Stirrings in the corn fields

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Diesel fuel made from oilseeds, petrol replaced by ethanol made from corn, sugar or grain—or even straw. They're here and are starting to change energy markets

AMERICAN output of maize-based ethanol is rising by 30% a year. Brazil, long the world leader, is pushing ahead as fast as the sugar crop from which its ethanol is made will allow. China, though late to start, has already built the world's biggest ethanol plant, and plans another as big. Germany, the big producer of biodiesel, is raising output 40-50% a year. France aims to triple output of the two fuels together by 2007. Even in backward Britain a smallish biodiesel plant has just come on stream, and another as big as Europe's biggest is being built. And after long research a Canadian firm has plans for a full-scale ethanol plant that will replace today's grain or sugar feedstock with straw. Output is still tiny compared with that of mineral fuels. But the day of the biofuel has arrived.

The reason is simple. Forget greenery or energy security, the grounds on which governments justify subsidising biofuels. Just take the past year's soaring price of mineral fuels, subtract the biofuel subsidy, and the answer is plain: for the user, biofuels are currently cheaper. Indeed, in America's corn (maize) states, locally produced ethanol is close to being competitive even without subsidy; imported Brazilian ethanol could have been so long ago, had not a federal tax credit for ethanol, originally 54 cents per American gallon, been carefully balanced by a 54 cent tariff.

Though production methods are rapidly evolving, the new fuels are new only in their rampant growth. An engine that Rudolf Diesel showed at the 1900 World Exhibition in Paris ran on peanut oil, and biodiesel has been in small-scale use here and there since the 1930s. You can make it from animal fats, oilseeds, used cooking oil, sugar, grain and more. Indeed, you can feed your diesel vehicle with cooking oil from the supermarket and it will run, until (as they will) the filters gunge up. As for ethanol, Henry Ford was an enthusiast for crop-based ethanol in the 1920s.

Modern uses were sparked by the oil shock of 1973. Brazil, rich in sugar-cane but not oil, led the way, building cars adapted to burn pure ethanol until the late 1980s, when sliding oil prices and rising sugar prices made sugar a more profitable end-use for the cane growers and the subsidy for ethanol too costly for the state. In 1989-90 ethanol pumps began to run dry, and sales of these cars collapsed.

Today, both biofuels tend to be used in mixtures. Europeans typically use “B5”—standard diesel, blended with 5% biodiesel, usually made from rape (canola) oil. In America, many drivers, often unaware of it, are using E10 “gasohol”—10% ethanol, 90% standard gasoline. But the proportions can be higher than that. Some American and Canadian public-sector vehicles run on B20. Californians use unmixed, 100% biodiesel, and, with additives to keep it usable down to −20°C, it is sold even in such colder places as Germany and Austria. As for ethanol, in its pure form it can damage standard gaskets and hoses. But, to meet Brazil's supply problems, carmakers there, already familiar with the stuff, in 2003 brought in “flex-fuel” engines that can run on any ethanol-petrol blend you like; at present 75% to 25% is standard. These now win 30% of new car sales there. The American version of flex-fuel runs on E85 (in practice, 70-85% ethanol, depending on the region and the season). Already America has 4m such cars, and they are multiplying. So are E85 pumps for them. Indeed, the corn-state press delights in anecdotes of John Doe who habitually fills his ancient Chevy with E85 and avers that it suffers no harm.

If he's right, he is no fool: E85 (though not E10) gives a bit less oomph per gallon than standard fuel, but even so he is saving money. Supply constraints may prevent E85 being the future of ethanol in America. But if the oil price stays high, Mr Doe and other penny-pinchers will certainly be using more biofuel.

The oil companies were originally far from happy to see "their" filling stations openly selling a rival fuel. They are still not eager. But pro-ethanol pressure has grown. America's environmentalists favour it (except the purists who object, truly enough, that the real "green" issue there is not the fuel but the cars that guzzle it). And the law, in some areas, is with them. Anti-smog rules require a clean-burn additive to petrol, and one formerly favoured, known as MTBE, turned out to have nasty properties, and is being phased out. Ethanol—as such, or used roughly half and half with another chemical in a compound known as ETBE—can do the job.

