



PRODUCTION

Crop Residues for Livestock Feed no. 0.551

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Quick Facts...

Corn, sorghum, and sugar beet residues are some of the highest quality residues and provide an excellent feed source for gestating beef cows, when supplemented.

Cereal grain residues generally are low quality and probably best used after treatment with anhydrous ammonia.

Due to their low energy value, maximum use of residues is with feeding programs designed for maintenance of animals rather than weight gain.

Maintenance of minimal amounts of residue in the field is important to provide soil erosion control.



Putting Knowledge to Work

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Large amounts of crop residues are produced annually in Colorado. Crop residue is the portion of the harvested crop that remains after the grain or marketable portion of the plant is removed. The most common is cereal grain straw from wheat, barley and rye, followed by corn stalks, grain sorghum residue and sugar beet tops. Dry bean and other crop residue are of lesser importance.

These residues can and do provide a sizeable contribution to the total available feed supply for livestock production in Colorado.

Quantity and Quality

The quantity of residue produced by various crops is shown in Table 1. Using estimates from this table, a grower could expect approximately 7,500 lbs/acre of residue from corn producing 150 bu/acre or 2,800 lbs/acre of residue from winter wheat producing 35 bu/acre.

The quality of various crop residues is determined by the protein and energy or digestible dry matter (DDM) content of the particular residue, because these are the nutrients most important to livestock performance. Corn and sorghum residue and sugar beet tops typically have the highest quality as indicated by greater DDM values (Table 2). The cereal grain residues generally are lower in quality, with oat and barley residue providing the greatest quality. All crop residues possess their highest quality at the time of grain harvest and decline in quality the longer they remain in the field. Sorghum residue does not decrease in quality as rapidly as corn.

Utilization

The primary problems with crop residues are low quality and harvesting. An advantage to using crop residues is that the cost to produce them generally is associated with the production of the grain or marketable product.

Crop residues are most economically used by grazing. Because of their lower quality, cereal grain residues do not lend themselves well to grazing. Corn and sorghum residues are well used in forage systems, particularly for beef cows. Sugar beet tops also are frequently used by sheep producers for grazing.

A Nebraska study involving the grazing of gestating cows during fall and early winter on corn and sorghum residues indicates that cows perform equally well on both residues (Table 3). However, beef cow performance can be expected to decline if grazing is allowed to continue beyond early winter, since feed availability and quality decline as the season progresses. This is because livestock typically graze the highest quality residue first and leave the lower quality stalks until last. Nutritionally, this is contrary to the needs of the cow.

In midgestation, the cow's needs increase as the fetus grows. The last trimester is the most critical period. Thus, little supplementation is needed during

Table 1: Crop residue production.

Crop	Unit	Lbs Residue
		/Unit
Rye	bu	100
Wheat	bu	80
Barley	bu	50
Oats	bu	40
Corn or sorghum	bu	50
Sugar beets	ton	150

Table 2: Crop residue quality at maturity.

Crop	% Crude Protein	% Digestible Dry Matter
	Rye	3.0
Wheat	3.6	45
Barley	4.1	48
Oats	4.4	50
Corn	4.2	52
Sorghum	6.0	52
Sugar beets	12.7	52

Table 3: Beef cow performance while grazing corn or sorghum.

Residue	No. of Cows	Wt. Gain 72 Days	Avg. Gain
Corn	46	135	1.87
Sorghum	45	142	1.96

the first 30 days of grazing, but some protein supplement should be fed thereafter. An excellent practice is to graze corn or sorghum fields with alfalfa fields after the fall-hardening period for alfalfa to provide protein supplementation.

The quality of crop residues generally is considered inadequate to provide for much weight gain in young cattle or sheep, unless significant grain remains in the field after harvest. Otherwise, supplement young livestock at all times with protein and energy in order to ensure adequate performance.

When grazing corn and sorghum residues, use caution regarding management of livestock. Often 60 to 150 pounds per acre of grain may remain in the field after harvest. While the grain is an excellent feed for livestock, overconsumption may produce acidosis or founder in cattle. There is less problem with grain remaining in the field with sorghum than corn.

