



NEWSLETTER



ENVIS CENTRE ON ENVIRONMENTAL BIOTECHNOLOGY Department of Environmental Science University of Kalyani



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Editorial

In recent decades, energy crisis became more prominent through out the world. Biofuel promotion appears to be one of options for harvesting renewable energy for multipurpose use in future. Biofuels are fuels like ethanol and biodiesel that are made from biomass materials, oil seeds. The two main types of biofuels are ethanol, used in gasoline engine and vegetable oil methyle ester (VOME), used in diesel engines.

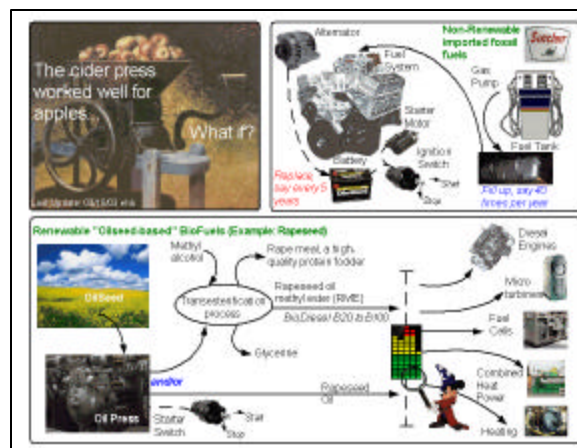
Biofuel is environmental friendly, i.e. renewable, non toxic and biodegradable and significantly cleaner burning compared to diesel & petrol. It produces less air pollutants like, particulates, Carbon monoxide, hydrocarbons and air toxic. It produce less black smoke & smells better.

Various plant resources so far identified as biofuel source for large scale commercial cultivation in India. *Jatropha curcas* is one such plant more extensively cultivated for biofuel extraction from seeds. A leading UK based D1 biodiesel company now give attention on *Jatropha* cultivation in India for production of bio-diesel. In future investigation on biofuel resources needs to be intensified for better commercial exploitation.

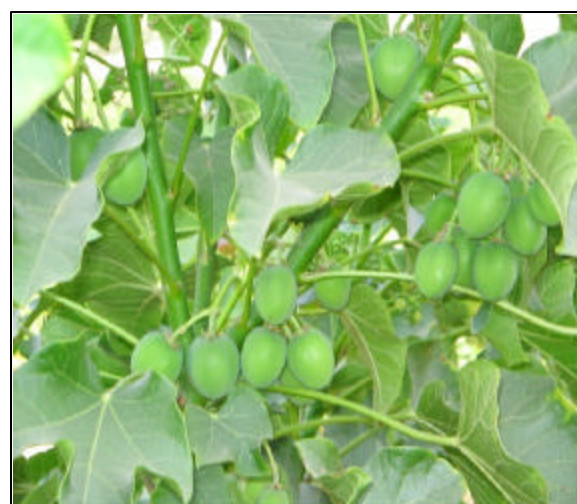
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Biofuel production from Oil Seeds



Jatropha plant used for biofuel

BIOFUELS - INTERNATIONAL SCENARIO

Internationally, two biofuels, biodiesel and ethanol, account for more than 90% of total usage. Biofuels are most commonly used in low concentration blends with petroleum products. In parts of North America, E10 is common and about 200 retail outlets sell E85 for 'flexible fuel vehicles'. In Brazil, petroleum contains ethanol within the range of 20–25%. In Europe, Sweden is the only country using direct blending extensively (at E5), but France and Spain produce ethanol. Spain and Germany are also beginning to produce fuel ethanol. European fuel standards allow up for blends of up to 5% of alternative fuels, including ethanol, without labeling. Biodiesel as B100 is relatively common in Germany and invariably also as a blend from B5 to B25. The EU accounts for over 95% of the world biodiesel production.

