

# Regional BMPs for Cover Crops in Specialty Crops and beyond

## Insights from Florida



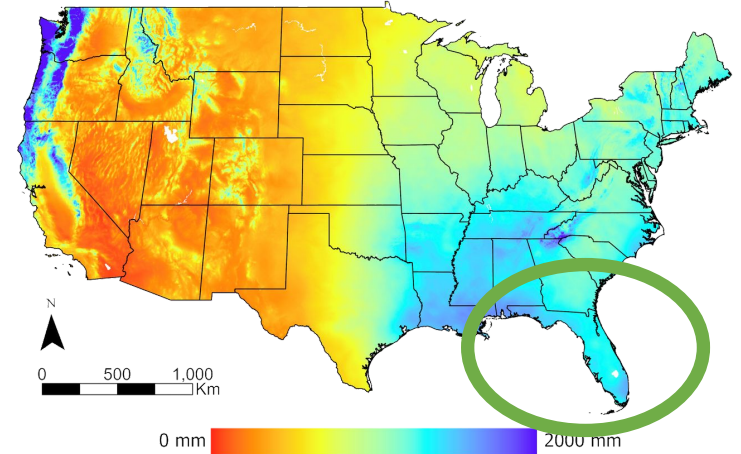
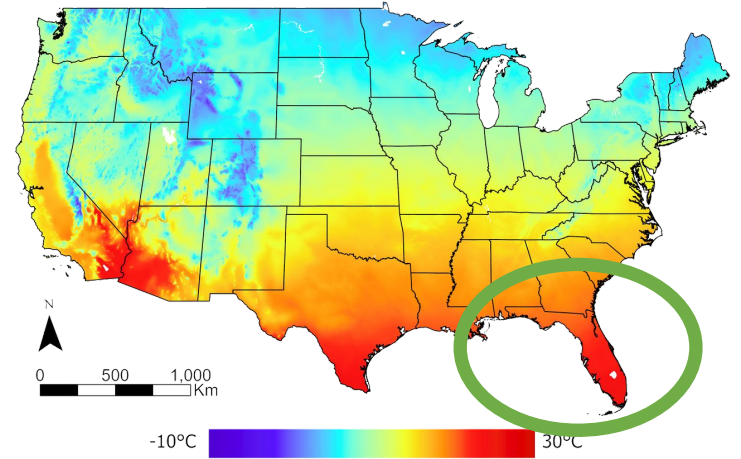
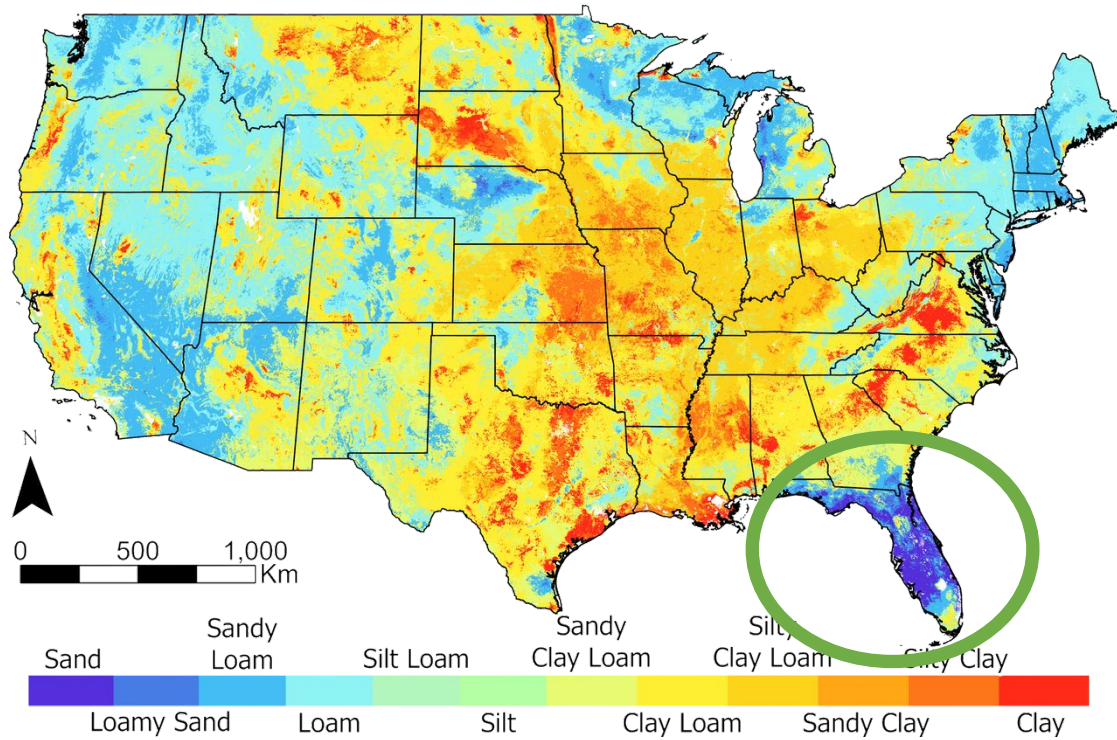
Gabriel Maltais-Landry



