

Everything a Landowner Needs to Know about Crop Residue Removal



Advanced Biofuels

POETDSM.com

A New Vision FOR RENEWABLE ENERGY & AGRICULTURE

American farmers have embraced a new role as producers of food, feed and fuel, making the most of an opportunity to find new value in U.S. crops while meeting the nation's energy security, economic and environmental needs.

POET-DSM is ready to take the next step by producing cellulosic ethanol, expanding the country's supply of domestic, renewable fuel while creating new opportunities for American farmers by tapping into a previously unused resource: crop residue.

Crop residue is plant material left in the field after harvest. This material can be used to make biofuel. Allowing crop residue to be collected on your land through a conservative and responsible management plan will provide a second valuable crop from the same acres and allow you to be at the forefront of the new ag economy. POET-DSM has contracted for thousands of acres of crop residue over several of the last harvests and will increase to 300,000 acres per year as we operate the commercial cellulosic ethanol plant. Farmers continue to report positive results from the experience.

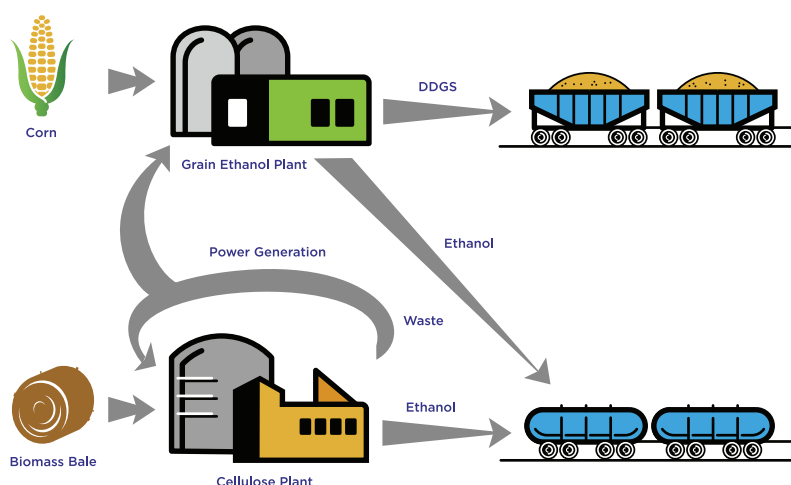
We have commissioned extensive research from experts at Iowa State and the U.S. Department of Agriculture and spent a great deal of time and resources to ensure that farmers are collecting crop residue in a way that is sustainable. I hope you take the time to review the important information in this document. If you have any questions, we encourage you to reach out to us. For additional information, you can also go to www.poetdsm.com. We hope you consider being part of this exciting venture by allowing residue removal on your land.

Adam Wirt
Biomass Logistics Director - POET Biomass

Cellulosic Ethanol: The First Plant

POET-DSM Advanced Biofuels' Project LIBERTY is a commercial-scale cellulosic ethanol plant scheduled to begin operations in early 2014. This plant, located adjacent to POET's grain ethanol plant in Emmetsburg, Iowa, will be one of the first of its kind in the world.

Approximately 285,000 bone-dry tons of cob bales will be processed annually to make 25 million gallons of cellulosic ethanol. To meet that total, farmers from surrounding counties are contracting to provide about 1 dry ton of biomass per acre from the 4-5 dry tons available on their land.

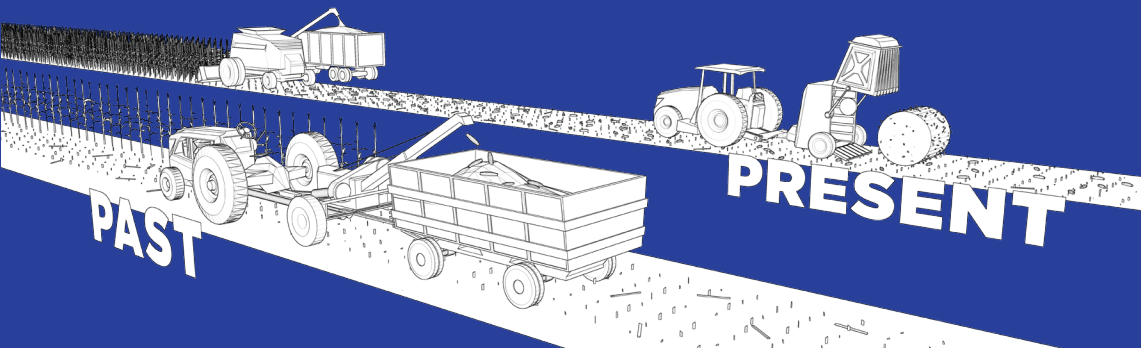


It is POET-DSM's vision that this technology will be replicated along side many other existing ethanol plants across the corn belt.

Collection Process

While testing collection methods for more than seven years, we focused on how to collect crop residue economically for all parties involved while ensuring that the process maintains soil health and productivity.

