



Runoff



Photo: T. McCabe (NRCS)

Algal Blooms



Photo: JE Smith

Turtle Tumors



Photo: Chris Stankis



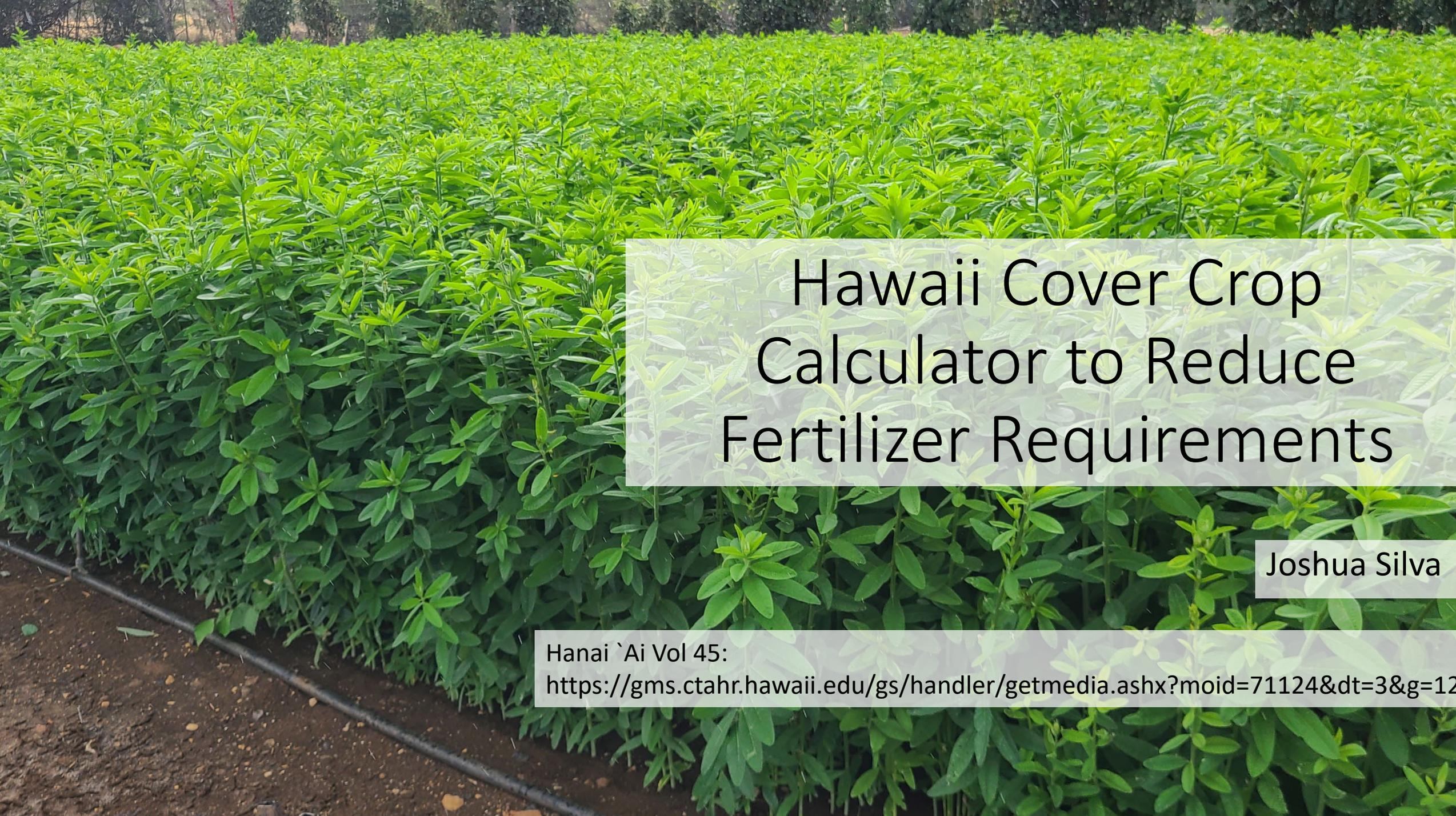
Photo: Flowvella

“Blue Baby Syndrome”