SOIL, WATER, AND  
ECOSYSTEM SCIENCES

Southern Cover Crop Council Conference  
Gainesville (FL) – February 25, 2026

# Soil & climate of the Southeast



# N and P in Florida

- Soils + climate make it hard to retain nutrients
- Agriculture is 2<sup>nd</sup> economic activity + increasing urbanization
- Many FL waterbodies impaired and under BMAP (Basin Management Action Plan)
  - N for the Suwannee river, P for the Lower St-Johns river, etc.
- BMPs help balance production and environmental protection
  - Cover crops can be a BMP

# Cover crops and nutrient cycling

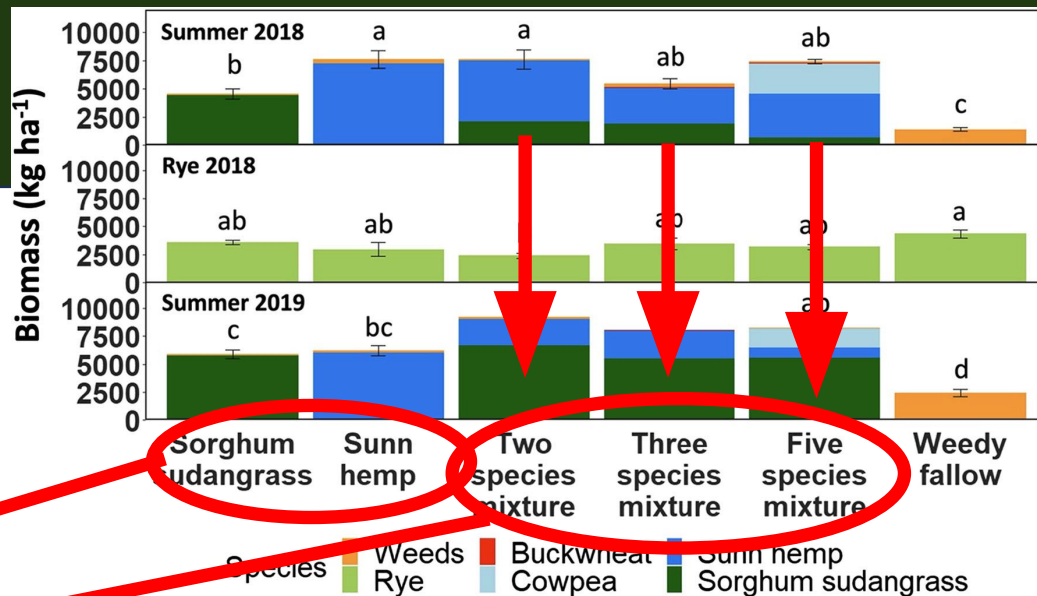
- Cover crops take up residual nutrients before they are lost
  - Can also provide new N via biological N-fixation in legumes
- Nutrient benefits to the system depend on synchrony between
  - Supply/release from residues & Demand/uptake by subsequent crop
- Effects are variable and depend on cover crop (and cultivar), diversity, subsequent crop, etc.
- How do we quantify those nutrient cycling benefits?

