Back to online version

GuardianUnlimited: Print version

# Swamp fever

As biofuel production using corn and sugar is criticised for putting food stocks at risk, could oil from algae solve the energy crisis?

**More on...**

**Environment**
Biofuels
Alternative energy
Energy

**Society**

**Peter Huck**
The Guardian, Wednesday January 9 2008

Has a sewage farm just outside the New Zealand city of Blenheim provided a solution to the world's energy shortages? Aquaflow Bionomic Corporation, a local start-up, has patented a process to extract biofuel from sewage, and last year the country's minister for energy, David Parker, roadtested a car run on the oil of microscopic algae.

"Wild algae is one of the ubiquitous units of nature," says Nick Gerritsen, a partner in the firm. "If you leave a bucket of water outside, the water will turn green as it is settled by wild algae. We realised very early that we needed to create a model that took advantage of wild algae feedstocks."

The challenge was to catch what he calls "the little blighters", the algae that contain oils or lipids, in the work's outflow pipe, a cleansing process known as bio-remediation. In May 2006, the company produced what it claimed was "the first biodiesel crude from wild algae". The process is secret, although oil was extracted from algae that had been separated from water, which Aquaflow wants to leave clean enough to drink.

**Self-sufficient**

Aquaflow first had to pass the energy balance test, creating a fuel that produced at least as much energy as went into creating it. The company went from pond scum to biodiesel in just over a year and says its fuel is suitable for domestic use and transport. Furthermore, it claims its technology fits "on the back of a truck", and is cheap enough to be adopted anywhere. "Our aim is to enable communities to use their wild algae feedstock and become as self-sufficient as they can," says Gerritsen.

Faith in algae to provide energy has spread. Last month, Shell announced it had formed a joint venture with HR Biopetroleum that will construct a demonstration plant to harvest algae they claim can double their mass several times a day, providing 15 times more oil per hectare than alternatives such as rape.

"Algae have great potential as a sustainable feedstock for production of diesel-type fuels, with a very small C02 footprint," says Graeme Sweeney, Shell's executive vice-president of future fuels and carbon, but admits the commercial potential of the scheme is yet to be proved.

Meanwhile, the Commercial Aviation Alternative Fuels Initiative, an alliance of aircraft manufacturers, industry organisations and entrepreneurs, is seeking a biojet fuel that could come from algae.

Last month, a San Francisco "algae summit" drew more than 300 delegates. One participant was Kelly Ogilvie, co-founder of Seattle firm Blue Marble Energy, which plans to harvest wild algae from sewage farms, lakes and rivers, mining ponds and algae blooms caused by pollution. It says its method is "low cost" and "low tech".

Unlike corn, soya beans, rapeseed and sugar cane - unsustainable monocultures that threaten food production already jeopardised by climate change - algae thrive in shallow, brackish water. Like all plants, they convert sunlight into energy and voraciously consume CO2.

Algae also emit CO2, but this can be offset by injecting nutrient rich CO2 emissions into algae-rich water. No one knows how much CO2 could be absorbed but Gerritsen believes it could be "quite significant". Best of all, he says, algae can double their mass in hours.

And they need less space than other biofuels. While corn produces 60 or so gallons of ethanol an acre annually, algae can provide up to 10,000 gallons of biofuel, says Dave Daggett, research chief at Boeing.

However, getting there is a challenge. "There are hurdles throughout the process stream," says Eric Jarvis, a senior scientist at the National Renewable Energy Laboratory (NREL). The US company, funded by energy company Chevron, has resumed work on identifying strains of algae likely to produce abundant lipid oils.

"You have to find an algae strain that thrives in your particular conditions. It must divide at a reasonable rate and produce oil. These things are tough. Then you need to separate the algae from water and extract oil from the paste. Once you have lipid oil, you have to create a fuel that passes specification tests," Jarvis adds.

Those who advocate algae monoculture believe ponds or bioreactors, closed systems that manipulate growing conditions, will do the trick eventually. But wild algae believers reject both methods as costly and unproductive.

"If the future of biofuels is algae, and I believe it is, you're never going to get enough volume in bioreactors or ponds," says Ogilvie. "It has to be something with greater volume." He says the best approach is to mimic nature by creating algae farms, or by harvesting algae blooms. "Why try to out-engineer nature?" he asks.

"It could be done really cheaply if people would shift their paradigm," says Ogilvie. "There has to be a rethinking of how we interact with the environment. Can you clean up the environment? Can you make money and energy doing so? And can you provide meaningful jobs to the people in the areas where you're doing it?" The answer must be yes.