Exploring Small Scale use of Algae as a Biofertilizer for Farmers

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Introduction

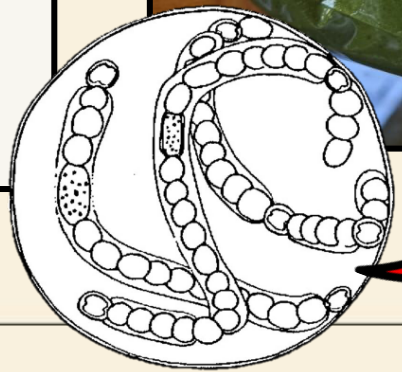
- Background Information
- FIU Biofertilizer Project
- Goals/Objectives
- Hypothesis

Introduction - Background

What is Cyanobacteria?

A kind of photosynthetic microorganism present in both terrestrial and aquatic habitats also known as blue-green algae.

Cyanobacteria creates algal blooms.



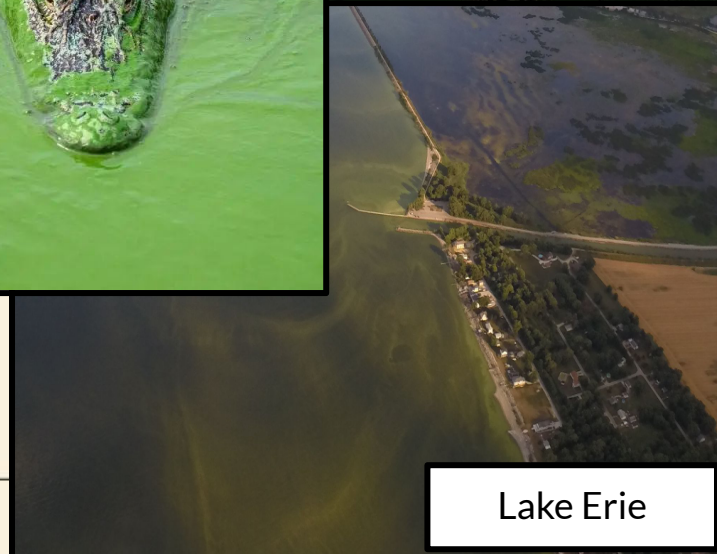
Introduction - Background

Algal blooms are fueled by excess nutrient runoff.

When the algae populations crashes, the amount of oxygen in water becomes so low that major fish death occurs.

Because of this, algal blooms pose a environmental and health threat.


Lake Okeechobee


Lake Erie

Introduction - Background

- The use of cyanobacteria as a Biofertilizer is being studied.
- Nitrogen fixing and high in iron.

Introduction - Biofertilizer Project at FIU

FIU is investigating recycling algae from algae blooms as a fertilizer

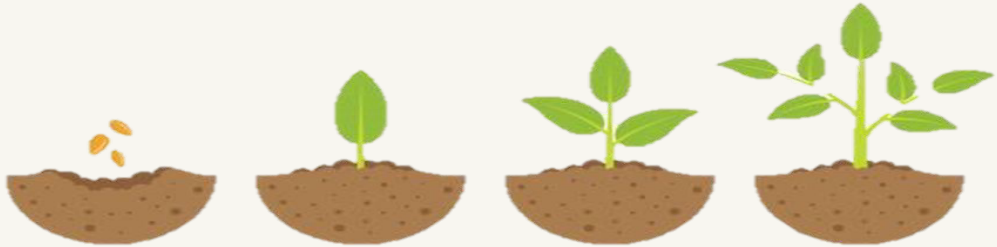
Our experiment was inspired by our mentor Jazmin Locke's project, where algae as a biofertilizer, is being compared to other organic fertilizers on okra.

Introduction - Goals and Objectives

1	2	3
Explore DIY solutions to collecting algae.	Comparing direct algae application vs. pond water.	Looking at cost benefit analysis for DIY Collection.

Introduction - Hypothesis

Okra plants treated directly with filtered algae biofertilizer will exhibit greater growth compared to plants treated with pond water and a control group receiving no fertilizer.



