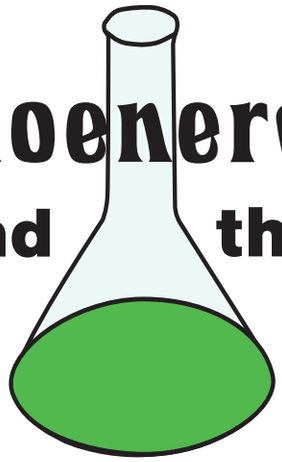
Bioenergy and the University of Florida/IFAS



By Mary Duryea and Larry Parsons

High gasoline prices have significantly impacted many aspects of all Floridians' lives. With gasoline approaching $4 per gallon, the nation is looking for fuel alternatives. Ethanol and biodiesel from corn and other crops have become the center of attention. Ethanol has been made for centuries by fermenting sugar or starch from various crops. Because the technology was readily available, a number of ethanol plants using corn have already been constructed.

When comparing other liquid fuels to oil, scientists often debate if the energy output gained is greater than the energy input to grow the crop. Corn has relatively high input costs including nitrogen fertilizer (which takes energy to produce). With traditional corn fermentation, starch first has to be converted to sugar to produce ethanol. Sugarcane has fewer energy inputs and is able to produce more ethanol than corn. Currently, 26 states have ethanol plants, and U.S. ethanol production in 2007 was nearly 6.5 billion gallons.

A more desirable option is to produce fuels from cellulose derived from waste products or crops that have minimal energy inputs. This is where the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) can contribute. Florida can play a major role in the national energy picture for several reasons. With its warm climate, Florida produces a great deal of biomass every year that can serve as a bioenergy feedstock source. Florida has 15 million acres of forest land and 10 million acres of farmland. In the United States, Florida is number 1 in production of citrus, sugarcane, forest residues and urban wood waste. In vegetable production, the state is number 2.

Besides sugarcane, Florida produces a number of potential bioenergy crops including sweet sorghum, bunch grasses (elephantgrass and energycane), silage corn, potatoes, sweet potatoes and hay. Potential production area for these crops ranges from 20,000 to 500,000 acres. Forest crops include pine, eucalyptus and cottonwood. These tree crops could potentially be grown on one to five million acres with a total production of 10 to 40 million dry tons. Agricultural and forestry waste products can contribute sizeable amounts of cellulose.

Citrus peel and pulp waste can also be converted to ethanol (but peel has recently increased in value as an animal feed). Research projects by UF/IFAS and other agencies are already under way on all of these crops.

The Department of Energy reports that America can produce more than 1.3 billion tons of cellulosic biomass per year — more than 93 million tons of that could be produced in Florida. If this were converted to ethanol, Florida could produce 5 to 9 billion gallons of ethanol per year.

Because of uncertainties in the citrus market due to diseases such as greening and canker, some growers have considered growing alternate crops. Growers have had to pay increasing pest control costs to deal with these diseases, but juice imports have recently decreased the price they get for their fruit. Ultimately, economics and citrus productivity will determine whether it is better to grow citrus or some alternate crop.

Lonnie Ingram in UF/IFAS is a leader in the area of cellulosic ethanol. He has engineered and patented microorganisms that produce ethanol from cellulose. Two spin-off companies have developed from this technology.

UF/IFAS is involved with two new ethanol plants. One is the Biofuel Pilot Plant Center of Excellence that is under construction in Gainesville. Another is a new Research and Demonstration Cellulosic Ethanol Plant that will be started with a $20 million grant from the State Legislature. The plant will be located at Florida Crystals near Belle Glade. The goals of these plants are 1) to accelerate commercial development of cellulosic ethanol processes, and 2) to provide alternative income sources for Florida agriculture and forestry. While these plants are not operational yet, they are a promising start.

UF/IFAS is involved in bioenergy research in a number of other ways. It is developing energy crops such as energycane, grasses and sweet sorghum. Goals are to increase yield and improve processing efficiency. Scientists at the Everglades Research and Education Center have selected 45 sugarcane hybrids that are being evaluated for biomass production. The best yielding hybrids could potentially produce more than 2,000 gallons of ethanol per acre. Other high biomass grass crops that are being evaluated include giant reed, elephantgrass, Erianthus, and Miscanthus. Research is also determining the best sweet sorghum varieties for Florida along with their fertilizer and water requirements. This will help investors, growers and scientists make informed decisions on sweet sorghum as a potential energy crop.

UF/IFAS forestry scientists are breeding for traits that improve processing efficiency. Breeding work is leading to poplar varieties that grow faster and have higher cellulose and lower lignin content. This combination can lead to higher ethanol production.

UF/IFAS is working in a variety of areas including energy crop production and conversion engineering to produce various kinds of bioenergy. Changes in crops will have environmental impacts and will ultimately affect soil, land and water use. Of course, policy decisions related to subsidies and incentives will influence how this works out economically.

Florida has a number of things going for it. The state has great capacity to grow biomass. With expertise in bioenergy and partnerships with government and industry, UF/IFAS can advance the science of bioenergy, accelerate the commercialization of renewable biofuels, and contribute substantially to a sustainable energy supply.

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