In contrast to Australia, global biofuel production and utilisation are accelerating rapidly, albeit from a low base. According to the IEA, if historical trends were to continue, annual growth rates would lead to a global increase from about 30,000 ML in 2003 to over 40,000 ML in 2020. However, with the Kyoto Protocol entering into force in February 2005 and the first target period under the EU Biofuels Initiative coming into effect in December 2005 the IEA considers a very different picture might emerge—a quadrupling of world production to over 120,000 ML in 2020. On a petrol equivalent basis, this would likely account for about 6% of world motor petroleum use in 2020, or about 3% of total road energy use.

Ethanol is produced in Europe from fermenting sugars or stalks from beets, corn (maize), barley and wheat. Ethanol represented around 18% of total EU production of biofuels in 2003. In 2003, Spain was the main European producer at 309 KT (392 ML) given the government collects no tax on ethanol. Biodiesel demonstration plants opened in Europe in the 1980s as a means to develop rural areas while responding to increasing levels of energy demand. Production of biodiesel declined due to falling oil prices in the early 1990s, but subsequent rising energy prices have supported its growth. Biodiesel represents some 77% of total European biofuels capacity.

- . Ethanol and biodiesel are the dominant biofuels globally. While growing in market share, they remain minor contributors to the overall fuel mix at under 1% of the total road energy use.
- . Brazil, closely followed by the USA, dominates fuel ethanol production.
- . China, India and Thailand are emerging as significant fuel ethanol producers.
- . Europe produces almost all of the world's biodiesel. Biodiesel is over 75% of total European biofuel production, reflecting its agricultural outputs.
- . Biofuels globally are supported by subsidies, regulatory preference and explicit supply mandates.
- . Globally, various objectives are associated with government support for biofuels, such as regional development, greenhouse gas abatement, air quality benefits and fuel security. In some cases, these have played a significant part in initiating policy development, but the main underlying global driver for effective policy intervention remains agricultural support.

COUNTRY WISE SCENARIO

Brazil

Brazil is the world's dominant producer and exporter of fuel ethanol which it produces from sugar. In 2004, the US was the world's second-largest producer of ethanol, principally from corn, while Canada was also a large producer and is fostering an innovative approach to R&D utilising lignocellulosic material, such as straw. Brazil began to focus on its production of fuel ethanol in the 1970s as a reaction to the oil crisis. At that time Brazil was also facing severe economic difficulties, including the world's largest foreign debt and heavy dependence on imported oil.

The *Proálcool* programme, launched in the 1970s, remains the world's largest commercial application of biomass for energy production and use. The government adopted measures to develop new plantations, produce a fleet of ethanol-fuelled vehicles, extend the number of distilleries, establish new fuel-distribution systems, stimulate alcohol demand, and sought to identify common ground among the agricultural and industrial players. With the mandate for

the quantity of ethanol in petrol in 1991, government succeeded in demonstrating the technical feasibility of large-scale production of ethanol as a transport fuel and its use in high level blends.

In recent years, Brazil offered government credit to the sugar industry to cover 60% of its storage costs in order to guarantee ethanol supplies, mandated their use in government fleet vehicles and pioneered flexible fuel vehicles that can operate on anything from straight petrol to E85. Brazil mandates the blend, each year, within the range of 20–25% ethanol in petrol. In 2003, government taxes on petrol containing 25% ethanol were about US\$0.30/L (A\$0.40/L) and approximately US\$0.17/L (A\$0.22/L) for hydrous alcohol (E85).

Brazil's ethanol exports are rising rapidly as costs continue to come down and world demand for biofuels increases. Brazil established the *National Programme for the Production and Use of Biodiesel Programme* in 2002 and legislation passed in 2004 year authorised B2 and B5 blends. A mandate will commence in 2008.

United States of America

Biofuels production in the USA is 99% ethanol. The US produced 3.4 billion gallons (12,870 ML) of ethanol in 2004, representing over 2% of US liquid fuel consumption. In the US, corn is the predominant crop used, accounting for 95% of the ethanol produced. The other 5% is derived from barley, wheat and sorghum, sugarcane and wastes from paper mills, potato processing plants, breweries and beverage manufacturers.