Methodology

- Research Design
- Collection Methods
- Procedures

Methodology Objective 1: Collection Methods

Collection Method 1	Collection Method 2	Collection Method 3
Scraping the pond floor to collect algae. Pros: It works. Cons: Time-consuming and Inefficient, requiring multiple rounds to collect a significant amount of biofertilizer.	Small handheld pump and a 10-micron mesh bag. Pros: Faster than the first method. Cons: Only good enough for small scale farming.	High-flow water transfer pumps or filtrations systems. Pros: Significantly faster collection. Facilitates the production of biofertilizer in commercially viable quantities. Cons: More costly than the other methods.

Methodology Objective 2: Treatments

Filtered Biofertilizer Application: Involves filtering algae creating a concentrated nutrient solution rich in nitrogen and phosphorus. Applied directly to soil.

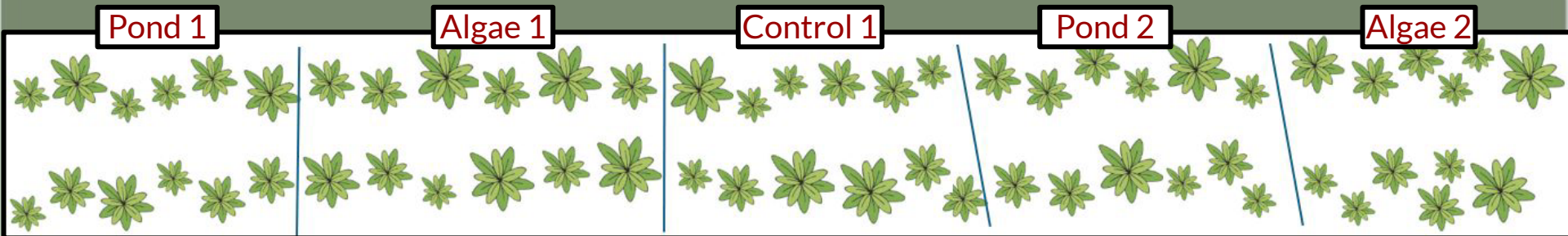
Pond Water Fertigation: Delivers diluted algae nutrients directly to crops, promoting growth and potentially reducing reliance on chemical fertilizers.

Methodology Objective 2 - Research Design

A row of soil was divided into 5 plots. Each plot contains 12 young okra transplants and receive different treatments.

Pond treatments: Received 12 liters of pond water

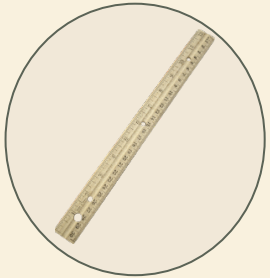
Algae Treatments: Approximately 50g of algae filtered from 12 liters of pond water dispersed evenly on algae plots.



Methodology Objective 2 - Tools & Technology

Plant Health and Measuring Metrics

Ruler
Measure the height of Okra Plants.



4-Way Soil Analyzer
Measures Soil Ph, Moisture, light, and temperature.

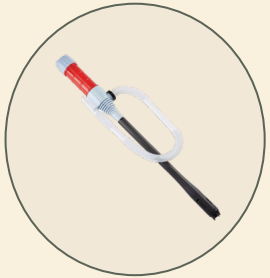
Spad Machine
To measure chlorophyll concentrations.

Paper/Pen/Binder
To record the information gathered.

Methodology Objective 2 - Tools & Technology

Algae Biofertilizer and Pond Water Collection

Water Transfer pump
Quickly transfers water from point a to b.



Watering Can
Used to apply pond water on Okra Plants.

Mesh Bag
Allows for water to pass through leaving the algae in the bag.

Multi- Parameter Tester
Used to test the Ph and Conductivity of water.

Methodology - Procedures

12 liters of Water and filtered algae were collected from the same pond and applied to designated plots twice weekly.

Weekly measurements of plant height and chlorophyll were taken using a ruler and Spad meter.

