	85-95	90
Leaf	66	6.0-13.0	10.0	40-65	56
Stalk	25	3.3-3.9	3.6	53-58	57
Soybean residue					
Leaf	87	11.0-13.1	12.0	36-40	38
Stem	88	3.6-4.5	4.0	33-36	35
Pod	88	4.5-9.0	6.1	34-51	41

<sup>a</sup>IVDMD = In vitro dry matter digestibility. IVDMD is approximately equal to TDN (Total Digestible Nutrients).

equivalent for one month. One acre of irrigated corn stalks or grain sorghum stubble will provide approximately two AUM of grazing. Dryland stalks will have about one-half the carrying capacity of irrigated stalks. This number depends, though, on factors such as harvest conditions and subsequent weather conditions. For example, excellent harvest conditions would mean less grain left in the field, resulting in a lower total nutrient value and fewer grazing days prior to moving cattle to a new stalk field. Another way to calculate the number of grazing days is to assume 4 percent of the grain yield is down corn and amounts to 1.9 pounds of corn dry matter per day. If there is minimal mud and trampling, we could estimate 80 percent of the corn, leaves and husks can be consumed. This would provide .8 days of grazing for a calf or .4 days of grazing for a cow per bushel of corn produced (Ex: 150 bu corn/Ac x .4 days = 60 days of grazing per cow per acre).

Cows grazing cornstalks or grain sorghum stubble will consume 25-30 percent of the available residue in 30-100 days, depending on stocking, leaving enough material to prevent soil erosion. In the Midwest, weather records indicate the average number of continuous grazing days for crop residue is 65-111 days.

During years of heavy snow accumulation, grain sorghum stubble provides better grazing than cornstalks. The grain sorghum head is cut off near the top of the plant leaving more standing forage in the form of leaves above the accumulated snow. However, delayed frost, unseasonably warm temperatures and moisture allow grain sorghum plants to remain green or develop new growth after grain harvest. *This new green growth, commonly referred to as "suckers", may be high in toxic prussic acid. If "sucker" growth occurs,*

cattle should not graze the stubble until at least seven days following a hard freeze.

When grazing residue, cattle will select and eat the grain first, followed by the husk and leaf and finally the cob and stalk. Because of this selection process, the cornstalk residue consumed could be very high in energy content (70 percent TDN) at first to very low (40 percent TDN) at the end of grazing. Also, as the stocking rate (number of cows per acre) increases, the nutrient content of the remaining residue declines more rapidly as the grain and husk are being removed at a much faster rate.

## Meeting Nutritional Needs

Nutrient (protein, energy, minerals, vitamins) requirements for cattle increase as their stage of production moves from mid-gestation; dramatically increasing after calving due to lactation. For a 1,200 pound mature cow producing 18 pounds of milk, the percent of protein in the ration should be 7.0 percent in mid-gestation and 8 and 9.5 percent for cows in late gestation and after calving, respectively. Restated in pounds, cows would require 1.4 pounds of crude protein daily in mid-gestation, 1.7 pounds of crude protein in late-gestation and 2.1 pounds during lactation. Likewise, energy (TDN) needs increase from gestation to lactation. Percent TDN needed in the ration daily is 49 percent (9.5 pounds TDN), 54 percent (11.2 pounds TDN), and 56 percent (12.1 pounds TDN) for mid-gestation, late gestation and lactation, respectively. For the first-calf-heifer, the pounds of crude protein and TDN needed on a daily basis are similar to the mature cow described above. However, the protein percentage needed for the first-calf-heifer is much different. Percent of the ration needing to be crude

protein is 8.1 percent, 8.5 percent, and 10.4 percent for first-calf-heifers in mid- and late gestation and after calving. Likewise, the percent of the ration that needs to be TDN is 55 percent, 57 percent, and 63 percent for first-calf-heifers in mid- and late gestation and after calving. The reason for the higher percentage required: is the first-calf-heifers have less rumen capacity and their rations must be more nutrient dense because they can't eat as much as mature cows.

