Permaculture: The Island School’s Journey to Food Security

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Introduction

Permaculture is a form of sustainable agriculture that is based on mimicking naturally occurring ecosystems. This semester’s research worked on implementing permaculture into campus planning and agricultural intensification at The Island School. As a whole, The Island School is 89% food insecure. This comes as a result from the sandy dune environment that dominates the island of Eleuthera. The Bahamas, as a Small Island Developing State, SIDS, suffers from food security due to its growing environment and location in the world. With 90% food insecurity, The Bahamas only receives 10% of its food from within the Bahamian archipelago. The 11% of food supplied locally to The Island School is an unstable source of food. The permaculture research group worked on developing solutions to increase food security at The Island School as well as finding more stable, sustainable, and self-sufficient ways to produce food on campus. This will benefit the local economy as more food will be locally grown and supplied by the farmers of Eleuthera.

Figure 1: The Rock Sound Docks where The Island School collects its’ produce every Tuesday

Research Questions

1. What are the most efficient farming practices, methods, and strategies for the Cape Eleuthera Institute (CEI) campus and Aquaponics system considering all aspects and variables for the location?
2. How much food could that potential area produce?
3. To what degree would a revised campus plan and food system offset the amount that the Island School imports onto the island of Eleuthera?

Figure 2: Aerial view of Campus

Figure 3: The Aquaponics System at CEI

Methods

To determine the most efficient way to utilize the CEI campus, the permaculture research group looked into a series of variables, practices, and methods that could go into agriculture and Aquaponics at The Island School. The permaculture research team ascertained five soil samples and analyzed pH, nitrogen, phosphate, potassium and soil depth in order to see if farming is a viable option. A soil transect of the CEI Campus was created using a Global Positioning System (GPS) Devise and Geographic Information System (GIS), this outline of buildings, plants and soil depths was compared to an Ortho-mosaic map and a sector analysis. The sector analysis and a data collection website called CampIS helped determine the natural obstacles of farming or building on this land. Utilizing the land by either agricultural development or Aquaponics can help decrease the Island School’s food insecurity. This revised campus plan will also save money by offsetting imports as well as reducing The Island School’s carbon footprint by decreasing food miles.

Figure 4: A weather stations on Campus

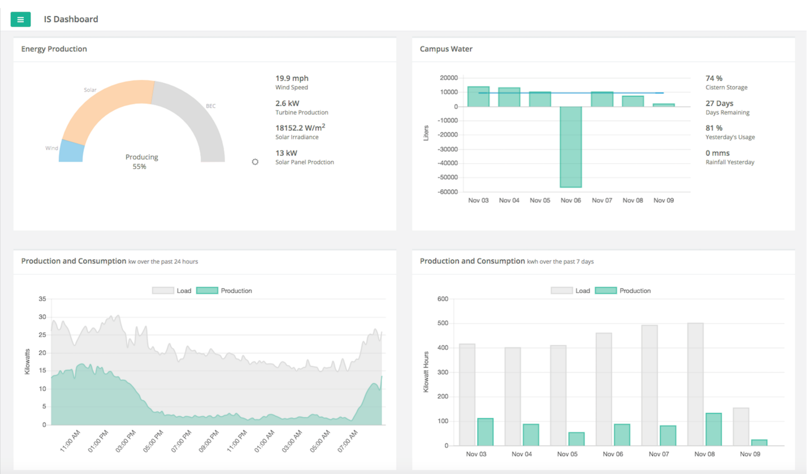

Figure 5: The CampIS Website

Data Collection

Soil Analysis: Scale and Composition

Soil Sample	pH	N	P	K
1	7.5	Depleted	Deficient	Adequate
2	7.5	Depleted	Surplus	Adequate
3	7.5	Depleted	Surplus	Adequate
4	7.5	Depleted	Deficient	Adequate
5	7.5	Depleted	Deficient	Sufficient

Fig. 6 Soil Analysis: As shown in the figure above, the lack of nutrients and high pH levels make growing certain crops challenging. The shallow soils ranged from 2.1 cm to 21 cm and averaged about 8.5 cm, this also generates challenges when growing select crops.

Figure 7: Soil Sample Analysis

Results

This semester’s research team did a sector analysis of the campus and looked at four variables; the first two being ambient air pressure and rainfall, wind direction/wind speed and temperature.

