

# **Enhancing Nitrogen Availability in Liquid Fertilizers Derived from Solid Organic Sources for Fertigation**

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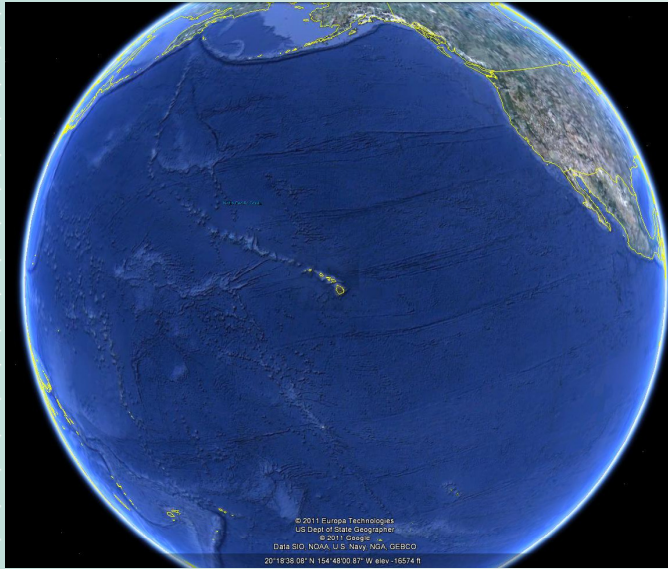
Department of Tropical Plant and Soil Sciences

The presentation was given at the ASHS annual meeting, Aug 4-7, 2015 in New Orleans, Louisiana.

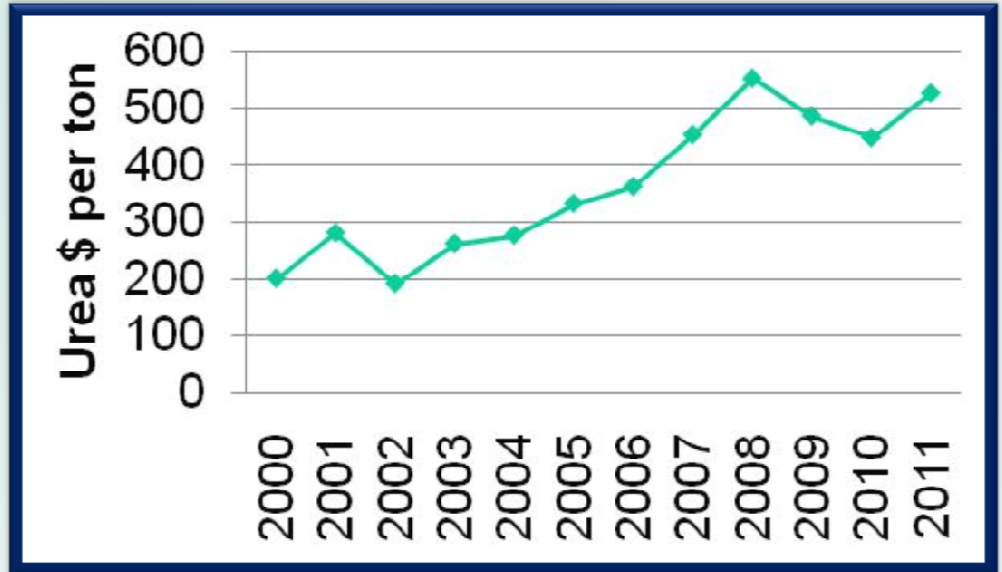


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# Isolation



# Costs



Hawaii is located approximately 4,000 kilometers from the nearest landmass.

Hawaii imports over 85% of the food consumed in the state, leaving it extremely vulnerable.

It is very important to increase local food production and self-sufficiency in the State.



