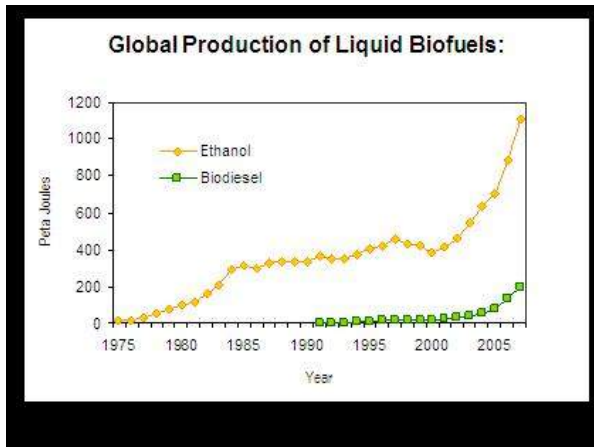




**Future of Agriculture, Food, and Conservation**  
Cornell Ag. Economist

1. A/F/C Policy is controlled by Congress.
2. Ethanol is not a scapegoat for higher prices.
3. Make cellulosic ethanol technology widely available, economical and profitable.

USDA/DOE have decided that our future is cellulosic ethanol.



**Seminar on "Uniform-format Feedstock Supply System Design for Lignocellulosic Biomass"**  
Richard Hess, Idaho National Lab

The USA has 1.3 billion tons of diverse biomass

1. Massive newly-designed harvest equipment.
2. Massive feedstock manipulation and fractionation to a uniform format.
3. Massive transport to massive biorefineries.
4. Massive yet-to-be-invented equipment for conversion of diverse feedstocks to ethanol.

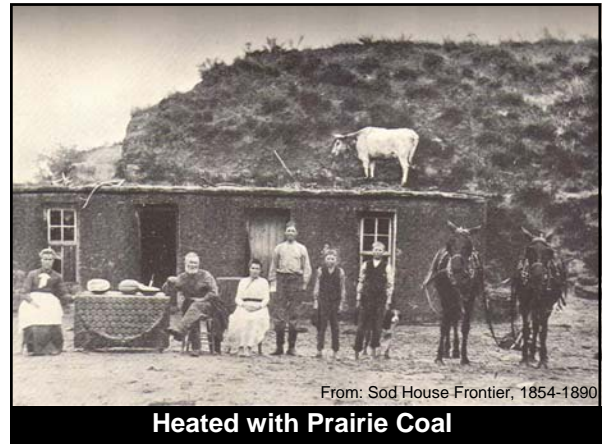


Energy Priorities??

Wind  
Solar  
Hydro

Energy Conservation

Nothing is perfect



**Heated with Prairie Coal**

**Letter from Daniel W. Oaks to his brother.  
Dec. 13, 1877, Sioux Falls, Dakota Territory**

"I do sympathize with you that have to chop wood. Instead of doing that all you have to do is whenever tired you can go and sit down by the side of a stack of hay and twist and rest all the same time. I would not chop wood if you would give it to me. I have altered my stove so that I can burn hay better than I can wood."

*(Letter provided by H. David Thurston)*

**Wash-boiler hay stove**

Illustration from:  
"In All Its Fury"  
by W.H. O'Gara

**Magazine type Hay Burning Stove**

Twisted hay was loaded into 30 inch cylinders and replaced two at a time.

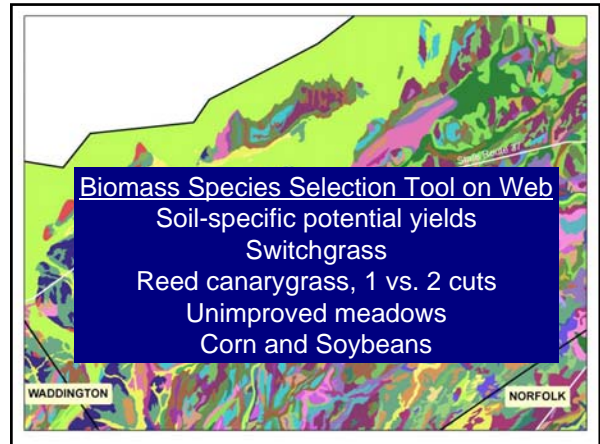
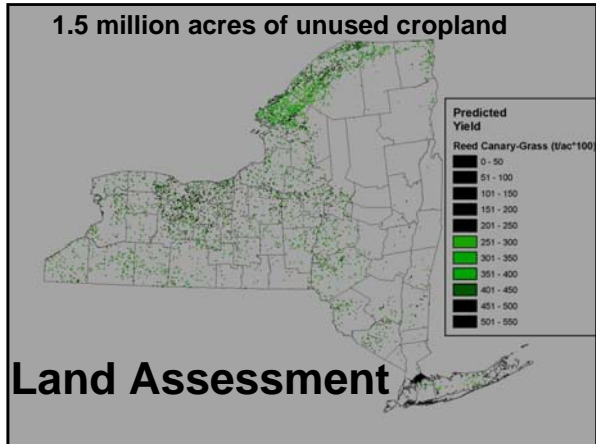
A spring pushed more hay into the firebox as it burned.

