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GROWING MARKET:

Baled corn stover is becoming an important cash crop in areas of Iowa where feedstock is in demand for cellulosic ethanol production. Corn stover for ethanol and industrial uses presents both opportunities and some constraints.



Iowa's new crop

By ROD SWOBODA

CORNSTALK balers were a common sight in northwest Iowa this fall. Farmers and custom operators, busy collecting corn stover to use as feedstock for the new Project Liberty cellulosic ethanol plant at Emmetsburg, are enthusiastic about their "new cash crop."

With its grand opening in September, Project Liberty is now converting bales of corn crop residue (mostly cobs, husks, leaves and tops of stalks) to renewable fuel. The first commercial-scale cellulosic ethanol production facility to open in the U.S., it is owned by Poet-DSM. Poet LLC, a major producer of ethanol from corn grain headquartered in Sioux Falls, S.D., partnered with Royal DSM, based in the Netherlands, on the \$275 million project.

When at full speed, the plant will use about 770 tons of biomass per day, or 285,000 tons annually, to produce 25 million gallons of cellulosic ethanol. That's about three times as much as Project Liberty bought last year as part of a pilot

program. The plant contracts with local farmers and custom balers to collect the stover. Farmers are paid \$65 to \$75 per dry ton for stover delivered to the plant. Poet-DSM will pay about \$20 million annually to farms within a 45-mile radius.

Central Iowa busy hub, too
Balers were also busy in central Iowa, where the state's second commercial-scale cellulosic ethanol plant is located in Nevada. Cellulosic Biofuel Solutions, owned by DuPont, will soon process baled cobs, leaves, husks and the upper portion of stalks into cellulosic ethanol.

These two Iowa plants and one that recently began operating in Kansas are the first three commercial-scale plants in the Midwest to use stover to produce ethanol.

Many of the farmers supplying stover to Poet-DSM use the EZ Bale system. This method, promoted by Poet-DSM, removes less of the cornstalk than conventional stover collection. Farmers disengage their combine's chopper and spreader to leave a windrow of cobs, leaves and husks. After

a couple of days, the windrowed material can be baled, says Adam Wirt, biomass logistics director for Poet. Many growers use round balers because of their lower capital investment, compared to balers that make large square bales.

Because the material coming out of the back of the combine is formed into windrows, the EZ Bale system involves no extra chopping or raking, which reduces dirt content in the bales and maintains plenty of crop residue. The system aims to remove about 20% to 25% of the total aboveground crop residue (about 1 ton per acre) from the field, which is within Iowa State University recommendations.

Real financial incentives

About 75% of the farmers supplying biomass bale it themselves, while the other 25% hire custom operators, says Wirt. Some have the labor available to bale, handle and haul stalks. Also, some farmers have bought balers together. Wirt says farmers have a price advantage of \$2 to \$5 per ton to do the baling themselves. Many

of these farmers also have flatbed trucks or trailers to make their own deliveries.

When corn was \$7 a bushel, the incentive to bale stover wasn't as appealing. Now that corn is at \$3.50, earning another \$40 per acre can help improve margins.

Project Liberty will store a three- to four-week supply of biomass bales in a 22-acre stackyard next to its cellulosic ethanol plant. The remainder of the bales is stacked at the edges of farm fields and hauled to the facility when needed.

That's why the price paid for the corn stover bales varies, depending on delivery date in the farmer's contract with Poet-DSM. If you're going to store bales on the edge of your field until next August, Poet will pay more for them. "We need to get stover coming into the plant on a consistent basis throughout the year," says Wirt. "So contracts have different delivery dates. Farmers who deliver the stover later in the year will get a little more for it than someone delivering at harvest."

■ See related articles, pages 4 and 54.

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Harvesting biomass

By ROD SWOBODA

BALED corn stover is becoming an important cash crop in areas where cellulosic ethanol plants are beginning operations. In Iowa, one such plant began operating at Emmetsburg earlier this fall, and another commercial plant at Nevada is scheduled to begin operating soon. They both use corn stover — cobs, husks, leaves and the tops of stalks — as a feedstock for cellulosic ethanol production.

Project Liberty, the Poet-DSM cellulosic ethanol facility at Emmetsburg, has had a pilot program in recent years. The plant is contracting with local farmers to custom-harvest and collect corn stover, and deliver it to the plant. "We've been working with farmers for almost eight years now to ensure the biomass harvesting is done right," says Adam Wirt, director of biomass logistics for Poet. Now that the plant is in commercial operation and will consume a lot more stover, Poet is contracting with more farmers to supply biomass to feed the plant.