# Tankage

**Meat and Bone Meal By-Products. Produced Locally in Hawaii by Island Commodities.**  
**It contains:**

**Nitrogen = ~ 10%,  
Phosphorus = ~2.5%,  
C:N Ratio = 5:1**





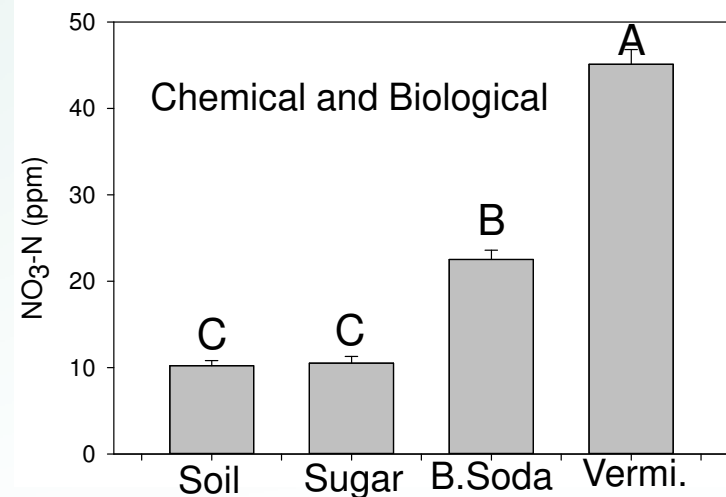
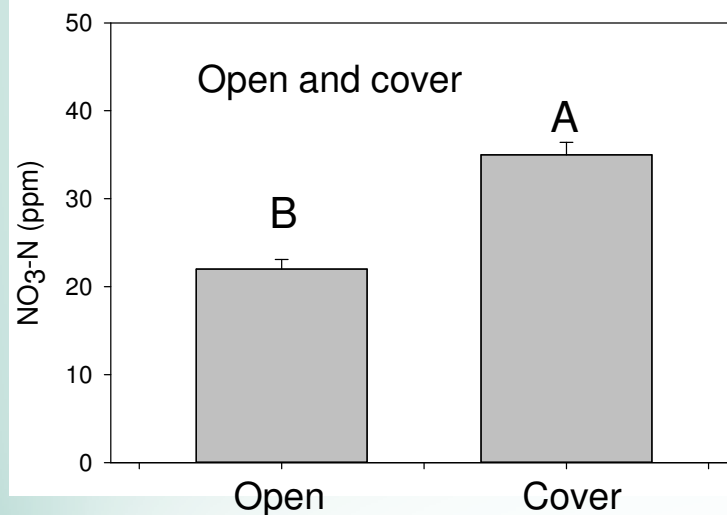
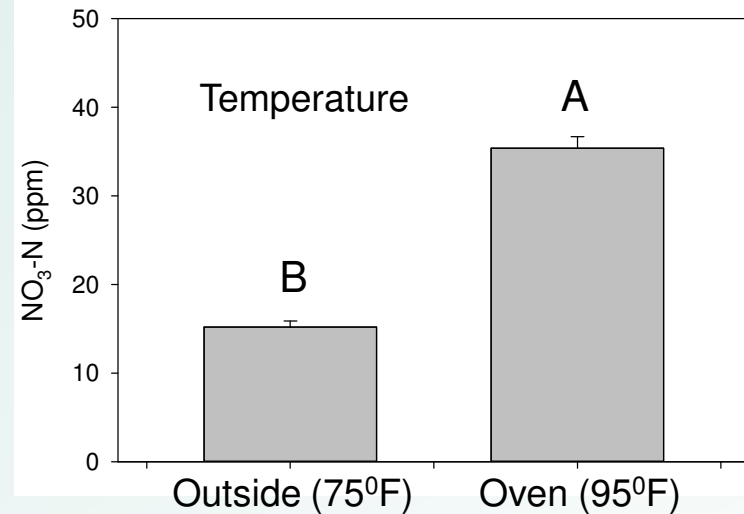
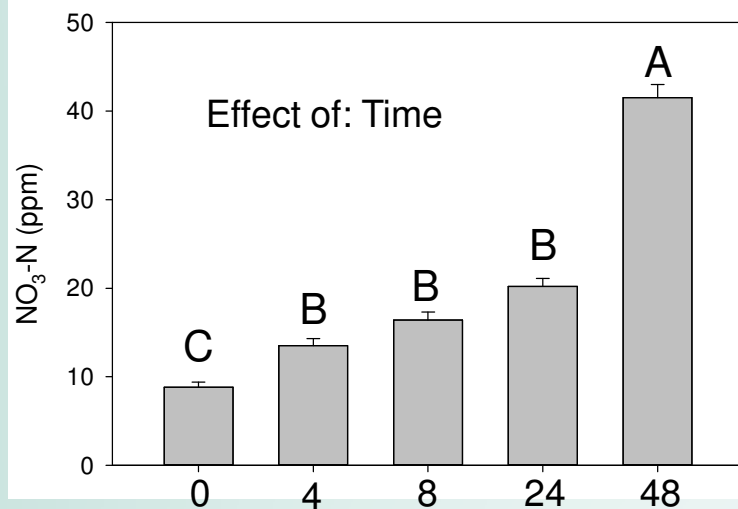
# Liquid fertilizer with high nitrogen from tankage



