Thesis Project Portfolio

A Floating Farm for Hydroponic Crop Cultivation in Small Island Developing States

(Technical Report)

What Are the Barriers That Have Prevented Widespread Adoption of Hydroponics in the United States

(STS Research Paper)

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Table of Contents

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Sociotechnical Synthesis

This study is comprised of two sections: the first covering the design, implementation, and development of a floating hydroponic farm, and the second exploring the viability of such technologies within the United States agricultural ecosystem. As this module is designed to be built and used within small island developing states (SIDS) outside of the US, both the material choice and cost were taken into consideration during the developmental process. As these economic restrictions did not hamper the ability to implement hydroponics to the project, I began to question why these technologies were hardly seen in today's agricultural sector here in the United States. This was the motivation behind the second portion of this study which explores what else may be stopping the integration of hydroponics when they appear to circumvent many of the problems present in conventional farming methods.

The technical section of this document discusses the implementation of hydroponics aboard a self-sustained platform that is capable of being closed to withstand the environmental hazards present in communities vulnerable to tropical storms. The project aims to provide a resilient means of food production that will lessen the detrimental effects on coastal communities imposed by flood events and high-speed winds. Additionally, the module was designed to contain onboard power reserves that may be used to either sustain the crops growing within during the days following a severe storm in the event that no one is able to tend to them manually or used as an emergency power reserve. Hydroponics were chosen as this method reduces water consumption as this is a resource which is highly valued in developing countries.

The sociotechnical research portion of this study explores the various social influences that have contributed to the extraordinarily slow integration of hydroponics to the United States' agricultural producers, both large and small. With a focus on the contributions of researchers,

producers, regulatory agencies, and consumers, this paper discusses the development of contradictory perspectives which have resulted in a myriad of misconceptions between parties. These misconceptions have in turn, exacerbated the problem, creating a divided consumer base with fragmented knowledge of hydroponic produce that has diminished the market for such products. By analyzing how this came to be, my paper seeks to identify critical points by which these misconceptions might be remedied in order to release the holds preventing the integration of what many consider to be a superior form of cultivation when compared to convention, open-field farming.

By conducting these two studies in tandem, I was able to gain several insights from each individual project with which to further the other. As the module is designed for use in less developed communities outside the United States, analyzing the social opposition that has so far limited the integration of such technologies has informed many of the design considerations of the technical project. These considerations prompted questions of how to make it more approachable as well as what to highlight when presenting such a thing to an unfamiliar consumer market. Additionally, the technical portion explored other markets such as urban food deserts that may also benefit from the project. This analysis of alternative markets informed potential avenues that hydroponics might be expanded to in order to find greater success in expanding its consumer base. The technical portion also served as a proof of concept for the viability of hydroponics for producers at smaller scales, further cementing that many of the problems that currently plague hydroponics integration lie not in the technical portion but the greater systems that surround it and the many social influence contained. With such closely related research questions between the two projects, there was a great amount of overlap which both inspired as well as answered many of the questions that would arise from both projects.