Microalgae could be Texas' next big cash crop

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"It's a huge, untapped source of fuel, food, feed, pharmaceuticals and even pollution-busters," said Dr. Carlos Fernandez, a crop physiologist at the Texas AgriLife Research and Extension Center at Corpus Christi who is studying the physiological responses of microalgae to the environment.

There are an estimated 200,000 to 800,000 species of microalgae, microscopic algae that thrive in freshwater and marine systems, Fernandez said.

Of all those species, only 35,000 species have been described, he said.

"We're only starting to scratch the surface of discovering the natural secrets of microalgae and their many potential uses and benefits," he said. "But already it's obvious that farmers will one day soon be growing microalgae on marginal land that won't compete with fertile farmland. They won't even compete for fresh water to grow."

To understand how best to grow it, Fernandez constructed a microalgae physiology laboratory to study how it's affected by temperature, salinity, nutrients, light levels and carbon dioxide.

"We have four bioreactors in which we grow microalgae to determine the basic physiological responses that affect its growth," he said. "We will then integrate these responses into a simulator model, a tool we can use in the management of larger, outdoor systems."

In this study, different strains of microalgae will be evaluated for their capacity to produce large amounts of lipids, or fats, that can then be converted to produce and refine diesel and other biofuels, Fernandez said.

"Along with that, after extracting the lipids from the biomass of microalgae, there is a residue that we are going to analyze for its quality for use as feed for animals, including fish, shrimp or cattle."

Eventually, studies will evaluate the possibility of using the residue as a soil fertilizer.

"There are lots of other potential uses for the residue, but for now our focus is on feed and fertilizer," he said.

The microalgae study includes other researchers, Fernandez said.

"We've just started this work and we're working closely with the nearby Texas AgriLife Mariculture labs in Flour Bluff, under the direction of Dr. Tzachi Samocha,

and the one in Port Aransas, under the direction of Dr. Addison Lawrence."

Studying microalgae in the Corpus Christi area is a natural fit for many reasons, Fernandez said.

"We have immediate access to seawater to grow microalgae," he said. "Because we're so close to the Gulf of Mexico, we've got lots of marginal land in the area where microalgae can be grown on a large scale. We have lower evaporation rates than in arid areas so water replacement is less.

"There are local power plants and oil refineries in the area that we can use as sources of carbon dioxide that helps microalgae grow while reducing CO2 pollutants. And we have a wealth of higher education institutions in the area with huge potentials to help in these studies, including Texas A&M at Corpus Christi, Texas A&M-Kingsville and Delmar College."

AgriLife Research at Corpus Christi has partnered with the Barney M. Davis Power Plant to conduct this and other studies.

"It's a natural gas-operated power plant that is an excellent source of carbon dioxide from its flue gasses that would reduce greenhouse gas emissions by passing them through microalgae systems," he said.

There also is the potential to partner with the City of Corpus Christi, which has several municipal water treatment plants in the area that can be used as sources of nutrients to reduce the cost of applying them to microalgae systems, Fernandez said.

"Our center director, Dr. Juan Landivar, took a huge leadership role in moving these microalgae projects forward by seeking and obtaining federal and private funding, and by encouraging teamwork and multi-disciplinary personnel to work on this," Fernandez said.

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