# Measuring effects on nutrient cycling

- Can quantify nutrient effects via a 3-step process
  1. Quantify biomass and nutrient accumulation
  2. Measure effects on soil nutrient pools and fluxes
  3. Determine the effect on cash crop yield, quality and nutrition
- Often focused on N (and P) but applies to all nutrients

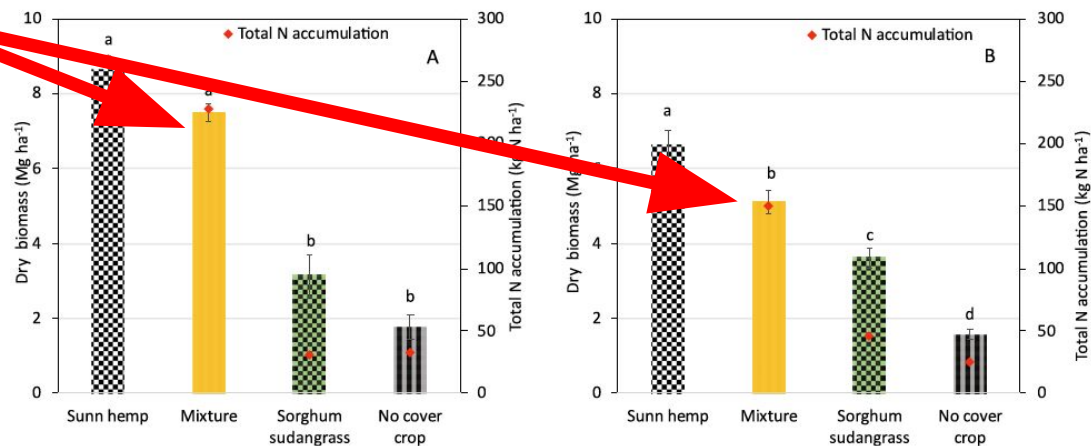
# Step 1a: Biomass

- Biomass modulates cover crop effects and varies by crop effects and varies by



- Crop & cultivar
- Monoculture vs. mixture
- Residual fertility (i.e., more grasses at high N)

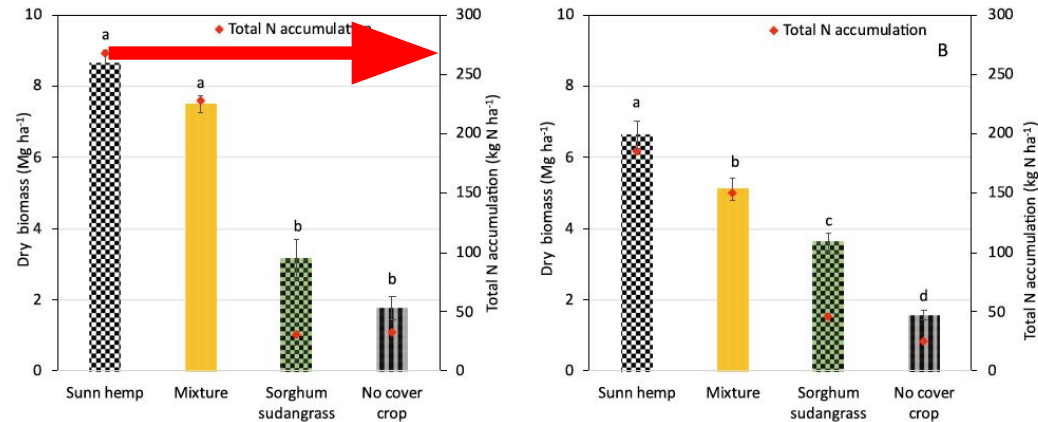
Allar and Maltais-Landry. 2022. NCAE. 122:119-138.



Bukomba et al. 2025. NCAE. 131:543-555.

