



CLEANTECH, BIOFUELS, ALGAE

A Mini-Cluster of Algae-to-Biofuels Technology Blooms in San Diego

Bruce V. Bigelow 12/30/08

When I sat down recently with Mario Larach, he was still excited about a [U.S. Department of Energy workshop](#) he had attended on algae biofuels earlier this month at the University of Maryland. As the co-founder of a local biofuel startup called Kai BioEnergy, Larach has been tracking a nationwide surge of interest in algae-to-biofuel technology as he seeks venture funding for his company.

It's an exciting idea—producing fuel from pond scum—but it has some practical problems that Larach and others are still trying to solve. A key issue, underscored in this [DOE fact sheet](#), is that algal biofuels produced in large volumes with today's technology would cost more than \$8 a gallon at the gas pump, based on conservative estimates. Larach told me a lot of people in the field have been using “photobioreactors” and transparent piping systems to grow algae, which are both costly to set up and to operate. “The gurus in the space say the only way to do this economically is to grow algae in open space,” in shallow ponds, Larach says.

The DOE has identified a variety of areas where advances are needed, including algal-biofuels process research, production, and integration, not to mention scaling up pilot plants and demonstration projects to industrial operations. Larach says growing a particular species of algae in open ponds poses other problems. One is the challenge of eliminating “weed algae” that seems to infiltrate ponds. Another stems from often-strident ecological and political opposition to projects that call for cultivating a genetically modified algae in open ponds.

For the record, Larach says Kai BioEnergy has been using only native strains of algae in developing its biofuel technology. Still, he says, “Right now, GMOs (genetically modified organisms) have a lot of issues, including EPA issues,” referring to the Environmental Protection Agency.

Solving such issues won't be simple, but Larach says San Diego is emerging as a capital for algae-to-biofuels technology. “If you did a map of the world in terms of where all the activity and the microalgae breakthroughs are, it's right here,” Larach says. His list of San Diego's expertise includes:

—Stephen Mayfield, a cell biologist at The Scripps Research Institute in La Jolla who also is a co-founder of Sapphire Energy, which established its corporate headquarters in San Diego (read on for more on Sapphire).

—B. Gregory Mitchell, another scientist who is regarded as a leader in the field, who specializes in photoplankton at UCSD's Scripps Institution of Oceanography.

—Sapphire Energy, a La Jolla startup with [VC backing](#) from Bill Gates and Arch Venture Partners, says it has [proven the feasibility](#) of using algae to make “green crude” that can serve as a substitute for crude oil.

—Synthetic Genomics, a La Jolla venture founded by J. Craig Venter, specializes in using genetically modified microbes to address global energy and environmental challenges.

—Genomatica, a San Diego-based venture, has developed [a pioneering process](#) that uses genetically modified bacteria to make a rubberized plastic known as 1,4-butanediol, or BDO, to replace petroleum-based feedstock used in chemical engineering and manufacturing.

—General Atomics, a private government contractor best known for developing the Predator UAV, recently landed a \$19.9 million Pentagon contract to develop ways of making jet fuel from algae. The company began working on biofuels research about two years ago.

—SAIC, another San Diego defense contractor, [also got a \\$14.9 million Pentagon contract](#) to find ways of making jet fuel from algae. Both contracts were awarded by DARPA, the Defense Advanced Research Projects Agency, as the Pentagon seeks ways to reduce its \$6 billion annual fuel bill.

—HRBiopetroleum, based in La Jolla, has established algae-to-biofuels operations in Hawaii. The company uses marine microalgae to produce vegetable oils and other biofuel-related products.

—Earthrise Farms, the 108-acre facility near El Centro, CA, operated by Earthrise Nutritionals of Irvine, CA, grows Spirulina, a microalgae used in food, biochemistry, and pharmaceuticals

—Carbon Capture is a La Jolla-based company developing new ways for using algae to absorb carbon dioxide emissions from electric power plants. The company operates a 160-acre site for a proposed 46-megawatt ultra-low emission natural gas power generation facility.

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