EMERGING HYDROPONIC LETTUCE PRODUCTION IN PUERTO RICO
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INTRODUCTION
Puerto Rico’s food industry and production is largely affected by weather events that the island faces. Over 33% of the population experiences food insecurities everyday. This number has increased since Hurricane Maria and Irma hit the island. The island of Puerto Rico is also highly dependent on imported food and is slowly decreasing agriculture production on the island.

Hydroponics is a method of growing plants without soil using a water-based nutrient solution. This process enhances plant yield while fostering rapid growth. This system allows for the ability to control water usage and recycle water. An indoor hydroponics system is ideal for year-round growth without the effects of seasonal weather.

Campo Caribe is in the process of constructing a commercial 5.5 acre deep water culture Hydroponic Research Greenhouse (Figure 1) where the roots grow on foam boards that circulate constantly allowing for precise pest control and uniform distribution of nutrients to all lettuce.

SEED TO FOOD
- Seeding: After seeding in the media, the trays are placed in a dark room for 48 hours before being transported to the propagation station tables. (See Figure 3)
- Propagation: plants are fertilized with a lower concentration of nutrients, typically there for 21 days (depending on variety) and arranged from younger to older trays
- Transplant: After 21 days in the propagation area, the plants get transported into foam boards, ensuring they are placed deep enough in the holes for the media to touch the water while remaining flush with the Styrofoam board. Each board is labeled with the variety and transplant date for food safety and tracking purposes.
- Production: Nutrients are mixed in the production ponds (Figure 2) where the plant stays for 24-28 days, with oxygen supplied to aid growth and control pathogens. Weekly samples are assessed for nutrient samples.
- Harvest: Utilizes a harvest machine to cut the product, collecting it in plastic baskets, and donate the lettuce to the local community and to feed local Marures.
- Packaging Room: The product arrives in plastic crates which will then be manually packed by a machine.
- Dispatch/Delivery: The Facility has 4 big doors for a refrigerated truck to dispatch and deliver accordingly.

SOCIAL, ECONOMIC, AND ENVIRONMENTAL VALUE
Campo Caribe promotes healthy alternatives while developing underutilized land in Barranquitas, Puerto Rico. Lettuce cultivation at Campo Caribe’s consumes ten times less water than tradition crops, with rainwater covering 100% of their water consumption. They also reduce the need to important leaf products.

COMMERICAL HYDROPONICS PRODUCTION COMPONENTS
- Recirculated Water Pumps
- Nutrient Room
- 3 Underground Cisterns
- Ozone Sterilization
- Chillers
- Board Washing
- Harvest Machine
- Irrigation Boom
- Priva Controllers

DATA ANALYSIS
- Daily Light Integral (17 DLI)
- Water Temperature (68°F)
- Humidity (70%)
- pH (5.8)
- Dissolved Oxygen (15 ppm)
- Air Temperature (72°F)

This Figure provided by The National Center for Biotechnology Information from an article titled, “Comparison of Land, Water, and Energy Requirements of Lettuce Grown Using Hydroponics vs. Conventional Agricultural Methods” shows the comparison of water usage based on Hydroponics vs. Conventional Agricultural farming methods. This study was performed in southwestern Arizona finding that hydroponics water demand is far less than water requirements for a conventional lettuce production.

CONCLUSION
Hydroponics remains a promising technology. As the future of availability to water, land, and food will increase demand. The hydroponics industry can be considered a more sustainable alternative to conventional lettuce farming techniques as well as food production.