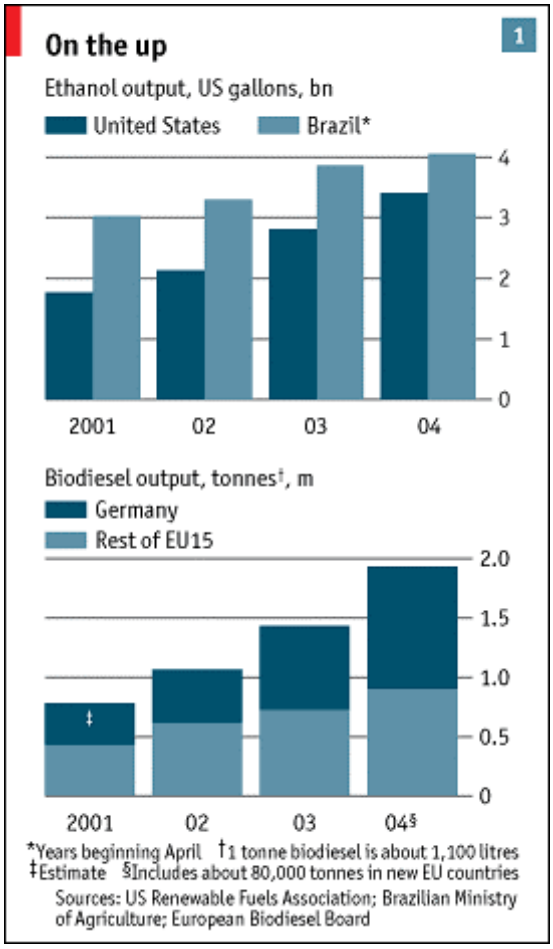
There is pressure too from the corn-growers, gleefully envisaging a huge new market; and hence from their politicians. The market is big already: of America's 255m tonnes of maize last year, 30m went into ethanol. One or two states have adopted mandatory requirements for a certain use of this fuel; Minnesota requires E10 as a minimum, and its legislature has just voted to make that E20. A federal bill launched in March, calls for the use of eight billion gallons of biofuels a year by 2012.

This and less ambitious bills are still merely bills, not law; and even eight billion gallons, though near double this year's likely American output, looks trivial beside total motor fuel use, which already exceeds 175 billion gallons. Yet if oil stays high that target may be exceeded, law or no law, greens or no greens, because drivers will demand ethanol.

Do the sums

The arithmetic is simple. Ethanol's federal tax credit is by now 51 cents per gallon (in European terms, 10.5 euro-cents per litre). So-called "small" producers, making up to 30m gallons a year, get an extra 10 cents. Several states add their own tax breaks, which can be worth 10-20 cents a gallon. Say, very crudely, 70 cents in all: 7 cents per gallon of E10, and nearly 60 cents for E85.

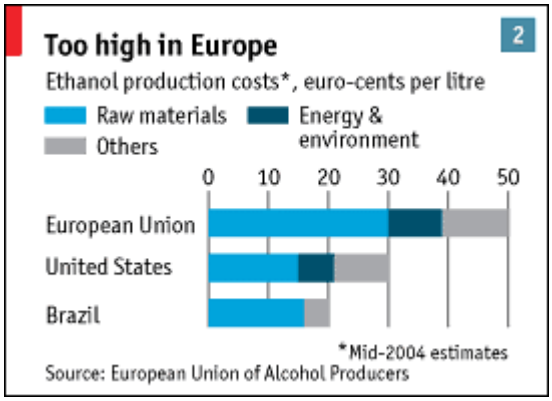
The subsidies in theory go mostly to the blender; how much in fact ends up with whom depends on the market, and is not simple at all. Witness some figures from filling stations in Minnesota—the E85 capital of America—in early May. The pump price of the E10 gasoline standard in that state varied little, from around $1.90 a gallon to $2.10. E85 prices varied more, from about $1.50 to $1.80. And the gap between the two varied wildly: 26 cents in Austin, 34 in Owatonna, 45 in Eagan and Shakopee, 50 in Redwood Falls, 58 in Alden. Say, typically, 35-45 cents and what the figures show is again simple, and conclusive: at today's prices, in that corn state, the wise driver buys subsidised E85 ethanol if he can; and it is only 10 cents or so from being cheaper than standard gasoline even were there no subsidies at all.



Other obstacles may be on the way out. Even now, a new flex-fuel car costs barely more than a standard one. There is little reason for any real differential, and as these cars gain popularity there may be none—as in Minnesota already. Guarantees have been a trouble: John Doe and his Chevy are past caring, but would you buy a brand-new car and risk invalidating its guarantee by using E85? But the car makers' attitudes are changing. Guarantees are especially relevant to America's infant biodiesel industry. A heavy truck or combine harvester is a big investment to put at risk. But Case, a leading farm-equipment maker recently extended its guarantees to B5 (and at another, John Deere, machines leave the factory filled with B2). Volkswagen has just done likewise, as it and others did long ago in Europe, for its diesel-engined cars, a rare species in America, but now spreading.