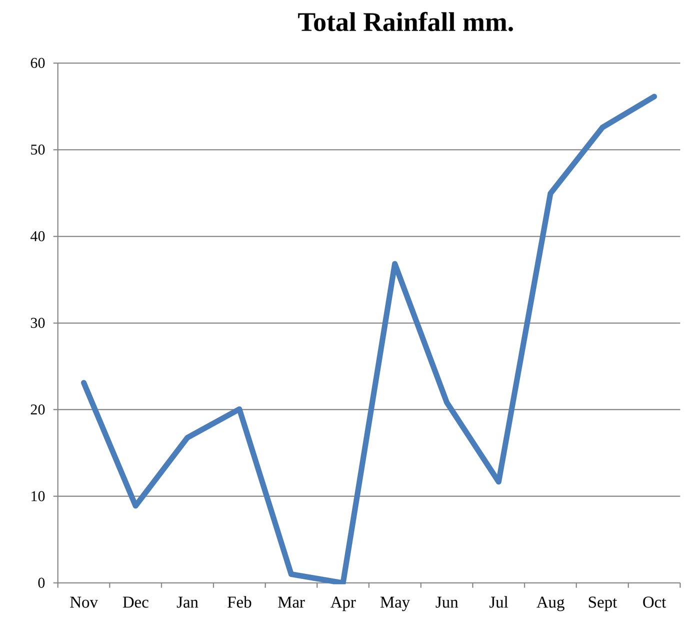

Fig. 8: In Eleuthera there is a very distinct rainy season and a dry season; which limits the crop diversity.

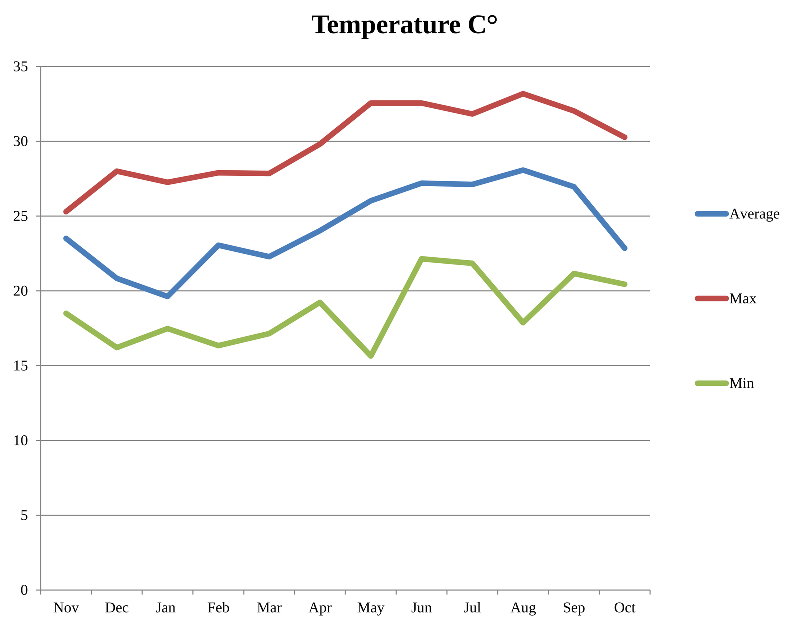

Fig. 9: Eleuthera is a warm weather climate during the summer months. The heat is so harsh that it inhibits certain plant growth.

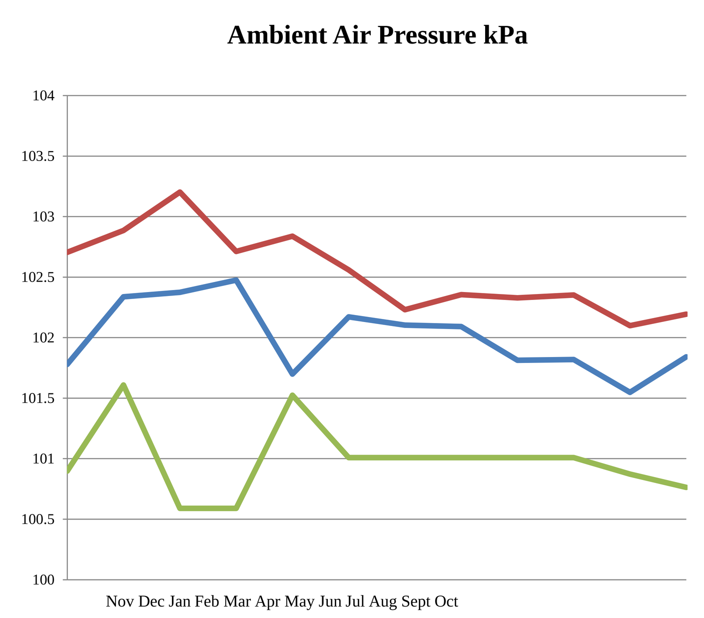

Fig. 10: The main concern is in regard to peaks and valleys. These are indicative of extreme weather events such as hurricanes.