US interest in fuel ethanol was established as a response to the oil crises of the 1970s. The US began assisting production in the 1980s to address a farm crisis, specifically in the corn industry. Ethanol attracted further interest as an anti-knocking agent when lead was phased out from that role in petrol.

Ethanol production has been given a significant boost as an indirect result of the Clean Air Act Amendments in 1990. These amendments established the oxygenated fuel programme that required petrol sold in areas with high carbon monoxide to contain 2.7% oxygen and later the Reformulated Gasoline Program which required petrol containing 2% oxygen to be sold in areas with high levels of photochemical smog. While MTBE was initially the principal oxygenate used, its progressive banning in a number of states has seen a significant uptake of ethanol to meet the oxygenate requirement.

Biodiesel production was stimulated by the Clean Air Act Amendments in 1990 and the Energy Policy Act of 1992 which established a goal of replacing 30% of motor fuels with non-petroleum alternatives by 2010. Output of biodiesel in 2004 totalled 30 million gallons (7.9 ML), i.e. 0.83% of the total on-road consumption of 36 billion gallons (9523 ML) of diesel. With new federal tax credits in 2004 and a requirement for diesel from 2006 to be sulphur free, demand is increasing.

Agricultural support remains a strong driver for US policy, highlighted by the mandates in the corn growing states, but recent statements by President Bush also emphasise reducing US dependence on oil imports. The USA imports over half (57%) of its oil. The 2005 Energy Bill contains provision for the development of a North American energy policy to achieve energy self-sufficiency by 2025, in an arrangement with Canada and Mexico.

Canada

Canadian policy for biofuels is driven by a combination of agricultural support and Kyoto Protocol obligations. The Canadian Government supports new investment to meet a target that 35% of petrol containing an E10 blend will be in place by 2010 (i.e. a 3.5% target for ethanol). Canada has a C\$105 million (A\$113 million) Ethanol Expansion Program as part of a larger renewable fuels strategy. The funding is spent principally on capital grants. In parallel, a number of provinces are supporting the development of new plant in an endeavour to be able to mandate the present and future use of biofuel blends. Ontario, for example, announced in November 2004 that a renewable fuels standard of 5% ethanol will be in place from 1 January 2007. Canada has put a small amount of money into a biodiesel bus trial in Montreal and into a new biodiesel production facility developed by BIOX Canada Ltd.

Canada is a leader in new biofuels technology. Given the success of a demonstration plant, Iogen-a Canadian company with a background in enzyme technology, with Royal Dutch/Shell, Petro-Canada and the Canadian Government, in investing more than C\$250 million (A\$267 million) constructing a full-scale commercial plant to develop cellulosic ethanol by 2007. The new facility will help enable Canada meet its target of 3.5% biofuels use by 2010.

European Union

Within the European Union, Sweden is making extensive use of E5, France is a leading producer of biodiesel, Germany is a major user of biodiesel and the United Kingdom is examining the means by which it can incorporate biofuels into its energy policy mix.

The use of biofuels in Europe is not new—EC Directive 85/536/EEC of 1985 proposed reducing dependence on oil imports through substitution, including with biofuels. Two directives were adopted in 2003 to promote energy supply diversification and the reduction of greenhouse gas emissions, given biofuels greatest potential, in the short and medium term, among fuels then available to displace petrol and diesel. However, biofuels in Europe remain predominantly biodiesel. Ethanol production is expanding as countries move to implement EU biofuels directives released in 2003.

Directive 2003/30/EC set a non-binding target for a 2% market share for biofuels (based on energy content) by 2005 and a 5.75% share by 2010. Directive 2003/96/EC allows EU member states to exempt biofuels (among others) in full, or in part, from energy tax. Energy crops are also treated favourably under the Common Agricultural Policy which, in some instances, increases the set-aside subsidy if the land is planted to raw material for biofuels.

