



COUNCIL FOR  
BIOTECHNOLOGY  
INFORMATION  
Good ideas are growing

BIOTECHNOLOGY

BIOFUELS

# BIOTECHNOLOGY AND BIOFUELS

Fueling Growth for Today  
and Tomorrow



*The United States offsets 3% of energy consumption from biofuels today, but production is growing fast, and energy legislation signed into law last year calls for a seven-fold increase in domestic biofuel production by 2022.*



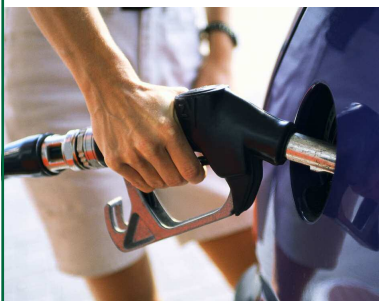
## Did You Know?

- 🌿 The United States imports 60% of the oil it consumes today, up from just 37% in 1980.<sup>1</sup> More than 15% of this imported oil comes from the Persian Gulf.<sup>2</sup>
- 🌿 The United States offsets 3% of transportation energy consumption from biofuels today, but production is growing fast, and energy legislation signed into law last year calls for a seven-fold increase in domestic biofuel production by 2022.<sup>3</sup>
- 🌿 We are not alone in the quest to convert to renewable fuels. Brazil has developed—and already widely uses—renewable fuels from sugarcane. Much of the automotive fuel sold in the country, for example, is blended with 25% ethanol.<sup>4</sup>
- 🌿 Biofuels are cleaner burning fuels when compared to gasoline and diesel fuel. They can reduce by up to 20% the harmful Greenhouse Gas (GHG) emissions that scientists believe are impacting global climate change, given today's technology.<sup>5</sup>
- 🌿 Biotechnology is already playing a role in helping to meet growing demand for biofuels. And new biotechnologies, like the development of biocatalysts that can break down many kinds of plant material, will continue to help for the future production of biofuels.

Continued



**How much is more?  
Last year, the  
additional grain  
resulting from  
increased yields of  
biotech crops was  
enough to produce an  
extra 366 million  
gallons of ethanol.  
Over the last 10 years,  
biotech corn has  
produced an additional  
1.9 billion gallons of  
ethanol, enough to  
power more than 2.5  
million cars for an  
entire year.\***



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is limited, yet the  
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## Agricultural Biotechnology: Helping Today and Poised to Grow for Tomorrow

**Making a contribution to our growing energy needs** – It is well known that our energy needs are growing. Agricultural biotechnology is playing a role to meet this growing demand today and is poised to do so tomorrow.

- **Ethanol** – Production of ethanol—derived from corn, sugarcane and other crops—is up 300% in the U.S. since 2000.<sup>6</sup> In fact, more than 40% of the gasoline used in the country today is actually a blended fuel containing up to 10% ethanol.<sup>7</sup>
- **Biodiesel** – made from soybeans and other oilseed crops—is increasingly having an impact today through its use in farm equipment, trucks and buses. Sales of biodiesel in the U.S. have tripled since 2004 and are expected to exceed 200 million gallons this year—up 100-fold since 2000.<sup>8</sup>

**Boosting crop yields** – Biotechnology helped increase crop yields by 8.34 billion pounds in 2005, according to experts.<sup>9</sup> Take corn, for instance—since the introduction of biotech corn in 1996, yields have increased more than 33.1%.<sup>10</sup> This growth is expected to continue in the coming years with more advances in technology.

**Higher yields mean more grain for food and fuel** – Biotechnology has boosted the amount of grain produced per acre. This is important because farmable land is limited, yet the demand for grain for both food and fuel is growing dramatically. Improved yields from biotechnology are playing an important role in meeting the growing demand for grains. More yield per acre equals more grain for food and more grain for fuel.




**Helping reduce foreign oil imports** – The production and use of nearly 5 billion gallons of ethanol in 2006 reduced America's dependency on imported oil by 170 million barrels,<sup>11</sup> equal to nearly a month's worth of U.S. imports from OPEC.<sup>12</sup> At current prices, this means \$11 billion stayed in the U.S. instead of going overseas. A small contribution overall, but a step in the right direction.<sup>13</sup>



*Researchers are developing biocatalysts—enzymes, yeasts and bacteria produced using biotechnology—that will make it possible to produce ethanol from just about any organic matter—so-called ‘cellulosic ethanol.’*

## Biotechnology: What’s in Store for the Future?

Companies and scientists are working in a number of areas to extend the benefits of biotechnology to new generations of biofuels:

-  **The next generation of biotech crops** – These new crops are being developed to more efficiently be processed into biofuels, to lower costs, further boost yields, and enhance biofuels production to meet rising demand. Scientists are also developing plants that fare better in the face of environmental stresses, such as drought, to help maximize yields.
-  **Researchers are developing biocatalysts** – enzymes, yeasts and bacteria produced using biotechnology—that will make it possible to produce ethanol from just about any organic matter—so-called “cellulosic ethanol.” This could expand the raw material for producing biofuels to include a variety of grasses and plants, trees, or even agricultural byproducts (such as cornstalks). In turn, this would maximize the use of byproducts in agriculture and put crop or plant residue to better use.
-  **Researchers are developing new, improved biofuels** – Biotechnology is being used to produce new, improved biofuels that perform more like gasoline than ethanol. They will be blended at higher rates, transported through existing infrastructure and provide better fuel economy.