#### *Cows and First-Calf-Heifers*

As long as cattle have grain to select in a cornstalk field, they will consume a diet that is probably above 7 percent crude protein and as high as 70 percent TDN (Table II). This will exceed the protein and energy needs of a 1,100 to 1,200 pound cow in mid-gestation. Spring-calving cows, which are at mid- to late gestation during fall and early winter, have nutrient requirements well matched to crop residue grazing programs. However, as the stalk grazing season progress, nutrient quality of the stalks decreases.

Periodically, producers should check what is available in the residue field. If corn is visible in the manure of gestating cows grazing corn residue, supplementation with other than vitamins and minerals is probably unnecessary. However, after most of the grain has been consumed, protein supplementation is needed. *Cows in mid- to late gestation, or after calving, forced to eat the cob and stalk will lose weight and body condition.* It is essential to monitor body condition of cows and manage them to achieve moderate body condition before calving (moderate condition score 5 to 6 using the scale 1 = very thin to 9 = obese).

Heifers in late gestation should not be allowed to graze cornstalk fields, or milo stubble especially after the grain has been consumed, unless supplemented with energy. Heifers have a high protein and energy requirement and the remaining residue does not meet their requirements.

Lactating cows, such as fall-calving cows, grazing crop residue also must be managed carefully. As long as lactating cows have grain to select in the field, their energy needs should be met. If the breed type has a high milk potential, however, protein supplementa-

tion is necessary even if the cattle have grain to eat.

#### *Calves*

Forage bulk may cause lower performance for young cattle, as their rumen capacity per unit of body weight is less than that of mature cows. Protein supplementation appears necessary for calves grazing cornstalks; even then gain may not exceed 1 pound per day. This may be adequate if a producer is wintering calves for low rates of gain and plans to summer them on grass. Supplementing the calf with energy may, however, provide greater gains and still be economical.

### **Grazing Strategies**

The producer who grazes livestock on crop residue must have an emergency feed supply, such as hay or silage, for use during severe weather. Also, supplemental forage can extend the crop residue grazing period and enhance animal performance. Snow cover up to 5 inches will probably not reduce grazing. Do not be in a hurry to provide supplemental feed or cattle will become lazy and not graze.

Ordinarily, dry cows will at least maintain body weight, and may gain .5-1 pound per head daily, on corn and grain sorghum residue grazing programs where grain, husks and leaves are available.

Strip grazing (fencing off portions of a residue field) or moving cattle from field to field provides a more uniform nutrient intake. Daily gains of cattle are greater when fields are stripped grazed versus whole-field grazing. However, if residue fields are strip-grazed and it happens to snow, some of the best feed may be lost because of snow cover.

Whole-field grazing is the most common grazing strategy. Early whole-field grazing has the potential to allow cattle to consume the best feed (grain and husk) prior to snow fall or muddy conditions. Whole-field grazing should allow cows to put on weight during the early phase, with weight being maintained or lost after grain has been gleaned from the field. To keep cows gaining or maintaining weight using

**Table II. Proportions and quality of residue in irrigated and dryland field corn residue.**

Item	Irrigated			Dryland		
	Proportion, percent	CP <sup>a</sup> , percent	IVDMD <sup>b</sup> , percent	Proportion, percent	CP <sup>a</sup> , percent	IVDMD <sup>b</sup> , percent
Grain	4.0	9.6	91.4	4.0	12.8	90.8
Leaf and husk	45.0	3.7	51.6	51.0	6.4	49.7
Stalk	40.0	3.0	42.6	33.0	5.9	47.8
Cob	11.0	2.6	33.6	12.0	4.6	36.2

<sup>a</sup>CP = Percent crude protein.

<sup>b</sup>IVDMD = In vitro dry matter digestibility.

unsupplemented crop residue, move them to a fresh field when all grain has been consumed.

Fall-calving cows may utilize crop residue for fall-winter grazing if fresh fields are made available at 2-4 week intervals. If the amount of ear drop is low, it may be advantageous to early wean fall calves at 90-120 days of age. Weaning calves would lower the nutrient needs of the cow, and grain and higher quality roughage can be fed directly to the calf and the cow could be maintained on crop residue. On the other hand, if the fall calving cow is pregnant with her next calf, it may not be necessary to wean. These cows, grazing crop residues and suckling a calf, may lose body condition; however, they will likely regain condition on summer pasture before fall calving. In this situation, pay close attention to first-calf-heifers.