Photo: completelegalinv

Wasted Costs



Hawaii Cover Crop Calculator to Reduce Fertilizer Requirements

Joshua Silva

Hanai `Ai Vol 45:

<https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=71124&dt=3&g=12>



Hawaii Cover Crop Calculator

K-H Wang et al. 2022

Dr. Koon-Hui Wang's website

- <http://go.hawaii.edu/bh2>



Cover Crop Calculator for Plant Available Nitrogen

Cover crops can contribute significant amounts of nitrogen to crop production. This app uses plant-available nitrogen mineralization rates from different areas, nitrogen content and biomass production of cover crop residues to estimate the nitrogen contribution from cover crop residues in Hawaii.

Looking for step-by-step instructions? [Click here.](#)

Location and Soil
Oahu - Poamoho - Oxisols

Select the location and soil order that best matches your area. To find the soil order of your area, check out the [SoilWeb Map](#).

Area * 1	ft ²	Fresh Weight * 1.2	lb
-------------	-----------------	-----------------------	----

Just before termination, sample above ground cover crop biomass from at least 4 locations in your field; i.e. four 1-ft² quadrants.

Combine all quadrant samples. Tear them up by hand and mix them for 1-2 minutes. Weigh the fresh weight of your field sample.

Total N (%) From Lab * 2	%	% Dry Matter From Lab * 23	%
-----------------------------	---	-------------------------------	---

Collect a 1-2 lb lab-sample from your field sample. Immediately send to an analytical lab that will dry and grind the whole sample before testing for total %N and % dry matter. If you don't have lab results, please refer to the [typical Poamoho / Lalamilo results](#).

If you don't have lab results, please refer to the [typical Poamoho / Lalamilo results](#).

Total N Requirement * 180	lb/acre
------------------------------	---------

Enter the total N requirement for your crop.

Hawaii Cover Crop Calc link

- <https://hawaiicovercropcalc.oahurcd.org/>





Hawaii Cover Crop Calculator

← → ↻ casoilresource.lawr.ucdavis.edu/gmap/

< Close **SoilWeb**

Kawaihapai
[Soil Data Explorer](#) | [Series Extent Explorer](#) | [Description](#)

- ▼ Soil Profiles
- ▲ Soil Taxonomy
 - Order: [Mollisols](#)
 - Suborder: [Ustolls](#) [Map of Suborders](#)
 - Greatgroup: [Haplustolls](#)
 - Subgroup: [Cumulic Haplustolls](#)
 - Family: [Fine-loamy, mixed, superactive, isohyperthermic Cumulic Haplustolls](#)
 - Soil Series: [Kawaihapai](#)
- ▼ Land Classification
- ▼ Hydraulic and Erosion Ratings
- ▼ Forest Productivity
- ▼ Soil Suitability Ratings
- ▼ Details

Steps

1. Soil type
(use SoilWeb app if unsure)
2. Area collected cover crop
3. Fresh weight from Area
4. From Laboratory
Dry Matter %
Total N %



Hawaii Cover Crop Calculator



Steps

1. Soil type
(use SoilWeb app if unsure)
2. Area collected cover crop
3. Fresh weight from Area
4. From Laboratory
Dry Matter %
Total N %



Hawaii Cover Crop Calculator

Agricultural Diagnostic Service Center
University of Hawaii, Manoa
1910 East-West Road
G. Donald Sherman Laboratory, Room 134
Honolulu, Hawaii 96822

PLANT TISSUE ANALYSES WORKSHEET

JCNO: 23-059043	RECEIVED: 5/23/2023	SAMPLE TYPE		CAT/COMMON NAME:	
CLIENT ID:	COMPLETED: 5/26	<input checked="" type="checkbox"/> PLANT TISSUE	REASON:	<input type="checkbox"/> OTHER	
CLIENT: Silva, Joshua	CROP:	PROBLEM <input type="checkbox"/>	COLLECTED:	MATERIAL:	
ATTN:	VARIETY:	MONITOR <input type="checkbox"/>	COMPLETED:		
ADDRESS:	AGE:	SURVEY <input type="checkbox"/>	COLLECTOR:		
CITY:	TISSUE:	EXP. <input type="checkbox"/>	SITE:		
PHONE:	TOTAL SAMPLE 1	OTHER:			
		SOIL SUBMITTED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			