*Meat and bone meal by products (Tankage). High nitrogen content (10%). Also good source of other nutrients.*

*125 ml flask (covered and uncovered) contain 1 gram tankage and 50 ml deionized water. Each treatment was replicated 3 times.*





*Nitrate release (ppm) from tankage under the effect of: Time; Temperature; Open or covered conditions, and Different materials.*



# Liquid Fertilizer from Tankage

## **Application Recipe:**

- 1.5 lbs of tankage into 10 gallon water.
- Add about 1 ounce vermicompost
- Air for 12-24 hours
- Strain and apply with drip irrigation (Fertigation).





## Collaboration with local farmers: Quoted from an email

From: Jared Davis

On: April 29, 2015

“Thanx Ahmad for awesome recipe, my first delivery!! We use no chemicals, no pesticides just Ahmad recipe, now that's organic. Super sweet this year. I'll keep you posted on the tonnage.”



## Measure BRIX in watermelon from the collaborator Jared Davis on Molokai

Sample# Location along Fruit Center Core

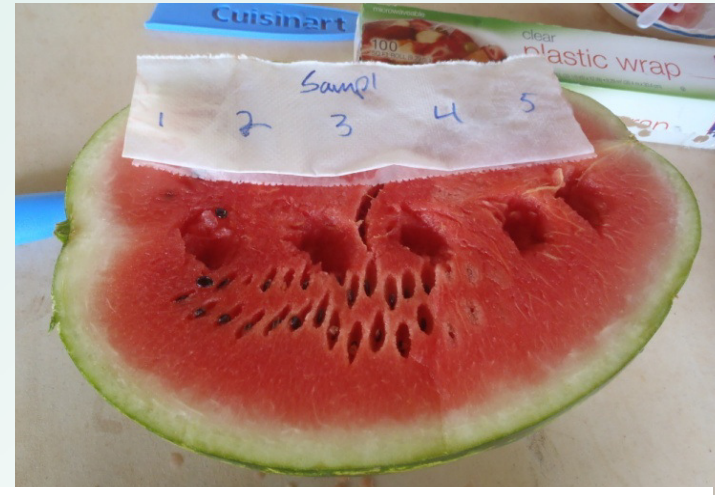
1-Fruit Peduncle End

2-Center Peduncle

3-Center

4-Center Blossom Calyx End

5-Fruit Blossom Calyx End



	Fruit Peduncle End	BRIX/Sample Location				Blossom Calyx End	
Melon #	Weight (lbs)	1	2	3	4	5	Average
1	24	10.2	12.0	12.2	12.3	12.1	<b>11.8</b>
2	19	10.8	12.0	12.2	11.8	10.8	<b>11.5</b>
3	18	11.2	13.0	13.0	13.0	12.0	<b>12.4</b>
<b>Average</b>	<b>20.3</b>	<b>10.7</b>	<b>12.3</b>	<b>12.5</b>	<b>12.4</b>	<b>11.6</b>	

Data taken by: Alton Arakaki on Molokai.





