Hydroponic Crop Cultivation (HCC) in Small Island Developing States (SIDS) to Address Food Insecurity Caused by Climate Change

(Technical Paper)

Evaluating Americans' Attitudes Towards Lab-Grown Meat

(STS Paper)

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Kaila Stein
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Technical Project Team Members
Shayne Cassidy
Matt Coulter
Thomas Finkelston
Klara Hoherchak
Antonio Mendes de Almeida
Colin Patton
Griffin Ott

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Signature_____ Date _____
Kaila Stein

Approved_____ Date _____
Garrick Louis, Department of Engineering, Systems, and Environment

Approved_____ Date _____
Kent Wayland, Department of Engineering and Society

General Research Problem: Creating a Sustainable and Reliable Food System

How can a sustainable, reliable food system be created in the face of climate change?

Climate change is altering the world around us, from rising temperatures and rising sea levels to increased droughts and natural disasters. Land is being lost due to sea rise caused by glacial melt and by the scourge of wildfires (Sardare & Admane, 2013). Unfortunately, these changes create a risk to the global food system. As the global climate changes, humans also must alter their way of life in order to adapt to the new normal. For example, the United States relies on meat as a major source of food. The meat industry is vulnerable to droughts, heat waves, and natural disasters (University of Exeter, 2018). Not only this, but the meat industry is also releasing millions of metric tons of greenhouse gases into the atmosphere which means that the system itself is worsening its own threats (Vermeulen, Campbell, & Ingram, 2012). If the food supply is left as it currently exists, there is a risk that it will be disrupted or partly destroyed, which would lead to many people suffering without means to provide food for themselves. Therefore, a sustainable, secure, and reliable food system needs to be established in order to reduce the negative impacts that climate change will have.

Technical Research Problem: Hydroponic Crop Cultivation (HCC) in Small Island Developing States (SIDS) to Address Food Insecurity Caused by Climate Change

How can food insecurity in Small Island Developing States be reduced through hydroponics?

Climate change is increasing the intensity and frequency of tropical storms, which is threatening the food sources of SIDS. The danger of tropical cyclones arises from a combination of factors including rise in sea level, violent winds, and heavy rainfall (Prevatt, Dupigny-Giroux, & Masters, 2010). These factors can cause devastation to agriculture by not only ruining the crops that are growing, but also by inundating farmlands with saltwater and making it hard to grow on the land. In addition, in the aftermath of storms farmers need a way to make food for relief and then to create profit as they rebuild their farms.

For my project, we are creating the design for a tropical storm-resistant hydroponic structure that is solar powered that can be used in SIDS after tropical storms when traditional agriculture is devastated. Hydroponics is a method for growing plants without the use of soil, instead having the plant roots immersed in a nutrient rich solution (Sardare & Admane, 2013). Plants may grow in another growing media such as coir or rockwool, but there can be no soil. Hydroponic systems have arose as a possible solution to making food systems more resilient to climate change because they require less land and water than traditional agriculture (Sardare & Admane, 2013). Although hydroponic systems have been implemented in developing nations, there has not yet been a model that has been storm-resistant introduced in Caribbean islands who frequently face tropical storms that can destroy agriculture.

The systems that we are designing will be sturdy, wind-resistant structures that are capable of floating in a flooding situation. In order to design the structure, we are doing research into wind and flood resistant design, hydroponics, solar microgrids, collapsible structures, and crops. We are also researching the common weather patterns in SIDS and crops that grow well on these islands. We will also be designing and sending a capacity factor analysis survey to understand the needs and abilities of the communities in which the systems will be deployed.

After performing this research, we will begin an iterative design process to choose the best design for the structure. The main goal of this project is to create design schematics that describe the mechanics of the structure as well as how the entire hydroponics system will function. If there is enough time, we would like to create a prototype of one of these structures. Eventually, the goal is that these structures will be implemented in the Bahamas and Dominica to be a supplemental food supply in the case of a disaster and an opportunity for capital gain by selling the crops during normal conditions.

Evaluating Americans' Attitudes Towards Lab-Grown Meat

Why are Americans wary of lab-grown meat and how might they come to accept it?