Poet-DSM held a biomass harvesting field day this fall on the farm of Terry and Tim Naig, two brothers farming near Cylinder in northwest Iowa. This is their first year of contracting with Poet to deliver corn stover to the new Project Liberty cellulosic ethanol plant at Emmetsburg. They watched neighbors participate in the project the past few years. The Naigs hired a custom baler for harvest and delivery this year.

"We saw what it takes to make good, sound, clean bales that meet specifications for cellulosic ethanol production," says Terry. "We're still learning from neighbors and others. There's more to this than people realize."

With high corn yields and more continuous corn being grown, farmers have to do something with the heavy amounts of crop residue building up on the soil surface when it interferences with planting. Harvesting a percentage of the residue is an option. "For soil conservation and water quality, harvesting stover sure beats tillage," says Terry. "You save money with less tillage, and save fuel and machinery costs. Plus, you have the stover to sell."

Advantages can add up

The biggest benefit the Naigs see in removing some of the heavy amount of corn residue is to help establish a good stand when planting the crop in the spring. "Soybeans are a little more forgiving," notes Terry. "But if you're growing continuous corn, you plant into residue. With feed mills



STOVER HARVEST: It's like adding a second crop or getting more from your corn crop, say Tim and Terry Naig, who farm near Cylinder in northwest Iowa. Stover harvest requires no farming inputs, such as extra tillage, planting or fertilizing, so it has little to no effect on soil sustainability when stover is removed responsibly from fields.



SUSTAINABLE: "When looking for sustainable harvest methods, we researched several different collection methods to find the one that best met our main criteria: minimal nutrient removal, leaving enough crop residue for erosion control, and maintaining current soil organic matter and carbon levels," says Poet's Adam Wirt.

and ethanol plants in an area, there's going to be a lot of corn on corn. Harvesting stover helps remove some of the residue that would interfere with establishing a crop the next spring."

There will still be tillage. But rather than doing more tillage in spring, you do less. "And soil is able to warm up quicker if the crop residue blanket isn't so thick," adds Tim. This helps in being able to plant early and get a crop up and growing.

"There are neat things happening in the biomass business and in agronomy and technologies that can be used to help farmers make money and yet save



COVER OR NOT? Is it better to wrap round bales with a netting cover or leave them unwrapped? It depends on when you'll deliver them to the plant. The longer the bales will sit outside, the better off you are to wrap or cover them. Poet-DSM recommends tarping square bales that will be stored past March.

the soil and be good stewards," Terry says. "Using more of the corn plant than just the grain as an energy crop is a good idea. But like any good idea, it has to be managed right."

The ethanol plant doesn't want rain splashing dirt on stover lying in fields. It's best to harvest stover by following right behind the combine. "The sooner you can get in a field with a baler, the better," says Tim. "You want to pick up the stover windrow before it settles down into the ground. Of course, the operator has a lot to do with whether a baler is picking up a lot of dirt when harvesting stover."

Finding a way to successfully hook a baler onto the back of a combine and immediately capture stover material is in

the works. A few companies are developing such a system. (See story on Page 54.) "We are seeing new and emerging technologies, creative ideas as this stover harvesting industry evolves," says Wirt. "Our growers are providing good ideas and feedback."

Harvest for high quality

What type of bale works best for a cellulosic ethanol plant? "Round, square or even if it's triangular, I don't care what configuration you bring in as long as it's a bale of high-quality stover," says Wirt. Poet prefers to get bales at 20% moisture or below. Poet pays \$65 to \$75 per ton for stover if it's bone-dry. It also factors in the delivery month and length of contract when setting the price per ton. The amount of ash the bales

contain is also a factor.

Because of the desired composition as a feedstock and to maximize the sustainability of stover harvesting, Project Liberty uses the EZ Bale system, baling the material that comes out of the back of a combine. A 14-ton bale is about 33% cobs, 43% husks and leaves, 16% stalks and 8% ash. The system often results in less nutrient replacement needed per ton of removed biomass than traditional stover collection processes. These bales contain less contamination because the material isn't raked or chopped.

Although Project Liberty has a 22-acre stackyard, the majority of the EZ bales are stored at the edge of growers' fields, to reduce risk of loss due to fire and limit the dedicated acreage at the biorefinery.