Future growth in the biofuels sector will be influenced by the EU report to the European Parliament, due in 2006, on the uptake of the 2003 Directives. A number of EU countries have implemented tax relief for biofuels, including some, such as Germany, Sweden and Spain, at 100%. Notwithstanding this, it appears that at least eight EU member states will not meet the indicative targets. In some cases they appear to be concerned about the economic costs involved.

Several EC texts govern biofuel use. European Directive 98/70/EC (amended by 2003/17/EC) on motor fuel quality officially authorises, for regular sale at the pump, petrol that contains no more than 5% ethanol or 15% ETBE, unlabelled. A 2005 report notes that for 2003, the specification across the EU for petrol was generally met.

Sweden

Sweden's has long supported biofuels. About 85% of petrol sold contains ethanol at E5 with the balance in E85 available at some 160 service stations for an increasing number of flex fuelled vehicles (FFVs). FFVs cost some A\$1600 more than other cars. With biofuels (including imports) exempt from excise, petrol outlets are able to offer blends at the same price as conventional fuels. Sweden imports (198 ML) significantly more ethanol than it produces (65 ML). Sweden, with Spain, has proposed to the EU that the 5% limit on ethanol in petrol be raised to 10% to help meet the EU biofuels target.

France

France has promoted biofuels since the early 1990s when it introduced measures designed to offset changes to the Common Agricultural Policy. In 2003, biofuels accounted for 0.76% of fuel consumed. It was the largest producer of fuel ethanol in Europe until 2003, when overtaken by Spain. Plans announced in 2004 will allow France to treble quota production of biofuels to 800,000 tons (951 ML) by 2007 to raise the share of biofuels to be in line with EU targets in 2010. The biofuels strategy is included in the French National Climate Plan but continues to be driven significantly by agricultural policy.

Germany

Germany has long promoted biodiesel at B100, taking advantage of assistance available under the Common Agricultural Policy for non-food crops on set-aside land. It is Europe's largest biodiesel producer, accounting for about 30% of EU production.

Following the EU biofuels directive in 2003, Germany moved to extend its full excise exemption to all biofuels and blends until 2009. As a result, biofuels production and consumption increased rapidly. Biodiesel production in 2004 was 45% higher than in 2003 and Germany's first fuel-ethanol plant opened in September 2004. Germany's long experience of using B100 means that biodiesel is widely available at service stations, including in unlabelled form as B5.

Germany is investing in synthetic biofuels (biomass to liquids), using a version of the Fischer-Tropsch process to convert wood and other biomass. Still in its experimental stage, Choren Industries is assessing its commercial

potential before investing in annual capacity of 13,000 tonnes (15 ML) before a commercial development of 200,000 tonnes (227 ML) planned for 2008. Unlike biodiesel production, biomass-to-liquids uses the entire plant, thus theoretically requiring less land use per unit of energy and offering greater economic potential for the agriculture and forestry sectors.

The uptake of biofuels is now so rapid that commentators are speculating about whether Germany can continue to afford the likely revenue foregone.

United Kingdom

Until recently the UK had shown little interest in biofuels. However, as with other EU member states the UK is moving to address the objectives of the Biofuel Directive (2003/30/EC). The government, through its white paper on energy in 2003, acknowledged that biofuels were an important potential route for achieving the goal of zero carbon transport, noting they could account for some 5% of road transport fuels by 2020.

The UK's main support has been through fuel duty incentives—a 20 p (A\$0.45) per litre duty incentive on both biodiesel and ethanol. This represents a 40% reduction until 2008. Other measures are under consideration. At current levels of support, the industry view is that biofuel use may stabilise at less than 1% of road fuel use, well below the EU target, as the duty differential rate of 20 p/L for biofuels is considered insufficient to stimulate production. The government estimates that, under present arrangements, annual fuel duty revenue foregone will total £90 million (A\$204 million) if biofuels achieve a 1% market share.

The UK acknowledges it can meet the 5% target by 2010 but at considerable economic cost. The level of its commitment is unclear. The British Transport Minister was recently quoted as saying:

If the UK is able to meet its target, the country would achieve savings of 1 million tonnes of carbon p.a. at a cost of some £350–750 (A\$800–1700) per tonne of carbon (equivalent to \$A218–\$463 per tonne of CO₂-e).