# Step 1b: N accumulation

- N accumulation a function of biomass and %N
  - Often 100-200 lb N ac<sup>-1</sup>
  - Can be up to 250 lb N ac<sup>-1</sup>
- C:N helps to separate mineralization (< 20:1) vs. immobilization (> 25:1)



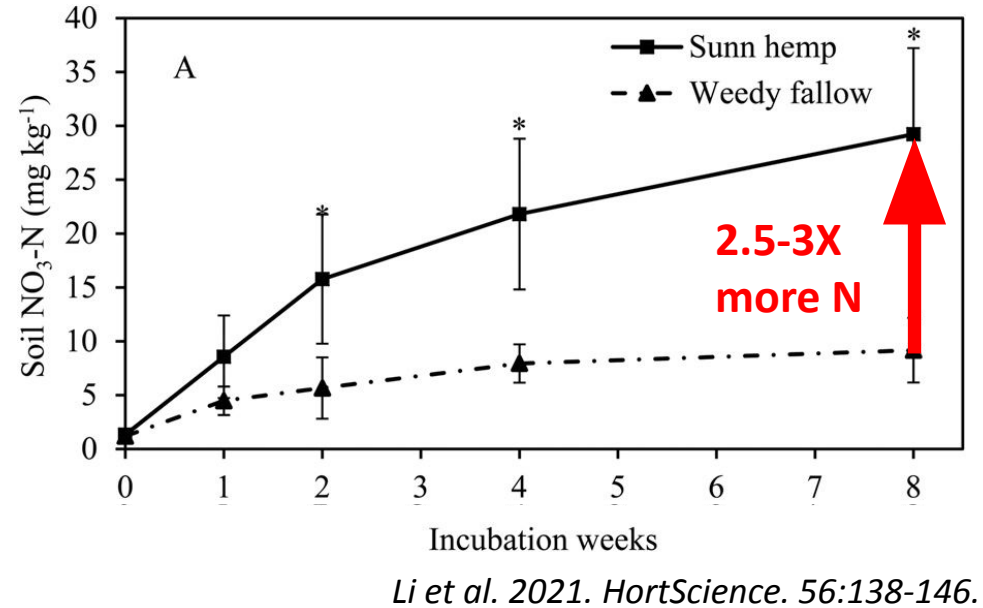
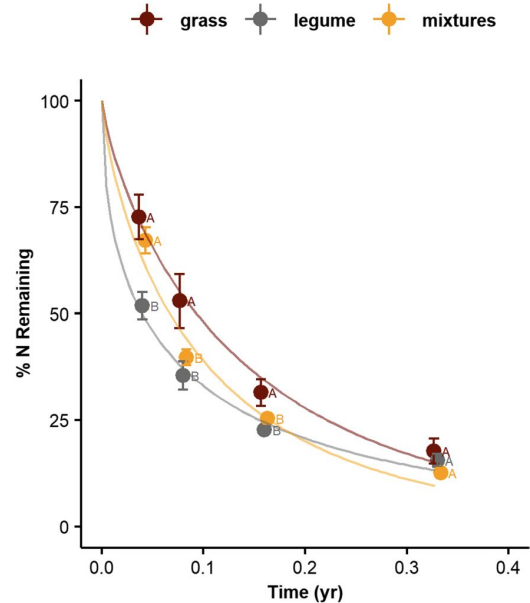
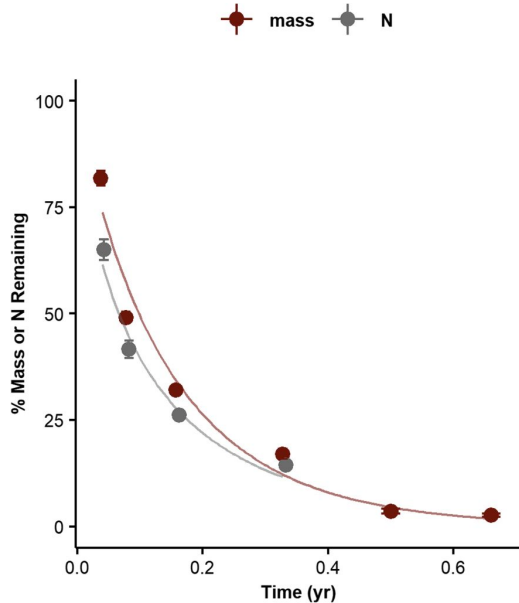
*Bukomba et al. 2025. NCAE. 131:543-555.*

