



## Energy Co2 : Renewable Energy

### The Top Five Biofuel Crops

**Biofuels can be produced from a number of crops and plants. Corn, rapeseed, palm oil, sugar cane, and jatropha are among the top five. But how efficient and sustainable are they?**



#### Picture Gallery (click on the image to start)

See five of the most important plants, where they are grown, and if they help fight climate change

#### Maize / Corn

**Major cultivation region:** United States

**Worldwide corn production in 2006/07:** 702 million tons

Corn is one of the most important crops worldwide and is increasingly processed into bio-ethanol. The world's largest producer of corn is the United States, accounting for about 40 percent of the world's total production, up to one third of which is processed into ethanol. The U.S. government has promoted ethanol fuel production with subsidies, claiming it reduces dependence on imported petroleum.

Producing ethanol from corn, however, is not very efficient. Growing corn requires more fertilizer and pesticides than most other crops. To process it into usable fuel, corn kernels have to undergo energy-intensive distillation and chemical extraction processes. Refined ethanol still has to be shipped to its final destination, which adds further costs. All in all, corn-based ethanol can currently only be produced with high subsidies.

The surge in biofuels has dramatically increased demand for corn. While corn farmers profit, importing nations are severely affected. Mexicans, for example, have had to cope with rising prices for corn, due in part to the ethanol boom in the United States.

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#### Rapeseed / Canola

**Major cultivation region:** European Union, China, Canada, India

**Worldwide rapeseed production in 2006:** 46 million tons

With annual production of around 12 million tons, China is the world's largest producer of rapeseed oil. The countries of the European Union collectively produce another 16 million tons. Traditionally used for oils, soaps, and plastic manufacturing, rapeseed oil has become the basis for biodiesel in Europe. In 2006, some 4 million tons of rapeseed oil went into biodiesel, making Europe the global leader in oilseed biodiesel.

This dominance is due to the EU's heavy subsidizing of rapeseed cultivation to meet its carbon dioxide reduction targets. Production will have to double over the next few years in order for the EU to realize its plan of supplying 10 percent of all vehicle fuel from biofuels by 2020.

Without technological breakthroughs, this will only be possible through further subsidies. Currently, production of biodiesel from oilseeds is two to three times more expensive than petroleum-based diesel. Growing rapeseed requires fertilizers, extracting the oil from the plants further aggravates the plants energy balance. Researchers say biodiesel from rapeseed oil is not as efficient as sugar cane-based biofuels, because its production uses more energy and releases more carbon dioxide.



Canefarmers "burn off" prior to harvesting at a cane farm at Giru, Australia

### Sugar cane

**Major cultivation region:** Brazil

**Worldwide production in 2006:** 1.3 million tons

Brazil is the world's largest producer of sugar cane, and accounts for about 45 percent of global ethanol production. The country has mass-produced biofuel since the 1970s, and has pioneered the use of ethanol for transportation fuel. Sugar cane can be distilled down to produce bioethanol. It needs little energy input, because its bagasse (a byproduct of sugar cane) is used to heat the distillation process. The plant also grows very fast and converts up to two percent of incident solar energy into biomass, which makes it one of the most efficient energy-producing plants.

While sugar cane is often produced in large plantations, ethanol plants are limited by the fact that sugar cane has to be processed within 48 hours. Environmentalists say that growing sugar crops fuels deforestation and boosts sugar prices. Ethanol from sugar cane does not need subsidies, critics say however that the ecological degradation caused by expanding sugar cane production outweighs any environmental gains from using biofuels.

### Palm oil

**Major cultivation regions:** Tropical regions, Indonesia, Malaysia

**Worldwide production in 2006:** 33.3 million tons

Malaysia and Indonesia are the key players in the palm oil market,

accounting for 85 percent of global production. Growth is driven mainly by demand from industrialized countries for biodiesel. According to some estimates, production costs of palm oil biodiesel are around 30 percent lower than rapeseed biodiesel. This is largely due to the productivity of oil palms, which on average produce 2.5 times more oil per hectare than rapeseed.

Environmentalists, however, strongly condemn producing biofuels from palm oil. They say that large tracts of rainforests in Indonesia and Malaysia are being cleared to make way for new plantations. This destroys the habitat of endangered species like the Orangutan. Diverting land away from food production may also have negative consequences, because palm oil is an important part of the diet of millions of people who are now faced with rising prices.

### **Jatropha**

**Major cultivation regions:** India, Myanmar, Mali, Philippines

**Worldwide production in 2006:** not known

Formerly used to make soap and candles, experts have identified this hardy plant from Central America as an efficient source of biofuel. Jatropha seeds contain up to 40 percent oil that can be burnt in a conventional diesel engine after extraction. The plant grows in difficult terrains, needs relatively little water, generates topsoil, and helps to stall erosion. A jatropha bush lives for up to 50 years, producing oil in its second year of growth. On the other hand, the plant is poisonous to men and cattle, and must be harvested by hand making it very labor intensive. Until harvesting jatropha can be mechanized, large-scale production is only viable in countries with high unemployment and cheap labor.

In India, government experts have identified more than 11 million hectares that would be suitable for growing jatropha. Critics, however, fear that jatropha could replace urgently needed food crops.

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