Our chosen method is called EZ Bale collection, in which the farmer collects the material in a second pass over the land after the grain harvest. During the grain harvest, the farmer leaves a row of primarily corn cobs, leaves and husk from the back of the combine. After the grain is harvested, a round or square baler comes through and bales this material. This method of collection is very similar to that of picking ear corn, a process that has been done for decades.



Harvesting a portion of the non-grain biomass from a field is not a new idea. In fact, early 20th century famers regularly removed cobs and husks from the very soils we farm today.

During this process, about 20-25% of the total above ground residue is removed from the field. Iowa State and USDA researchers have specifically studied the land in the Emmetsburg area to determine that this removal rate is conservative and well within an acceptable range to maintain soil nutrients, organic matter and erosion control.

Agronomics

Since 2008, POET has partnered with Iowa State University and the USDA-Agricultural Research Service to study how removing different levels of corn residue affects the agronomics, or health, of the soil. At the completion of the fifth year, researchers concluded that removing 20-25% of the residue had no adverse effects on grain yields and no change in soil organic matter or carbon levels.

Average grain yield at research site from 2008-2012

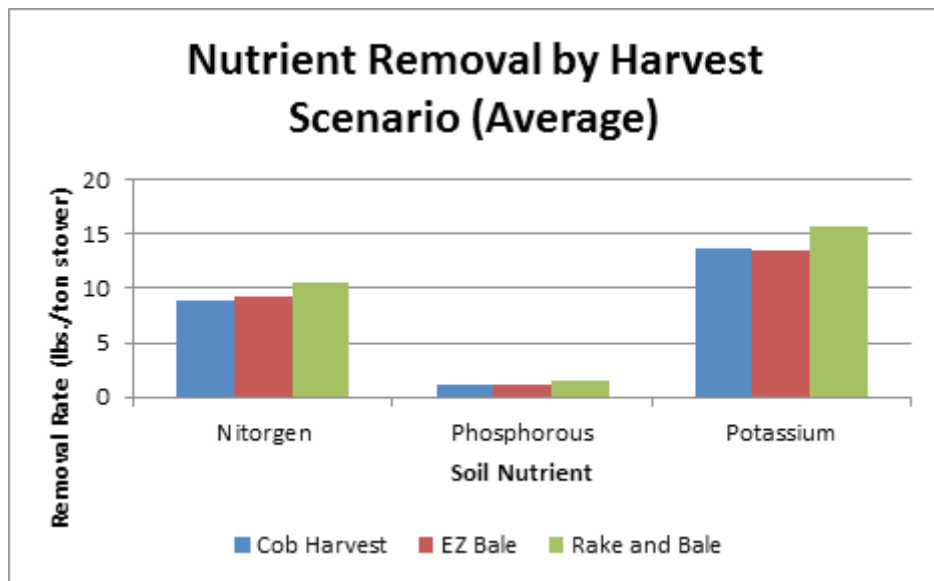
Treatment	----- Grain Yield (bu/ac) -----						
	2008	2009	2010	2011	2012	2012 (beans)	Average (corn)
Conventional	180.1	156.5	151.8	157.6	173.0	56.0	162.4
EZ Bale	185.8	152.8	152.6	157.1	176.5	53.0	165.0
Stover Bale	174.4	170.0	150.2	146.1	181.0	55.0	164.3
Average	181.8	161.8	155.0	151.1	179.5	54.0	163.4



Nutrient Removal

Along with the agronomics data, researchers studied soil nutrient levels to see if farmers needed to replace additional nutrients after crop residue removal. While needs can vary somewhat from field to field, research showed that a slight decrease in potassium was the only meaningful effect. An additional 10-15 units of potassium are needed to replace what is removed with the EZ Bale.

As you look at the chart, you may wonder why additional nitrogen is not suggested. The reason is that any nitrogen that is left with the residue will be used to help breakdown the residue. When this happens, it will get tied up (immobilized) in that process and unable to be used until conversion to organic matter happens. Therefore, by taking biomass off, less nitrogen is needed in that breakdown process and additional nitrogen is not needed.



The above chart illustrates nutrients removed during biomass harvest. As explained above, research indicates that for nutrient replacement, generally an additional 10-15 units of potassium are needed, while nitrogen and phosphorous replacement is not necessary.

Residue Management

At current corn yields, there are 4-5 dry tons of residue per acre to manage after grain is harvested; that is roughly a 450% increase in the amount of residue vs. what was found in 1970. It takes large tillage equipment to incorporate this material back into the soil, and as yields increase there will be even more residue left in fields. If not managed correctly, this material can build up and create an insulative blanket that harms grain yields and limits productivity of the land. This large volume of material can also be an incubator to common plant diseases that affect corn growth. EZ Baling is a great way to help manage some of this residue and allow the soil to be more productive and efficient.

Conclusion

POET-DSM is already collecting crop residue on thousands of acres with great success. We hope you consider allowing your ground to participate in our program and encourage you to contact us if you have any questions (712-852-8211).