# Replicated Field Trials

- Poamoho Research Station on Oahu.
- Pak choi, lettuce and daikon crops were used.
- Tankage and synthetic 10-30-10 were used.
- Randomized complete block design (RCBD) with 3 replicates (blocks).
- Fertigation applied through drip irrigation.

**Measured:** Relative chlorophyll content in leaf weekly using SPAD meter and fresh and dry weight after harvest.



# Field Trial



Field trial setup at Poamoho Research Station on an Oxisol soil.



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# Field Trial



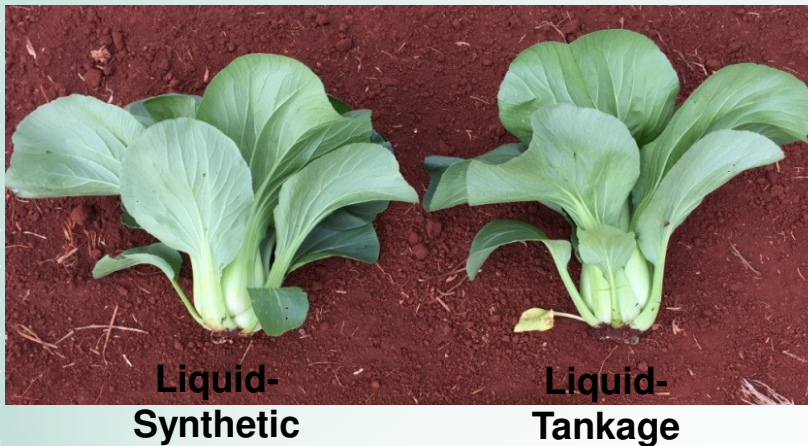
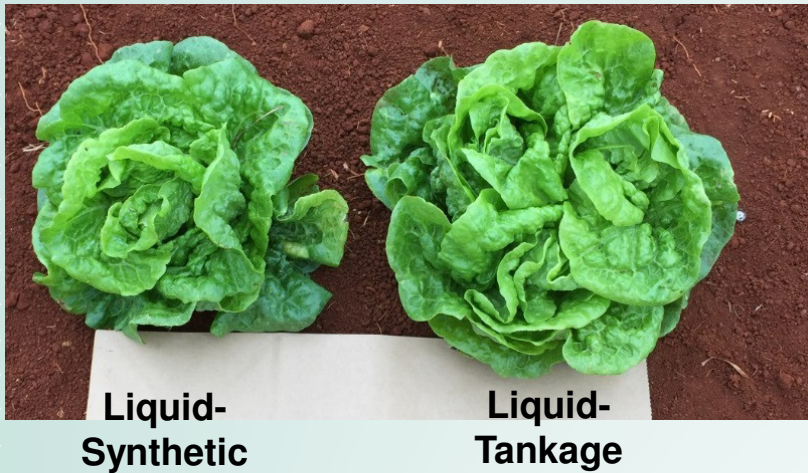
Fertigation from 20 gallon bucket.



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# Results-Lettuce, Pak Choi, and Daikon