Japan

Japan is exploring means by which it can use biofuels to address its Kyoto targets; India is seeking to capitalise on its large agricultural base; China's goal is to reduce its growing dependence on foreign oil and to improve air quality; and Thailand is keen to find new markets for its agricultural surplus.

Under pressure to meet its Kyoto targets, Japan has proposed a target of 500,000 ML of biomass derived fuels by 2010. This would equate to about 1% of projected fuel use. To encourage the uptake of ethanol, the government proposed an E3 standard in 2004 as a prelude to a national E10 blend standard by 2010. In mid 2005, Reuters reported that Japan was considering a 7% ETBE standard rather than E3 after strong industry opposition to costs and concerns about health impacts. Industry claims that ethanol would require blending at the service station while ETBE would reportedly be made using idle facilities previously being used to make MTBE. The ETBE would be blended with petrol at the refinery.

There are problems in developing a biofuels market given there is minimal domestic supply. Initially, there is a need to reduce costs, and later to secure a stable supply from a number of sources. Among others, in May 2005, Japan and Brazil signed a US\$500 million loan agreement to finance domestic infrastructure development projects as well as capital investments made by Brazilian exporters, which include local Japanese affiliates.

China

China, having replaced Japan as the world's second-largest oil consumer, has annual production levels of ethanol of around 3000 ML, most not for fuel use. Reducing dependency on fuel imports, and urban air quality concerns, are among China's key policy drivers. The current biofuels policy framework was set by the Renewable Energy Law endorsed in February 2005. This law raises the target up from the present level of 3% of renewable energy to 10% by 2020.

The third largest global producer of ethanol, China's annual production is sourced from surpluses primarily in corn, but also cassava, sweet potato and sugarcane. China began trials of E10 from July 2003 and a market forecast suggests as much as 25–30% of the country will use corn-based ethanol fuels by 2007. Part of that demand will be met by supply from the world's largest fuel ethanol plant, the Jilin Tianhe Ethanol Distillery, which opened in 2004 with an initial capacity of 750 ML. China consumed 95,000 tonnes (108,000 ML) of diesel in 2004 of which 60,000 tonnes

(68 ML) was biodiesel. This low level will increase with new production capacity of 100,000 tonnes (113 ML) by end 2005. Biodiesel is also listed as a R&D priority.

Thailand

Thailand is seeking to follow Brazil as both a major producer and user of ethanol. Its targets for biofuel use in 2010 equate to 2% of projected energy needs to reduce its dependence on oil imports, support local agricultural commodity prices and ease the oversupply of sugarcane.

The government has an alternative fuel support package that involves abolishing tariffs on energy efficient vehicles and encouraging the use of FFVs. It offers tax incentives for private investors and producers of E10 with producers also exempt from contributions to the Oil Fund and the Energy Conservation Fund. MTBE is banned from 2006 and E10 is mandated for all government vehicles. As a result, E10 is cheaper than petrol and consumption is increasingly rapidly. In the lead-up to the 2010 target, the Thai Government has set a target to increase consumption of ethanol to 10% of expected daily demand for gasoline by 2006. Thailand has a biodiesel production capacity target of 176 ML in 2006 rising to 722 ML in 2010.

NATIONAL SCENARIO

Indian Biofuel Policy

The biofuel policy announced recently by the Union Petroleum Ministry has received a lukewarm response from the industry. The industry is worried that the policy has fixed a price for biofuel without any reference to the raw material price. However, traditional oil mills that have been catering to other industrial users have welcomed the announcement. This will stabilise prices in the long run and give the mills a new market.

