



Team Name:

Underground Ocean Farmers

Team Schools/Organizations:

Santa Fe Community College, Santa Fe, NM

Abstract:

New Mexico is a high-elevation desert region with high mountains and low rainfall. Between the mountain ranges are vast arid areas with large saltwater aquifers that require heavy filtration and treatment for agriculture and drinking water. It is considered unusable in many aquifers in the state, but as the long-term drought in the southwest U.S. continues, agriculture practices and water use laws are changing the emphasis towards conservation. Desalination could be a future solution for drinking water at a high cost. However, these unused aquifers have the potential to produce an abundance of highly nutritious food without having to be filtered.

The Algae Oasis project will determine if sea vegetables can be grown in the brackish groundwater from these aquifers and develop an economic model to demonstrate how they could provide the resources for food production in the desert without using freshwater aquifers. There are possibilities of using desalination plant wastewater and food processing wastewater as well. The long-term goal would be to eventually create a new agricultural industry supporting the local food supply and employment in counties with the lowest incomes.

Gracilaria sp. is a productive seaweed with many capabilities that we intend to focus on for this project. It is a culinary favorite and considered one of the most delicious sea vegetables in the world. We will test the potential of this seaweed by cultivating it in Intermediate Bulk Containers (IBC totes). Once the growth potential is validated with artificial seawater, cultivation will be carried out in water samples collected from local aquifer wells that closely match the chemical profile of seawater. This will make it possible to choose which aquifers in the state can provide a stable chemical environment for sea vegetables. The goal is to find optimal water, light, and temperature conditions for algal food production using Santa Fe Community College's greenhouse. The

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environment can be controlled in the greenhouse and the cultures can be protected from pathogens, predators, and grazers in the totes. Safe food handling practices are taught as part of the Controlled Environment Agriculture program and access to a commercial kitchen on campus makes it possible to take algae from cultivation to finished food product. The campus facilities provide the perfect test environment for demonstrating the feasibility of this project and potential business.

Gracilaria sp. has many other uses aside from food production. It is the main source of agar for sterile growing medium, gelatin products, and a major component of biodegradable plastics. It is often used for agricultural animal feed, water recycling, and tank display in the aquarium industry. Its vibrant red pigment can be used for food coloring and is also valuable to science and medicine. Gracilaria sp. has important medicinal compounds currently being used for pharmaceuticals and bioavailable nutrients. This multi-use sea vegetable could create an industry that would have a positive impact on the agriculture market, economy, and residents of New Mexico.

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