Also, cows will substantially graze soybean stubble if allowed access to both cornstalks and soybean stubble, consuming the pods or beans left on the ground. Again, because of the high lignin content of the soybean stalk, there is little energy in this residue.

## Supplementation Strategies for Cattle Grazing Crop Residues

Salt, phosphorus, calcium and vitamin A supplements are recommended for all cattle grazing dormant winter range and crop residues. These supplements can be supplied free-choice.

When protein supplementation is required, natural protein sources provide a better response than protein sources containing large amounts of nonprotein nitrogen, such as urea or biuret. Three-year-old cows grazing cornstalks from mid-November to February 1, supplemented with .4 pounds of crude protein equivalent per head per day in the form of either soybean meal, 7.2 percent urea supplement or 9.2 percent biuret, gained .99, .76, and .83 pounds per day, respectively, indicating that if cows have only husk and leaves to consume in a cornstalk field, an all-natural protein source is recommended. This could be in the form of a good quality alfalfa or a concentrated natural protein supplement. Protein supplements containing protein sources such as sunflower meal, canola meal, feather meal, corn gluten feed and distillers grain tend to be cheaper per unit of protein than protein supplements containing soybean or cottonseed meal.

### Cornstalk Grazing Supplementation

Do not force cattle to eat the cobs and stalks. Even with protein supplementation—cows will lose weight and body condition. Heifers in late gestation should not graze cornstalk residues, especially if there is no grain available, unless provided an energy supplement.

If supplemented with protein, mature cows can graze stalk fields after the grain has been consumed and the husk and leaf remain. It appears the TDN (Table I) is adequate, but protein on the average is slightly below requirements. If protein needs are not met, the energy in the leaf and husk is not used efficiently.

If we assume the average crude protein composition of a diet of leaf and husk is 5.5 percent crude protein, and the cow is in mid- to late gestation, she is protein-deficient. To stimulate intake, and for efficient utilization of the energy in the leaf and husk, protein must be supplemented. If the cows are 1,200 pound and in average body condition, they would be approximately .51 pounds deficient in protein. This protein deficiency could be made up by feeding 3.2 pounds of alfalfa (18 percent CP, 88 percent D.M.) per head per day or 1.7 pounds of a 32 percent range cube per head per day.

When supplementing protein to beef cows, it is essential all cows get their share. Feeding the protein source every other day or every third day means larger quantities are fed and timid and young cows are more likely to get their share compared to daily feedings.

Calves grazing cornstalks also need escape protein supplementation. An escape protein is a protein source that is not digested in the rumen but rather is digested and absorbed in the small intestine. Grain is a good source of escape protein, but as the grain is gleaned from the field the calf's escape protein decreases. Research indicates a protein supplement with at least .36 pounds of escape protein per head is needed. However, supplementing escape protein is expensive. Total protein supplementation may need to be as high as .9 pound per head per day and even then average daily gain for calves grazing cornstalks may not exceed 1 pound per day. Non-protein nitrogen will meet the rumen bacteria needs and minimize cost, but have safety and palatability problems. Alfalfa, corn gluten and protein cubes containing soybean meal or cottonseed meal may be the most economical feed sources.

### Milo Stubble Supplementation

On average, the energy and protein in the leaves of milo stubble appear adequate for cows in mid- to late gestation, but not for heifers in late gestation (Table I). Monitor body condition of mature cows grazing milo stubble. If they appear to be losing condition, supplement protein. If the nutrient quality is low, cows may be .45 pounds deficient in protein and need to be supplemented similar to that described above (Table I). Remember, because of the milo's hard outer coat, it is not utilized by the cow.

## Grazing Strategies for Cornstalk Fields with Excess Grain

Excess grain (more than 8-12 bushels per acre) left in the field can cause both acidosis and founder in cattle. Founder, a severe foot or hoof condition, results from excessive grain intake, which causes an increase in rumen acid production. In severe cases of acidosis, the result is long toe or hoof growth and severe lameness. While hand-picking corn would be the most effective solution, it may not be realistic for producers looking to get cows on traditional stalk fields for winter feed.