According to official estimates, India has about 40 million hectares of 'wasteland' – 14 per cent of the country's total area – that could be fully or partially cultivated with jatropha. The Indian government's Vision 2020 document says that cultivating ten million hectares with jatropha would generate 7.5 million tonnes of fuel a year, creating year-round jobs for five million people. In April 2005, Labland Biotechs, based in the south Indian city of Mysore, signed a contract with the one of the world's main biodiesel companies, UK-based D1 Oils, to supply about 100 million jatropha plants and 150,000 tonnes of jatropha oil, valued at US\$50 million.

In 2003, the country's Planning Commission proposed increasing the proportion of biofuels used in India from five to 20 per cent by 2012. The commission was due to launch a 'biofuels mission' in April 2005, but this has been delayed.

In the northern state of Uttar Pradesh, a classic 'chicken-and-egg' scenario is playing out, according to reports in the local media. In July, it was reported that until farmers begin growing Jatropha, investors are unwilling to fund refineries. But without infrastructure to refine Jatropha oil, farmers are unwilling to take the plunge and begin growing the trees.

National Biofuel Centre (NBC)

The National Biofuel Centre inaugurated by Shri S.C.Tripathi, Secretary to Govt. of India, Ministry of Petroleum & Natural Gas at the Petroleum Conservation Research Association (PCRA), New Delhi, on January 14, 2005. URL: www.pcrabiofuels.org

Aims:

- ❖ Be a nation wide resource center
- ❖ Gain insight into the potential world of biofuel
- ❖ Network and create linkages amongst stakeholders
- ❖ Publicize information for awareness

The NBC at PCRA is an information Centre on Biofuels, which will provide information related to biofuels to all stakeholders ranging from farmers to businessmen as well as other agencies working in this field.

Activities:

- ❖ To organize multimedia awareness campaigns in partnership with the national television, All India Radio, and the Print Media
- ❖ To provide all information related to biofuels at one designated point by various channels – in person, on telephone, e-mails, website, by post, and other means of communication
- ❖ To collect and disseminate information about biofuel at National and International levels
- ❖ To provide details of equipments and machinery required for production of biofuel
- ❖ To provide details on the plantation of Jatropha and similar plants
- ❖ To establish Know How Centres on: Seed evaluation (Superior genotypes), Soil analysis, Crop species, Irrigation system, transplantation, Germination technology, Irrigation technology, Maintenance requirements (Pest and disease Control), harvesting technique, Seed collection, Oil extraction, Refining, Monitoring, Quality management, Usage, Commercialization (Economics and Marketing), Training, Market strategy, Testing and Consultation
- ❖ To develop an entire chain from suppliers of seed, cultivators, purchasers, extractors, refiners and the end-users
- ❖ To set up cooperative societies and develop nurseries
- ❖ To mobilize a large number of stakeholders including individuals, communities, entrepreneurs, oil companies, business, industry, banks government and related institutions

Source: Biofuels India

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FORTHCOMING EVENTS

Events	Date	Place & Correspondence
International Conference on Advanced Technology in the Environment	February 6-8, 2006	Lanzarote, Canary Islands, Spain, calgary@iasted.org http://www.iasted.org/conferences/2006/Spain/atef.htm
Delhi Sustainable Development Summit 2006	February 4-6 2006	New Delhi avanche@teri.res.in http://www.teriin.org/dsds/2006/
Carbon Markets Americas	March 28-30, 2006	Rio de Janeiro, Brazil nadim.chaudhry@greenpowerconferences.com http://www.greenpowerconferences.com/events/Latam.htm
World Bioenergy 2006	30 May - 1 June 2006	Elmia Conference Centre, Jönköping, Sweden worldbioenergy@svebio.se www.worldbioenergy.se
Biofuels Markets Asia	June 5-6, 2006	Bangkok, Thailand http://www.biofuelsmarkets.com
Bangalore Bio 2006	June 7-9, 2006	Bangalore, India mahinder@bangalorebio.in http://www.bangalorebio.in
Cellular and Molecular Biology - Biophysics and Bioengineering (BIO6)	July 14-16, 2006	Vouliagmeni, Athens, Greece info@wseas.org http://www.worldses.org/conferences/2006/greece/bio

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