ITEM	Sample Lab No.	Description	Anal. Code	%								ug/g							
				N	C	P	K	Ca	Mg	Na	S	Fe	Mn	Zn	Cu	B	Mo	NO3-N	NO2-
1			T2, T3	3.45	28.7	1.30	0.54	6.43	0.58	0.35		12,416	380	753	473	43	16		
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

Steps

1. Soil type
(use SoilWeb app if unsure)
2. Area collected cover crop
3. Fresh weight from Area
4. From Laboratory
Dry Matter %
Total N %



Hawaii Cover Crop Calculator



COLLEGE OF TROPICAL AGRICULTURE
AND HUMAN RESOURCES
UNIVERSITY OF HAWAII AT MĀNOA



Cover Crop Calculator for Plant Available Nitrogen

Cover crops can contribute significant amounts of nitrogen to crop production. This app uses plant-available nitrogen mineralization rates from different areas, nitrogen content and biomass production of cover crop residues to estimate the nitrogen contribution from cover crop residues in Hawaii.

Looking for step-by-step instructions? [Click here.](#)

Location and Soil
Oahu - Poamoho - Oxisols

Select the location and soil order that best matches your area. To find the soil order of your area, check out the [SoilWeb Map](#).

Area * 1 ft ²	Fresh Weight * 1.2 lb
-----------------------------	--------------------------

Just before termination, sample above ground cover crop biomass from at least 4 locations in your field; i.e. four 1-ft² quadrants.

Combine all quadrant samples. Tear them up by hand and mix them for 1-2 minutes. Weigh the fresh weight of your field sample.

Total N (%) From Lab * 2 %	% Dry Matter From Lab * 23 %
-------------------------------	---------------------------------

Collect a 1-2 lb lab-sample from your field sample. Immediately send to an analytical lab that will dry and grind the whole sample before testing for total %N and % dry matter. If you don't have lab results, please refer to the [typical Poamoho / Lalamilo results](#).

If you don't have lab results, please refer to the [typical Poamoho / Lalamilo results](#).

Total N Requirement * 180 lb/acre

Enter the total N requirement for your crop.

Steps

1. Soil type
(use SoilWeb app if unsure)
2. Area collected cover crop
3. Fresh weight from Area
4. From Laboratory
Dry Matter %
Total N %



Hawaii Cover Crop Calculator

Results

<p>28 Day Estimation</p> <p>60.28 % PAN</p> <p>87 lb/acre Actual PAN</p> <p>63 lb/acre Estimated N Fertilizer for Next Crop</p>	<p>70 Day Estimation</p> <p>73.58 % PAN</p> <p>106 lb/acre Actual PAN</p> <p>44 lb/acre Estimated N Fertilizer for Next Crop</p>
--	---

This section provides you with the estimate N fertilizer needed for your crop. Compare your cover crop results with UH ranges (found below in the [Reference Data](#) portion of this page). Use caution if your estimates are unusual.

Reference Data

Plant Available N of Typical Cover Crops Used in Lower Elevation in Hawaii (e.g. Poamoho)

Season/tillage	Cover Crop	Fresh Weight (lb/ft ²)	Dry Content (%)	Dry Weight (lb/Acre)	Tissue N (%)	Total N (lb/A)	PAN (%)	Actual PAN (lb/A)	PAN (%)	Actual PAN (lb/A)
Winter/Till	Sunn hemp	1.2	23.10%	12074.83	1.66	200.44	55.24	110.72	67.82	135.94
Winter/Till	Cowpea (Blackeye #5)	1.04	13.70%	6206.43	2.87	178.12	63.74	113.54	75.17	133.90
Winter/Till	Lablab	0.9	14.89%	5837.48	2.75	160.53	62.72	100.68	75.22	120.75
Winter/Till	Pigeon pea	0.55	20.47%	4904.20	3.47	170.18	66.14	112.55	81.69	139.02

Results

1. Plant Available Nitrogen %
2. PAN in lbs/acre
3. Estimated N Fertilizer for Next Crop (i.e. amount of fertilizer need to add separate from cover crop)

