Biofuels News
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Bioenergy, conservation and wildlife protection can boost each other

(Biopact) - Discussions about biofuels and bioenergy often focus on their potential impacts on biodiversity and on risks like deforestation. However, these legitimate concerns should not veil the fact that energy crops can just as well contribute to strengthening ecosystem services, to conservation, to the fight against desertification and erosion, and to the restoration of wildlife habitats.

Biopact has referred to numerous examples of this kind: the creation of the Green Wall of the Sahara, the greening of toxic brownfields by energy crops to allow wildlife to reemerge, the revitalization of depleted soils via carbon negative bioenergy (terra preta), or the restoration of prairies and biodiversity with high-yielding polycultures of native grasses in the U.S. More: the creation of bioenergy plantations to stop desertification in Inner Mongolia, the prevention of forest fires by utilizing undergrowth as biofuel feedstock, replanting lost genetic resources (e.g. switchgrass varieties) to restore original biodiversity, switching to modern biofuels as a way to prevent deforestation, or stripping biomass for energy to revitalize ecosystems destroyed by nitrogen pollution.

An interesting new example comes from the Minnesota Department of Natural Resources (DNR), which, once a year, brings together the people most involved in the issues surrounding hunting and fishing in the region. Usually this gathering concentrates on predictable topics, but this year the meeting in St. Cloud took on the issue of bioenergy head on. DNR officials sense that bioenergy - both biofuels for transport as well as biomass for power and heat - will be a big part of Minnesota's future, and that it could play an important role in conservation.

According to Mark Lindquist, energy/biofuels project manager with the DNR, under the right conditions, biofuels could provide a big boost for soil, water, and wildlife too. The right conditions include using native plants grown on previously disturbed or highly erodible land not well suited to agriculture, using residues from other enterprises such as agriculture or logging, and minimizing inputs of fossil fuels into production and distribution.

Biofuels offer an opportunity to harness market forces to help support our conservation agenda, so we can be putting more grass on the landscape, more trees on the landscape, creating more wildlife habitat, more recreational opportunities, improving water quality, and helping stabilize the flow of water through our agricultural watersheds. - Mark Lindquist, energy/biofuels project

manager with the DNR

Conservationists should have a say in how the future of bioenergy plays out in the state, according to Steve Hirsch, with the DNR's ecological resources division. "Are we going to be at the table and help direct this, so we can have mutual benefits for fish and wildlife while we try to solve some of our energy needs, or is it going to be done without us at the table with no concern for conservation? That's why we're trying to get very involved with this issue", Hirsh says.

Beyond corn ethanol

When thinking of extracting energy from plants, most Americans think of ethanol made from corn grain. It's no wonder that's what comes to mind: in Minnesota alone, 17 factories produce the popular gasoline supplement, and four more are being built. In 2006 alone, Minnesotans pumped some 263 million gallons of the biofuel into cars. At first glance it seems to be a fine fuel. Corn is plentiful, and farmers know how to grow it. The technology for converting it to a fuel for automobile engines is well worked out and available on a commercial scale.

But from an environmental perspective, corn ethanol has its limitations. From tilling to fertilizing to irrigating to distilling, corn ethanol production consumes large amounts of fossil fuels and water - offsetting some of the biofuel benefits of being local, renewable, and carbon neutral. And the increased demand for corn puts pressure on farmers to convert grasslands to cornfields. Soil erosion and water pollution increase when grassland is plowed and fertilized for corn. And few animals find cornfields to be as satisfactory for habitat as native grasslands and brushlands.

Corn starch is not the only source of plant power, however. In fact, it represents only the tiniest fraction of the energy Minnesota vegetation gathers from the sun. The vast bulk is tied up in cellulose, a compound that contains the same chemical components as starch, but in a different configuration. Ethanol made from cellulose instead of corn starch uses parts from all kinds of plants, including grasses, shrubs, and trees. And that could make the environmental impact of ethanol production far more favorable for several reasons.

First, many plants - particularly native perennial plants - need far less fossil fuel input to grow, so production of ethanol from native plants would generate less CO2. Prairie grasses, such as switchgrass, big bluestem, prairie cordgrass, and Indiangrass (or better yet, a mixture including wildflowers), also provide superb wildlife habitat. Grasses help soil stay in place and filter polluted runoff. If plant species and genetic makeup, land, and harvest regimen were coordinated to maximize natural resource potential, native vegetation managed for cellulosic biofuels could provide far better homes for ducks, deer, songbirds, prairie

chickens, and other native species than row crops.

