

WILL TRANSITIONING GLOBAL BANANA PRODUCTION FROM MONOCULTURES TO POLY CULTURES SATISFY THE GLOBAL DEMAND FOR BANANAS?

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Background

- The vast majority of the world's banana production is grown as a single variety, called the Cavendish, grown on large monoculture plantations. This lack of genetic variety makes them extremely vulnerable to fungi and other diseases. In order to maintain production levels, banana growers must continuously increase the strength and volume of harmful fungicides, pesticides and fertilizers, which has devastating environmental and social consequences. (Ordonez, 2015)
- In addition, as the fungi and pests grow increasingly resistant to the fungicides and pesticides being used, it is only a matter of time before Cavendish bananas become extinct just as the Gros Michel variety disappeared in the 1960s due to a strain of Panama Disease. Aside from the inability of consumers in the industrialized world to buy Cavendish bananas, this would have a devastating impact on agricultural workers across the globe and the food supply of many people in the developing world who rely on Cavendish bananas as a main food staple. (All About Bananas: Producers, Where They're Grown & Why They Matter)

Motivation

- A 2020 study by the Fujian Agriculture and Forestry University on the effects of polyculture banana growth indicated that intercropping with Chinese Chive has the potential to reduce Panama Disease in bananas without the use of harmful chemicals. (Li, 2020)
- We propose to evaluate the extent to which polyculture farming methods can be used on a scaled basis to reduce global dependency on harmful pesticides and fungicides in Cavendish banana production by comparing the outputs of intercropping banana with Chinese Chives with the crop yields of the standard monoculture practice used today. (Li, 2020)

Hypothesis

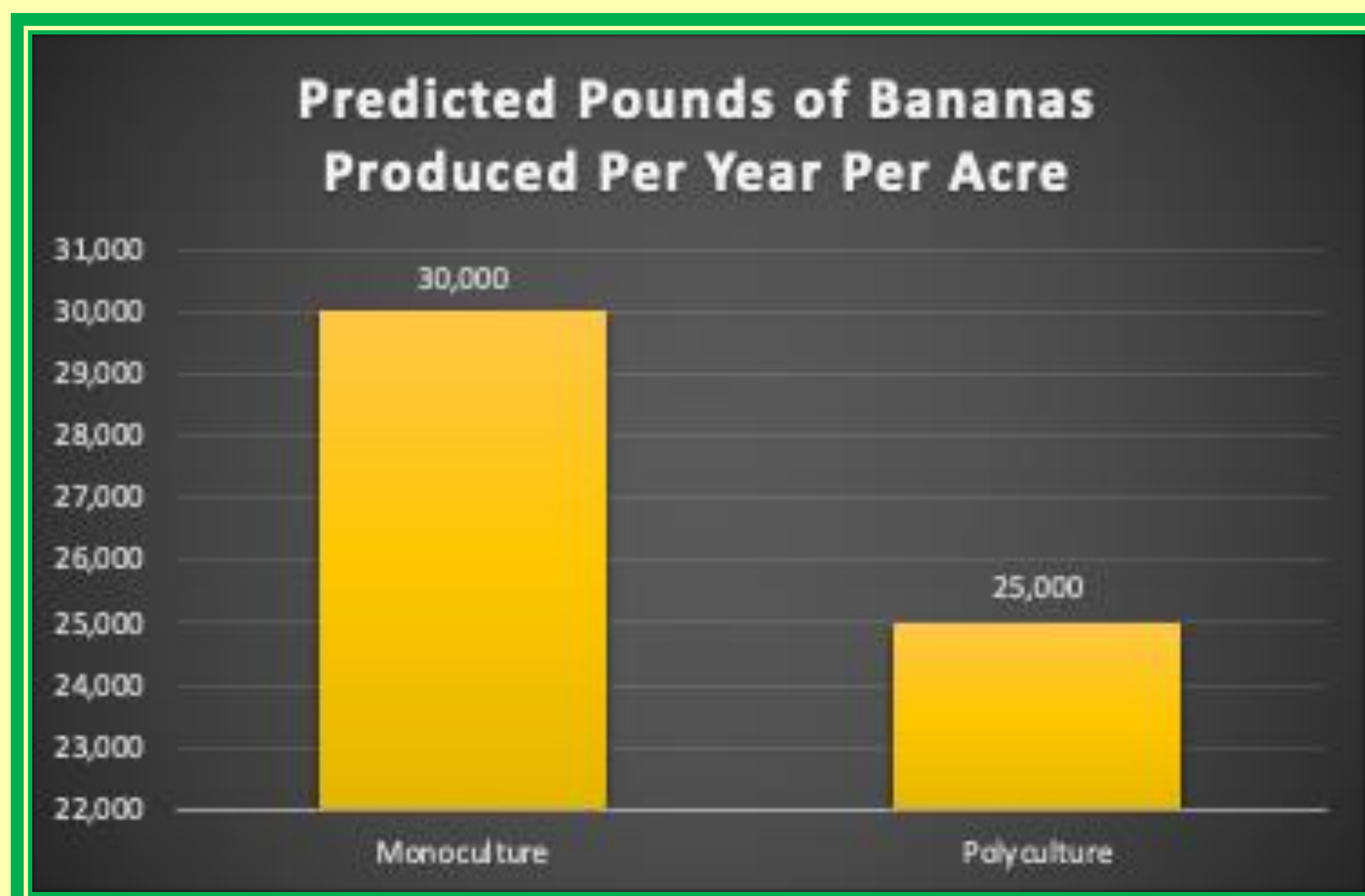
- We hypothesize that the crop resulting from the intercropping of bananas with Chinese Chives will yield less per acre than the monoculture banana crop.



Monocultural Banana Plantation



Banana tree affected by panama disease.



Study Design

- We will conduct a field experiment in the El Oro province of Ecuador where we will prepare two separate acre size parcels. The first acre will be planted with the maximum number of banana plants to yield the largest crop possible and managed on a monoculture basis, utilizing the standard fertilization, pesticide and fungicide regimen as is used in the same region by Rey Banono El Pacifico, Ecuador's largest banana producer. The second acre will be planted with the maximum number of banana plants that may be planted in the field in addition to planting Chinese Chive plants, which necessarily will reduce the number of banana plants planted on the second acre. Each acre will be managed for maximum yield.
- The study will follow a before –after-control-impact design with banana plant data collected from each field, including number of plants per field, leaf quality, stem height and diameter.
- The study will conclude with the harvesting of each acre and a tabulation of the yield, including numbers of bananas and weight of total harvest.

Intended Analysis

- The analysis of the output of the study will inform agricultural decisions regarding the transition from monoculture to polyculture farming by major banana producers. Although the output of the polyculture acre are expected to be less based on a lower number of plants per acre, the reduced cost of fertilization, pesticides and fungicides as well as long term environmental benefits will drive funding for further study in this area and experimentation utilizing a more diverse array of intercropped plants.

Ordonez, N., Seidl, M. F., Waalwijk, C., Drenth, A., Kilian, A., Thomma, B. P., ... & Kema, G. H. (2015). Worse comes to worst: bananas and Panama disease—when plant and pathogen clones meet. *PLoS pathogens*, 11(11), e1005197.

Li, Z. F., Wang, T., He, C., Cheng, K., Zeng, R., & Song, Y. (2020). Control of Panama Disease of Banana by Intercropping with Chinese Chive (*Allium tuberosum* Rottler): Cultivar Differences.

All About Bananas: Producers, Where They're Grown & Why They Matter. (n.d.). Retrieved November 28, 2020, from <https://www.bananalink.org.uk/all-about-bananas/>

Loon, R. (2016, November 17). A Space for Every Seed – the Power of Polycultures. Retrieved November 30, 2020, from <https://caminoverde.org/blog/2017/11/17/a-space-for-every-seed-the-power-of-polycultures>