Strategies for using high-grain cornstalk fields would be: graze yearling cattle or calves first, then follow with cows; graze cull cows destined for slaughter first, then follow with the main herd; short-term graze (only a few hours per day); increase the stocking rate to reduce grain intake per animal; divide the field into strips with power fence using polywire and fiberglass posts, forcing cows to consume some husks and leaves along with the ears of corn, thus reducing the potential of founder.

The experience level of the cattle grazing a cornstalk field determines how efficiently they will glean a field for grain. Old cows with previous experience in cornstalk fields can pick up amazingly high amounts of corn, as can experienced yearling cattle, so inexperienced calves may have the least risk of founder or acidosis in high-grain cornstalk fields because they must first learn how to find corn so their grain intake increases gradually.

Another technique to reduce risk of acidosis or founder might be to feed some ear-corn 7-10 days before cattle are turned out to help them adapt to a high-grain field.

### *Estimating the Ear Drop*

Estimating the amount of corn down in a field helps producers determine a grazing strategy. An 8-inch ear of corn contains about .50 pound of corn grain, therefore 112, 8-inch ears would equal to 1 bushel (1 bushel = 56 pounds). By counting the number of ears; the amount of corn can be estimated. If corn is planted in 30 inch rows, count the number of ears in three different 100 foot furrow strips and divide by two to give an approximate number of bushels per acre. Small ears and broken ears should be counted as half ears, while very large ears could be counted as an ear and a half. Any amount beyond 8-12 bushels per acre will require a well-planned grazing strategy.

### *Estimating Milo Head Drop*

Because of the hard outer coat, the grain in a milo stubble field is essentially unavailable to cattle, yet when there are large amounts of grain available founder can occur. One milo head has about .12 pounds of grain, and about 400 milo heads would

equal 1 bushel of milo (1 bushel = 56 pounds). As fields approach 10-15 bushels down in the field, producers need to implement well-planned grazing strategies to avoid founder.

## Effect of Grazing Crop Residue on Subsequent Grain Yield

Few experiments have evaluated the effect of winter grazing of crop residues on subsequent grain production. Three years of data from experiments conducted in Nebraska indicate grazing has no significant effects on crop yields compared to ungrazed areas. Neither corn, soybean nor grain sorghum yields were adversely affected following grazing. Residue cover was, however, significantly reduced from grazing compared to ungrazed plots. In no-till cropping systems, additional tillage was not required following fall and winter grazing. In the ridge-till system, grazing of cornstalks did not adversely affect the integrity of the ridges, but soil bulk density in the top (0-3 inches) depth was increased in the inter-row following grazing under muddy conditions. Other measurements showed soil bulk density may increase in tracked areas following grazing. Spring grazing indicated a significant decrease in water infiltration rate compared to ungrazed areas. Spring grazing of stalks also showed a decrease in residue cover and increase in bulk density.

These data indicate cattle should not be allowed to graze crop residues in March, due to the high possibility of mud. Otherwise, it appears little compaction occurs in fields due to grazing.

## What Are Crop Residues Worth?

There are several ways to assign a value to crop residue. The owner of the corn field can consider what is being sacrificed—the nutrients and organic matter removed from the field, the cost of waiting to begin post-harvest field operations and scattering weed seeds. On the other hand, pasturing corn stalks can reduce volunteer corn problems next year and eliminate the need to shred stalks and some nutrients are returned to the soil in the manure. The user of the cornstalk field may have feed savings and additional weight gains from utilizing the field, but may incur additional costs in moving the livestock and providing water and fencing. Grazing your own cornstalks with your own livestock may provide a different perspective from renting due to the difficulty in controlling weed seeds brought in by a renter's cattle and hay.

Several of the advantages and disadvantages of pasturing crop residue are difficult to value, including the cost of delaying field operations; the loss from removing nutrients and organic matter; and the benefit from reducing volunteer corn and getting cattle

out of a confined lot. It is also difficult to place a value on the risk in moving cattle and the additional risks of overseeing cattle further from home.

