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West Central News

Using LCA data to optimize ethanol production

Joel Tallaksen, Renewable Energy Scientist

Over the last decade, the ethanol industry has faced criticism for using significant amounts of fossil energy during the production of a renewable fuel. The chief use of energy during this process is combustion of fossil fuel, natural gas or coal, to distill pure ethanol from a mixture of water, ethanol, and other substances. Ethanol production facilities have made steady improvements in the distillation process both to reduce production costs as well reduce energy use. This is especially important as some states, notably California, are beginning to assess fossil energy used to produce the renewable fuels sold in their state. Fuels having a lower carbon footprint (less fossil fuel) are given preferential treatment in terms of access to the large California market. Two main areas are considered when calculating the amount of fossil energy used; production of the grain and the actual manufacturer of the ethanol fuel. While ethanol production facilities don't have control over production of grains, many have implemented changes to their production methods and upgraded their infrastructure with energy saving equipment.

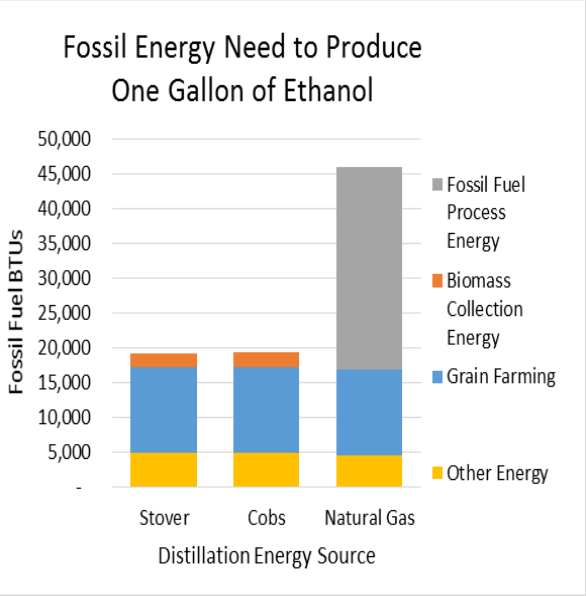

Figure 1. Model predictions of the amount of fossil energy needed to produce one gallon of gasoline using different energy sources for the distillation

Work at the West Central Research and Outreach Center is examining another potential pathway to further reducing fossil energy use in ethanol production. Supported by the USDA Sun Grant Initiative, the research looks at the energy balance associated with using agricultural residues to replace fossil fuels. Using Life cycle assessment (LCA) methods, the fossil energy for production, collection, and handling of corn stover or cobs was compared to the direct use of natural gas in the distillation process. The results (figure 1) indicate that the use of corncobs or corn Stover could substantially lower the amount of fossil fuel being used to produce ethanol. The model predicted that distillation of a gallon of ethanol uses around 29,000 btus of natural gas compared to the roughly 2,000 btus of fossil fuels needed for the collection, transport, and processing of corn stover or cobs. This has the potential to reduce the overall amount of energy for ethanol production by roughly 35%.

While using cobs or stover may be a tool for ethanol producers in the future, it is not feasible at the moment. Low natural gas prices in the US mean that it is not currently economical to use corn Stover or cobs for ethanol production. Additionally, both farmers and ethanol facilities lack the infrastructure to begin using agricultural biomass in the ethanol production process. It would also take some time to develop the supply chains needed to supply the volume of biomass these facilities would need. However, biomass may become a viable option if natural gas prices get as high as they were a few short years ago. The West Central Research and Outreach Center will continue following the use of agricultural biomass as a substitute for fossil fuels and as a potential new market for the area's agriculture sector.

AgCountry Auditorium
April 21—Hort Event (Rain site)
April 22—Stevens Co. Ext. Meeting
April 28—Stevens Co. Ext. Meeting

Seminar Room
April 23—WCROC Faculty Meeting

Producing produce cold weather style

By Carol Ford, Program Coordinator, Southwest Regional Sustainable Development Partnership
(Adapted from an article by Carol in the Produce Grower magazine www.producemag.com)

The market for vegetables grown by greenhouse producers appears poised to grow as consumer demand for fresh produce continues to climb. But how to sustain such enterprises, in cold-weather climates has been, for the most part, an impractical and near-impossible business challenge.

Scarlet Frill mustard is one of more than three dozen salad greens varieties that thrive in cool passive solar winter greenhouse such as this. Photo by Chuck Waibel

However, that no longer needs to be the case. Ten years ago, my husband, Chuck Waibel, and I began a professional partnership that led us down a path to partnership efforts with growers that could very well change the way we think about food throughout the United States.

We combined our talents – mine as a horticulturist and Chuck's as an inventor – to develop a unique passive solar greenhouse designed to produce fresh produce throughout the winter months in northern climates. Little did we know that our combined skills would not only launch our successful winter production business—but also lead to the formation of the Deep Winter Producers Association, an entity comprised of produce growers that share a passion for providing fresh food to local markets.

We saw growing fresh, local produce during the winter months in the rural area of west central Minnesota as a potential niche market. Our rural county is considered a "food desert" by the USDA because of the distance required for consumers to access fresh vegetables and fruits. We quickly learned that the economic advantage of a local foods system for small towns was a very important piece of keeping communities resilient and attractive to families migrating back into small town America.

But first, we had to create a structure to support food production and also be fuel efficient in a tough winter climate. Our structure is a passive solar "cool weather" greenhouse that produces salad greens, kale, chard, broccoli raab, and Chinese cabbage that customers crave in the winter months. Advantages of cooler greenhouses are fewer soil and pest-related problems low operation costs. The 16- x 22-foot structure uses, on average, $100 a season in propane.

After 10 successful seasons, we wrote a manual "The Northlands Winter Greenhouse Manual" to help others. As a result, there are many more greenhouses built from the concepts we shared. It became clear that the concept of partnership needed to be taken up a notch. My husband Chuck was awarded a Fellowship from the Bush Foundation to help create an association to explore ways to work collaboratively and support new farmers.

Sadly, just as Chuck was beginning his project, he was diagnosed with cancer and died within a month. The Bush Foundation opted to turn Chuck's fellowship into a memorial grant managed by the University of Minnesota's Regional Sustainable Development Partnership (RSDP). I was hired as the project coordinator with our goal to build a foundation for the Deep Winter Producer Association that will go statewide after this initial project concludes.