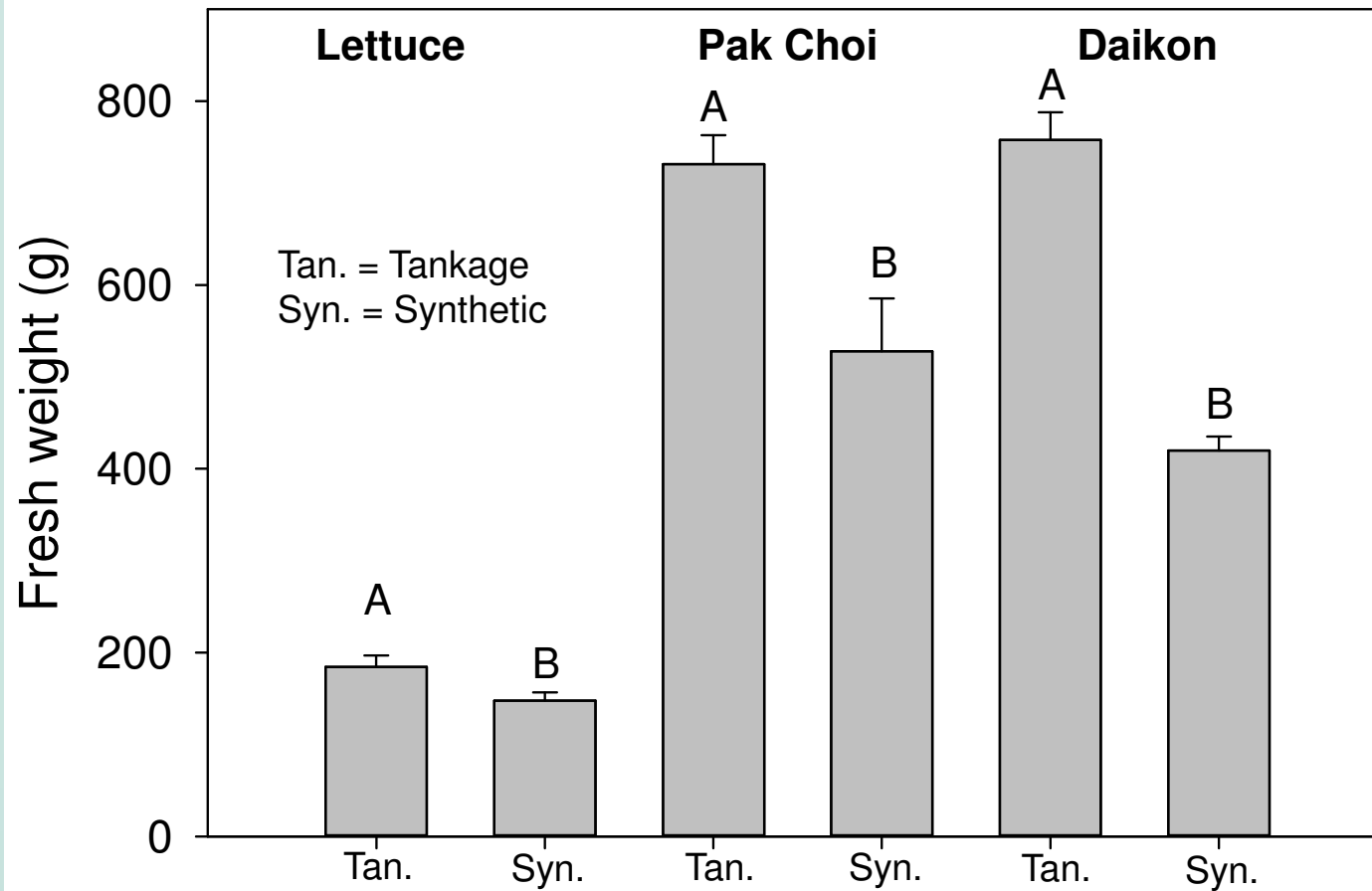
Lettuce and Pak choi were harvested after 4 and 5 weeks of seedlings transplant, respectively