1-PASS BALING: The single-pass round baler system that Tim Couser has been testing makes stover bales on the go, as the baler is pulled behind the combine with no stopping.



Bale best of stover behind combine

By LYNN BETTS

TIM Couser and his father, Bill, harvest more than grain when they run their combines through their central Iowa corn and soybean fields. Their combines pull balers, so in one pass, they also bale the cobs and leaves that come through the combine.

"It's called MOG — Material Other than Grain — and it's a really high-quality feed source for our cattle," says Tim Couser of Nevada in central Iowa. The farming partners have been working with John Deere and Hillco Technologies, a company that specializes in aftermarket products for large combines, for the past few years to develop and test a new "single-pass round baler," or SPRB, system that efficiently gathers and bales MOG in one pass through the field.

"We're catching high-quality feed from the combine that would otherwise be left as waste in the field," Couser says. "It was important to us that the baler not slow down the combine. This baler rolls and drops the bales on the go, so it's an efficient single-pass system. You hardly know the baler's back there."

Couser says the combine's straw chopper blows the cobs and leaves from the combine spout into an accumulator that's attached to the front of John Deere's S69 round baler. "Three sensors in the accumulator indicate how full the hopper is. The baler engages when the MOG level reaches the third sensor," Couser says.

"When the bale reaches optimum size, the feeder system shuts off, while the bale wraps and ejects. Meanwhile, more MOG is still filling the hopper of the accumu-

Key Points

- Single-pass round baler system offers high-quality feed.
- SPRB efficiently gathers and bales in one pass through the field.
- More than enough residue is left in the field to protect against erosion.

lator while this is happening," says Couser. "All this allows continuous harvesting and baling, with no stopping."

"You don't appreciate how easy it is to operate, and how seamless it is, until you use it," notes Couser. "We have a camera in the cab that gives us a view of the baler, and we have a monitor in the cab that shows the status of a bale."

Couser says the standard bale is 5 feet wide and 6 feet high (diameter), but adds that John Deere is also working on a 4-by-6-400 bale for easier handling and easier side-by-side fit on a trailer. The farm has been using both balers with two combines.

'High-quality' bales

"We get a well-formed, high-quality bale that weighs about 1,800 pounds, depending on moisture content," states Couser. "They're heavier and more dense than the typical stover bales you get from raking and baling stalks from the ground. We're capturing 95.5% of the starch from the corn plant now. We still have a little header loss, but we don't have any loss through the combine. We get all the cobs, plus the chipped or cracked kernels, and that makes it a high-quality addition to our cattle feed mixture."

What they don't get from the system is



HAVE RESIDUE AND EAT IT, TOO: The bales Tim Couser makes from cobs and leaves that run through the combine are high-quality rations for cattle feed. At the same time, there's ample crop residues left on the soil surface for erosion control.

much ash, or dirt. "We may get 3% ash in the bale, from dust that was on the plant," says Couser. "But we don't get that 10%, 15% or even 20% dirt you can get from raking and baling stalks off the ground. We don't want that dirt in our feed. We want the best material, the most usable product, that's already been segregated by our corn header."

Couser also likes the fact that the MOG is the least nutrient dense part of the plant. "Potassium is least concentrated in that top part of the plant — taking the grain and the MOG still leaves more than half

the potassium in the rest of the stover in the field," he says.

Since the MOG accounts for less than 20% of the residue left after combining, the baling system also leaves more than enough residue in the field to protect against soil erosion. "On 200-bushel-per-acre corn, we get about a bale to 1.2 bales per acre," explains Couser. "We're left with so much crop residue, we can use this on all our highly erodible land."

"You can simply unhook the baler whenever you don't want to use it," says Couser. He adds that it takes only about half a day to remove the accumulator and revert back to a baler only. The system is designed to work with the John Deere S670, S680 and S690 combines.

"It works great for us because we use all this MOG material from both corn and soybeans for cattle rations," Couser says. "But I could see the bales as an added revenue source if you didn't have cattle. We haven't had many breakdowns. We see a lot of upside to this, and plan to continue to use it for a long time."

Betts writes from Johnston.

Watch SPRB in action

THE Cousers are among a dozen or so farmers who have been testing the single-pass round baler on the farm. Tim Couser says the accumulator will be available through John Deere dealers. You can see video of the system in action online by searching "YouTube single-pass round baler."