Algae hold the key to the biofuel conundrum

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IT IS no secret that biofuels made from food crops such as corn and palm oil have driven up food prices and depleted rainforests, often without reducing net greenhouse emissions. The message was driven home by two recent UK reports, first from the Royal Society and then last week from the House of Commons Environmental Audit Committee.

The days of unbridled enthusiasm for first-generation biofuels have passed, even if production is still rising. Last week the European Commission controversially called for 10 per cent of transport fuels to be biofuels by 2020. Yet the drive to develop second-generation biofuels - ethanol brewed from plant cellulose in the form of wood, grass, or even waste - is edging towards commercialisation in the US.

Many experts say this next generation holds the greatest promise in the short term for cutting greenhouse gas emissions from transport, with potentially far fewer of the social and environmental effects of first-generation biofuels.

Many countries lack the land to grow enough wood and grasses to replace significant amounts of traditional transport fuels, if guzzled at the present rate. The solution is algae, says Greg Mitchell of the Scripps Institution of Oceanography at the University of California, San Diego. Algae can double their size in a day, making them among the most efficient organisms at converting light energy into biomass. They could help plug the gap while using a fraction of the land.

"Algae [in ponds] on around 20 million acres of land would supply all of the US's transportation fuel needs - that's a small fraction of the total amount of agricultural land, which is something over 900 million acres," says Mitchell.

While some species of algae - basically the scum on top of ponds - are more than 50 per cent lipid, others are mainly starch, making them a potentially high-yielding source of either biodiesel or bioethanol. They need a good supply of carbon dioxide to grow at an acceptable clip, and they can feed on nutrients in sewage, raising the appealing prospect of producing fuel while treating sewage. They are aquatic, but can grow in salty or brackish water so they don't have to compete for the land and water needed to grow food crops.

Not surprisingly, algae are getting increasing attention from oil and power companies, including Shell, and venture capital firms. The US Defense Advanced Research Projects Agency (DARPA) is investigating algae as a source of jet fuel.

One of the biggest challenges will be figuring out how to grow and harvest the right strain of algae on an industrial scale. Thousands of years of human experience underpin the farming skills needed to produce traditional crops, but algae farming is far more recent and until now has only been conducted on a small scale to

produce high-value health supplements. Shell is building a pilot algae-to-biofuel facility in Hawaii to develop the technology.

However, translating the potential of algae as a fuel source into an affordable reality will be tricky. As Charles Wyman of the University of California at Riverside puts it: "It's always going to be difficult to come up with sustainable ways to support our unsustainable lifestyle."

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