Alternative Feeding Options

Make use of crop residues to reduce winter feed costs.

by Stephanie Veldman

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► Cows in a strip-grazing system need a half acre per cow per month to maintain body condition says Jim Russell of Iowa State University.

Winter feed costs are generally considered a cow-calf producer's most expensive input. Therefore, managing winter feed resources to minimize costs is key to a profitable cow-calf enterprise. To lower those feed costs, some producers seek ways to extend the grazing season into the winter months.

"One of the real keys to profitability in cow-calf production is to reduce the hay by making use of crop residue," says Jim Russell, an animal scientist at Iowa State University (ISU). "Our major resource for substitution of hay in the Midwest is corn crop residues."

Corn crop residues represent about one-half of the plant dry matter. For example, a field that produces 120 bushels (bu.) of corn per acre produces close to 3 or 4 tons of roughage dry matter per acre.

"We've found, over a number of years of doing corn crop residue grazing work, the conversion of corn crop residue to hay savings is about 15%," Russell says. "So if you had a corn field that had 3 tons of cornstalks, we would have a savings of about 900 pounds of hay per acre of cornstalks grazed."

Effects on soybean yield

Although grazing corn crop residues is effective in reducing feed costs, farmers worry about the adverse effects on soybean yields the following year when using a rotational cropping system.

Russell has worked on several research projects using corn crop residues. Two of the more recent projects studied the effects on soil properties after grazing. They took place in Chariton and Atlantic, Iowa. These research projects were conducted over three years and studied the effects of soil compaction and subsequent soybean yields.

"We found there is a small increase in soil penetration resistance in the upper 4 inches of soil in paddocks that have been grazed when the soil was not frozen. We did not find any [increase] in soil bulk density," Russell says.

He says that soil bulk density is a way of measuring soil compaction. It is calculated by taking a core sample of soil from the field and measuring the length and width to calculate the volume. After the soil is dry, the core sample is weighed. The more it weighs per a given volume, the more compressed the soil is.

Russell says they found a small increase in surface roughness, which is caused by deep hoof prints left in the soil, and a slight decrease in crop residue cover in paddocks that were grazed when the soil was not frozen.

"The bottom line is — what is the effect on crop production for the following year?" Russell says. "We found no effect of corn crop residue grazing on soybean yields either planted with disking or no tillage in the subsequent year. In one of the three years, we observed a small decrease (3.5 bu. per acre) in yields of soybeans planted with no tillage in fields grazed when the soil wasn't frozen. Over the entire field, this amounted to a 0.8% decrease in soybean yields and was not observed other years or in paddocks grazed when the soil was frozen or in fields in which the soybeans were planted with disking. Therefore, the impacts on soybean yields are minimal and can be managed by timing of grazing or use of tillage."

Strip grazing cornstalks

Russell says several factors need to be considered when grazing corn crop residues. The first is how to allocate them — the stocking rate, strip grazing, nutritional supplementation, etc.

Russell says he prefers strip grazing, in which cows are moved to a new section of the field monthly rather than left to continuously graze an entire field. "It does limit the effects of grazing selectivity on nutrient loss, and it keeps nutrients out there for a longer period," he says.

Grazing selectivity refers to the order of materials the cows eat when turned out onto the fields. They first eat any dropped ears, which are the most digestible and contain the most nutrients. They will then eat the husks and leaves, which are palatable but don't contain as many nutrients. Finally, if forced, they will eat some of the stalks, which are the least palatable and least nutritious part of the plant.

Russell says strip grazing keeps nutrients available for longer periods. "If you throw them out onto a field and let them eat with no control at all, they are going to go through the entire field and clean up all the ears and husks first and then go around after the leaves," Russell says.

"If you have a spring-calving cow whose nutrient requirements are obviously increasing late in the winter, you want to have the highest-quality forage available to that cow at that time," he adds. "So the concept of strip grazing is to only allow them a certain amount of the area and force them to clean up the material in that

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location. When you open up the next location there will be ears, leaves and husks available again. It is a way of controlling grazing selectivity."

A study done at ISU found that cows in a strip-grazing system needed a half acre per cow per month to maintain body condition. This allowed the cows to have access to forages that were 58% digestible. Russell compared the strip-grazing system to a continuous-grazing system, which found cows needed 2 acres per cow per month to maintain body condition.

Since digestibility decreases due to the order in which the cows eat the residue material, the stocking density must be lowered on a continuous-grazing system because cows aren't being moved to new sections in the field as they are in a strip-grazing system.

Russell said strip grazing limited the effect of trampling the cornstalks into the mud. It also controlled excessive grain consumption, which will help control foundering.

