



## USA History of Grasses for Biofuel

**Purpose:** The purpose of this publication is to provide a brief overview of the history of grass biofuel on the tall grass prairies of the Midwest.

John Davie Butler in Nebraska in the late 19<sup>th</sup> century noted that "*Straw and old prairie grass have been thought as useless as grave stones after the resurrection.*" Then he observed firsthand how grass heating had saved the lives of many Great Plains settlers.

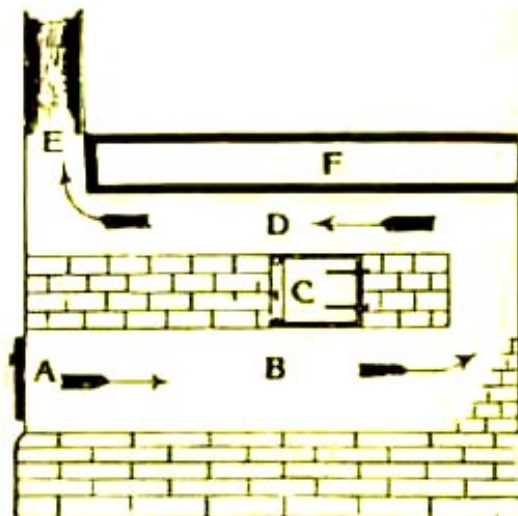
Large stone fireplaces were used to burn grass in Europe for centuries. Immigrants familiar with such structures settled on the Great Plains in the 19<sup>th</sup> century.

Two of the primary concerns of pioneers moving to the Great Plains were fuel and water, both were scarce. People traveled up to 40 miles and gathered wood, sometimes illegally, on government lands. Even the stumps of previously felled trees were dug up for firewood. After all wood was exhausted, buffalo and cow chips (prairie coal) were used as fuel, until homesteaders completely replaced the buffalo and ranching. Poverty was too great to allow the purchase of coal so herbaceous plants were used as a last resort. Weeds such as sunflower, both plant and seeds, were used for fuel.

### Hay as fuel

By the late 19<sup>th</sup> century there was widespread use of hay for fuel. The simplest of furnaces used to burn grass was called by many names, including a Russian furnace and a Mennonite grass burner.

*Russian fireplace.* The furnace was made of adobe brick or stone, with a fire box up to 4' long, 1.5' high and 1.5' deep. Hot air from the fire was forced around several corners before being exhausted. This allowed the structure to heat up and retain the heat. Loose grass was pitched into the furnace for up to 20 minutes at a time. This was only done 2-3 times per day, and provided enough heat for cooking and extended radiant heating between fuelings.



Adobe house grass burner, central Kansas  
A. Door to firebox; B. Firebox and baking space; C. Door to heat chamber for small bedroom; D. Smoke track (draft); E. Chimney; F. Heat chamber for bedroom. Firebox adobe was a mix of one part sand and two parts clay. (Pioneer Adobe House Museum, Hillsboro, KS)



Russian oven in Krause House, photo courtesy of the Mennonite Heritage Museum, Goessel, KS. The metal "zweibach" pans were designed to fit into the long narrow baking chamber. Grass, straw or dried manure served as fuel.

*Grass "densification"*. Except for the Russian fireplace, all other heating appliances required some type of densification of feedstock to work efficiently. Typically, grass would be twisted into a convenient form, often stove-wood lengths about the diameter of a man's arm. Various techniques were developed to keep the "twists" or "cats" firm and compact by tucking in loose ends. Several devices were patented for twisting hay, these were made with wood and included a crank and roller. Some small prairie homes were almost filled with hay twists going into the winter.

*"Drum" stove*. This hay burning stove used drums of sheet iron to hold the hay for burning. The stove was about 4.5' tall, with a top that lifted off and exposed the drum. The drum was about 2' in diameter, with each stove having two or more interchangeable drums. Drums packed tight with hay supposedly kept a good fire for 1-2 hours.

*"Wash boiler" stove*. Hay was packed firmly into a metal container and turned upside down and connected to the stove. The stove was used for cooking and baking.



Nebraska State Historical Society

"Magazine" type stove

*"Magazine" type stove*. This stove used a pair of removeable pipes or magazines about 25" long for loading twists of hay. The stove consisted of an ash box and a firebox above it that the magazines connected to. Above the firebox was a hot plate and cookstove. As the hay burned in the firebox, the spring-loaded magazine fed more hay into the burn chamber. A ratchet at the cap end of the magazine rewound the spring and permitted loading of another pair of hay-filled magazines. Several

filled pairs of magazines were kept on hand.

Below is part of a letter sent by Daniel W. Oaks near Sioux Falls, Dakota Territory to his brother on Dec. 13, 1877 (Courtesy of H. David Thurston, Cornell Emeritus Professor of Plant Pathology; Great grandson of D. Oaks).

*"Now D.B. I would like to tell you about how we got along without wood for fuel instead of working my team to death a hauling wood from 6 to 20 miles all winter to get enough to last. All summer I just take my mower and horses and go down to the Sioux bottom and in two days I can cut and put up enough hay to last me one year. And then not having to cut it. That is the worst of all. 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 the wood if you would give it to me. I have altered my stove so that I can burn hay better than I can wood."*

*"Safety-first" was not their motto*. Hay was considered to have the same heating value as wood by the pioneers, but hay made a very hot fire. All of the heating structures and appliances described here were relatively dangerous. In particular, hay burning stoves with removable refueling canisters allowed hot coals to escape during reloading.

Modern pellet stoves make for a safe burning environment, as an open fire is never exposed to the room. They are much safer to operate than chunk wood stoves. As long as common sense is used and operating directions are followed, pellet stoves are a safe heating option.

As soon as a transportation infrastructure was established for the Great Plains, other fuel sources became available and economically competitive. Grass heating had kept many pioneers alive during this period, but disappeared from the landscape very quickly.

For more information



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