Reference data from initial calculator experiment



Sunn Hemp-Fertilizer Field Trial





75% FP

SH
No Fertilizer

SH
50% FP

100% FP

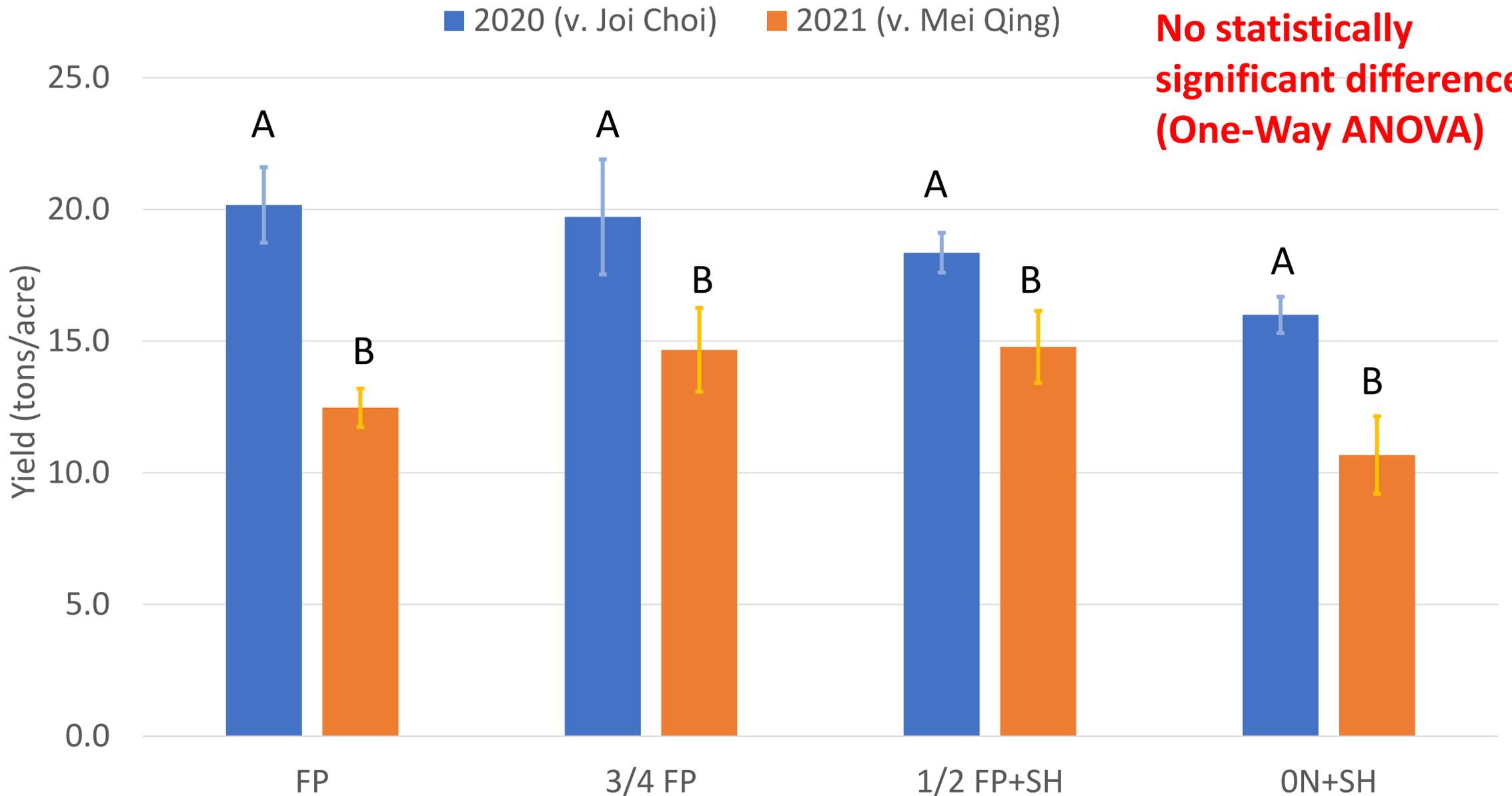


- Yellow sunn hemp
- Seeded at 80 lbs/acre
- Incorporated after ~1.5 months (first flower)
- 4 treatments





