

A Green Future for Puerto Rico

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Intro

During my time in Puerto Rico I had the opportunity to see its beautiful forests and ocean. I snorkeled for the first time and got to see Puerto Rico's amazing coral reef and colorful fish. While it was sad to see dead coral and hear that there were fewer fish compared to years before it was not surprising. With climate change and the ocean reaching its maximum levels of absorption of CO₂, it is inevitable that marine life would be affected. Carbon emissions aren't the only the problem creatures of the ocean face, it's also waste from trash and runoff that enters the ocean through rivers. Microplastics are the result of plastic breaking into tiny pieces, and it is a cause for great concern that every marine organism has microplastic in their system [2]. The best way to clean up plastic and water waste in the ocean is keeping it from entering the ocean in the first place.

Islands face problems related to water and waste management and Puerto Rico is no different. On average one Puerto Rican disposes of 5.56 pounds of solid waste every day, higher than the average mainland American that produces 4.91 pounds a day [1]. With land being scarce, open dumps and landfill facilities are expected to overflow in a few years [1]. The beautiful marine ecology that surrounds Puerto Rico is in danger of facing more degradation by waste entering the ocean through runoff from storms or litter from the beach. The application of algae biotechnology through biomass is a form to combat waste problems Puerto Rico faces.

Biotechnology and Algae Biomass Solution

While getting a private tour from Dr. Alok Arun, a biotechnology professor from Universidad Interamericana De Puerto Rico Barranquitas, in the interactive marine biology museum he was explaining the different types of algae that grows around Puerto Rico and his research in creating protein supplements from microalgae. He said they sell the green protein powder to a local bakery who uses it to make "super strong" green cupcakes. The current lab where he grows the algae is a small scale of what he plans for the future. "It would be great to grow algae 15 feet in the ocean to be able to grow and sell a bigger supply" of protein supplements Dr. Arun says as he shows us a concrete tub with a water wheel to oxygenate the water where he currently grows the algae. He was more than happy to share that algae is one of the fastest growing biomass crops and wishes to share this information to farmers so they can produce their own protein supply to feed their livestock.

Although there is no company in Puerto Rico producing algae biomass, there is a company called C-Compound that picks up an algae called sargassum from the beaches of Puerto Rico and other Caribbean islands during the sargassum bloom. C-Compound produces plant-based materials that are carbon neutral, and marine biodegradable such as bioplastics, textiles, and cosmetic products [3]. If farmers from Puerto Rico were to grow algae, they could sell the algae biomass to a company called Bloom that turns the algae into plastic pellets at its headquarters in Mississippi. Bloom then sells the plastic pellets to other companies such as Adidas [4].

If Puerto Rican farmers were to grow and sell algae, they would need lots of nutrient water. They could use the drain water from aquaponic agriculture to grow their algae. I had the opportunity to visit a company called Campo Caribe where they have a 5.5-acre aquaponic greenhouse that grows three different types of lettuce [5]. The algae produced from the drain water could be sold and would clean the drain water [6]. Seeing Campo Caribe's facilities and the market for fresh produced vegetables for the island I think that it would be great to also tap into the international market of biomass. Farmers would be able to sell produce in aquaponic systems and algae biomass.

Reflection

As I was cleaning up the trash in Llanos Costa it was heartbreaking to see the blue of the pacific ocean while carrying a trash bag so full of litter that it was ripping apart. The biodegradable material produced from biomass would help in diminishing the amount of plastic in the ocean. Puerto Rico has a great sunny climate that could be used to cultivate the future of sustainable bioplastics and biomaterial products. The Puerto Rico municipalities could use algae to treat their water waste and be able to sell the biomass it would produce. Puerto Rico could be an island that supplies instead of being supplied. Creating economic growth and reducing the amount of microplastic in the ocean and marine life can be done through algae biotechnology.

Getting to meet and learn from the people of Puerto Rico was the highlight of the trip. Talking to the bus driver I found out he used to be a chief and a musician . Talking to plantain farmer Jose Rafael Medina Fuentes and his wife Blanca I. Cordova Diaz, I learned they used to live in the city before Jose took over the family business. The people of Puerto Rico are the definition of resilient and it was a privilege to learn the importance of adaptability, positive outlook, and generosity from them. The advice that I have been given has helped me see that the future can be planned but shouldn't be expected. It is all about keeping your head up and pushing forward.

Acknowledgement

Thanks to CAS Global Experience Fund, USDA NIFA, Precollege Programs, Sea Grant, and OSU SACNAS. I would like to thank Wanda Carnell, Interamericana de Puerto Rico Barranquitas, and Dr. Alok Arun and anyone who supported this program



Fig1. Campo Caribe Aquaponic greenhouse



Fig2. InterAmerica Barranquitas algae tub and Dr. Arun



Fig3. Llanos Costa



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