Fueling the Debate: Agrofuels, Biodiversity, and Our Energy Future #8 Next-Generation Biofuels

in

- Agrofuels [1]

Carmelo Ruiz Marrero - May 1, 2008

Americas Program, Center for International Policy (CIP)
americas.irc-online.org

First-generation biofuels like ethanol and biodiesel debuted on the world stage as the solution to the fossil fuel trap. Soon evidence began to mount indicating that the solution may well prove to be just a new set of problems.

Executives and scientists of agribusiness and biotechnology corporations know the problems caused by first-generation agrofuels, and are wagering that these can be solved by a new generation of agrofuels derived from cellulose.

Cellulose, the most common organic compound on earth, is a key structural component of the cell walls of green plants and many forms of algae. About 33% of all plant matter is cellulose. Scientists have devoted major efforts to find practical ways of turning it into liquid fuel. In nature only fungi and certain bacteria found in the guts of termites and ruminant mammals (such as cows) produce enzymes that can digest cellulose. The ability to turn cellulose into fuel would make it possible to use any vegetable matter, living or dead, to this end.

"WHAT IF WE COULD CONVERT not only corn, but also corn stover "the leaves, stalks, and cob "into ethanol? What if we could transform sugarcane bagasse (leafage) to transportation fuel? Could poplar and pine trees, wheat and rice straw, or even municipal waste become a sustainable source of biofuels? If so, energy crops like fiber cane, switchgrass, and miscanthus could become our country's strategic "oil" reserve, and Oklahoma could be the next member of OPEC. In the past, scientists using traditional chemistries have been unable to cost-effectively convert these residual plant products and energy crops to ethanol. Now, recent advances in industrial biotechnology are providing powerful new tools to solve this historic challenge."

Source: Verenium corporation

In 2006 venture capitalists invested $235 million in the development of cellulose agrofuels. That same year the Chinese government announced it would spend $5 billion over the next decade to expand ethanol production, with a special emphasis on cellulosic ethanol. Meanwhile, the U.S. Energy Department is investing $385 million in cellulosic ethanol facilities for the period 2007-2010.

The development of new-generation cellulosic fuels will undoubtedly be dominated by U.S.-based biotech giant Monsanto, world leader in agricultural biotechnology. In 1982 its scientists created the first GM plants. A quarter-century later, the company has 3,000 scientists on its payroll, and approximately 90% of the world's GM seed is either patented by Monsanto or contains some technology that is patented by Monsanto.

Monsanto became the life sciences behemoth it is today by buying out its competitors. According to Claire H. Cummings' book "Uncertain Peril: Genetic Engineering and the Future of Seeds," the buying spree began in 1996 when it bought Agracetus for $150 million and Calgene for $240 million. Monsanto went on a veritable buying spree, purchasing Dekalb, an American company, for $2.3 billion, Holden Seeds in 1997 for a price that was 23 times its annual earnings, seed companies in Brazil and India, Unilever's European wheat-breeding business, and Cargill's international seed
operations for $1.4 billion. Cummings explains that Monsanto sought more than increased market share and production: "... it was about owning the parent seed lines and getting control of the genetics."

In 2005 Monsanto became the world's biggest seed company by adding the Seminis Corporation to its acquisitions for a cool $1.4 billion. Seminis, the world's largest developer, grower, and marketer of fruit and vegetable seeds, was founded in 1994 by Mexican tycoon Alfonso Romo. The company boasted 70 research stations, seed production sites in 32 countries, and sales in 120 countries. At the time Monsanto bought it, Seminis had 40% of the U.S. vegetable seeds market. Monsanto now owns its vast catalog of seeds, which includes 75% of tomatoes sold in the United States, plus numerous varieties of lettuce, cabbage, melon, and spinach.

In 2007 the Mendel Biotechnology company "co-owned by Monsanto "bought the German corporation Tinplant Biotechnik, which owns the world's largest collection of miscanthus varieties. This perennial grass native to Africa, also known as elephant grass, is considered ideal for cellulosic ethanol production because of its rapid growth and high biomass yield.

Mendel is currently developing GM miscanthus varieties and in June 2007 oil giant British Petroleum (BP), the world's fourth largest corporation, announced it would fund Mendel's five-year cellulosic fuel research program. As a result of the deal, BP became a shareholder of Mendel with representation on its board.

