

Pocket Guide to Ethanol



RFA

RENEWABLE
FUELS
ASSOCIATION

30 Years of Leadership

ETHANOL FACTS AT A GLANCE

Ethanol is a high-octane biodegradable motor fuel produced from renewable biomass. It is used as a blend component in more than 90% of the nation's gasoline supply today to improve engine performance, reduce engine knock, reduce harmful tailpipe emissions, and lessen our reliance on imported oil for our fuel needs.

Most ethanol is consumed as an additive to gasoline, comprising up to 10 percent of the fuel blend (E10). Increasingly, however, ethanol is being used as a gasoline replacement in the form of "mid-level blends," such as E30, E40 and up to E85. Today, the starch in grains such as corn and sorghum is the feedstock for approximately 99% of all U.S. ethanol production. Technologies converting additional feedstocks such as perennial grasses, corn cobs, wood waste, garbage and algae are being developed and commercialized.



Key ethanol stats (January 2011)

Number of operating plants:204
Operating production capacity:13.5 billion gallons
Idled capacity:564.0 million gallons
Capacity under construction:560.0 million gallons
States with ethanol facilities:29

Historic Ethanol Production

(in billions of gallons)

2010:13.0*
2009:10.75
2008:9.2
2007:6.5
2006:4.6

*estimated

Top Five Ethanol-producing States

Iowa
Nebraska
Illinois
Minnesota
South Dakota



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Ethanol production stats

- Each bushel of corn yields 2.8 gallons of ethanol and 17 pounds of livestock feed.
- Since 2001, energy requirements (thermal BTUs) for ethanol production have fallen 28% and electricity is down 32%.
- Each gallon of ethanol production capacity requires approximately 2.7 gallons of water. That is roughly equal to the amount of water needed to produce a gallon of gasoline.
- Ethanol yields between 1.9 and 2.3 units of energy for every one unit of energy used in production, according to recent USDA research.

PRODUCING FEED AS WELL AS FUEL

American farmers and ethanol producers are becoming increasingly more productive. In addition to fuel, ethanol producers also supply a growing volume of livestock feed—dried distillers grains (DDGs), corn gluten meal, and corn gluten feed. One-third of each bushel of corn used in ethanol production is returned to the feed market in the form of these nutrient-dense co-products.

Simultaneously, U.S. farmers are producing ever larger crops. In 2010, farmers produced more than 12.45 billion bushels of corn based on 152.8 bushels per acre, the third-largest crop and fourth-highest average yield on the books. The 2010 crop was the fourth in a row and the fourth in history larger than 12 billion bushels—produced on virtually the same amount of acres used in the mid-1970s.

Dispelling the Myth of Food versus Fuel

U.S. ethanol production is not the driving factor behind food prices, nor does it cause hunger and food insecurity. Ethanol production uses just 3% of the world's supply of grain on a net basis. Moreover, factors such as energy costs, market speculation, global demand, and weather conditions have far greater influence on prices than ethanol, as reports/studies by the United Kingdom government and the World Bank have confirmed.

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Historic Corn Production

(billions of bushels)

2010:	12.45
2009:	13.2
2008:	12.1
2007:	13.1
2006:	10.5

Historic Feed Production

(mil of metric tons)

2010:	32.5*
2009:	30.5
2008:	26.6
2007:	23.0
2006:	16.0

*estimated

Historic DDGS/ Feed Exports

(mil of metric tons)

2010:	9.0*
2009:	5.5
2008:	4.5
2007:	2.3
2006:	1.25

*estimated

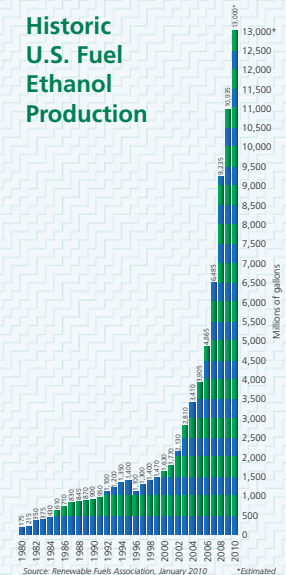
Historic Corn Use

(gross billions of bushels)

2010:	4.65*
2009:	3.8
2008:	3.2
2007:	2.3
2006:	1.8

*estimated

Historic U.S. Fuel Ethanol Production



Source: Renewable Fuels Association, January 2010

*Estimated

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CREATING JOBS AND ENERGY SELF-RELIANCE

The production and use of domestic ethanol creates jobs, spurs economic opportunity, provides new tax revenue for state and local governments, and reduces America's reliance on imported oil.

Jobs, Jobs, and Jobs

The production and use of 13 billion gallons of ethanol last year helped create **more than 400,000 jobs** across the economy from agriculture to manufacturing to the service sector. **Nearly 70,400 Americans are directly involved in producing ethanol** and providing ethanol facilities with the goods and services needed. The remaining jobs, those deemed indirect and/or induced, are found in Main Street cafes and local stores as well as in a wide array of industries across the nation that support the production, distribution, and use of domestic ethanol.