American output of biodiesel is still trivial: last year 30m gallons, in a total on-road diesel consumption of 36 billion. A year ago, biodiesel cost about 20-30 cents a gallon more than petro-diesel. But in October a new law gave it too a federal tax credit: one cent for every 1% of biodiesel in the mix. Oil prices are higher now. And new rules requiring diesel in 2006 to be all-but free of sulphur will help. Taking the sulphur out makes the fuel less slippery; adding biodiesel can make it more so.

The story has been much the same in Europe, though the leader there is biodiesel. In Germany, where more than half of all cars are diesel-engined, pure biodiesel, retailed as such, has long escaped fuel tax. In January 2004 blends up to B5 were legalised, and the exemption was extended, pro rata, to them. Per "biolitre", it is now worth €0.47 (in American terms, $2.30 a gallon). Italy takes off 40 euro-cents, France 33 (though both governments set a quota for output), Spain and Britain 29.



The public hears little of these tax breaks: in Germany or in France—where pure biodiesel is not sold—the driver looking for "diesel" seldom knows, or cares, that he may be getting B5. And even in Germany the pure stuff is available at only one filling-station in ten, thanks to the hostility of the oil companies. But where it is, drivers are eager for it: it is 10-12 euro-cents a litre cheaper than plain diesel. Big users buy in bulk, to blend for themselves at whatever percentage they like. And demand from the oil companies, since blending was authorised, has given Germany's biodiesel producers a huge boost.

Go, diesel, go!

As in America, there is also political pressure, though the politics, so far, is more that of the green lobby than the farmers. The European Union, unlike the United States, has ratified the Kyoto treaty on emissions and the environment, and the EU authorities in 2003 issued indicative targets for translation into national law: 2% of motor-fuel consumption should be biofuel by 2005, and 5.75% by 2010.

Many of the 25 EU governments have thumbed their noses at Brussels. In February, the European Commission sent warnings to 19 for failing to put their targets into law; and later to nine for not even fixing targets. Even of those that have, many picked figures below the EU's hopes. The politics sounds like a typical EU non-event.

In fact, not so: EU governments dislike being tied down by Brussels, but few will mind tying down their own citizens, or at least cajoling them with tax breaks. And there is national pressure for that, from committed greens below and ministers eager to look green above. Even Britain's government this year extended its biodiesel subsidy to bioethanol too. France is to enlarge the quotas of biofuel output that qualify for subsidy.

Yet in the end it is the market—producers, intermediaries and consumers—that will decide. And there are already signs that, given the price signals (and the supply of raw materials) they may in time leave governments behind.

Really? In America and Europe alike, that today looks far from likely. And if oil prices slump, the signals will not come. Yet look at the response, already visible, to the leap in oil prices and the biofuel savings or profit opportunities it represents.

In America, by late 2005 ethanol capacity may hit 4.4 billion gallons a year, against 3.4 billion in 2004. There are 84 existing plants, 16 being built, and new projects galore. And while one big grain firm, ADM, used to dominate the ethanol industry, many are backed by local farmers, eager for a new outlet as corn prices have slid. In Missouri, 730 farmers put in $24m of $62m needed for a 50m-gallon plant—a size that reflects the cost of corn transport.

State governments aid such plants. Missouri gives producers 20 cents a gallon for their first 12.5m gallons, 5 cents for the second. Besides $7m for an ethanol research centre, and freeing biofuels from state sales tax on biofuel, Illinois has put $4.8m into one project to help it raise other capital. North Dakota has done likewise. Predictably, though, enthusiasm is abruptly reversed if the fuel is not American-made (or even, in some cases, made from home-state corn). The import tariff apart, two bills came up in the Senate last year to block the small volume from Brazil that could avoid it by being partly processed in the Caribbean basin.

Sprouting plants

In Europe, Germany's biodiesel producers say output has trebled since 2002 to maybe 1.5m tonnes (about 1.7 billion litres, or 450m American gallons) this year, as new plants come on stream. The producers say that by now 4% of all diesel sold there is theirs—over 2% of all motor fuel already, even if ethanol were never to make its mark there (as it certainly will). France's biggest diesel producer, Diester Industrie, already making 250,000 tonnes a year at Europe's biggest plant, near Rouen, plans to double another plant in the north to 200,000 tonnes, and build a 160,000 tonne one in central France. It is also in talks with Cargill, an American grain and oilseed giant, about yet another plant at west-coast Saint-Nazaire.

In Britain, though half of all motor fuel sold is diesel, biodiesel use has been tiny. But a new 50,000-tonne Scottish plant is due to be overtaken later this year by a 250,000-tonne monster on Teesside, near the east coast. And, with partners, Tesco, a supermarket giant that also runs filling stations, plans another east-coast plant. It will not be huge, but in Britain Tesco's name could give biofuels a huge boost.

