One Farmer's Bright Idea

By Dee Ann Littlefield

Six years ago, Madisonville, Texas, farmer and rancher Buddy Alders had a bright idea. He wanted to produce enough on-farm electricity to independently power his farming and ranching operations.

He first considered wind and solar energy as power sources.

"But where I live and operate, the sun doesn't always shine and the wind doesn't always blow," Alders says.

That's when he teamed up with his friend, George King, a former power engineer. The two came up with an idea that could energize the farming community and revolutionize the green energy industry.

Their plan is to harvest hybrid forage sorghum and convert the sorghum to silage. The silage will be processed by an anaerobic digester and converted to biomethane and carbon dioxide. This biogas will then be piped to an engine to power a generator that will produce electricity.

In June 2009, the pair put their plan in action when they broke ground to build the first cellulose biogas plant in the United States. Located near Leona, Texas, the one-megawatt Mustang Creek Biogas Plant, is expected to be operating by early 2010, using hybrid forage sorghum silage as its fuel source. Two 150 kilowatt wind turbines will be placed at the plant to improve the plant's efficiency by providing electrical energy for the plant. The project is being privately funded through a financial management group.

Houston County Electric Cooperative has the option to buy the electricity and transport the produced energy into the ERCOT (Electric Reliability Council of Texas) electric grid close to the plant site. Alders' and King's plant will provide enough electricity to power approximately 400 homes year round, far exceeding Alders' original goal.

"This is a landmark project for the U.S. and the ag industry," states USDA-Natural Resources Conservation Service (NRCS) Texas State Conservationist Don Gohmert. "This has

the potential to revitalize agriculture as millions of acres that could no longer produce profitable commodity crops, now have a new opportunity for income."

Long time conservationists and clients of the NRCS, Alders and King consulted with agronomists, soil scientists, plants specialists and others within the NRCS Texas staff to gain key input for the project's foundation, which is based on conservation.

"We couldn't have gotten this far, this quickly without the help of the NRCS," Alders says. "We couldn't find any other agency or company that could provide the breadth and depth of information and technical assistance that NRCS has."

Allen Smith, coordinator of the Post Oak Resource Conservation and Development (RC&D), a branch of the NRCS, has been working with Alders and King for over two years, helping to provide grant research, soil and plant science data and other information to help them achieve their goals of green, clean energy. Their combined research led them to Germany, where they toured biogas plants, after which they are modeling the Mustang Creek Plant.

They teamed up with MMR Genetics, of Vega, Texas to find a hybrid variety of forage sorghum that will have maximum tonnage yield in the field, and produce the most gas in the plant's digestive process. Contrary to maize, corn, switchgrass or other energy crops, this hybrid forage sorghum requires less rain fall and less fertilizer, but yields 12 to 20 tons per acre.

"We chose sorghum because it will grow well in a wider variety of soils in a wider variety of climates than other crops," Alders says. "It also needs much less water with less input costs."

Smith explains that many feedstocks could be used in this process, and like any other technology, 10 years down the road they might run across something that works better. But for now, the hybrid forage sorghum fits the bill.

Unlike food crops grown for energy production, the hybrid forage sorghum is a type of grass, so no valuable food sources are used to generate the electricity. The water contained in the silage will be used in the digestion process. Silage is, on average, 67 percent moisture. This water, combined with the valuable minerals and nutrients left in the digestate, becomes liquid fertilizer. This liquid fertilizer will reduce the input costs when it is applied back to the land.

Additionally, the 2,400 acres of sorghum silage dedicated to the biogas plant are going to be grown on fallowed farm land. Representatives from the NRCS helped Alders identify

fallow cropland that would work well under this project, as well as implement conservation practices, such as minimum tilling, to keep the land healthy.

In the 2002 Ag Census, over 21 million acres in Texas was listed as cropland, but was not being harvested. For economic reasons, many farmers had let their fields go fallow and then grazed livestock on it. This fallow farmland can be put back into production by increasing the organic matter and nutrients in the soil, making it an ideal seedbed to plant a dryland crop such as hybrid forage sorghum.

"People were skeptical about the project at first," Alders says. "But when we tell them we aren't asking for subsidies; we aren't affecting the food and fiber production because we aren't using land currently being used for crops, and we are dryland farming, then the light bulb comes on and they start to see how great this project is for the economy, the environment and the energy industry."

The entire project, from farming to energy delivery, is a carbon neutral process. The greenhouse gasses emitted will be offset by their capture and all of the byproducts produced in the process will go back into the cycle or utilized offsite. The CO_2 that results in burning the biomethane will be captured in the second phase of the project. The CO_2 will be combined with nutrients, including poultry litter, to grow algae, which will produce biodiesel. The biodiesel will then go back to the farmers that are raising the crops.

"It is a balanced system that involves land management, conservation practices, water savings, and it has a huge economic and community development role," Smith explains.

Smith points out that with every single generation, America is losing more and more farmers. "This project could provide a new future for farming and energy in America," he says. "This is a crop that will actually keep the next generation of farmers on the farm."

Alders and King never intended to revolutionize the energy industry; they just wanted a more efficient way to farm and ranch. But what they've discovered is a renewable energy model that could work nationwide.

Sidebar note:

How the Plant Works

More than 4,000 of these types of biogas plants exist in Europe, where they are often referred to as a "concrete cow" because the process mimics a cow's digestive system. The digester takes in the food source, the bacteria breaks down the cellulose and produces biomethane. The digested solids plus the produced liquids are returned to the soil completing the Bio-Hybrid-Energy-Cycle™. The plant's design has the option of selling the biogas produced as a natural gas product, or to sell the electricity generated from the biogas.

This one megawatt plant will consume two tons of silage per hour. Running 24 hours a day, seven days a week, the plant will require 17,520 tons of sorghum per year.

On average, each acre of hybrid forage sorghum will produce 12 tons. The extra acres in production will provide for crop rotation. The Biogas Plant will store ~~and~~ two years of feedstock at all times there by "Banking Renewable Energy". This banked energy stored at the plant site will steadily feed the "concrete cow" in the non-stop production process.

Within the next year, four more new plants will begin construction all in the central Texas. In the next eight years, King and Alders have plans to have 50 plants up and running throughout central Texas.

Based on the expected revenue from this first plant, an economic analysis using the Regional Industry Multiplier System, predicts an additional 137 jobs and 14 businesses will be created in the economic region from this first project alone.