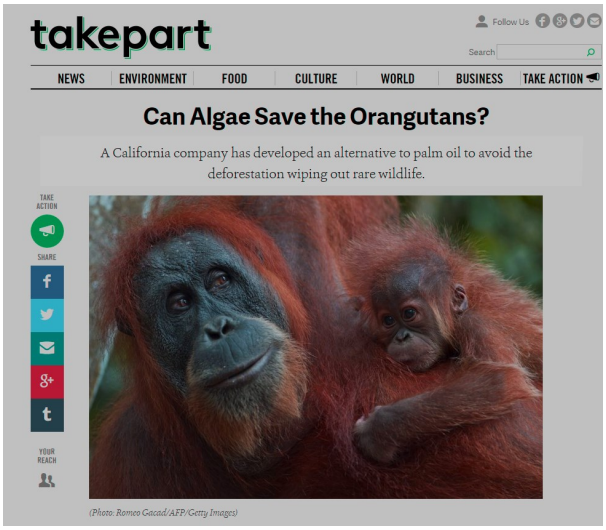
Beware False Promises: Algal Oils and Other Products of Synthetic Biology Aren't About to Save the Orangutan.... But Carry Serious New Risks.

Briefing by Friends of the Earth US and Biofuelwatch, February 2016



"Algal oil" and "oily yeast" have been aggressively promoted as promising alternatives to palm oil and potential saviours of orangutans. At the forefront of this promotion is the California-based biotech company Solazyme.

They make no mention of synthetic biology—which is an extreme version of genetic engineering. Yet synthetic biology lies at the heart of Solazyme's business. And "chemically engineer[ed]" oily yeast - presented as a "viable alternative to palm oil" in an article which has had nearly 16,000 social media shares—is genetically engineered yeast using methods which many would class as synthetic biology.

What is synthetic biology?

The term Synthetic Biology covers a range of extreme forms of genetic engineering—such as creating 'artificial DNA' or making multiple changes to the genome, for example to create algae, bacteria and yeast with a very different metabolism from what is found in nature, e.g. ones which can produce different chemicals, or which can compete better against other microorganisms.

What is the problem with genetically engineered microbes?

Microorganisms, including algae, play a fundamental role in regulating all of the Earth's cycles on which all life depends, including the carbon cycle, the nitrogen cycle, and nutrient cycling in soils. Microorganisms are more diverse than any other life forms, but they are far less well known and understood. Only 1% of soil microbes have ever been identified.

Microbes are being engineered to produce more oil, break down different sugars, including sugars contained in wood, to survive in hostile conditions, to kill competitors, etc. Some of those are traits associated with alien invasive species. The genetic engineering techniques commonly cause unintended mutations—so nobody can be sure what the traits of all the GE microbes really are. So what will happen if such GE microbes escape into lakes, soils and other ecosystems? Could they harm soil fertility, plants or animals? Could escaped algae engineered to produce more oil, for example, cause environmental pollution? Nobody knows, and there is virtually no research into the risks.

But won't those GE microbes be contained?

Solazyme and many others claim that their microorganisms won't escape because they will be used in a closed bioreactor. A report by the Convention on Biological Diversity cautions "*physical containment is never fail-proof*". Solazyme's GE algae are transported across land and sea, from California to Brazil, and then they are used in an industrial refinery, largely operated by engineers, not microbiologists. This poses obvious risks of accidental release. Escaped GE microbes will be impossible to detect—unless they end up forming large populations and causing harm. Furthermore, the release of GE microbes, whether accidental or unintended, is irreversible—and it poses particular dangers because microorganisms multiply and evolve much faster than other species.

Harvested sugar cane plantation in Brazil. Photo: *Rettet den Regenwald e.V.*

Solazyme's algal fuels still rely on monoculture crop plantations

Solazyme's algae don't get their energy from photosynthesis. They get it from feeding on sugar sourced from Brazilian sugar cane plantations in São Paulo state via the multinational agribusiness corporation Bunge. Sugar cane expansion in that state displaces other agricultural activities into the Cerrado, which is the world's most biodiverse savannah region, and into the Amazon forest. It is associated with degrading working conditions and soil and water depletion and pollution.

Could Solazyme and other oil produced by GE microbes help to save the orangutan?

Palm oil demand, including for biofuels, has been growing rapidly because it is the cheapest vegetable oil. Oils produced through synthetic biology, on the other hand, are extremely expensive to produce. So far, biotech companies making oils with GE microbes have only managed to sell tiny quantities in high-cost niche markets. Solazyme might have boasted publicly that they ramp up their technology rapidly to stem deforestation from palm oil, but their financial reports tell a different story. There they admit: "***We have had a limited operating history and have incurred significant losses to date, anticipate continuing to incur losses and may never achieve or sustain profitability.***" In October 2015, Solazyme had to close their US production plant even though their Brazilian plant has not been fully commissioned due to technical problems.

As for the oily yeasts claimed to offer hope to orangutans and other animals threatened by oil palm plantations—scientists are currently only able to produce a few grams every 5-7 days. They have been given funding to 'scale it up' to less than 200 tonnes per year over four years time. It is very common for results of small-scale laboratory experiments to be presented as 'promising breakthroughs' which could result in new ways of producing biofuels, vegetable oils, etc.—but which never translate into any commercial breakthrough, even after years or decades of Research and Development.

Orangutan numbers have declined by one-third in the past decade. Devastating fires in 2015, coupled with the Indonesian government's opposition to zero-deforestation policies show that urgent measures to stem oil palm expansion and end deforestation are needed. All that biotech companies and researchers can offer are vague hopes of a biotech-breakthrough which may or may not materialise in years or decades to come—whilst the risks of their technologies remain unassessed and unaddressed.