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A Stronger Economy

Domestic ethanol production's contribution to the U.S. economy is substantial. Ethanol production **adds nearly \$54 billion to the Gross Domestic Product (GDP)** and increases household income by \$36 billion.

A survey of ethanol industry employees found that 83% of those working directly for the industry report annual salaries of at least \$40,000.

Giving Americans an Energy Choice

America spends \$1 billion a day on imported oil. Ethanol use helps us reduce those imports and provide American consumers with a real energy choice. The use of 13 billion gallons of ethanol in 2010 **replaced the gasoline refined from 445 million barrels of imported oil**—more oil than we import from Saudi Arabia. Eliminating the need for such imports saved the economy \$34 billion.

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Facts on Ethanol Employees:

America's ethanol industry requires chemists, engineers, accountants, receptionists, agronomists and other blue and white collar employees to make it successful. A 2009 survey of these employees found that 73% have a 2- or 4-year college degree. Four out of five employees make \$40,000 per year or more. And, nearly 99% report receiving health care from their employers.

EXPANDING THE ETHANOL MARKET

Growing the market for ethanol blends is critical to achieving the goals of the Renewable Fuel Standard and providing America with more choice in its energy future. Blends such as E15 (15% ethanol/85% gasoline), E20, E40 and up to E85 must be part of a consumer's choice at the pump.

Rolling Out E15

Based upon the best science available, the U.S. Environmental Protection Agency (EPA) has approved the use of E15 blends for all cars, pickups and SUVs made in model year 2001 and later. This represents approximately 62% of the American vehicle fleet and an even larger percentage of vehicle miles driven.

Sales of E15 will begin slowly as federal regulatory requirements associated with any new fuel's introduction are fulfilled. Additionally, because of the segmented approach to the approved use of E15 by EPA, a label will have to be established to inform consumers that E15 is not yet approved for all vehicles. Individual state fuel regulations as well as misfueling concerns expressed by gas station owners must also be adjusted and resolved before widespread availability of E15 will be seen. The RFA projects limited E15 availability to begin in the second half of 2011 and gradually increase with time.

Mid and Higher Level Ethanol Blends

There are currently more than 2,600 gas stations across the country that offer E85-specific pumps. There are an estimated 160,000 gas stations in the U.S. Most commonly, these stations are offering E85 blends for flex-fuel vehicles (FFV) use only. There are approximately 9 million FFVs in use today.

Increasingly, stations are also turning to mid-level ethanol blends (MLEBs) comprised of between 20 and 40 percent ethanol. MLEBs are commonly sold through blender pumps—a gasoline dispenser allowing station owners to offer multiple ethanol blends from 0% to 85%. Approximately 900 gas stations have installed blender pumps with one-third of those offering MLEBs. Efforts to install more blender pumps remain a focus of the industry. More can be found at www.ChooseEthanol.com.



ESTABLISHING A SUSTAINABLE ENERGY FUTURE

Any fair and objective analysis of the environmental profile of U.S. ethanol production demonstrates a clear greenhouse gas benefit to using ethanol compared to gasoline. Moreover, the use of ethanol reduces harmful tailpipe emissions and works to clean the air in America's most congested cities.

Cleaning the Air, Improving the Environment

Domestic ethanol production and use lowers emissions of greenhouse gases (GHG) from motor vehicles. Scientific research has commonly shown a 30-50% reduction in these emissions compared to gasoline depending upon ethanol process technologies. More specifically, the use of 13 billion gallons of ethanol last year reduced tailpipe GHG emissions by 21.9 million tons—the equivalent to removing 3.5 million vehicles from the road.

In addition, ethanol production is becoming ever more efficient. Ethanol production today requires 28% less energy and 32% percent fewer gallons of water than it did just a decade ago. As a result, recent U.S. Department of Agriculture calculations on ethanol's energy balance show a positive balance of 1.9 – 2.3 units of energy per unit consumed in production.

Don't Believe the ILUC Hype

A common criticism of environmental activists opposed to ethanol is the notion of indirect land use change (ILUC). This idea states that land use for ethanol production in the U.S. requires new acres elsewhere in the world to be brought into crop production. This is a fundamentally flawed theory that is not supported by empirical evidence.

Ethanol production requires just 3% of the world's grain supply and less than 2% of the world's total arable acres. There is no trade off needed between agriculture and sensitive lands such as rain forests. By example, deforestation rates in the Brazilian Amazon have fallen to their lowest levels since the government began keeping data in 1988. During that same time, ethanol production has increased more than ten-fold.



21ST CENTURY POLICY FOR A 21ST CENTURY INDUSTRY

Federal policies to promote the development of a domestic renewable fuels industry have been widely successful. Ethanol represents nearly 10% of the nation's gasoline supply and is responsible for helping support hundreds of thousands of jobs. To ensure that growth, innovation and evolution of the industry continues, thoughtful policies must remain and be implemented.