Results

- Data
- Graphs
- Data Analysis
- Interpretation of Results
- Cost Analysis

Results Objective 2 - Data Analysis


Plot 1. (Pond 1)

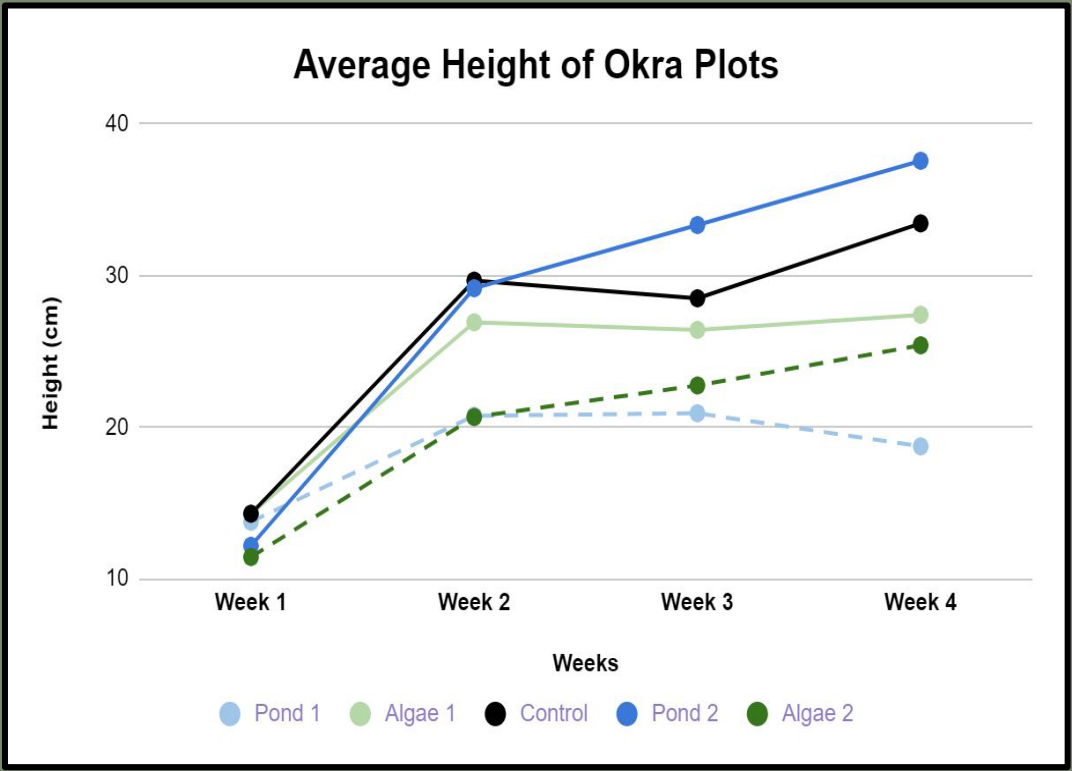

Plot 2. (Algae 1)


Plot 3. (Control)


Plot 4. (Pond 2)

