Fish Effluent from Aquaponics to Improve Soil Health

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Aquaponics

- **Traditional**
  - Circulating
  - Limited by grow bed size
  - Heavy electricity usage
  - Restricted pest management
- **Proposed**
  - Non circulating
  - Limited by reservoir size
  - Requires less electricity
  - Access to labeled crop protection chemicals
  - Water exchange

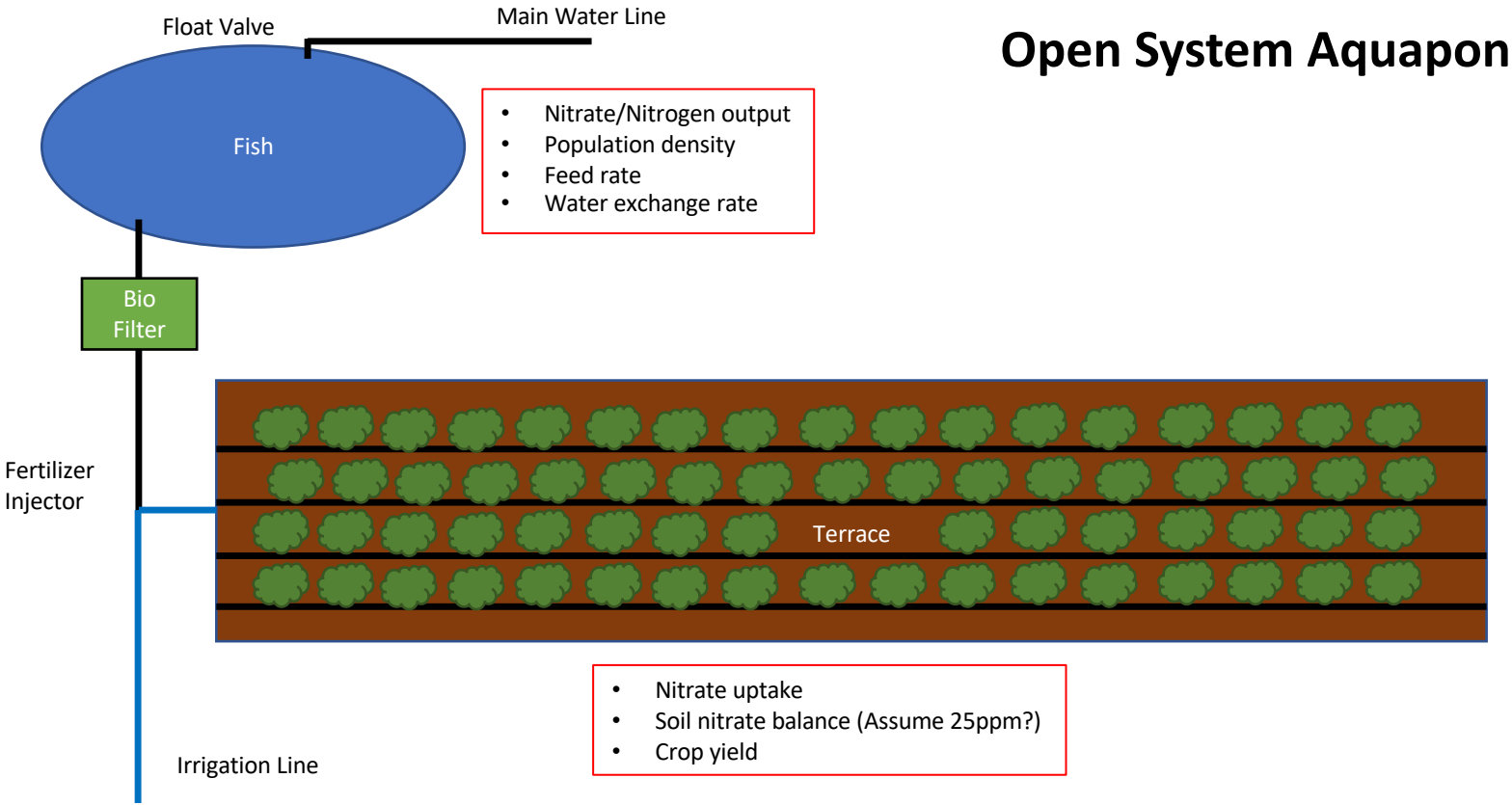
Water Testing

- 5 farms
- 20ppm Nitrate
- 6ppm Phosphorus
- 16ppm Potassium

Skretting Fish Feed

- 40% Protein

Open System Aquaponics



- Nitrate/Nitrogen output
- Population density
- Feed rate
- Water exchange rate

- Nitrate uptake
- Soil nitrate balance (Assume 25ppm?)
- Crop yield

Off- Grid Solar System

- 3 x 147 watt Panels
- Victron 100v/50amp solar controller
- 5 Interstate Deep Cycle Batteries (model SRM-4D)
- GoWISE pure sine wave inverter (12v DC to 120v AC)

Water Pumps

- Wayne 1hp sprinkler pump
- Matala Pump Pre Filter

Inline filtration

- Netafim 2” Arkal 200 Mesh Disk Filter

1 fish per 6 gallons

Taro Trial

- Treatments
  - Grower Practice
  - Fish Effluent
  - Treated Fish Effluent
- Taro Variety
  - Lehua
- Planted January 17, 2019
- Increased fish density