Put All Energy Tax Policy on the Table

All forms of energy receive some kind of preferential tax treatment the world over. Some, in the case of petroleum, receive more than others. Any talk of ethanol tax incentives and their fate must be part of a larger conversation about energy tax policy. Some estimates are that oil companies avail themselves of up to \$280 billion of taxpayer money annually.

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Thoughtful Reforms of Ethanol Policy

The chief incentive for ethanol use—the Volumetric Ethanol Excise Tax Credit or VEETC—and the corresponding offsetting tariff expire at the end of 2011. Ideas abound about the fate of VEETC and what should be done with this very successful policy. Any reforms must take into account that market access is as important as market economics in driving ethanol demand. Expanding ethanol fueling infrastructure is as critical as ensuring ethanol can compete with the virtual oil monopoly. Additionally, any reform must recognize the promise and contributions of advanced and cellulosic ethanol production to the future of the industry and the nation. Commercializing these technologies is critical to achieving the goals of the Renewable Fuel Standard.

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ETHANOL'S NEXT EVOLUTION

Today, more than 20 demonstration and pilot-scale operations utilize a wide array of technologies to turn woody biomass, algae, grasses, corn cobs, sugar waste, and even garbage into ethanol. Operating in at least 17 states, these facilities are the proving ground for advanced and cellulosic ethanol technologies. They will provide the necessary data, feedback, and experience for companies to take these technologies from demonstration scale to the commercial level. Despite having proven technologies, many companies are facing a lack of availability in investment capital to begin construction on commercial-scale, multi-million gallon per year biorefineries.

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From Demonstration to Commercialization

The race to commercialize advanced and cellulosic ethanol production technologies has been slowed by a weakened economy and ineffectual public policy. Capital concerns remain the chief hindrance to commercialization. Policies that help ease the flow of

capital investment and expand the market for these fuels are essential.

In January 2011, the U.S. Department of Agriculture granted three advanced and cellulosic ethanol producers loan guarantees totaling more than \$400 million to begin construction on commercial scale biorefineries. Additional guarantees from USDA along with reform of a similar loan guarantee program at the Department of Energy that has been mired in red tape will accelerate the development of these technologies and demonstrate their efficacy in the commercial market.

Advanced and Cellulosic Ethanol Feedstock under Development:

- Grasses
- Corn residue (cobs, stalks, leaves)
- Wood wastes
- Fast-growing trees
- Sugar wastes
- Dedicated energy crops (energy cane)
- Citrus wastes
- Algae
- Organic matter in municipal solid waste

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GLOSSARY

1 bushel of corn = 2.8 gallons of ethanol and 17 pounds of livestock feed

A gallon of ethanol contains 77,000 BTUs

Ethanol has an octane rating of 113

Ethanol—a colorless, renewable alcohol fuel processed from grain, plant sugars, and other plant material

Cellulose—a developing feedstock for ethanol production, it is the material in plants that holds them together and contains sugars that are increasingly cost effective to convert into ethanol

Biomass—collectively it is all of the organic matter produced, such as wood wastes, corn cobs, grasses, citrus wastes, other agricultural residues, wheat straw, etc.

VEETC—the Volumetric Ethanol Excise Tax Credit of \$0.45 per gallon is available to gasoline blenders and marketers for every gallon they blend into their finished fuels, regardless of the origin of the ethanol

Secondary Tariff—an offsetting tariff of \$0.54 per gallon placed on imports of ethanol to recoup the VEETC for which imports are eligible

Carbon Intensity—the measurement of lifecycle carbon emissions for any product, including fuels

Distillers Grains—the nutrient-rich livestock feed co-product of ethanol production from grain sources

Flex-Fuel Vehicle (FFV)—a specifically designed vehicle with an engine capable of running on ethanol blends up to 85%

Indirect land use change (ILUC): the theory that increasing production of biofuels will divert cropland away from food production, in turn forcing new cropland from rainforests and virgin acres to be brought into production in other parts of the world



THE RFA AT 30

Since 1981, the Renewable Fuels Association has been the unparalleled voice of American ethanol in Washington and around the world. The RFA and its members have been at the center of every successful policy fight and market initiative that has meaningfully expanded ethanol production and use. The RFA has worked with Congress to pass key policies from tax incentives to two Renewable Fuel Standards that have laid the foundation for the growth of this industry.

The expertise of the RFA and its members is not limited to Capitol Hill. For 30 years, the RFA has been the authoritative voice on the technical issues that determine the size of ethanol's market share. The RFA has worked with state and federal regulators to implement common sense approaches that allow for the sale of ethanol blends.

The RFA has been able to advocate on behalf of American ethanol production because those who actually produced the fuel supported the RFA and the industry. As the industry moves forward, the RFA will continue to advocate on its behalf to enact policies and meaningfully expand the market for all ethanol producers regardless of feedstock.



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