

THE MANAGER

CROPPING STRATEGIES

By Jerry Cherney

Grass biomass has potential as an alternative crop on Northeast dairy farms

What's the future for grass biomass?

The Northeast has millions of acres of abandoned, underutilized land suitable for grass biomass production. The crop won't interfere with typical dairy farm cropping, can absorb excess production capacity and use existing farm equipment. Importantly, grass biomass production has the potential to be another income stream for dairies.

Grass can be burned for heat, either as whole bales or after bales are chopped. It can also be densified into pellets or briquettes before being burned. This is the process Tom Lee, a contract heifer raiser in Madrid, N.Y., has adopted for the 40 acres of grass biomass he's growing.

A few years ago Lee attended a meeting on pelleting grasses that piqued his interest. "It seemed like it had potential," he says. "My main objective in growing and processing switch grass was to contribute information to the process." He also

plans to stop raising heifers at some point and hopes the switch grass briquettes he processes will be an income stream.

Growing grass

In general, grass biomass desirable for combustion is opposite of that required for dairy forage. Mature, leached-out grass high in fiber is the goal for a combustion fuel, not higher quality grass.

Warm season grasses such as switch grass are more suitable for biomass compared to cool season grasses. They're productive with little nitrogen (N) fertilization required. And they tend to have low ash content, including low concentrations of potassium (K), chlorine (Cl) and N.

Soil fertility is a consideration when growing grass biomass. For example, both K and Cl cause undesirable buildup in the combustion chamber, as well as undesirable emissions. But if both minerals are in excess of plant requirements during grass growth, there'll be high concentration of them in grass biomass.

Harvest management has a major impact on grass composition. Mature grass is essential for biomass and, fortunately, mineral concentrations in grass decline as the plant matures. Because K and Cl are soluble in water and highly leachable, rainfall following mowing will help leach these undesirable components.

Warm-season grasses can be mowed in the fall and overwintered in cut swaths, or they can be left standing over winter. In his 4-acre trial plot, Lee cut and baled the grass in November two consecutive



Tom Lee, Madrid, N.Y., processes switch grass, grown on his farm and combined with reed canary grass and soybean straw, to make 1.5 inch diameter briquettes to use as a heating source. Photo by Stephen Canner.



FYI

- Jerry Cherney is the E.V. Baker Professor of Agriculture in the Cornell Department of Crop and Soil Sciences. Email: jhc5@cornell.edu
- Find answers to nearly all your questions on grass biomass at this website: www.grassbioenergy.org
- Eleanor Jacobs, an editor for PRO-DAIRY, contributed to this article.

THE MANAGER

years. Last year, however, he had to leave the switch grass in the field.

The advantage to overwintering is the loss of flower heads and leaves, which are high in ash. The result is a biomass similar to wood in composition.

Overwintering, however, diminishes yield. In cut swaths overwintering will reduce yield by at least 20%. While grass left standing over winter is likely to be at least 40% lower yielding than fall-baled grass. Cool season grasses, such as timothy and orchardgrass, typically do not withstand the winter well enough to consider overwintering for spring harvest.

Warm season grasses have disadvantages:

- They're slow and difficult to establish. It took Lee three years before switch grass plants dominated in one of his fields. Establishing the crop "takes a lot of patience," he says. "Is it difficult to establish or just different from other crops we're used to growing? Switch grass starts slowly because of the time of year and few herbicides available to control weeds."

- They can't be managed to produce an acceptable forage crop for dairy. Bedding may be their only alternative use.

End product

Lee feeds the baled switch grass into an old hammer mill to chop the grass. He then combines it with reed canary grass and soybean straw to put through a PTO-driven machine called a Slugger, manufactured by BHS Energy in Pennsylvania. It heats the grasses and straw to 200 to 225 degrees and pushes it through the die to form briquettes that are 1.5 inches in diameter and 1 to 1.5 inches long.

The combination of switch grass, reed canary grass and soybean straw holds together better than switch grass alone, Lee says. Also, he hasn't yet grown enough switch grass to meet his needs. This year he hopes to be harvesting 20 acres of the 40 acres he has planted to switch grass.

So far Lee has spent \$30,000 for the processing machine and a small amount on the old hammer mill that he adapted. He's spent about 200 hours making the briquettes.

Lee uses the briquettes to heat his farm shop and sells some to people in the area. He's also part of an effort to supply briquettes to heat an apartment building. There's a need, however, for a boiler system that can efficiently burn the briquettes.

All-in-all, Lee is hopeful that his experiment with growing, harvesting and processing switch grass will bear positive results. □

Grass biomass status

The Biomass Crop Assistance Program (BCAP) has been operated by the USDA Farm Service Agency since 2009 to provide incentives for farmers to establish and cultivate biomass crops. This program was primarily created to generate feedstock for liquid cellulosic fuel production to meet a 2022 U.S. Renewable Fuels policy mandate for the production of 36 billion gallons of renewable liquid transportation fuel per year. But BCAP will also subsidize grass production for heat and power.

Under BCAP, producers can receive annual payments for herbaceous biomass for up to five years as long as they sell the biomass to an FSA-approved biomass processor. The likelihood of many liquid cellulosic fuel conversion facilities appearing in the near future in the Northeast is very remote. An unintended result of BCAP may be to encourage the establishment and expansion of biomass heat and power facilities.

Biomass quality issues have hindered the widespread use of grass pellets or briquettes in residential combustion systems. Residential-scale pellet boilers are now being designed and tested to specifically address the compositional issues of grass pellets.

In Europe where grass biomass production is heavily subsidized, boilers have been designed to efficiently burn whole square and round bales.

European companies have also designed a variety of bale feeding and chopping equipment to automatically process bales for burning in more conventional boilers. These boilers are typically installed with a hot water storage system to provide heating needs for multiple farm buildings, including grain drying facilities. Though well-built, European biomass heating equipment is considerably more expensive than North American heating systems.

In the Northeast, grass pellets and briquettes are being used on a limited scale as a combustion fuel. In general, the larger the combustion appliance the easier it is to effectively burn nonwood biomass. Larger scale boilers also are more cost effective for the addition of any emissions control equipment. While it is possible to burn grass pellets in some residential-scale appliances, a more economical use for grass biomass at this time may be for light industrial or industrial combustion applications.

— By Jerry Cherney