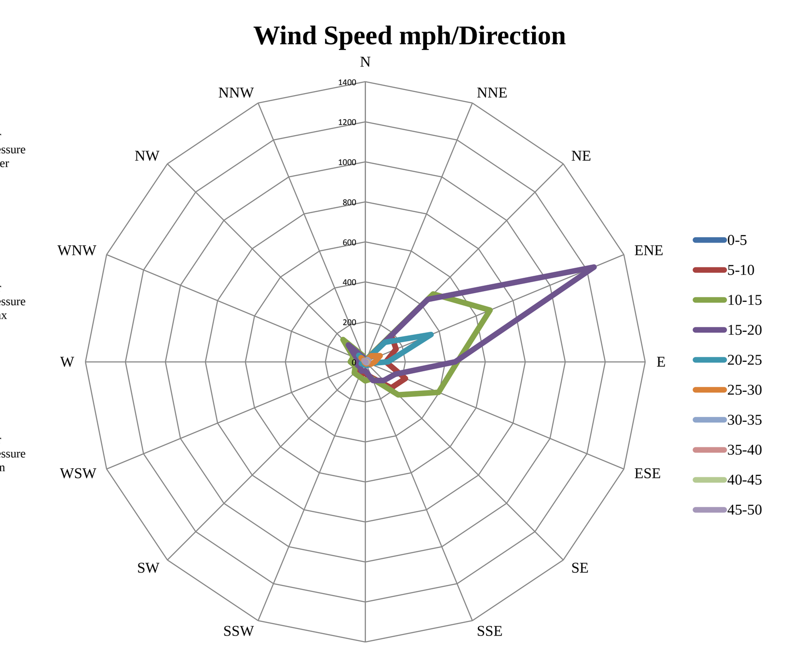

Fig. 11: Wind direction and wind speed; the wind is predominantly coming from the east-northeast at an average speed of twenty miles per hour.

Proposed Campus Expansion

The Research cohort conducted a sector analysis of The Cape Eleuthera Institute (CEI), or the southeast quadrant, within the greater 7.3 hectares (18 acre) campus on Cape Eleuthera. This semester, research and field work centered around data collection on site to better understand the macro and microclimates, growing conditions, and current efficiency of the Aquaponics System. Results and ongoing research indicate that future campus expansion will revolve around agricultural intensification of the Aquaponics System.

Figure 12: An aerial photograph of the CEI portion of campus. The red lines represent transect lines where soil sampling and depth analysis were conducted.

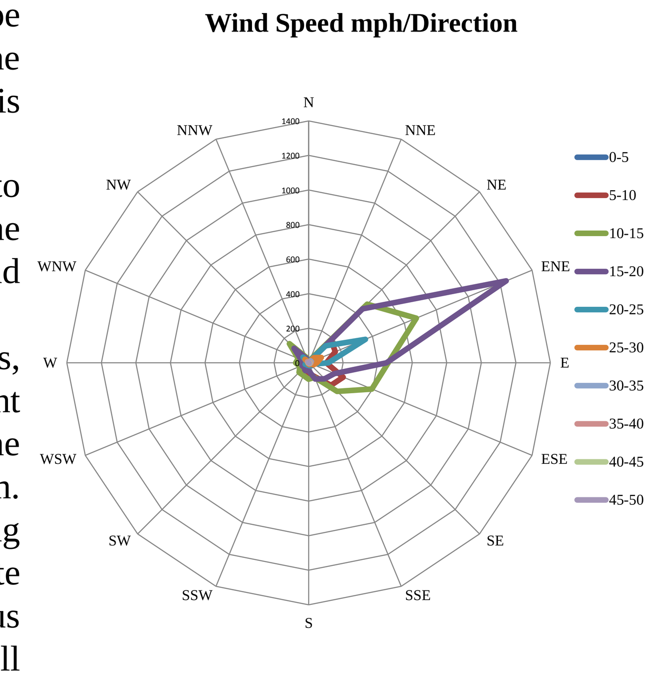

Figure 13:The predominant, prevailing winds on site originate from the east-northeast, essentially making The CEI campus a wind tunnel. To increase agricultural productivity on site, coastal buffers and natural wind blocks need to be incorporated into future campus planning.

Discussion

The results from this semester’s research indicate that The Island School campus has agriculturally poor soils, thus making it difficult to grow many traditional agricultural crops. With deficient soils, an expansion of the Aquaponics system is a possible solution to reduce food insecurity at The Island School. The next step in our research for the Aquaponics expansion plan is to analyze crop diversity. In order to make the Aquaponics system a more robust, layered, and multi-tropic system, Malaysian Giant Shrimp are going to be added to one of the five Aquaponics grow beds. The individual shrimp cages within the deep grow beds will be a different size in order to accommodate the various life cycle stages of the fresh water shrimp. Along with this modification, the plan is to implement a Nutrient Film Technique (NFT) on top of this grow bed. The NFT system is a horizontal, shallow, gutter system that utilizes the Aquaponics water from the grow bed and greater closed-loop system. In order to make The Island School more food secure, this proposed and fully functional future expansion of the Aquaponics has the potential to increase food security on campus by at least 17.4%. Additionally, if this system modification is coupled with purchasing produce from local farmers in Eleuthera, The Island School can even greater increase their food security and reduce their carbon footprint.

Figure 14: How does The Island School Reduce its Food Insecurity

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