Cover crop <sup>z</sup>	N accumulation (kg·ha <sup>-1</sup> )	C:N
Sunn hemp	156.5 ± 10.1 a	21:1 ± 2:1 a
Weedy fallow	44.0 ± 5.6 b	23:1 ± 2:1 a
Sunn hemp leaves	76.5 ± 5.7 b	10:1 ± 0:1 c
Sunn hmp stems	46.1 ± 4.5 c	32:1 ± 1:1 a
Sunn hemp <sup>x</sup>	122.6 ± 8.1 a	18:1 ± 1:1 b
Weedy fallow	43.8 ± 6.2 c	16:1 ± 5:1 b

*Modified from Li et al. 2021. HortScience. 56:138-146.*

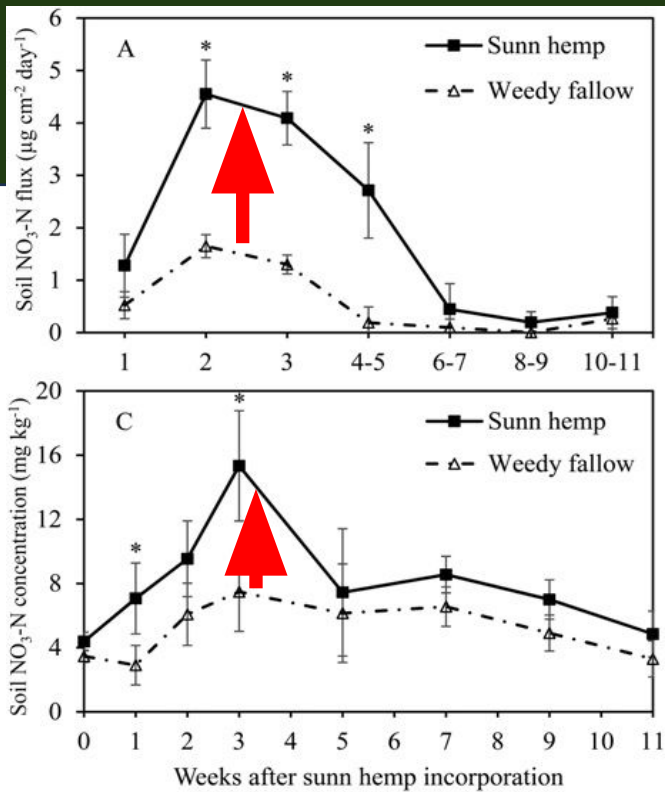
