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Kill king corn

Biofuels need new technology, new agronomy and new politics if they are not to do more harm than good.

Zea mays has become the very emblem of plenty, with rich golden cobs of corn (maize) overspilling from some of the most effectively farmed arable lands on the planet. *Jatropha curcas*, on the other hand, is an unprepossessing and indeed toxic plant, better suited to scrubland and hedges. Yet in the world of biofuels, ugly-duckling jatropha has the potential to be, if not a hero, then at least one of the good guys, and a harbinger of better things to come. The golden-headed siren corn, on the other hand, is inspiring a wrong-headed gold-rush — to a dead-end of development that is polluting the modest aspirations the world might have for biofuels in general.

The common complaints about biofuels — and they seem to become more common by the day — are that they are expensive and ineffective at reducing fossil-fuel consumption, that they intensify farming needlessly, that they dress up discredited farm subsidies in new green clothes, and that they push up the price of food. All these things are true to some extent of corn-based ethanol, America's biofuel of choice, and many are also true of Europe's favoured biodiesel plans.

As far as the greenhouse goes, figures from the International Institute for Sustainable Development's Global Subsidies Initiative put the cost of averting carbon dioxide emissions by using corn-based ethanol at more than $500 a tonne of carbon dioxide. What's more, the heavy use of nitrogen fertilizer in growing corn leads to significant emissions of nitrous oxide, an even more potent greenhouse gas.

Despite this, the generous tax allowance of 51 cents a gallon given to ethanol blenders in the United States has made corn peculiarly profitable (provided that tariffs continue to keep out far more efficiently produced ethanol from the sugar plantations of Brazil). In a recent article in *Foreign Affairs*, C. Ford Runge and Benjamin Senauer of the University of Minnesota in Minneapolis point to estimates that this artificial price-hike will drive world corn prices up by 20% by 2010. This has a knock-on effect on other staple crops — more land for corn means less for wheat, for example. Higher prices are good news for farmers, including some of those in developed countries. But they can be bad news for the very poor, who spend a disproportionate amount of their income on food. According to World Bank studies, for the poorest people in the world a 1% increase in the price of staple food leads to a 0.5% drop in caloric consumption.

This sorry state of affairs has the small benefit of providing a stark, contrasting background against which to sketch out what a successful and sustainable biofuels industry might look like. It will be based not on digestible starch from staple crops such as corn or cassava, but for the most part on indigestible cellulose, with some room for biodiesels that, because they grow on marginal land, do not compete with food production. In the medium to long term, it will not seek to produce ethanol — a poor fuel — but a range of more complex fuels delivered by carefully designed microbes.

"A successful biofuels industry will not be based on digestible starch from staple crops such as corn."

A rosy biofuels future will enjoy the benefits of free trade, allowing the countries and peoples of the tropics to ship some of their abundant sunlight north in the form of fuel. It will also require serious amounts of agronomic research — as we report on page 652, one of the most significant problems with jatropha is that, as yet, remarkably little is known about how best to grow and improve it. One focus of such research must be in the development of plants, such as jatropha, that make do on little water, and those that require low inputs of nitrogen. This is inherently more feasible in the case of fuels, where all that needs to be taken out of the system are carbon and hydrogen, than in the case of food, where there is a need to export nitrogen in the form of protein as well. Another focus will be on systems that actively store carbon in the soil, improving it for future agricultural use and at the same time doing a little bit more to take the edge off the carbon/climate crisis.

Biofuels are unlikely ever to be more than bit-players in the great task of weaning civilization from Earth's coal-mine and oil-well teats. But they may yet have valuable niches — including some that allow them to serve some of the world's poor, both as fuels for their own use and as exports. Provided, that is, that someone kills king corn. ■

A matter of trust

Social scientists studying electronic interactions must take the lead on preserving data security.

For a certain sort of social scientist, the traffic patterns of millions of e-mails look like manna from heaven. Such data sets allow them to map formal and informal networks and pecking orders, to see how interactions affect an organization's function, and to watch these elements evolve over time. They are emblematic of the vast amounts of structured information opening up new ways to study communities and societies. Such research could provide much-needed insight into some of the most pressing issues of our day, from the functioning of religious fundamentalism to the way behaviour influences epidemics.

One factor such research could helpfully focus on is the generation and transmission of trust. From the promise on a banknote to the exchange of rings at a wedding, our societies are based on the creation and protection of trust. More parochially, trust is of crucial importance to the contract between scientific expertise and the broader society that supports it. When it breaks down — whether over vaccines, nuclear waste or the security of the food chain — there are serious repercussions on both sides. The