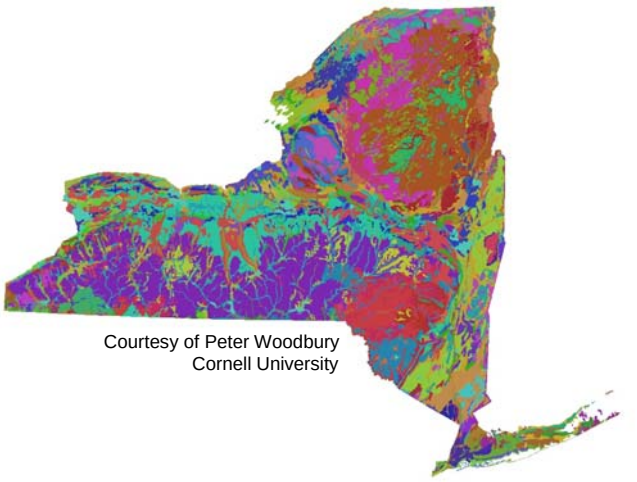
Grass Bioenergy in the Northeast USA

Purpose: The purpose of this publication is to provide an overview of the potential of grass biofuel for the Northeast USA.



Courtesy of Peter Woodbury
Cornell University

Relative yield potential based on soils.

The Northeast USA is the "hay and pasture" region of the USA, grass is well suited to this region. The variable and marginal soil types found in much of the region are not well suited to row crop production. Abandoned fields quickly become mixed grass meadows, with rapid encroachment of woody species if not mowed. New York State has approximately 1.5 million acres of unused or underutilized agricultural land. Most of this land will not grow row crops profitably, all of this land will support grass production.

Grass Bioenergy

Grass bioenergy is not a new concept, Europe has been utilizing grass energy for decades. Many developing countries use biomass as a very significant portion of their total energy useage. Much of this useage, however, is very inefficient, with potentially dangerous amounts of particulates and chemicals released into the home environment. Pelleting not only provides the densification necessary for economical transportation of bulky biomass, but also allows controlled feeding of the fuel so as to maximize energy efficiency and permits clean burning of the feedstock.

Advantages of Grass Pellet Energy

Sooner or later we will have to get serious about alternative energy. Sooner or later carbon credits will have meaning in the USA. Grass pellet energy has the following positive characteristics:

- High grower acceptance.
- High rural economic development potential.
- Very efficient conversion.
- Cost effective, requiring no subsidies.
- Efficient use of marginal cropland.
- Compliments nutrient management plans.
- Ideal for soil conservation.
- Compatible with wildlife nesting.
- Ideal for maintaining open spaces.
- Sustainable one-cut harvest system.
- Nearly greenhouse gas neutral.

Basic Crop Management

High producing grasses such as reed canarygrass or switchgrass can be sown for biomass production, or an existing mixture of grass species can be utilized. Animal manure can be spread in the spring or after harvest to increase productivity. Forage is cut in mid to late summer, leaving it on the field to allow leaching out of nutrients that will otherwise end up as undesirable ash. Baling at normal hay crop moisture allows stable storage of feedstock until pelleting. No further drying is required for pelleting. Additional binders are not required to hold pellets together, although they may improve pellet stability.

Mid-summer is great for haymaking.

Energy Conversion Options

Crops store solar energy and recycle carbon, removing it from the atmosphere during photosynthesis and returning it to the atmosphere as the organic matter is burned or decays. Although it typically takes some fossil fuel to produce perennial grasses, these crops are considered to be around 90% carbon neutral. They do not add significantly to atmospheric carbon dioxide. Fossil fuels, on the other hand, are considered non renewable since they take millions of years to form, and they add huge quantities of carbon dioxide to the atmosphere.

Direct combustion. This is the most straightforward option, and the most energy efficient. Grass has been burned in large boilers in Europe for decades. Grass has been cofired with coal in Iowa and Alabama. Grass has been burned in bales, as a powder, or as densified pellets, briquets or cubes in Europe. Current pellet stoves are not designed for high ash, but could be optimized for grass.

Harman corn stove burnpot

Cellulose to Ethanol. Plants are composed mostly of carbohydrates or simple sugars. As soon as an economically viable conversion process is developed grass could be become a major source of ethanol. A very significant ongoing investment has been made for several decades to refine the cellulose-to-ethanol conversion process to make it practical.

Electricity or synthetic liquid fuels. A variety of gasifiers have been developed which are potentially capable of utilizing high ash feedstocks, such as grasses. Gasification is not a new concept; the U.S. military had a fleet of gasifier vehicles in the 1940s. Using closely controlled temperatures, combustible gasses are released from a feedstock and collected for later combustion in a boiler, turbine or internal combustion engine. The remaining residue is burned to provide the heat source for feedstock drying and for the gasification reaction. Heat, electricity, and liquid fuels are all possible products of gasifiers. Gasifiers have great potential, but are a work in progress.

Status of the Grass Pellet Industry

Grass pellet bioenergy is one of the few alternative energy options that is potentially economically feasible without government subsidies. Perennial grass managed with one harvest per season offers a litany of environmental benefits. All field equipment is commonly available and management practices are familiar to farmers. Pelleting requires minor modifications to wood pelleting equipment. Residential appliances need redesigning to address potential corrosion issues due to high chlorine, potassium and sulfur content of grass biomass.

Wild-type reed canarygrass selections in 2006.

The Northeast USA has millions of acres of land suitable for grass biomass, without interfering with traditional agricultural crops. So what is the stumbling block holding grass energy back? Grass lacks a political lobby. Grassroots support is very encouraging but carries with it little political support. A very modest amount of startup support is needed, along with some incentives for the development or modification of appliances that can more efficiently cope with high ash feedstocks.

For more information

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