Daikon was harvested after 9 weeks of planting



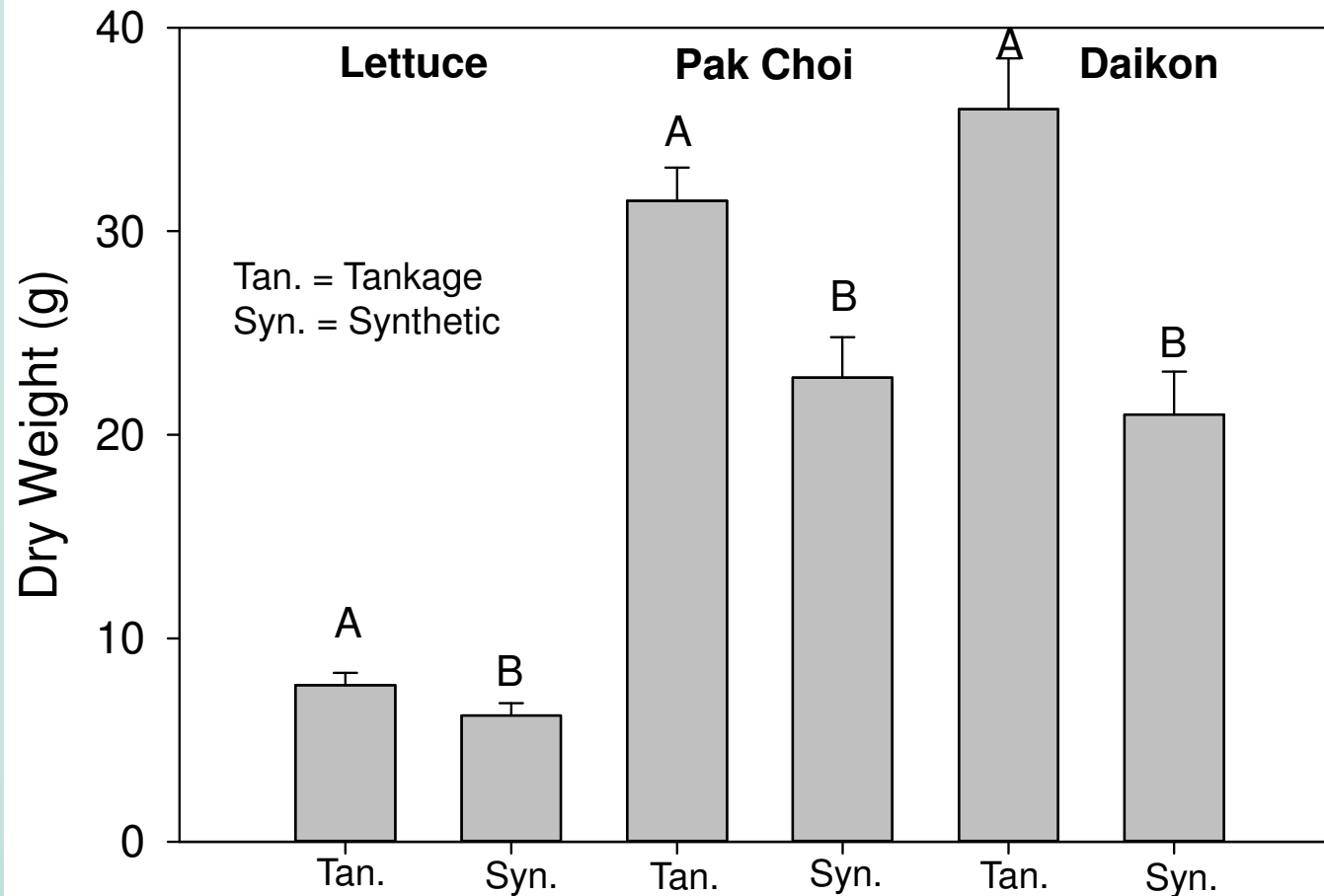
## Results-Fresh weight (g)



Fresh weight (gram) for lettuce, pak choi, and daikon under organic and synthetic liquid fertilizers application.