The feed value of crop residue can be estimated based on daily consumption and price of feed saved, which is usually the largest benefit of using crop residue. As long as the cattle have grain and leaves to select, corn and grain sorghum residue are comparable in nutritional value to good quality grass hay (8 percent protein and 52-58 percent TDN). Additional savings may be realized in reduced wear-and-tear of drylot facilities, reduced equipment operating costs and labor reduction for feeding and manure removal, although these savings may be more than offset by the additional costs of supplying water and fencing, moving cattle and inspecting the grazing cattle. Evaluating cornstalk fields with considerable amounts of fallen grain may require an estimation of the grain and the level of expected utilization. Renting fields based on the weight gain realized would reflect the feed value of the crop residue.

An example for estimating crop residue value is presented in *Table III*. The budget assumes 1 AUM per acre actual grazing (60 head at one animal unit per head for 80 days for a total of 4,800 animal days or 160 AUM's). The example considers an additional 40 days on a 160-acre crop residue pasture but with snow cover requiring supplemental feed. For illustration, additional

weight gain is assumed to be zero. Manure credit is also ignored, as little detailed information is available on the net gain or loss in converting crop residue to manure. The primary savings in manure may likely be the reduced cost in removing the manure from the drylot facilities and not having to spread the manure.

The value of the crop residue can be estimated on an acre or head-per-day basis. Due to weather variability, the rental value of crop residue grazing on a per acre basis is uncertain. Renting crop residue on a per day basis can reduce renter's uncertainty, if the rental period can be adjusted with weather conditions. Livestock producers grazing their own crop residue would realize the benefit from both sides as estimated in *Table III*. Livestock producers renting crop residue could consider the net cost of their next best alternative (for example, supplementation on dormant pasture or feeding in drylot) as the maximum rental value of the crop residue. Landlords could consider any livestock costs covered by the landlord, minus the net benefit to the crop enterprise, as the minimum rental value of the crop residue. Both the maximum rental value the cattle could realize (\$10.09, *Table III*) and the minimum rental value the crop must cover (\$2.50, *Table III*) should be adjusted based on factors discussed earlier. The remaining range in rental values provides a basis for negotiating a rental rate.

**Table III. Example budget estimating the value of grazing crop residue**

<i>60 Cows Grazing 160 Acres of Crop Residue for 120 Days</i>		
Net benefit to livestock enterprise		
Feed savings <sup>1</sup>	60 head @ \$.65 per day for 80 days	\$3,120
Drylot savings <sup>2</sup>		837
Value of additional weight gain (loss) <sup>3</sup>		0
Less crop residue grazing costs <sup>4</sup>		-2,343
	Net livestock benefit	\$1,614
	per acre = \$1,614 ÷ 160 acres =	\$10.09
	per head day = \$1,614 ÷ (60 head x 120 days) =	\$.224
Net benefit to crop enterprise		
Saving shredding stalks 160 acres @ \$2.50/acre <sup>5</sup>		\$400
Manure credit less nutrient and organic matter consumed <sup>6</sup>		0
	Net crop benefit	\$400
	Per acre	\$2.50

<sup>1</sup>Example feed savings based on 80 days at 26 pounds grass hay per head per day at \$50 per ton. May need to be adjusted for supplemental feed needed while grazing crop residue.

<sup>2</sup>Electricity cost for pumping 25 gallons water per head per day at 5¢ per 1,000 gallons. Depreciation and interest for water tank and tank heater of \$32 per annum. Fuel cost for tank heater based on 1 gallon per day for 60 days. Lot cleaning and repairs of \$100 per year. Labor for feeding and oversight of 1 hour per day.

<sup>3</sup>Add value of any additional weight gain expected from crop residue grazing (or subtract loss in value). Example assumed to be zero.

<sup>4</sup>Moving cattle 5 miles at 30 cents per mile equipment charge plus 12 hours labor. Water costs as described above plus hauling 1 mile at 25 cents per mile equipment charge and 2 hours of labor per day. A total of \$154 per year for depreciation and interest on fencing materials, battery charges and labor for installation and tear down. Additional oversight costs of 10 pickup miles per day at 25 cents per mile, plus 30 minutes labor time per day.

<sup>5</sup>Fuel, repairs and labor cost.

<sup>6</sup>The manure produced may contain more nutrients than the stalks removed, but nitrogen losses are possible, making it difficult to estimate a net manure credit.

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