We think [biomass harvest] can have a positive benefit, particularly if it means something that's in row crop production now is converted to grass, or if it means we have lands that are decadent that we can then use biomass harvest as a management tool to increase the productivity of those lands for wildlife. DNR currently invests hundreds of thousands of dollars each year in brushland management for brushland-dependent wildlife species such as sharp-tailed grouse. If brush becomes a commodity, management could start to pay for itself. That's a win-win situation for us. We couldn't ask for anything more.- Bill Penning, DNR farmland wildlife program leader

J. Drake Hamilton, science policy director for Fresh Energy, a Twin Cities-based nonprofit group, says that, combined with energy efficiency, cellulosic biofuels could shape a healthier energy future for Minnesota. "We think of cellulosic ethanol as the next generation we need to get to as soon as possible," she says. "We think it represents the best opportunity for replacing oil with a renewable fuel and at the same time improving our national security and our environment."

Start-up challenge

Cellulosic ethanol, unfortunately, is a lot easier to envision than to produce. The microbes that turn starch into ethanol can't put a dent in cellulose's more durable chemical bonds, so cellulosic ethanol production requires sophisticated processing that's not yet available on an industrial scale.

Cellulosic feedstock yields less energy per pound than corn kernels, so more has to be hauled (presumably in fuel-burning vehicles) to the processing plant. Corn enjoys generous government subsidies that give it an economic edge over other feedstocks. And then there's the chicken-and-egg challenge of producing feedstock and building conversion facilities: Who's going to do one before the other is in place? "There's a lot of barriers and hurdles that we've got to figure out," Lindquist says.

But things are moving forward. Research groups like the Initiative for Renewable Energy and the Environment at the University of Minnesota are hot on the trail of better ways to grow, harvest, and transport biomass and to convert it to usable fuels. Last February the U.S. Department of Energy announced the allocation of nearly $400 million to set up six commercial-scale production facilities around the country. They are expected to make more than 130 million gallons of ethanol per year from agricultural residues, wood wastes, and energy crops such as prairie grass. And in May the energy agency announced it would provide up to $200 million over five years to fund small-scale facilities to test innovative ways of producing liquid fuels, along with other products, from cellulosic feedstock.

Lindquist says it's a matter of time. "You've got to hit that single and get the runner on first, and then another runner, and advance runners around the bases," he says. "Eventually, if you focus on getting runners on base, you score runs."

Heat and electricity too

Though ethanol for automobiles is getting the most attention, it's not the only way to tap the solar energy stored in Minnesota's abundant vegetation. If you've ever toasted a marshmallow or warmed up by a woodstove, you've been the beneficiary of another approach - using plants to make heat and electricity. Paper mills have been burning wood scraps for fuel since the 1920s. Today, according to DNR forest products utilization and marketing program leader Keith Jacobson, virtually every pulpwood facility in the state uses bark, sawdust, or other tree bits and pieces to energize its operation, saving more than 3 trillion Btus annually in fossil fuels.

As fuel costs climb and concern about climate-altering carbon emissions from coal-fired power plants and natural-gas burning grows, more businesses are turning to wood. Power plants and industrial facilities in Grand Rapids, Cloquet, Duluth, Hibbing, Virginia, St. Paul, and Little Falls use wood waste for energy.

Electricity generated from wood could also power electric cars. A report published last September by the Duluth-based Natural Resources Research Institute estimates that an electric car, recharged by electricity derived from woody biomass, could travel 2.5 times farther on a dry ton of woody biomass than a car fueled by cellulosic ethanol. The report estimates that Minnesota lands could sustainably produce 1.3 million cords of logs and more than 2.6 million dry tons of woody crops, wood from thinning stands, and harvest residues annually for energy.

"There's certainly a role for that," says Don Arnosti, director of forestry with the Institute for Agriculture and Trade Policy. However, Arnosti emphasizes, it's important that such use respects the biological limits of the system by harvesting trees sustainably and leaving enough residue on the site to provide habitat, restore soil nutrients, and minimize runoff.