Additionally, the regrowth that occurs after grain harvest of sorghum may be high in prussic acid or nitrates, particularly after a frost. Both compounds can be lethal to livestock if eaten in significant quantities. For further information regarding these potential problems, contact your county Colorado State University Cooperative Extension office for fact sheets 1.610, *Nitrate Poisoning in Livestock* and 1.612, *Prussic Acid Poisoning in Livestock*.

Sugar beet tops have long been used as a crop residue, with very little being wasted. Most beet tops are grazed or harvested in the field after beet topping and digging is complete. Typically, the topper windrower is used prior to digging of beets to remove the tops. This residue remains in the field for grazing purposes. The best use of beet tops is with sheep, but cattle also perform well grazing beet tops. Beet tops also provide a desirable supplement for cattle grazing corn or sorghum residue, because the beet tops can possess additional protein that corn and sorghum residue may lack (Table 2).

Harvesting

During late winter and early spring, it is necessary to feed harvested forage to livestock in Colorado. Grazing of crop residue usually is not feasible after February 1 and pasture is not available until May. This is an expensive period for feeding livestock because feed must be harvested and the livestock nutrient needs are high, particularly for gestating or lactating cows. The low quality of harvested crop residues generally will not meet the energy needs of the beef cow.

Two possibilities can enhance the quality of residues:

1. harvest early to capture residue quality, or
2. chemical treatment, primarily with anhydrous ammonia.

Corn and sorghum residue are of good quality immediately after the grain is harvested. If it is harvested at greater than 20 percent moisture, the residue will likely contain more than 50 percent moisture.

Anhydrous ammonia treatment of dry-harvested crop residues holds potential for increasing the feeding value of low quality residues. In general, this treatment is accomplished by stacking bales of residues, covering the stack with a sheet of plastic, and sealing the edges of the plastic. Anhydrous ammonia is injected underneath the plastic cover. Depending on ambient temperatures, two to three weeks are needed to complete the reaction.

Treatment of residues results in doubling the protein content for cereal grain residues, while only a 5 percent increase in protein is seen for other residues, such as corn and sorghum. Digestibility of all crop residues can be expected to increase by as much as 20 percent. Thus, treatment of cereal grain residues results in greater increases in quality than treatment of corn or sorghum residues. In general, treated residues probably are equivalent to average-quality hay, depending on the quality of residue treated and effectiveness of treatment.

Either early-harvested corn or sorghum residues or ammonia-treated

References

Wedlin, W.F. and T.J. Klopfenstein. 1985. "Cropland pastures and crop residues," p. 496-506. In M.E. Heath, R.F. Barnes, and D.S. Metcalfe (eds.), Forages - The Science of Grassland Agriculture. Iowa State University Press, Ames, Iowa.

residues have the potential to decrease the cost of beef cow feeding during the harvested-feed period. While residues might make up the majority of the feed supply, some supplemental feed in the form of high-quality hay or concentrates may be needed. Cows should gain weight during this period to help rebreeding.

Protein Supplement

The type of protein supplements referred to are the naturally occurring proteins such as those from soybean, cottonseed and sunflower. Other protein supplements may contain nonprotein forms of nitrogen that must be converted into protein in the rumen. To accomplish this, the rumen must have readily available forms of energy. Low quality crop residues do not have large amounts of available energy to facilitate this conversion. Thus, use of naturally occurring protein supplementation with crop residue programs is encouraged to maximize animal performance.

Residue Management for Soil Erosion Control

When grazing or harvesting crop residues in Colorado, it is important to keep some residue in the field to protect the soil from wind and water erosion. The amount of residue required depends on the type of residue and soil type. However, in general a minimum of 1,200 pounds per acre of cereal grain residue and 2,550 pounds per acre of corn or sorghum residue is required to provide soil erosion control.

Using the residue production figures in Table 1, dryland crops of wheat (35 bu/acre), corn (60 bu/acre), and sorghum (50 bu/acre) will not provide much opportunity for grazing or harvesting these crop residues and provide soil erosion control at the same time. Therefore, most residue utilization programs should make use of crop residues produced on irrigated land, where residue production levels are much greater.

For further information regarding crop residue and soil erosion, consult the Soil Conservation Service (SCS).

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