

THESIS PROJECT PORTFOLIO

Hydroponic Crop Cultivation as a Strategy for Reducing Food Insecurity

(Technical Report)

Globalization of Agriculture and its Effects on Small-Scale Farmers in Haiti and Jamaica

(STS Research Paper)

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SOCIOTECHNICAL SYNTHESIS

HYDROPONIC CROP CULTIVATION AS A STRATEGY FOR REDUCING FOOD INSECURITY

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GLOBALIZATION OF AGRICULTURE AND ITS EFFECTS ON SMALL-SCALE FARMERS IN HAITI AND JAMAICA

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PROSPECTUS

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Agriculture plays a very present role in the Caribbean economy; however, the region remains a net importer of food, averaging between 60% to 80% of consumed food being imported. This leaves the food systems of the region vulnerable to economic and climate shocks that could leave millions without food. The domestic food supply is partially produced by rural small-scale farmers who own farms that are around 0.15 to 2 hectares of land each. These small-scale farmers make up a majority of farming enterprises and are essential for keeping the domestic food supply from being entirely imported. This thesis investigates how the empowerment of small-scale farmers in the Caribbean can increase food security and economic stability in the region through two components. The technical aspect of this thesis builds upon previous capstone work to design and build a floating hydroponic unit for small-scale farmers to use in wake of disasters. The socio-technical aspect of the thesis investigates how small-scale farms in Haiti and Jamaica are being impacted by globalized agriculture in terms of country policies and academic research.

Coastal communities of Caribbean island states, like those included in the sociotechnical research, are increasingly at risk to flooding due to rising sea level and extreme weather events. This technical project seeks to understand the role that hydroponic crop cultivation can play in mitigating the risks to food security presented by these environmental challenges. Building off of previous research, the project focused on building a prototype of a hydroponic crop cultivation system that is capable of floating on water. A multi-criteria decision-making method was used to select the dutch bucket method of hydroponics as the ideal method for the use case based on interview responses from industry professionals. The final product of this component was a prototype, complete with solar panels, rain collection unit, and floatation capacity, as well as a stand-alone dutch bucket hydroponic system. The floating platform prototype was successfully

tested and able to float with more than the required weight of the system. The dutch bucket system also proved to be an improvement from conventional crop growing and proved to be much faster, and produced larger crops.

The socio-technical aspect of this thesis focuses on the interaction of small-scale farmers in Haiti and Jamaica with globalized agriculture through the lens of neo-colonialism and responsible research and innovation. This section identifies two cases of agricultural policy development which had different levels of small-scale farmer inclusion. The first case looks at a post-disaster development plan in Haiti where small-scale farmers were excluded from the decision-making process and, therefore, left out of the benefits of the policy. The second case looks at the Jamaican Rural Economic Development Initiative which epistemically included small-scale farmers in the policy making process which led to rural empowerment and a success of the program. Finally, agricultural publications were analyzed in a bibliometric study to determine if there is an epistemic research gap between Haiti and Jamaica and ‘northern’ countries such as England and the United States.

This thesis set out to answer how the empowerment of small-scale farmers can increase food security and economic stability in the Caribbean by developing a new farming technology resistant to the effects of climate change and analyzing how small-scale farmers and local knowledge are included in research and policy in the region. Overall, both components of the project were largely successful. The capstone team was able to design and test a working prototype for a floating hydroponic dutch bucket system which may eventually be distributed to small-scale farmers to mitigate the impacts of climate change on their farming capacity. The socio-technical aspect found that there is an exclusion of local knowledge in research and policy creation in the region, however, the Jamaican Rural Economic Development Initiative case

shows a promising pathway for creating inclusivity in the policy space and empowerment of rural small-scale farmers. Future work on the subject could include analyzing the agricultural policies of other Caribbean countries to see how they compare to the two cases in this thesis. In terms of the bibliometric study, future researchers should attempt to find a case of responsible research and inclusion of local knowledge in international research to use as an example in order to build that capacity in the Caribbean.