"Working with BP, Mendel aims to be at the forefront of seed supply into the future energy grass seed market," according to the company's press release. "Mendel will establish breeding stations in the Midwest and the Southeast United States, and accelerate breeding collaborations with groups in Germany and China."

Other oil corporations that have joined the cellulose trend including Chevron, Shell, and Conoco-Phillips. The latter invested $100 million in a joint venture with Tyson Foods to process animal fat into fuel. Brazil's Petrobras has jumped on the bandwagon with a bio-ethanol agreement with Japan's Itochu.

Monsanto is also interested in the fuel potential of switchgrass (Panicum virgatum), and currently collaborates with the U.S.-based Ceres corporation to research its possibilities. A native of the North American prairie, switchgrass was mentioned by President Bush in his 2006 State of the Union address as an alternative to fossil fuels.

Ceres says it is "improving switchgrass as a crop via selection of improved types but, more importantly, is bringing its proprietary genes, tools, and procedures to enhance the improvements more rapidly and provide the plant with attributes ideally suited to being farmed on large acreages to produce consistently higher yields." The company claims to possess the largest proprietary collection of fully sequenced plant genes, with patents on more than 75,000 genes.

A substantial portion of cellulosic ethanol research is focused on sugarcane. The Brazilian Votorantim conglomerate owns CanaVialis, world leader in the field of sugarcane genetics, and sugarcane genomics company Allelyx. Both subsidiaries are developing GM sugarcane for ethanol. Monsanto announced in 2006 that it is working with Votorantim to commercialize GM sugarcane by 2009.

Meanwhile Syngenta, Monsanto's major European competitor, obtained access to inedible sugarcane strains with ultra-high cellulose content developed by the Celunol biotechnology company. In 2007 Celunol merged with Diversa to form the Verenium Corporation. In February 2008 Verenium, headquartered in Cambridge, Massachusetts, received a grant from the U.S. Department of Energy to develop cellulosic ethanol.

U.S. universities are fishing for big money in the cellulosic ethanol rush. In 2007 BP gave the unprecedented sum of $500 million to the University of Illinois' Lawrence Berkeley Laboratory and the Berkeley campus of the University of California for the development of agrofuels (see sidebar). Stanford University's Global Climate and Energy Project is getting $100 million from Exxon-Mobil, the world's second largest corporation, over a 10-year period, in part to develop new GM agrofuels.
Other corporate donors are General Electric and Toyota, each one giving $50 million to Stanford.

$500 Million Corporate Grant Ignites Academic Controversy

British Petroleum (BP) signed in 2007 an agreement with the University of California's Berkeley campus and the University of Illinois' Lawrence Berkeley Laboratory to found the Energy Biosciences Institute (EBI), a "private-public" entity that will employ biotechnology to develop agrofuels.

What's in it for the two universities? $500 million, a private donation without precedent in the history of academia. BP chief Robert A. Malone said, "We are joining with some of the world's best science and engineering talent to meet the world's demand for low-carbon energy. As part of that effort, we will be working to improve and expand the production of clean, renewable energy through the integrated development of better crops, better processing technologies, and new biofuels."

The BP-Berkeley deal has provoked heated opposition from groups of students, faculty, and citizens. "This partnership reflects the rapid, unchecked, and unprecedented global corporate alignment of the world's largest agribusiness, biotech, petroleum, and automotive industries," denounced Berkeley professor Miguel Altieri and Eric Holt-Giménez, director of Food First. "With what for them is a relatively small investment, these industries will appropriate academic expertise built over decades of public support, translating into billions of dollars in revenues for these global partners."

"BP-related employees would be housed in buildings funded and equipped by the public," declared U.C. Berkeley professor and former Shell Oil scientist Ted Patzek. "The public would then be blocked from entering the BP-occupied buildings. Most information would flow through and be filtered by the BP personnel and their UC Berkeley affiliates, who would need to sign non-disclosure agreements, making it impossible to distinguish between their private and public roles."

Patzek notes with great concern that the Berkeley side of the EBI will be run by Mendel Biotechnology CEO Chris Somerville. "Mendel Biotech is 'completely aligned' (their own wording) with Monsanto and Savia Ltd. Monsanto controls most sales of GMO seeds worldwide. Savia is the world's largest dealer of non-commodity crops: trees, flowers, vegetables, grasses, etc., and is deeply vested in GMO manipulations.