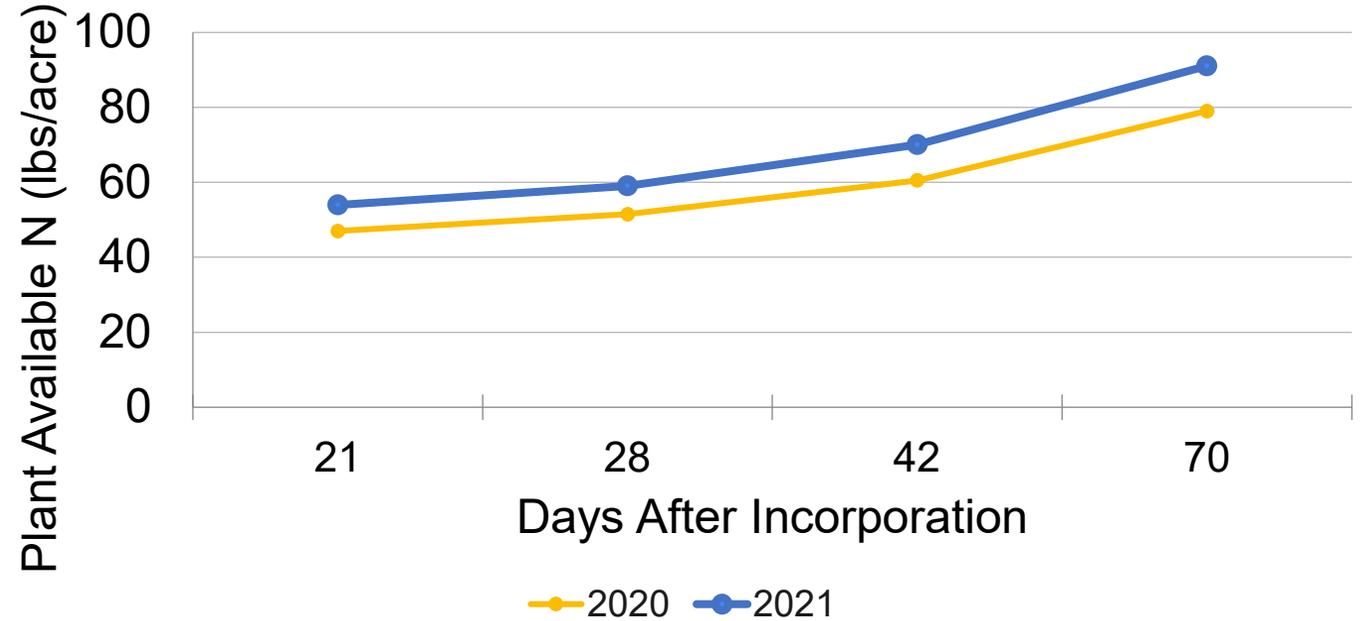
- 'Joi Choi' August 2020 ;
- 'Mei Qing Choi' May 2021
- Fertilized 1x per week
- 12 sq.ft. harvested, triplicate
- Sunn hemp, soil nitrate data



No statistically significant differences (One-Way ANOVA)