So, in a different way, may the decision of Fortum Oil, part of Finland's Neste conglomerate, to build a 170,000-tonne biodiesel plant at its Porvoo refinery near Helsinki, which now makes 4m tonnes of conventional diesel. The oil companies' war with biofuels has already become a truce; now it may become an alliance. Not all their skills are transferable: coastal biofuel plants, like refineries, have an eye on bulk, seaborne inputs, but most of Europe's biodiesel is made from rapeseed (or rape oil) brought in by truck, not tanker or pipe. It is the economics of supply, more than distribution, that inspire the wide spread and relatively modest size of biofuels plants. But the oilmen are mighty.

Europe's coming ethanol boom in part reflects a different aspect of supply: its source. Italy has just cut the total of its biodiesel output eligible for tax relief, switching the money to ethanol. A greener fuel? No. But the rape or soya that go into biodiesel are not common crops in Italy; the grain, sugar or wine used for ethanol are.

Likewise, France's tax-aided biofuel push will be more ethanol-slanted than its far bigger biodiesel industry thinks fair. Lo, wheat and sugar beet, the main inputs for ethanol there,

matter far more to French farmers than rape does. Three new German ethanol plants, due to make about 500,000 tonnes a year, mostly from rye, will eat near three times that weight of grain—3% of Germany's total harvest. No wonder the EU's offer to take a billion litres (near 800,000 tonnes) a year of Brazilian ethanol duty-free alarms EU farmers; they want imports limited, as in America, to a percentage of EU output. And as the EU cuts direct subsidies to farmers, their search to open, but then protect, new outlets will surely gain influence.

There may be good news for them (and, for once, for EU buyers of their products too). A firm from Spain, Abengoa, is the European leader in ethanol, with 260,000 tonnes of capacity there, and 160,000 more on the way. Big also in America, it hopes, using its experience there, to build the EU's first maize-based plant, in south-west France. But it may lead Europe in a far more significant direction than that.

The biofuellers make much of their green credentials. Critics claim their stuff takes more energy to make than it gives out; not so, say allies, citing advances in technology. But neither greenery nor energy-efficiency is the real issue. It is double-headed. First, can they compete, unsubsidised, with mineral oil? Not yet in biodiesel, says German experience. Nor in Europe's ethanol, says Abengoa's boss, Javier Salgado: oil would have to reach $70 a barrel. But in America, yes, at about $50 a barrel. So...

And another thing

Second, can they compete with each other? The big transatlantic difference is in raw material costs: about 30 euro-cents (39 American ones) a litre in the EU, half that figure in America or Brazil, lament the EU's ethanol-makers. The Brazilians gleefully agree. They expect to make some 16 billion litres of ethanol this year, about as much as America. And overall, they say, American ethanol costs 50% more to make than theirs, European ethanol 150%; their stuff, they claim, became competitive with petrol, at pre-tax prices, in 2002. By 2010 their state oil company, Petrobras, hopes to be exporting 8 billion litres a year.

So, in a free-market world, only Brazil and the traditional oil companies would be keeping transport moving? Not necessarily. Biofuel technology is rapidly advancing. Even in Europe, Abengoa reckons its ethanol could compete with mineral fuels within ten years. And a new technology, aided by some biotech, may both cut costs and ease raw-material constraints. Mr Salgado's firm, under an EU contract since 2003, has been studying how to make ethanol not from grain but straw.

It is not alone—nor indeed first. A Canadian firm, Iogen, backed with capital not just from the government (which freed ethanol from federal tax in 1992) and ex-state-owned Petro-Canada, but from Shell, opened a pilot plant for such "cellulosic" ethanol a year ago. It now plans a full-scale one in the Canadian prairies or Idaho. Another firm has begun studying a plant, proposed for British Columbia, using wood. America's Department of Energy heavily finances similar research, and enthusiasts there say that within 20 years the result could cost only 80 cents a gallon, well below today's gasoline cost. And in a study, "Growing Energy", put out last December, serious dreamers claim that by 2050 cellulosic biofuels, mainly ethanol from switchgrass, a native American plant, could total nearly 120 billion gallons a year—over two-thirds of today's total motor-fuel needs.

That is blue-sky stuff, and none of this is sure to happen: if the oil price were to slump (or, as America's wind farms have shown, if subsidies yo-yo), much may develop much more slowly or never. But the old idea of biofuels as merely a green diversion from the real world can no longer hold. Fine, when oil was $20 a barrel; not even oil companies believe it now.