Land Stewardship Project Fact Sheet #21

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Growing Green Fuel: RIM-Clean Energy

How we can jump-start sustainable biofuel production.

RIM-Clean Energy

Producing energy from native perennials is a critical next step in moving towards clean, renewable energy. Minnesota can be a leader in this next generation of bioenergy with the right state policies as drivers. To do this we must invest in farmers who are willing to be early innovators in driving this change by growing native perennials for bioenergy. We can do this through an initiative called Reinvest in Minnesota-Clean Energy (RIM-Clean Energy). The intent of the program is to support native perennial biofuels production that has environmental and conservation benefits, including improved water quality and soil health, as well as reduction of chemical inputs, storage of soil carbon and increased biodiversity/wildlife habitat. RIM-Clean Energy is not a traditional conservation easement program. It is designed to be a "working lands" easement program.

How RIM-Clean Energy would work

RIM-Clean Energy will pay farmers for a 20-year commitment to growing native perennials for bioenergy. The agreement requires best management practices that, for example, utilize lower amounts of pesticides and fertilizers. The program will operate in areas where the presence of perennials will have a proven positive impact on impaired waters and other natural resources. RIM-Clean Energy project areas will also be in regions where they can efficiently provide feedstock for bioenergy industry development.

The RIM-Clean Energy base level payment for planting one native perennial grass or native woody species would be 80 percent of estimated market value. Landowners would also be compensated for the cost of establishing such plantings. A multi-tiered payment system would make it possible for landowners to receive more money if they plant a greater diversity of species. The program would be funded through bonding funds which are used by the state to purchase a 20-year easement on the property.

2008 legislative funding needed

During the 2008 session of the Minnesota Legislature, a coalition of farm, conservation, wildlife and environmental organizations are supporting $46 million in bonding funds to launch RIM-Clean Energy. This would provide for approximately 13,000 acres of native perennials. These acres will be targeted to local communities with planned or existing bioenergy facilities that are prepared to use the perennial crops.

Why perennials?

Scientists and conservationists say that corn-based ethanol is a good interim step towards creating more sustainable energy systems. However, since corn is an annual crop that only covers the soil a few months out of the year and relies on petroleum-based inputs to grow, it is not the final answer. A recent paper in the journal *Science* concluded that when changes in land use are taken into account — plowing up grasslands to plant corn for example — corn-based ethanol could nearly double greenhouse emissions over a 30-year period.[1] The USDA has also raised concerns that increased corn plantings prompted by the booming ethanol market will exacerbate soil erosion.[2]

That's why there is great interest in making biofuels from perennials—plants such as grass that cover the land year-round and that comparatively can grow with relatively few chemical and energy-intensive inputs.

Research at the U.S. Department of Energy's Oak Ridge National Laboratory shows that making fuel from switchgrass could be 15 times more energy efficient than corn-based ethanol.[3] The USDA's Agricultural Research Service found that switchgrass produced 540 percent more energy than was needed to grow it. The study, which was conducted on fields in Nebraska, North Dakota and South Dakota, also showed that greenhouse gas emissions from switchgrass-based cellulosic ethanol were 94 percent lower when compared to gasoline.[4]

Perennial monocrops not enough

But planting monocrops of switchgrass isn't the ultimate answer. Monocrops, including grass, usually must rely on chemical inputs such as petroleum-based fertilizer to stay viable year-after-year. Diverse stands of grasses and forbs

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which replicate the native prairie ecosystems of the past, on the other hand, can be self-supporting for decades, according to David Tilman, a University of Minnesota ecologist who has been working with an interdisciplinary scientific team to research how biofuels can be produced in environmentally and economically sustainable ways. The excess biomass would be harvested in the fall for energy, leaving a permanent stand of perennial plants as ground cover and a future source of growth. This could be done on marginal farmland without high amounts of fertilizer, pesticides and energy, says Tilman.

A Tilman study featured in the journal *Science* found that 51 percent more biofuel energy per hectare was produced by a diverse mix of native grasses when compared to corn-based ethanol. The research also found that highly diverse plots of grasses containing such species as goldenrod, Indian grass, big bluestem and switchgrass yielded 238 percent more energy than stands consisting of just one species.[5]

Good for the local climate & water

Greenhouse gas emissions, in carbon equivalent, could be reduced as much as 36 percent in Minnesota's Chippewa River watershed study area if more perennial plant cover was established, according to a Multiple Benefits of Agriculture analysis.[6]

Another benefit of utilizing perennial plants as biofuels is that it could dramatically improve water quality in rural watersheds. A modeling study conducted on two Minnesota watersheds found that land use changes such as establishment of more perennial plants reduced the amount of soil sediment eroding into a local waterway by as much as 84 percent. These land use changes also produced other water quality benefits. By getting more perennial vegetation on the land in the form of grasses, hay crops and trees, water runoff was reduced as much as 35 percent in both watersheds. That meant more water was percolating into the soil and less was rushing to the waterways, carrying soil and other contaminants along the way.[7]

A diverse bioeconomy

Researchers writing in the journal *Science* say that perennial plant systems could serve as the basis for a new multifunctional bioeconomy-based agriculture. For example, perennial grasses could produce cellulosic biofuels and cheap livestock feed. At the same time, such systems would provide ecological services such as saved soil, cleaner water, sequestered carbon and wildlife habitat. These are services that are quite valuable to society; a statewide public opinion poll found that Minnesota citizens on average are willing to pay an additional $201 per household annually for specific and substantial benefits that are produced by diversified land use and farming systems.[8]

Hurdles remain

It should be noted that there are many questions to answer about how perennial plant cellulosic fuel production will fit into current farming systems. For example, could stands of native perennial plants and forbs planted for biofuel production also be used for grazing livestock? How will the perennials be harvest and stored? What is the best way to establish and maintain these fields of native perennials? These questions and more are what the early innovators will need to answer.

Priming the pump

While research into the commercial viability of cellulosic biofuels production continues, we need to help farmers and others who are taking the risks associated with early adoption of the plant systems that will serve as the foundation of this system. This is where RIM-Clean Energy could play a vital role. It doesn't pick a winner—it simply jump-starts the production of one key element in the coming cellulosic bioeconomy revolution: native perennials.

Minnesota has led in cellulosic biofuels research. Now we must help our farms and communities lead in the implementation.

Sources

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This fact sheet is brought to you by the members and staff of the Land Stewardship Project, a private, nonprofit organization devoted to fostering an ethic of stewardship for farmland and to seeing more successful farmers on the land raising crops and livestock. For more information, call 651-653-0618 or visit www.landstewardshipproject.org