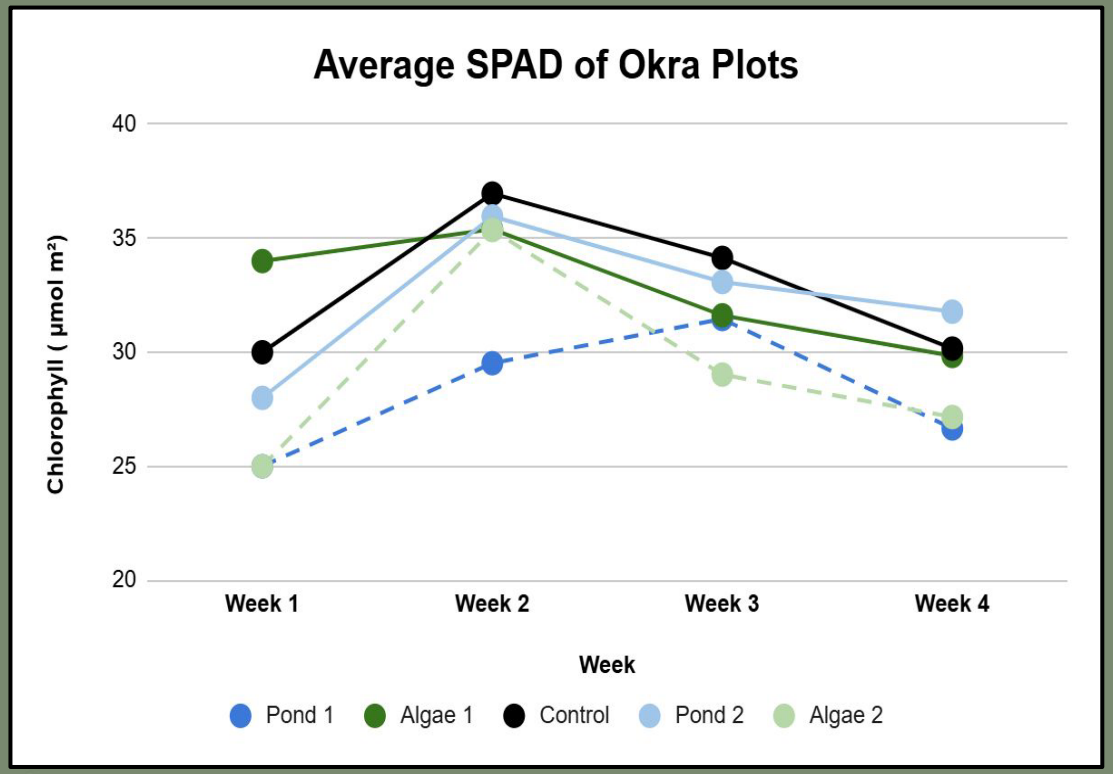

Plot 5. (Algae 2)

Results Objective 2- Data Analysis



Pond 2. had the **most** height on average.

Results Objective 2- Data Analysis



Pond 2 has the **most** chlorophyll output. Chlorophyll is a measurement of health.

Results Objective 1 & 2

Results Objective 1

It's possible to have DIY solutions to collecting algae.

Results Objective 2

Based on the data pond may be the best application

We data had interferences that may have affected the data.

Results Objective 3: Cost Analysis

Expense	Cost
10 Micron Felt Bag	$10.99
Water Transfer Pump	$17.99
Labor (5 hours)	$50.00
Total for 10 lbs	$78.98

We estimated it would require 10 hours to extract 10 lbs of algae with our DIY method.

Assuming half of those hours are active labor at a rate of $10 per hour

Generic Synthetic Fertilizer Cost for 10lbs:
$27.70
Difference of $51.28

Results Objective 3 - Benefit- Cost Analysis

- The method we compare is the 2nd method with the handheld pump and 10-micron mesh bag.
- The current system used to collect algae is too slow and not economically sustainable with the synthetic fertilizer being cheaper.
- We assume the third method of collection would be the best since the collection rate would be much faster.

Conclusion

- Key Points
- Importance of Project
- Summary

Conclusion - Key Points

- Algae has potential as a economically viable fertilizer and can serve as a way to deal with algal blooms.
- There is potential in growing, collecting, and applying algae grown in a local farm water feature.
- Using pond water to irrigate may be an option to explore in the future.