"If you are [grazing cornstalks] in muddy conditions, the cows will trample the stuff into the mud," he says. "To prevent that, strip grazing has proven helpful." He adds that one option to limit trampling of the feed resource is to keep the cows in the muddy paddock until the ground dries or freezes before moving them to a fresh paddock.

Russell adds that his studies have shown that strip grazing is most effective in dry, cold weather. During a year with 2.5 inches of snow fall, cows strip grazing a half acre per cow per month gained comparably to cows in a continuous-grazing system stocked at 2 acres per cow per month.

"The next year we had 16 inches of snow, and the strip grazing was the worst group we had in terms of weight loss," he says. With that much snowfall, forage availability is controlled by the amount of snow on top of the forages, not by an electric fence.

Despite the results from the second year, Russell still recommends strip grazing because it keeps the cornstalks from being trampled into the mud.

Supplemental feeding

When considering supplement needs, Russell recommends producers first review production goals, taking these four things into account:

(1) Cow maintenance needs. Does she need to add weight [body condition score (BCS) 3 or 4], or does she just need to be maintained (BCS 5)?

Research completed at the Leopold Center for Sustainable Agriculture at ISU showed that cows can maintain bodyweight on as little as a half acre of corn crop residues per month. If bodyweight gains are necessary, though, one cow may need up to 2 acres each month.

"If you have a set number of cows and have a low condition score, obviously you'll want to start supplementing earlier than if you had a cow that started the winter in a condition score of 5 or 6," Russell says.

(2) Limiting, or deficient, nutrients. These are the nutrients that are not present in large enough quantities to meet the animal's requirements.

"Limiting nutrients in corn residues include both degradable proteins and escape proteins, phosphorus, vitamin A, salt, and trace minerals," Russell says. Producers should supplement salt, trace minerals and vitamin A from the start, because there are not enough quantities in cornstalks to fulfill a cow's requirements.

Which nutrients are limiting will change over time due to weathering and grazing selectivity, he adds. Corn ears contain plenty of phosphorus and protein, but when cows begin grazing the husks and leaves, phosphorus may need to be supplemented.

"If the condition score on the cow starts decreasing, I would start supplementing," Russell says.

(3) Changing composition of corn residues associated with weather and grazing selectivity.

"On average, the digestibility of cornstalks decreases at a rate of about one-tenth of a percentage unit per day. So, in 100 days the digestibility has decreased by 10%," Russell says. "So if you start the winter at a digestibility of 55%, within 100 days it will be about 45%." Digestibility will decrease at a greater rate in wet conditions with mild temperatures.

(4) Availability and cost of nutrient sources.

"When supplementation of protein does become necessary, think about degradable protein based on cost," Russell says. Degradable proteins, like plant protein sources (alfalfa hay, soybean meal and grain processing byproducts), can all be effective nutrient sources (see Table 1). "We found that just about any source of degradable protein will work, so base it on cost."

Alternative grazing options

Corn is not the only crop residue cattle can graze. Soybean residues also work, although researchers in Nebraska found cattle need three times more acreage for soybean residues than corn crop residues for comparable performance.

"Once again, the animals are very selective when grazing crop residues," Russell says. "They primarily eat the pods. Those pods are higher in protein but lower in digestibility than corn residues."

Other crops suitable for residue grazing, Russell says, include sorghum; annual forages like ryegrass, cereals (rye, wheat, triticale and oats) and standing corn; annual legumes like bird's-foot trefoil and clover; and turnips.

"Looking at every case, these materials are very digestible, and they will have moderate to high protein, so they are very nutritious. How they are utilized depends on how you want them integrated into your system," he said.

Russell suggested a double-cropping system, with small grains as a second crop, or integrating them in as a cover-cropping system.

However, he cautioned producers to expect limited production. Annual forages planted into standing corn or into a double-cropping system can be very drought susceptible, and the length of the growing season could be a problem as well.

Russell warns, "Unless you get those materials in early enough, there is not going to be enough nutrition."

Table 1: Example total mixed rations for 1,300-lb. beef cows in late gestation using ground corn crop residues

	Ration		
Item	1	2	3
Feedstuff, pounds, as fed			
Ground corn stover	28.5	23.5	25.5
Soybean meal	3.4	-	-
Corn gluten feed	-	6.5	-
Ground alfalfa hay	-	-	7.0
Dicalcium phosphate	0.2	-	0.2
Salt	0.05	0.05	0.05
Trace minerals	0.01	0.01	0.01
Vitamin A premix	0.01	0.01	0.01
Daily cost, $/cow	0.68	0.61	0.49

Source: *Winter feed management to minimize cow-calf production costs: Corn crop residues,* by Jim Russell, department of animal science, Iowa State University