

Thesis Project Portfolio

**Hydroponic Crop Cultivation (HCC) for Food Security
in Small Island Developing States**

(Technical Report)

Charlottesville Economic Initiative

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Thomas Finkelston

Spring, 2020

Department of Engineering Systems and Environment

Table of Contents

Sociotechnical Synthesis

Hydroponic Crop Cultivation (HCC) for Food Security in Small Island Developing States

Charlottesville Economic Initiative

Prospectus

Sociotechnical Synthesis

Throughout the course of an engineer's time at any university, he or she will come to recognize the consistent theme of optimizing everyday life. Whether we are identifying remedies to improve public health, infrastructure, or business, there is always that ultimate goal of creating an opportunity for growth in a field. In the Technical Report and STS Research comprised in my thesis, both seek to identify methods of creating economic opportunities within struggling towns. Both also go on to discuss technologies and resources that contribute to that effort, but they ultimately diverge. The Technical Report investigates an individual, in-home solution, while the STS Research investigates a joint, communal solution.

In the technical investigation, my team uncovers a technology that provides hope for recovery for Bahamian people who have been plagued by natural disasters. The investigation led to a hydroponic crop cultivation (HCC) system that allows victims to grow nutritious crops in a safe environment. The hydroponic contains features such as a collapsible design, insect deterrent, abundant water supply, and solar power. During the process, the technology saw progress in helping families receive essential foods and nutrients. However, the technology saw some external goals achieved, such as fostering an income for hydroponic users who sold their goods in the marketplace. Upon that realization, I dove into the challenge of weighing the nutrition and financial trade-offs of various crops, and provided a list of optimal crops. This method provided an alternative to the STS Research because it promoted success through an individual effort. The investigation could have been furthered through examining actual results from the recommended crop list. For example, schools implementing the "golden crop" curriculum could provide feedback on the efficacy of the program. Further researchers may build upon this by analyzing the implementation.

In contrast to an in-home remedy, the STS Research examined towns overcoming economic struggles via community efforts. The project investigated how struggling Charlottesville residents may take advantage of the University of Virginia's (UVA) resources to foster financial stability. I focused on optimizing the outreach process of UVA clubs and programs to bolster the local economy and its constituents. At the end of my research, I was able to understand the wholesome components a communal effort must possess at a university. Late in my research, I revealed a potentially obvious, yet meaningful observation: no single resource can resolve a communal issue without the joint effort of its counterparts. Every club at UVA played their part in fostering economic opportunities, but it is the collaboration of all entities that make the effort successful. Another researcher may find intrigue in investigating the demographics behind the economic outreach at UVA. All in all, I was inspired by the results and people I had the privilege of meeting. I am grateful the University of Virginia gave me the chance to grow through these projects, and would like to thank Garrick Louis and Sean Ferguson for their continued support.