Traditional Innovation: Introducing A Borrowed Approach To Hawaiian Dryland Agriculture

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Research Question

Is it possible to increase sweet potato yields of the Leeward Kohala field system by introducing non-native intercropping when compared to traditional sugar cane?

Fig 1. This is a drawing of the Hawaiian sweet potato (Wendy Hollender)

Leeward Kohala Field System

The Leeward Kohala field system is the largest traditional dryland agricultural system built by ancient Hawaiians (Ladefoged, 2018). The Leeward Kohala field system successfully created complex societies and monumental architecture (Ladefoged & Graves, 2008). Ancient Hawaiians practiced traditional intercropping of the Leeward Kohala field system of dryland taro, sweet potato, and sugar cane. Intercropping is planting crops that work together near each other to facilitate growth. Intercropping benefits involving resistance against natural disturbances, wind erosion, pest control benefits, weed control, and water infiltration (Zhu et al. 2011). Colonization severely impacted the Leeward Kohala field system and the Native Hawaiian population (Kagawa & Vitousek, 2012).

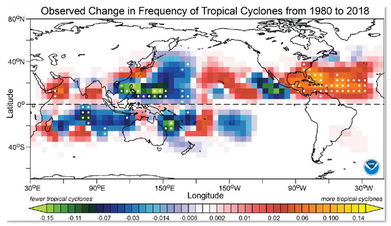

Fig 2. Map courtesy of Muriyama 2020.

Methods

The Agriculture Productivity Index (API) is a formula that calculates the productivity of crops and selects dispersal patterns of crops (Sri Lanka Journal of Advanced Social Studies, 2009). The center of this research is comparing the agricultural productivity of an introduced intercropped plant to the traditional crop over two growing seasons. For my design project, I will implement 12 plots, 3 plots will be the control group, 3 plots will be the traditional method of farming, and 3 plots will include the one phosphorus-fixing plant, 3 plots will have nitrogen-fixing plant. API will calculate the weight of each yield from each plot. The agricultural productivity is determined by the inputs and outputs of each plot.

Literature Review

Function of the System

The Kohala field system is the most well-known studied dryland agricultural system on Hawai’i Island (Kagawa & Vitousek, 2012). Many soil scientists have found interest in the function of these ancient rain-fed systems, archeology related to traditional agriculture, soil composition, and complex societies of ancient Hawaii (Kagawa & Vitousek, 2012). The Leeward Kohala field system is a valuable natural resource to promote food sovereignty in Hawaii.

Change in Climate

Climate change is an impeding problem in the state of Hawaii. On Hawaii Island, there is an increasing trend of extreme rain events (Chen & Chu, 2014). The increasing precipitation challenges the agricultural industry by altering the environment. This reinforces the need for sustainable and resilient farming methods in Hawaii.

Climate Change Adaptations

Hawaii relies heavily on imported food from the mainland and larger government entities. Research found that tubers are resistant against drought and high humidity regions which makes tubers exceptionally resilient against climate change events (Zhu et al. 2011). The focus of my research is increasing the agricultural productivity of an ancient Hawaiian system by supplementing the traditional crop for a more productive non-native plant.

Fig 3. An Interpretation of traditional Hawaiian dryland agriculture. (Source; ‘ulu co-op)

Fig 4. This is an image of the Kohala field system today (source; Ho’okuleana)

API Inputs & Outputs

The Agricultural Productivity Index will help determine the quality of each plot’s yields. The API will involve the inputs and outputs of the Leeward Kohala field system. The inputs include the value of the surrounding environment specifically the amount of rain for each unit, the soil organic matter temperature, and the individual soil nutrients of each plot. The value of the inputs will affect the results of the outputs, the outputs include the weight of each yield, the growth rate of the plants, and the quality of each yield.

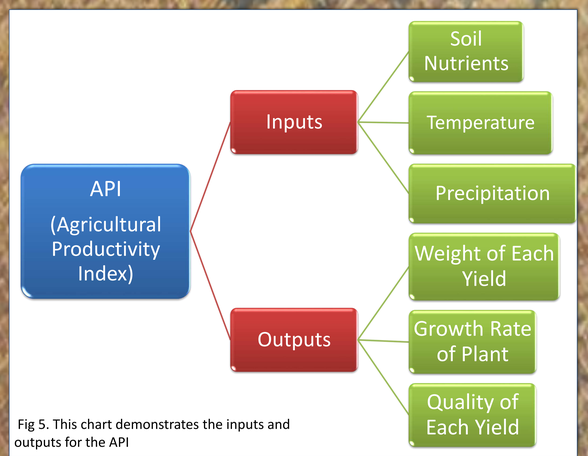

Fig 5. This chart demonstrates the inputs and outputs for the API

Implications

My research aims to implement traditional ecological knowledge of ancient Hawaiians. This project acknowledges the ingenuity of ancestral people. An estimated 90%-95% of the food in Hawaii is imported while 41% agricultural lands are still unfarmed (Kurashima, Fortini, & Ticktin, n.d.). My research intends to combat food sovereignty issues by proposing a sustainable farming practice when compared to conventional monocropping, transforming the agricultural industry in modern Hawaii.

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