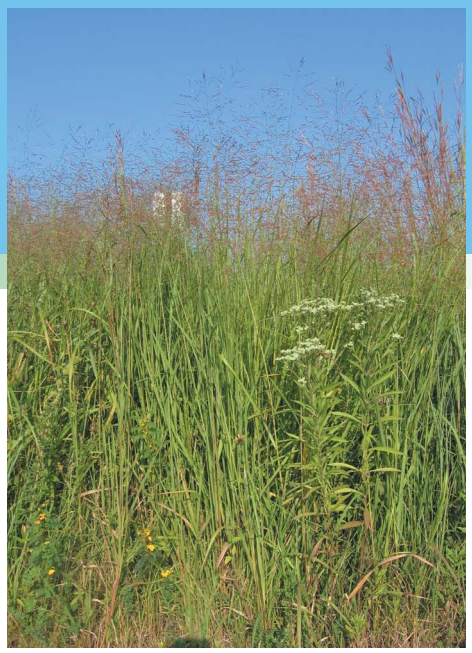
IOWA Learning Farms

Building a Culture of Conservation

Farmer to Farmer: Iowan to Iowan



Switchgrass and other prairie grasses are excellent sources of biomass.

photo by Meghann Jarchow

Cellulosic biofuels and your farm

Supplying biomass for the biofuels industry: It begins with you

The biofuels industry is planning tremendous growth in the United States over the next several years. This industry is relying on farmers to provide biomass at a competitive price in a form the industry desires.

Is your farming operation equipped and prepared to contribute to this quickly growing and changing industry?

Let's look closer at what needs to be considered when supplying biomass for biofuels.

Biofuels

Biofuels are produced from living organisms or from organic or food waste by-products. In order to be considered a biofuel, the fuel must contain over 80 percent renewable materials.

Biomass is any organic material such as crop residues, wood, plant material, or municipal waste that can be used in the production of energy. Energy can be produced by converting biomass to liquid fuels using different methods including thermo-chemical, bio-chemical and pyrolysis. Each conversion method has specific demands for the biomass that it processes.

Biomass contracts, harvest methods, storage and transportation are all important logistical variables to consider. You will want to have a clear understanding of the true cost of removing biomass as it relates to the long-term productivity of your farming operation.

Biomass contracts

A contract with the biomass buyer is necessary to ensure a fair agreement and industry representatives indicate that they are willing to offer 3- to 5-year contracts. There may be consolidator companies involved who will harvest biomass from your fields and, in turn, contract with the biofuel industry. If so, you may need a contract with the consolidator rather than with the biofuels company. Be sure the contract includes provisions for what happens if biomass cannot be harvested due to weather, what conditions could lead to discounted product values and what happens if you need to break the contract. You will need to research payment rates for biomass per ton and be aware of industry changes from year to year.

If you rent the land you farm, make sure the landowner knows, and is in agreement with, your decision to sell to a biofuels company.

Harvest and biomass collection

A big consideration is the additional machinery needed to harvest biomass. Keep in mind the initial equipment cost, costs of upkeep, and the in-field time needed to collect the biomass. Also, factor in the extra fuel needed and increased soil compaction that result from additional passes through the field.

Be aware of the industry's changing needs – today they may want corn cobs, later they may decide to take stover as well. Be prepared to address challenges of harvesting biomass if seasonal conditions result in wet soils, wet biomass, or non-harvested fields.

Preprocessing

The biofuels industry prefers a bone-dry, flowable biomass. In many cases, they would prefer biomass to be densified or made more compact. Compacting biomass into pellets or bales can make it easier to handle, thus adding value to the biomass. If a consolidator preprocesses your material, there might be an additional cost to you as a grower.

Storage

Unprocessed biomass is bulky and difficult to manage. Currently, much of the biomass is stored at the edge of the field until the biofuel company is ready for it. Harvest timing and material collection can be critical. Will the biomass be removed by spring? Will there be price deductions due to decomposition or high moisture content of biomass? Will in-field biomass collection areas affect field operations or potential yields during the next crop season?

Handling and transportation

Be sure to understand who will be responsible for biomass delivery to the factory. If it is someone other than you, know who and when the biomass will be retrieved from your field or storage area.

The most important consideration is how the removal of biomass will affect the long-term productivity of your farmland.

Biomass builds Soil Organic Carbon

Soil organic carbon (SOC), also known as organic matter, greatly affects the quality and health of soil. Crop biomass left on the land contributes to SOC.

Increasing SOC offers these benefits:

- Improved soil structure and aeration
- Retention and recycling of crop nutrients
- Increased cation exchange capacity
- Support for microbial life
- Increased water infiltration and aeration.

Repeated crop biomass removal will decrease SOC. It is also decreased by tillage, biological respiration, erosion and other field activities. Tillage breaks open the soil surface and increases SOC decomposition (loss of SOC). Tillage may also lead to erosion of carbon-rich topsoil. Therefore, more crop residue is required to maintain SOC in tilled fields.

SOC Example

Stover yield varies depending on corn grain yield. Corn grain and corn stover have an approximate 1:1 ratio, at 15% harvest moisture. Below is an equation to determine the amount of stover produced based on annual corn yields.

_____	X	56	X	0.85	=	_____	
bu/acre		56 lbs per bushel		Stover at 15% moisture		Stover produced/acre	
175 bu/acre	X	56 lbs.	X	0.85	=	8,330 lbs/acre, or 4.17 tons of stover/acre	

Compare stover produced to stover necessary to maintain SOC. How much stover can be removed while sustaining SOC? Is there a carbon gain or loss if stover is removed? Do you produce enough stover to maintain soil organic matter for your current tillage system?

For more information about the value of stover, see the "Economics of Residue" publication in this series.

SOC Improvements

In fields where residue is removed, cover crops can supplement remaining residue, helping to build organic matter. Cover crops can be seeded aerially before crop harvest or drilled after crop harvest. Vegetative growth will begin in the fall. Non-winter hardy cover crops like oats will winter-kill. Winter-hardy rye or wheat will require spring herbicide application or tillage. Please consult with your local ISU Extension Agronomist to decide which cover crop best suits your management style and need.

As always, it is important to have appropriate conservation structures such as terraces, grassed waterways and buffer strips, in place before you make any biomass removal decisions. Extended rotations that include oats or alfalfa add additional organic matter and carbon to the soil.

Residue removal tips

- rotate fields where residue is removed
- don't remove residue on highly erodible slopes; but rather from high-yield, low-slope field areas
- adjust crop rotations, such as corn-soybean-wheat, to offset the impact of removing residue.

References

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U.S. Department of Energy. "Feedstock Logistics" www1.eere.energy.gov/biomass

For more information

Contact your area Iowa State Extension University Field Agronomist or local NRCS field specialist for more information about the biofuels industry.

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