# Step 2a: N release from residues

- N release can be measured via
  - Lab incubations
  - Litter bags

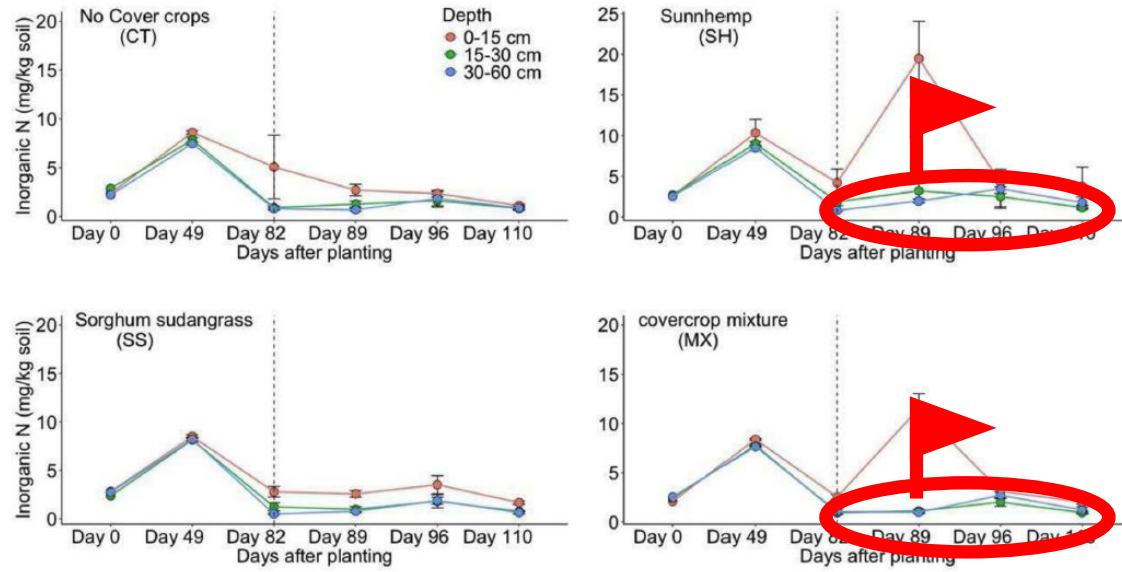


Nyabami et al. 2023. *Plant and Soil*. 492:399-412.

# Step 2b: Soil N cycling



Li et al. 2021. HortScience. 56:138-146.

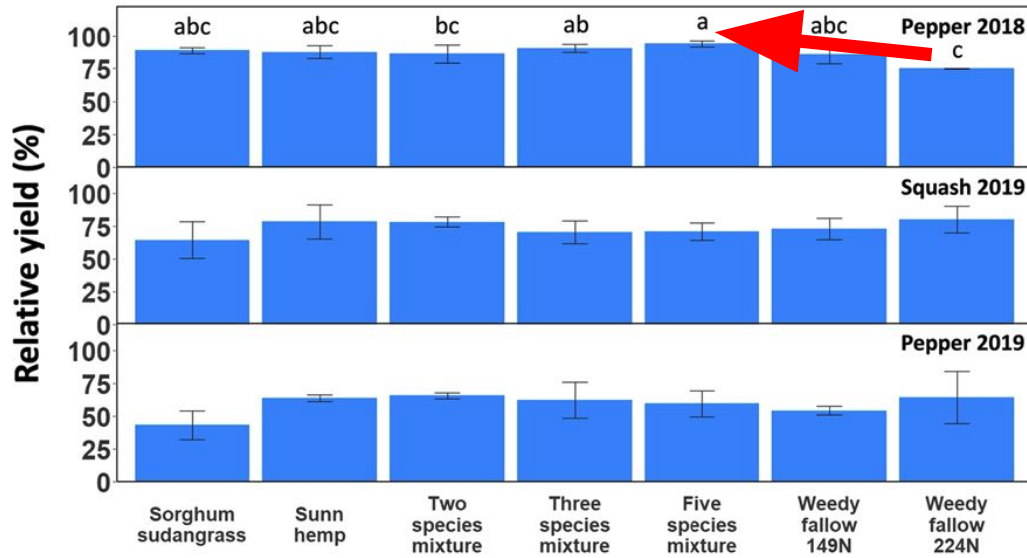


Bukomba et al. 2025. NCAE. 131:543-555.

- Greater soil N after sunn hemp
- Similar patterns with concentrations or buried resins