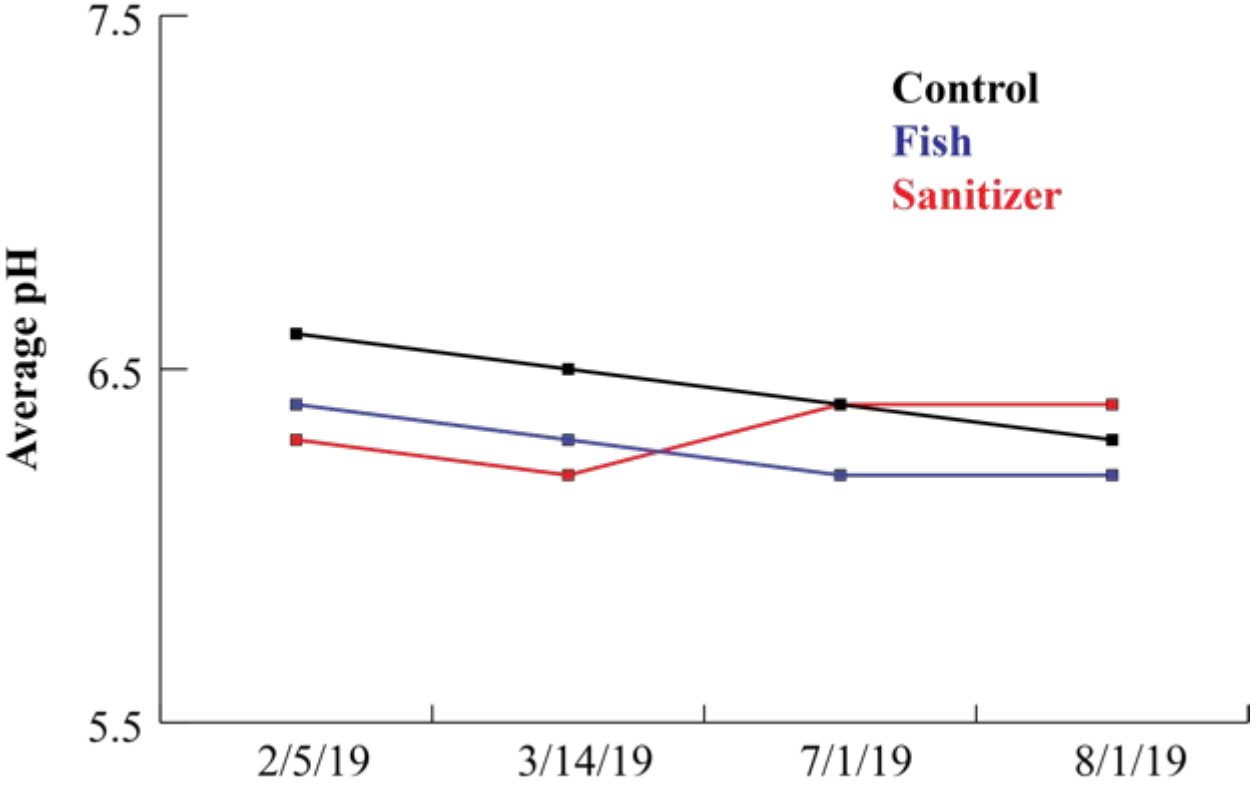
Nitrogen Output/Input

- Tank Nitrate Levels
  - 50ppm Daily Average
- Daily Output
  - 200gal (17,286gal per acre) of fish water per 504 sq ft (8 Rows)
- 1.2oz of Nitrate per day per 504 sq ft (8 rows)
- 75 days of irrigation
- Estimated 5.6lbs total nitrate per 504 sq ft (8 rows)