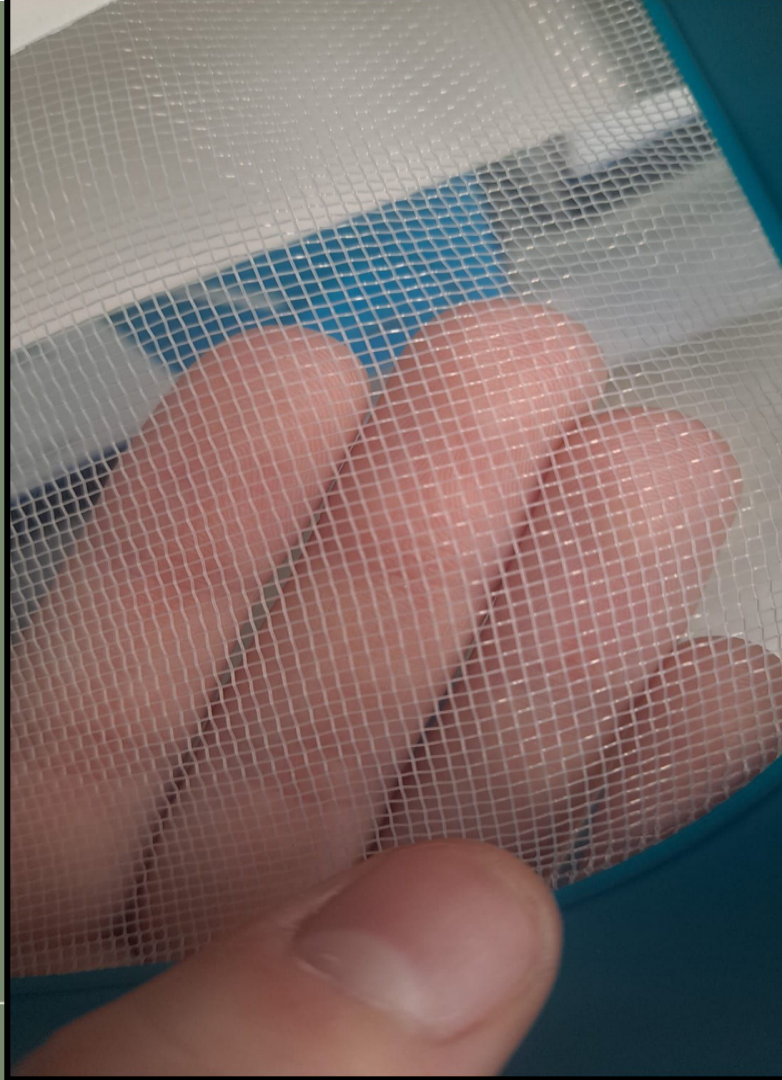
Conclusion - Importance of the Project

This research investigates the potential of pond-derived fertilizers, including biofertilizer and raw pond water, as sustainable alternatives for conventional fertilizers.

A successful outcome could provide farmers with an eco-friendly and cost-effective solution, potentially mitigating harmful algae blooms while promoting sustainable agricultural.

Improvements

- Critical Reflection
- Possible Changes



Improvements - Possible Changes if Repeated

Better Algae Collection System

Would provide better insight into economic sustainability of the fertilizer.

Protection Against Pest

Would provide more accurate data.

More plots

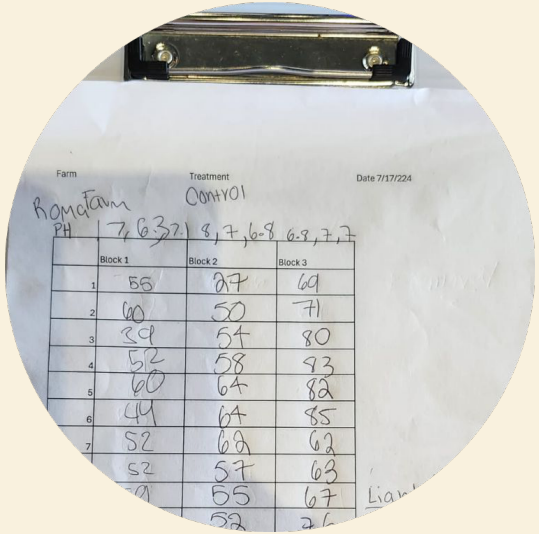
Would provide more accurate data.

Reflection

- Personal Learning
- Experiences
- Challenges Faced
- Skills Gained during Internship

Reflection - Personal Learning/Experiences

Collaboration



Time Management

Hands On Experience

Reflection - Challenges Faced

Figuring out what the Experiment was going to be

↳ Collaborative discussions and communication solved this.

Harsh Outdoor Conditions

↳ Bringing proper attire and gear.

Plant Deaths from Weather, Pests, and Outside Interferences

↳ Understanding what factors affected the plants.

Inefficient Algae Collection

↳ Designing a simple but more efficient collection system.

Reflection - Skills Gained During the Internship

Collaboration: Learning to work effectively together towards common objectives.
Communication: Improving skills in exchanging ideas and discussing findings.
Problem-Solving: Addressing challenges collectively and finding solutions.
Time Management: Coordinating tasks and responsibilities efficiently.

These experiences enhanced our ability to collaborate effectively and manage tasks in a scientific research settings.

Acknowledgements

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