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The drive for fuel

The production of clean energy for transportation makes demands on resources that are already scarce. Biofuels can contribute to a solution, but only to a limited extent.

Meeting the world's transport needs while reducing the use of fossil fuels is one of the more daunting challenges ahead. Biofuels have been put forward as a relatively simple solution to the difficult problem of replacing petrol: they are comfortingly similar to what we are used to and are easy to imagine as the twenty-first century's tiger in the tank.

But as the debate goes on, biofuels are increasingly seen as being in competition with humanity's other vital needs, wrestling with food production for land and freshwater resources. (At the same time electricity and fuel are needed to deliver fresh water and food to the world's ever-expanding populations, as discussed in the Commentary on page 283.)

In the foreseeable future, demands on food, water and energy are likely to become larger simultaneously. A growing population, increasingly concentrated in cities and megacities, needs a matching supply of goods that must be transported in from further and further away. Burgeoning economies around the globe require more energy, and water may well become regionally and temporarily scarce due to climate change, especially where winter rain is replacing the snow that used to provide water well into late spring.

Competition for resources is the price of sustainability. In essence, sustainability demands that we use only what we replace — in no more time than needed for consumption and on the land we have. Fossil fuels have allowed us to use energy captured from the sun in the distant past and stored by plants over many millions of years. Production of liquid energy in the form of petroleum did not compete with today's farmers for land, freshwater or nutrients. Rather, all of these requirements were freely met when oil reserves formed, with no human population yet asking to be fed, watered or transported.

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Biofuels from a niche. Switchgrass (top) and jatropha (bottom) have been proposed as non-competing sources for biofuel.

Today, however, the situation is changing. With greenhouse-gas emissions rising and resources of oil diminishing — not to mention geopolitical problems with a commodity that is central to most economies but accessible and plentiful in only a handful of source regions — it is imperative that we find new ways of fuelling transport.

With the help of science and technology, biofuels can play a part in making transportation sustainable. But they should be produced with the competing demands on land and fresh water and the need to curb carbon emissions in mind. With some research effort, it may be possible to make biofuels out of plant material that is not suitable for consumption, that is grown in barren regions not used for farming food crops or covered with rainforest, and that does not require additional irrigation. We may also be able to optimize biofuels' chemical makeup, leading to practical and more efficient fuels than ethanol.

Yet biofuels that are produced exclusively in non-competing niches are unlikely to meet a substantial portion of the global demand for fuel. For this reason, it is important that other sustainable means of powering transport, such as hydrogen fuel cells and batteries (if they are run on renewable energy), and improvements in energy efficiency be pursued.

But if that is not enough, we will need to start prioritizing between competing demands from transport, food production and people on land and water. With issues of global equity at stake, this is a task for policy makers, not for the free market.