## Results-Dry weight (g)

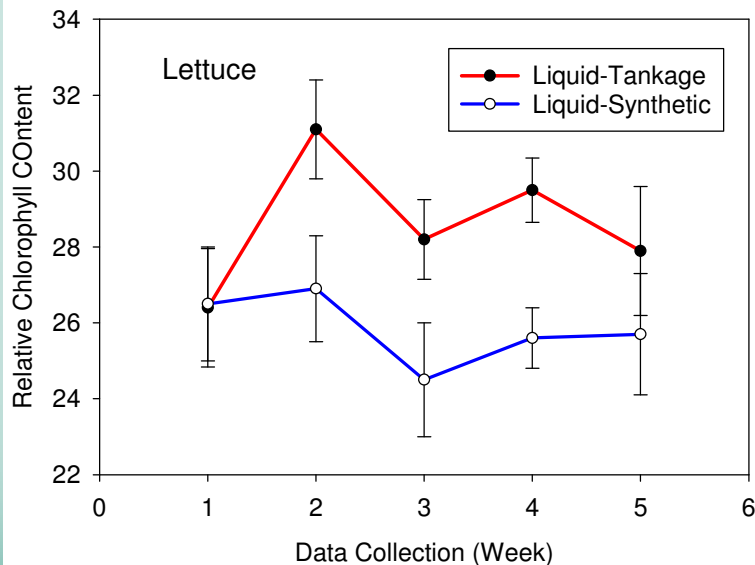
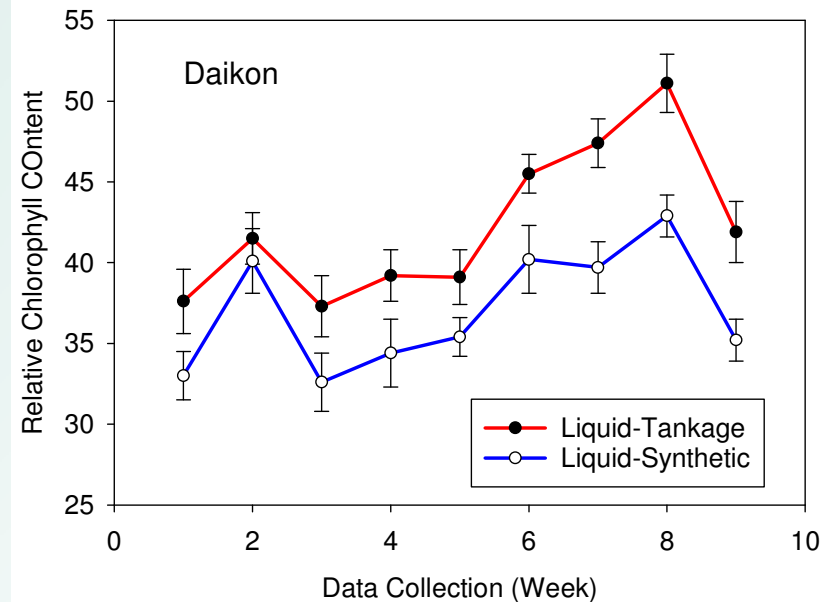
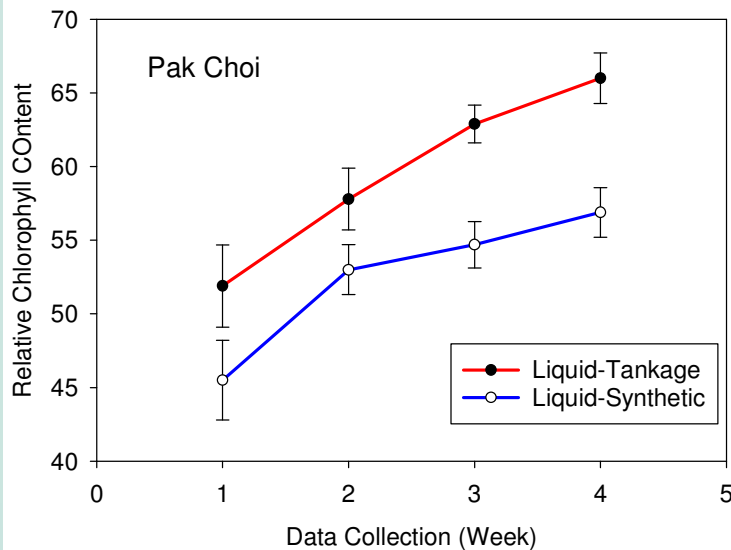


Dry weight (gram) for lettuce, pak choi, and daikon under organic and synthetic liquid fertilizers application.





# Results-Chlorophyll content



Relative chlorophyll content, data were taken weekly using Minolta SPAD meter, for pak choi, lettuce, and daikon under organic and synthetic liquid fertilizers application.



# Conclusions:

- It's possible to produce high nitrogen liquid fertilizer from organic local sources at a farm level.
- Time, temperature, and biological agents are useful tools to enhance nitrogen mineralization from tankage.
- The use of tankage in producing liquid fertilizer may provide different nutrients for plant growth besides nitrogen.



# Acknowledgements

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**Department of Agriculture**  
STATE OF HAWAII





# Thanks for listening

..... Questions?