1 Energy Information Administration, See net imports (<http://tonto.eia.doe.gov/dnav/pet/hist/mtntus2a.htm>) as a percentage of total product supply (<http://tonto.eia.doe.gov/dnav/pet/hist/mttupus2a.htm>) for 1980 and 2006.

2 Energy Information Administration, United States Imports by Country of Origin. ([http://tonto.eia.doe.gov/dnav/pet/pet\\_move\\_impcus\\_a2\\_nus\\_ep00\\_im0\\_mbb1\\_a.htm](http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbb1_a.htm))

3 United States Government Accountability Office (<http://www.gao.gov/docsearch/abstract.php?rptno=GAO-07-713>) and the Energy Independence and Security Act of 2007, Sec. 202 ([http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110\\_cong\\_bills&docid=f:h6enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf))

4 National Alcohol Program of Brazil. (<http://projects.wri.org/sd-pams-database/brazil/national-alcohol-program-proalcohol>)

5 Renewable Fuels Association, 2007 Ethanol Industry Outlook, p. 17. (<http://www.ethanolrfa.org/resource/outlook/>)



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## BIOTECHNOLOGY BIOFUELS



6 Renewable Fuels Association, 2007 Ethanol Industry Outlook, p. 2.  
(<http://www.ethanolrfa.org/resource/outlook/>)

7 National Corn Growers Association. ([http://www.ncga.com/ethanol/main/your\\_car.htm](http://www.ncga.com/ethanol/main/your_car.htm))

8 National Biodiesel Board Production Statistics and Estimates.  
(<http://www.biodiesel.org/resources/faqs/>)

9 Sankula, Sujatha. Executive Summary, "Quantification of the Impacts on US Agriculture of Biotechnology-Derived Crops Planted in 2005," National Center for Food and Agricultural Policy, Nov. 2006, p. 2. (<http://www.ncfap.org/whatwedo/pdf/2005biotechExecSummary.pdf>)

10 NASS; United States Department of Agriculture

11 Renewable Fuels Association, 2007 Ethanol Industry Outlook, p. 16.  
(<http://www.ethanolrfa.org/resource/outlook/>)

12 The U.S. imports close to 170 million barrels of crude oil per month from OPEC. See Energy Information Administration Crude Oil Imports by Country of Origin by Month.  
([http://tonto.eia.doe.gov/dnav/pet/pet\\_move\\_impcus\\_a2\\_nus\\_epc0\\_im0\\_mbb1\\_m.htm](http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_epc0_im0_mbb1_m.htm))

13 Renewable Fuels Association, 2007 Ethanol Industry Outlook, p.16.  
(<http://www.ethanolrfa.org/resource/outlook/>)

\* Additional ethanol produced due to biotech corn is from the following source: National Center for Food and Agricultural Policy report, "Quantification of the Impacts on US Agriculture of Biotechnology-Derived Crops Planted in 2005," p. 11 (see link above). The calculation of the number of cars powered by extra ethanol was done as follows:

1 The average car travels 12,012 miles per year according to the Environmental Protection Agency. Average fuel economy is set by the government at 27.5mpg. Therefore:  $12,012\text{m}/\text{car} \div 27.5\text{mpg} = 436.8$  gallons of gasoline burned per car per year.

2 Compensating for energy content:  $1,900,000,000 \text{ gal. of ethanol} \times (84,000\text{btu}/\text{gal. ethanol}) \div (125,000\text{btu}/\text{gal. gasoline}) = 1,276,800,000 \text{ gal. of gasoline.}$

3 Therefore, in one year:  $1,276,800,000 \text{ gal. of gasoline} \div 436.8 \text{ gal. gasoline}/\text{car} = 2,923,076 \text{ cars.}$

### ABOUT THE COUNCIL FOR BIOTECHNOLOGY INFORMATION

The Council for Biotechnology Information communicates science-based information about the benefits and safety of agricultural and food biotechnology to sustainable development. Sustainable development seeks to balance and integrate immediate and long-term community needs. It helps enhance our quality of life today, as well as to protect, preserve, and fulfill our needs in the future. Sustainable agriculture is a key component of sustainable development, particularly because it allows for economically and environmentally sustainable agricultural practices. In the United States agricultural biotechnology is contributing today to sustainable agricultural practices, and it has the potential to make even greater contributions in the future through production of bio-fuels to help meet energy needs; development of drought-tolerant plants to better preserve and manage water resources; and increased crop production to feed our nation and the world's growing population. CBI members are the leading agricultural biotechnology companies.

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