Jacobson agrees. "It's a good thing if it's done right," he says. "There are solid forest management reasons and certainly economic reasons and renewable energy and even national security reasons for utilizing more wood for biomass for energy. But that comes with some risks. There is value for leaving the stuff on site for different kinds of wildlife habitat, soil nutrients, site productivity maintenance, aesthetics."

To that end, DNR Forestry and the Minnesota Forest Resources Council recently released guidelines for harvesting logging leftovers and other woody

biomass for fuel in a way that protects habitat, soil, and water.

"We're as on top of it as anybody," Jacobson says. "If you look around the country, these are the first biomass guidelines that are existing to my knowledge. I think we're ahead of the game."

More options

Energy innovators in central and southern Minnesota are gearing up to turn other sources of biomass into heat and electricity as well. The University of Minnesota, Morris, started construction last summer on a research and demonstration biomass gasification facility that will use a variety of cellulosic fuels, including cornstalks, other agricultural byproducts, and native prairie plants, to meet some 80 percent of the campus heating and cooling needs. The Phillips Biomass Community Energy Project in Minneapolis is looking at retooling a retired incinerator to use city tree trimmings and crop residues to provide heat and electricity. The Central MN Ethanol Co-op in Little Falls is using gas made from wood waste in place of natural gas to make corn ethanol and has plans to build a cellulosic ethanol plant next door that uses wood chips.

All told, about three dozen Minnesota facilities currently use some type of cellulosic fuel - wood waste, agricultural residue, or something else - to produce heat and power, and at least 20 more are preparing to join them.

"We just think this is a better way to go," says Paul Kramer, vice president of Rahr Malting in Shakopee.

Rahr and the Shakopee Mdewakanton Sioux Community broke ground last September for a $55-million, 16.5-megawatt facility that will burn byproducts of malt production along with other cellulosic fuels, including crops and crop residues, to produce electricity and heat for the malting process and the community. Kramer says the heat generated by the facility will replace the consumption of 1.1 million Mcf (1,000 cubic feet) of natural gas each year.

"It's sustainable, that's what I like about it," Kramer says. "It's good stewardship of Btus."

Two-edged technology

Minnesotans will likely be hearing more about cellulosic biofuel in months and years to come. The 2007 Minnesota Legislature funded feasibility studies for several proposed bioenergy facilities, gave the Minnesota Board of Water and Soil Resources $200,000 to put together a plan for encouraging landowners to grow native perennial plants on existing croplands for energy, and set a goal for cellulosic ethanol production in the state. The Legislature also assigned a DNR-led task force the job of figuring out the best way to produce high-quality native

prairie seed. Lands planted to prairie with the seeds could provide biomass fuel and environmental benefits such as carbon sequestration, wildlife habitat, and water-quality protection.

The Legislative-Citizen Commission on Minnesota Resources and the U.S. Geological Survey recently awarded University of Minnesota researchers nearly $1.1 million to demonstrate how native prairies can produce biofuels while also filtering polluted water. At the federal level, the farm bill, though still stalled at this writing, shows some glimmers of hope for encouraging biofuels that are good for conserving natural resources as well as the nation's energy supply.

Lindquist predicts that in one form or another - or, more likely, in one form and another - cellulosic biofuels will be an important part of Minnesota's energy future. But exactly how it will all shake out, no one knows.

"This is brand-new stuff," he says. "We're basically trying to roll out a revolution in our energy system and our agricultural system and our natural resource system all at once."

The main thing to remember, he says, is to think carefully about the how and where of biofuels development. Will cellulosic fuel production disturb natural lands? Or will it encourage naturalizing already disturbed land? Will planting and harvesting damage healthy habitat? Or can growing cellulosic fuels make degraded land ecologically healthier?

"It's not quite the same kind of sense of environmental home run that wind and solar energy are," Lindquist says.

Arnosti agrees. "I refer to biomass or bioenergy as a two-edged sword - it can cut both ways," he says. "If we are smart enough as a society and a community to deploy this technology wisely, we can achieve many benefits."

Whether that's what actually happens, he adds, depends on all of us.

"I think it's really important that the public get involved," he says. "I would ask the people of Minnesota to look behind the curtain, like in The Wizard of Oz. Ask tough questions, and try to think long term."

Source: Biopact

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