  - 484lbs nitrate per acre
- Grower Practice Received 400lbs of Nitrogen as Urea

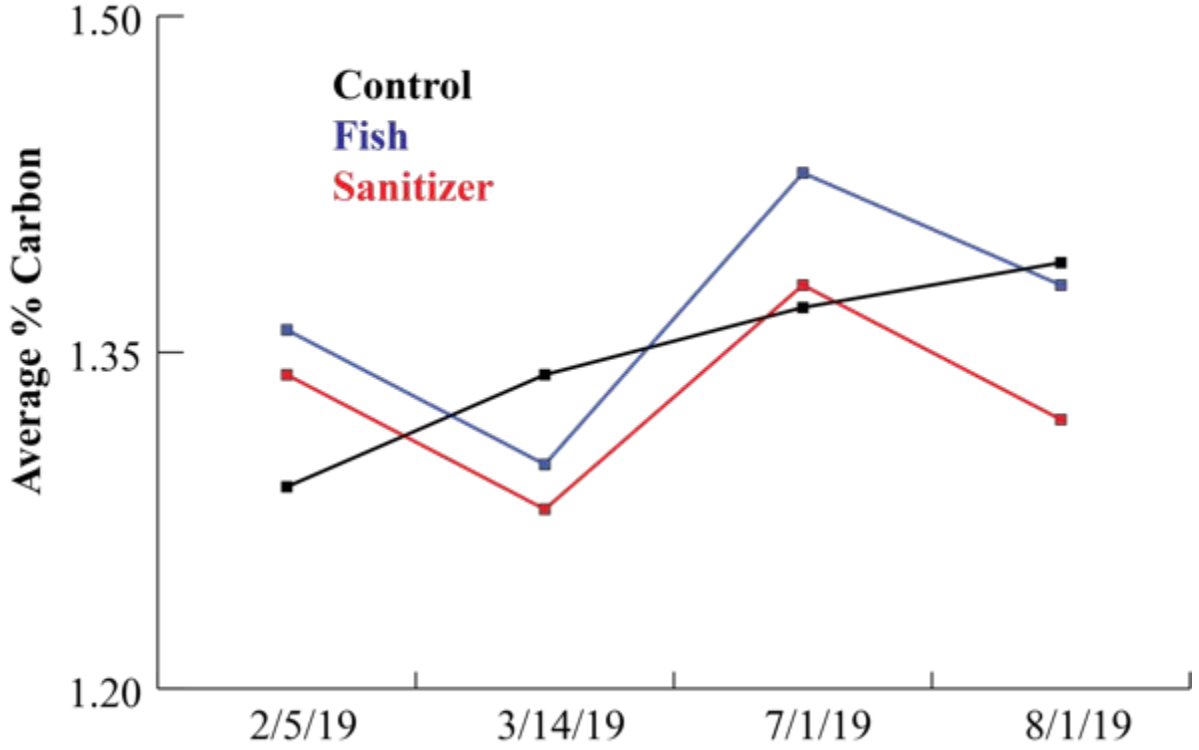
Sanitizer Treatment

- Sanitizer – Biosafe Systems Sanidate 5.0
- Active Ingredient – Peroxy Acetic Acid
- Rate – 4ppm
- Injected via Dema Injector