Forerunner of the coal stoker stove.

Nebraska State Historical Society

**Ash Content**

- 11 Lawn grass clippings
- 10 Alfalfa hay or silage for cattle
- 9 Grass silage for cattle
- 8 Straw (range of 5-11%)
- 7 Grass hay for cattle
- 6
- 5
- 4 Perennial grass with in-field leaching
- 3 Overwintered switchgrass
- 2
- 1 Corn grain
- 0 Short rotation willow
- 0 Hardwoods
- 0 Softwoods





**Can we harvest old meadows economically?**

Warm-season grasses will have best composition.  
Warm-season grasses will have low N inputs.  
Cool-season grasses will potentially yield higher on wet soils and work well on dairy farms.  
Cost of mowing/baling must be recovered.  
If the entire USA must rely on one grass species for biomass, we are in trouble.



**Will a grass pellet industry materialize?**

**Recent emails:**  
I represent a start-up renewable energy company in South Carolina. We have been marketing Switchgrass as a combustible coal alternative to utilities in the U.K. Recently, we have secured a purchase order for several thousand tons of switchgrass pellets to do a test run.

I represent a company in Poland and would like to know how many train-car loads of grass pellets you could provide to us annually for industrial combustion use?

**Main drivers of pellet consumption growth in EU**

**Direct institutional drivers** **Pilot**

- Political drivers => EU Energy Policy and National energy policies
- Energy balances
- Legislation, standards

**Information drivers** **Flight Attendant**

- Research information
- Education
- Information services (from VAPO group)

### Two diverse pathways for grass biomass

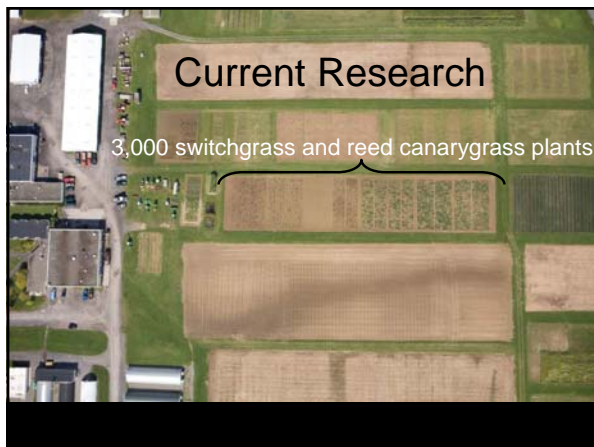
Light Industrial Scale use:  
750K to 50M BTU boilers.  
Greenhouses, commercial buildings.

Residential scale use:  
Pellet stoves, indoor/outdoor boilers.

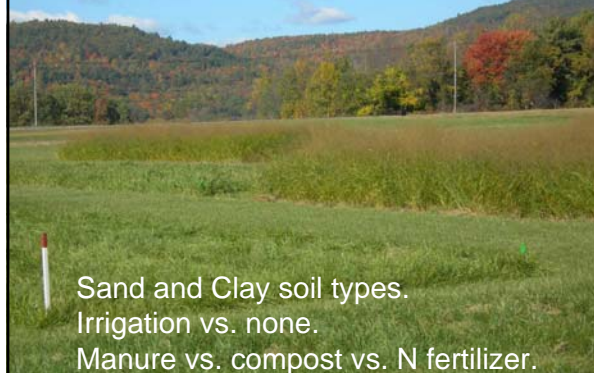
### Two diverse pathways for grass pellets

Large scale:  
Outside investors.  
Pellets shipped outside the region.

Small to Medium scale:  
Possibly mobile.  
Local production, local consumption.



### Essex Co. Switchgrass, reed canarygrass, and tall fescue.



### Obstacle to Grass Combustion Bioenergy

USDA/DOE have decided that our future is cellulosic ethanol with corn stover and switchgrass.

#### SCOPE

Scientific Committee on Problems of the Environment

UN Foundation funding for an assessment:

**Biofuels: Environmental Benefits & Consequences**

Preliminary results: Liquid biofuels are not sustainable. Biomass combustion is a much better alternative.

## Grass Combustion Bioenergy



Closed local energy loop  
Fits in with dairy farms  
High energy efficiency  
Low net GHG production  
Can be grown organically  
Complimentary to bird nesting

The End