"Dr. Somerville's company has received $46 million from Monsanto and Savia to conduct research on genetically modified plants."

"Chris Sommerville, CEO of Mendel, has been apparently rushed in to Berkeley through a secretive and highly irregular flash-hire process to be safely on the UC side as a professor for the signing of the agreement," denounced Professor Ignacio Chapela, long-time critic of the biotechnology industry. "Not surprisingly, there is no outward sign that the Academic Senate even knew about all this ... In this proposal, Berkeley is nothing but a business partner with these corporations, and professors, entrepreneurs, and students, simply cheap labor, paying high fees for the privilege of giving their work to the right corporation."


Agricultural "Waste"

Environmentalists warn that the use of any plant matter, including forest deadwood and agriculture and garden residues, entails considerable ecological costs.

"As farmers and agronomists know, 'biomass waste' does not exist; it is the organic matter that you have to put back after harvest in order to maintain the soil's fertility," advises GRAIN. "If you don't, you mine the soil and contribute to its destruction. And that is precisely what will happen if the world's topsoil has to compete with the bio-distillers."

If so-called "agricultural waste" is not used to fertilize fields, it will have to be replaced by synthetic fertilizers, which are industrial agriculture's biggest contributor to global warming. Once applied to fields, the nitrogen in fertilizer combines with oxygen to form nitrous oxide, a powerful greenhouse gas. According to the Stern Review on the Economics of Climate Change, a 700- page document...
commissioned by the British government, agriculture-related greenhouse gas emissions will increase 30% by 2020. Half of this will be due to increased fertilizer use. In the same period, the Third World is expected to double its fertilizer use and much of this increase will be for agrofuels.

A 2005 joint report by the U.S. Departments of Energy and Agriculture notes that the use of wood, grasses, and "plant waste" for the production of cellulosic ethanol would require 1.3 billion tons of dry biomass a year. Obtaining this amount of biomass would be possible only by removing most of the country's agricultural residues, planting 55 million hectares under perennial crops like switchgrass, and putting all U.S. farmland under "no-till" agriculture, say the report's authors.

"The removal of organic residues from fields will require greater use of nitrate fertilizers, thus increasing nitrous oxide emissions, nitrate overloading, and its very serious impacts on the biodiversity on land, freshwater, and oceans," according to a 2007 report authored by 11 civil society organizations, including Argentina's Grupo de Reflexion Rural, Watch Indonesia, EcoNexus, Corporate Europe Observatory, and Friends of the Earth Denmark.

"The complete removal of plant material is also likely to accelerate topsoil losses, causing further decline in soil nutrients. This could have serious implications for human health in terms of future nutrient deficiencies in food crops. It is also likely to reduce soil water retention, making agriculture more vulnerable to droughts."

The report continues, "The removal of dead and dying trees from managed forests already leads to large-scale biodiversity losses and possibly to lower carbon sequestration in forests ... Removing even more 'wood residues' for agrofuels would almost certainly accelerate biodiversity loss and reduce carbon storage in forests. Growing millions of hectares of land under perennial crops for bioenergy will put intense pressure on land both for food production and communities, and for natural ecosystems. Many plants which have been identified as preferred choices for second generation agrofuels already cause serious environmental harm as invasive species, such as miscanthus, switch grass, or reed canary grass."

Carmelo Ruiz-Marrero is a Puerto Rican independent environmental journalist and environmental analyst for the Americas Policy Program (www.americaspolicy.org [3]), a fellow of the Oakland Institute and a senior fellow of the Environmental Leadership Program and founder/director of the Puerto Rico Project on Biosafety (bioseguridad.blogspot.com). His bilingual web page (carmeloruiz.blogspot.com) is devoted to global environment and development issues.

For More Information

Related Articles:

This is part of Americas Policy Program series Fueling the Debate: Agrofuels, Biodiversity, and Our Energy Future, found at: http://americas.irc-online.org/am/4558 [4]

Biotech Bets on Agrofuels http://americas.irc-online.org/am/5179 [5]

Expansion of Biotechnology in Brazil Augments Rural Conflicts http://americas.irc-online.org/am/5070 [6]


Source URL: http://nwrage.org/content/fueling-debate-agrofuels-biodiversity-and-our-energy-future-8-next-generation-biofuels

Links: