CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J1917

Project Title
Aquaponics, Hydroponics, or Soil Farming? Determining the Most Eco-Friendly Approach to Feeding the World

Abstract

Objectives/Goals
The goal of this experiment was to compare and contrast growing vegetables using aquaponics, pH-controlled aquaponics, hydroponics and soil farming to determine the best growth rate, taste, density, and cost efficiency.

Methods/Materials
A four section vegetable grow test bed was built with 2x4" and 2x8" lumber, plywood, .25mm plastic sheeting, Styrofoam panels, soil, and drainage rock. An aquaculture system was assembled to raise tilapia and generate water for the aquaponics using a 55 gallon drum, air pump, heater, 50 gallons of water, thermometer, 500mg vitamin C, chlorine test kit, ammonia test kit, and pH test kit, insulation blanket and twelve tilapia fingerlings.

Lettuce, dill and basil were simultaneously grown in each of the four test beds while being measured daily for height, density, and growth rate. The experiment was conducted using 84 plants run twice to compare results. Data was collected and analysis was run on the cost of each method. Finally, the different lettuces were put through a taste test to determine if there was any noticeable variation.

Results
The growth testing showed plants in the hydroponic solution were the fastest growing, followed by pH-controlled aquaponics solution, regular aquaponics solution, and soil. The growth space efficiency testing showed a 140% increase in density for hydroponics, aquaponics vs. soil. The hydroponics method was the least expensive however the aquaponics method also produced fish for protein. In the taste testing there was no significant difference found between any of the methods.

Conclusions/Discussion
The purpose of this experiment was to evaluate different techniques that modern scientists are using to help solve world hunger, minimize pollution, and lower the cost to feed people. Both hydroponics and aquaponics were faster, more space efficient, and more eco-friendly than traditional farming. Aquaponics uses 95% less water than traditional farming, no soil, and additionally produces protein for the community with fish in the aquaponics system.

This experiment showed that aquaponics is viable, from a small backyard system all the way to full-scale production. It is environmentally friendly, cost efficient, and a viable option for farmers as part of solving the international food crisis.

Summary Statement
This experiment evaluated growing vegetables in an aquaponics system, hydroponics system, and through traditional soil farming to determine if using aquaponics was a more efficient, eco-friendly and cost efficient than traditional farming.

Help Received
I would like to thank my teacher Mrs. Gillum, for the many hours spent mentoring and reviewing my work, Sherilin Heise (aka Tilapia Mama) for her seminar on aquaponics, my dad and mom for helping me through the entire experiment, and my sister for helping with planting and feeding the fish.