Estimated Plant Available Nitrogen- Sunn Hemp

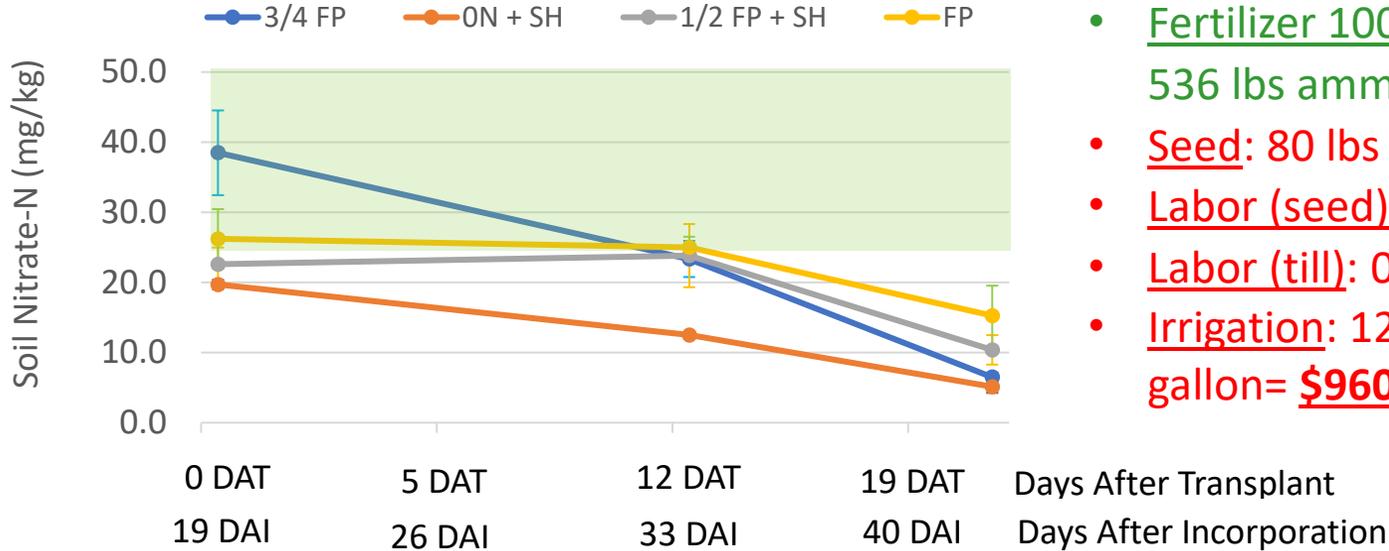


- Utilized Wang et al. (2017) cover crop calculator
- Biomass from 2ft x 2ft area
- Sunn hemp N of 2.59% from previous work

	SH No Fert	SH 50% FP	75% FP	100% FP
N- Fertilizer		56 lbs	90 lbs	112 lbs
N- Sunn Hemp (2020)	61 lbs	61 lbs		
Total lbs N/acre (2020)	61 lbs	117 lbs	90 lbs	112 lbs
N- Fertilizer		56 lbs	90 lbs	112 lbs
N- Sunn Hemp (2021)	54 lbs	54 lbs		
Total lbs N/acre (2021)	54 lbs	110 lbs	90 lbs	112 lbs



Soil Nitrate Levels- 2020 Trial



*Green shaded area is critical range of 25-50 mg/kg soil suitable for vegetables

Trial Costs (farmer practices for sunn hemp)

- Fertilizer 100% FP:
536 lbs ammonium sulfate per acre per crop x \$0.49/lbs= **\$262.54**
- Seed: 80 lbs seed per acre x \$0.50 per pound= **\$40**
- Labor (seed): 0.25 hours x 5 workers x \$20 per hour= **\$25**
- Labor (till): 0.5 hours x 1 worker x \$20 per hour= **\$10**
- Irrigation: 1200 gal per acre x 10 minutes x 40 days x \$0.002 per gallon= **\$960** (room to improve irrigation practices)

- **Sunn hemp treatments with reduced fertilizer rates yielded similar amounts of pak choi as higher fertilizer rates**
- Sunn hemp with 50% reduced fertilizer contributed similar nitrogen amounts as the 100% farmer practice
- Soil nitrate tests indicated nitrate levels for all treatments except for the ON+SH were adequate for cabbages, with nitrate levels between 25-50 mg/kg soil being the critical range (Loo, M. 2018 thesis)
- Costs-Benefits of growing cover crop need to be evaluated for each farm (e.g., irrigation, nematodes, soil health, etc.)



Thank you!

Joshua Silva

UH Cooperative
Extension

jhsilva@hawaii.edu

Acknowledgments: Dr. J. Deenik,
Dr. K. Wang, J. Uyeda, T. Maaz, A. Krenz



This presentation is supported by
HDOH project 19-249; WSARE
WPDP19-21, WESP 19-01.



COOPERATIVE EXTENSION
UNIVERSITY OF HAWAII AT MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