Introduction

The way that America's current food system is set up is destroying the planet and worsening climate change. Current meat farming practices have many negative environmental impacts, including using large amounts of land and water, creating large amounts of waste, causing deforestation, and releasing large amounts of greenhouse gases (Thornton & Herrero, 2010). In addition, the current system is susceptible to many risks that could cause a decrease or halt in production, including weather events such as drought and heat waves, epidemic viruses, and antibiotic resistance (University of Exeter, 2018). In response to the growing understanding of the detrimental effects of meat cultivation on the environment and the need to reduce our dependence on traditional meat, many meat alternatives have been created. Although there is an increasing number of people who have decided to forego eating meat because of its environmental impacts, the large majority of people feel unable to do so for many reasons including personal preference and culture (Zaraska, 2016). Therefore, one alternative meat of particular interest is lab-grown meat. This meat is cultivated in a lab setting using cellular biology, allowing meat cultivation to become a much more secure process that could have less of an effect on the environment (Post, 2012). If lab-grown meat were to become an environmentally-friendly, affordable, culturally-acceptable form of food, it could be one solution to help halt the climate crisis without requiring substantial dietary change from the common meat-eater, which is currently a large barrier to change in our food system. Researchers are currently still working on lab-grown meat in order to reduce the price and environmental impacts, but one thing that they cannot control is whether or not the public will accept lab-grown meat and want to eat it. Without public buy-in, cultured meat could be a technological fix that doesn't help solve the problem because no one will use it. By understanding Americans'

wariness towards cultured meat as well as their attitudes towards traditional meat, it will be clear how lab grown meat could become accepted in the future.

Evidence and Data Collection

First, I will look at the question of why Americans are wary of lab-grown meat. I will begin by looking at surveys that ask Americans if they would consume lab-grown meat products and their opinions about lab-grown meat. I will then search media and social media sources using a set of keywords to see the ways in which Americans discuss and describe lab-grown meat. Some of the sources that I will look at will also be people's statements about pop-culture references to lab-grown meat in movies and books where the idea of lab-grown meat is discussed. Next, I will discuss the lack of science literacy in the U.S. and describe how that could be causing misconceptions and fear about a scientific food process.

Then, I would like to look into the reasons that Americans enjoy meat by looking at studies about American meat consumption. There are consumer surveys that address the issue of what people describe as enjoyable about meat. This will help show the standard that lab-grown meat will need to rise to in order to be palatable to Americans. Then, I would like to look at the tendency for Americans to feel cognitive dissonance around eating meat, enjoying the taste but not the implications. For this part of my research, I will look at psychology articles that address the issue of American's relationship with meat. There are articles addressing the cognitive dissonance and the rationalizations they use to ease their minds, which will help to show an opportunity that lab-grown meat could have into Americans' diets.

Analysis Methods

To analyze the media and primary social media sources, I will perform content analysis to analyze trends in the discussion of lab-grown meat. To do this, I will pull posts from Reddit, blogs, and social media to analyze how people talk about lab-grown meat. The question that I am hoping to answer with this analysis is how people describe lab-grown meat and what their reasons are for saying that they will or will not eat it. I will look for trends about comparing lab-grown meat to real meat, unease with not understanding how it is made, taste, safety, and distrust of the companies that would make it. I have already seen these trends in some of the data that I have looked at, but throughout my analysis I will also look for emergent categories. I will sort the data into categories, subcategories, and supercategories. Then, I will look for connections between and within the categories. After this, I will analyze the data and draw conclusions.

Takeaways

I hope that this research will help explain the reasons that Americans are wary of lab-grown meat to outline the current state of opinions. By understanding the trepidations Americans have about cultured meat, it is easier to understand how to market the product in the future to encourage larger uptake of the technology. This research would be useful to the creators of lab-grown meat so that they can better understand the consumer market for their product, which is

the last part of the equation to make lab-grown meat a success. Scientists could also alter the lab-grown meat in order to better fit customer preference in order to appeal to more people.

Conclusion:

The creation of resilient and sustainable food systems looks different all over the world. In this research, I have looked at two very different systems and ways in which they can improve to prepare for the changes brought by climate change. This shows that it is essential for all countries to evaluate their food systems to uncover vulnerabilities. The way that humans have been operating can no longer be sustained and we must change our ways in order to survive in the face of climate change. Future research that would be useful would be identifying vulnerabilities in the food system and research on how to update the system to avoid these vulnerabilities. Every part of the food supply system needs to be considered in order to truly become resilient.

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