Average Soil pH



Average Soil Carbon

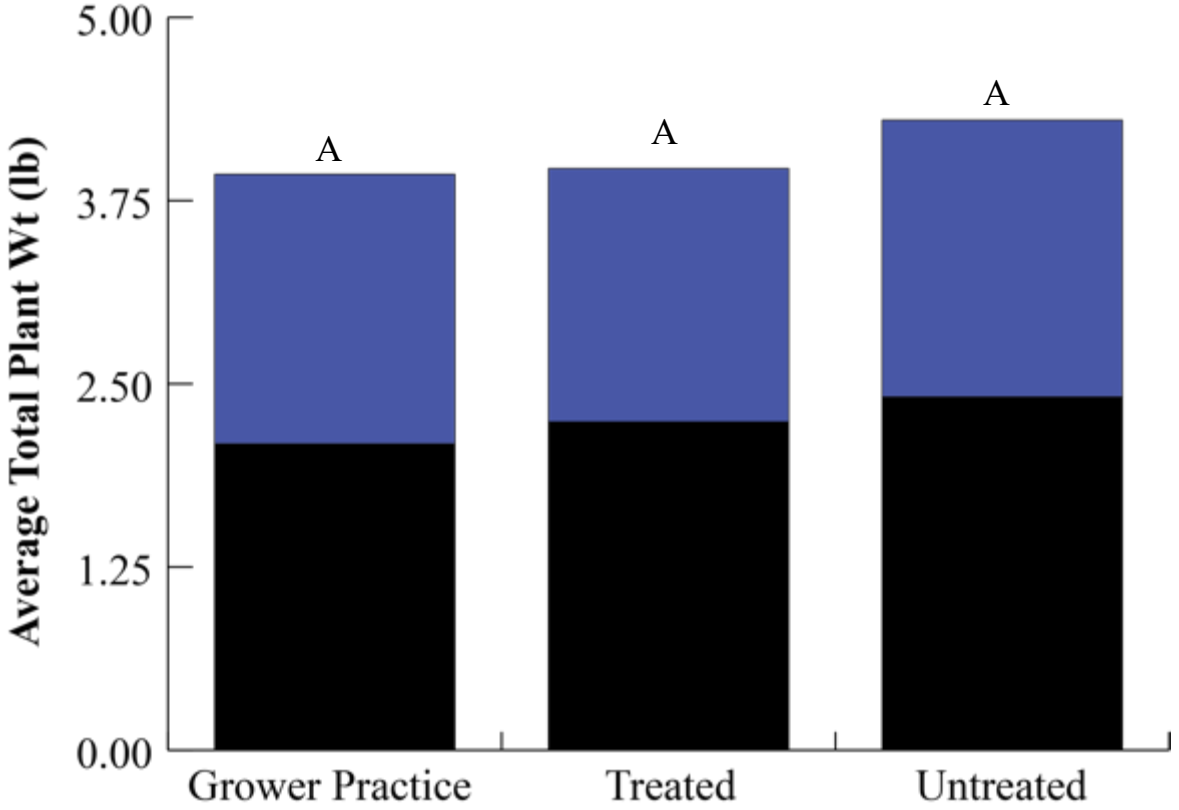



Grower Practice


Treated Fish Water


Untreated Fish Water

Total Average Corm Weight per Plant

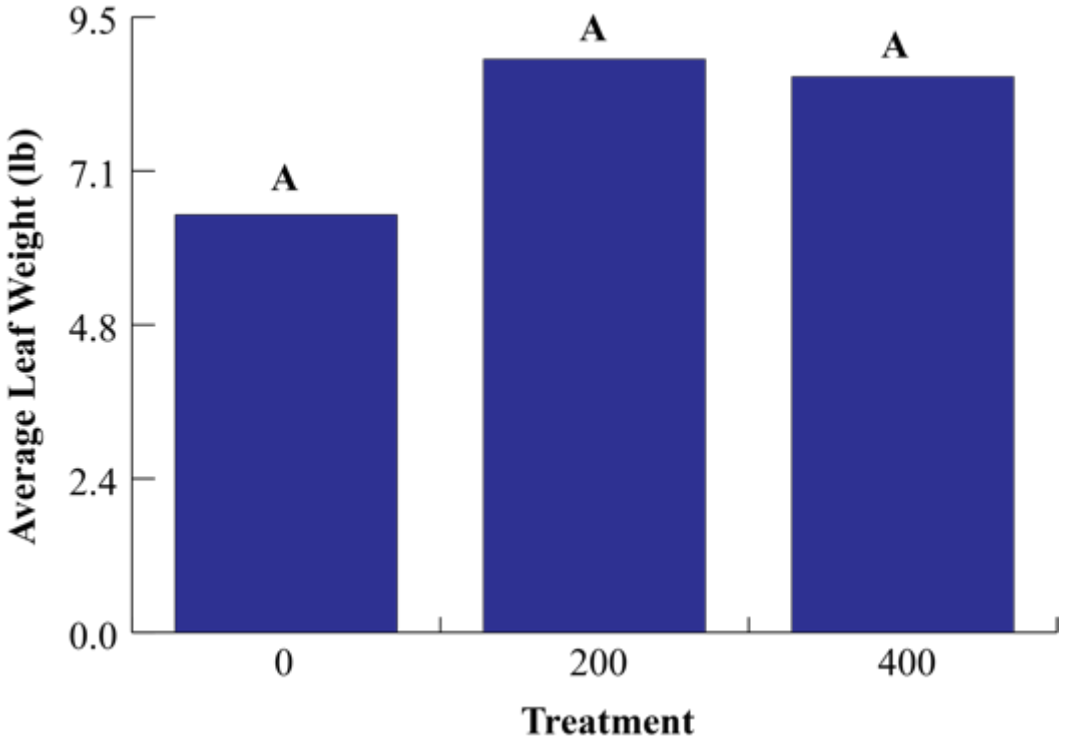


Kula, Maui Taro Leaf Trial

Treatments

- **0lbs** of urea per acre plus daily fish effluent
- **200lbs** of nitrogen as urea per acre plus daily fish effluent
  - Split into 4 applications of 50lbs of nitrogen as urea per acre
- **400lbs** of nitrogen as urea per acre plus no fish effluent
  - Split into 4 applications of 100lbs of nitrogen as urea per acre

Total Average Leaf Weight per Plant



Fish Nitrogen Calculations

- Average daily effluent nitrate concentration – 15ppm
- Gallons of effluent per field per day 35.4 gallons per day
  - 30 min of irrigation through drip at 0.67gal/min 100ft of drip
  - 176 ft of drip tape (1.18gal/min)
- 5 days a week (70days)
  - 2,478gal applied total
- 15ppm ≈ 15mg/l
  - 15mg/l of nitrate = 0.0020029oz/gal of nitrate
  - 4.96lbs of nitrate per field
- 0.62lbs of nitrate per plot
  - **416lbs** of nitrate per acre

Biosolid Nutrients

Nutrient	Value
Nitrogen	4.87%
Nitrate	15.27ppm
Ammonium	1252ppm
Phosphorus	2.65%
Potassium	0.2%
Calcium	5.3%
Magnesium	0.34%
Iron	5818ppm
Manganese	303ppm
Zinc	1701ppm
Copper	117ppm
Boron	15ppm

Thank You!