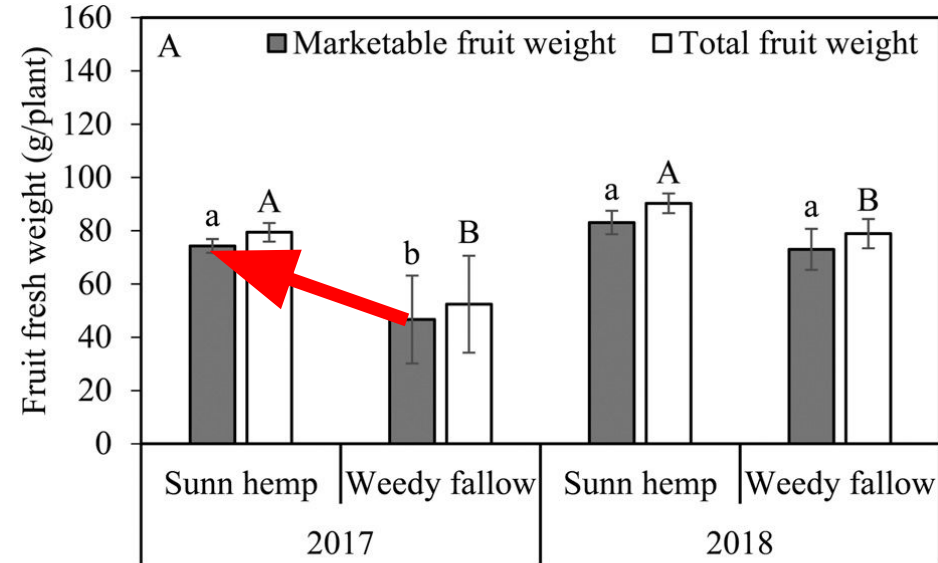
- Greater soil N after sunn hemp or mixture
- Limited N accumulation at depth
  - Limited leaching?

# Step 3a: Yield effects



Allar and Maltais-Landry. 2022. NCAE. 122:119-138.

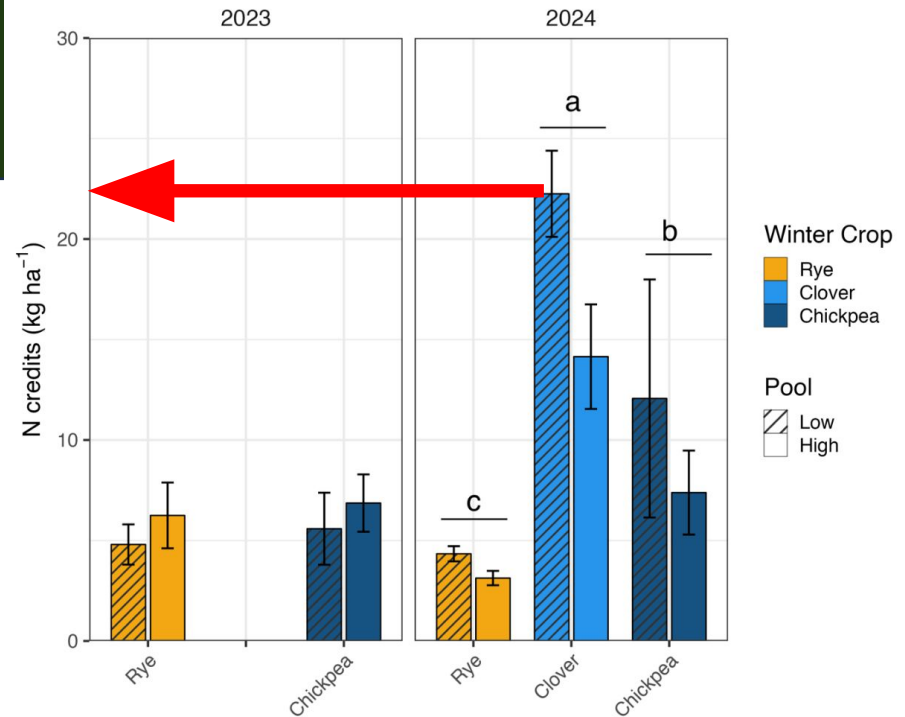
- Greater yields for pepper 2018, but only with 5-species mixture
- Sorghum has negative yield trends



Li et al. 2021. HortScience. 56:138-146.

- Sunn hemp increased early season strawberry yields in 2017
- Important to get economic premium

# Step 3b: N credits



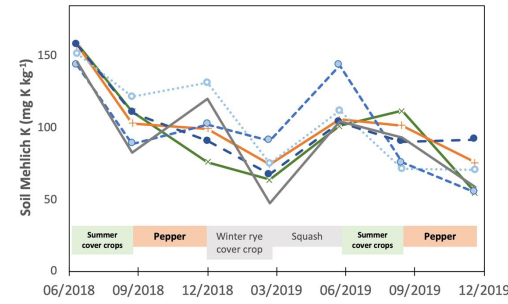
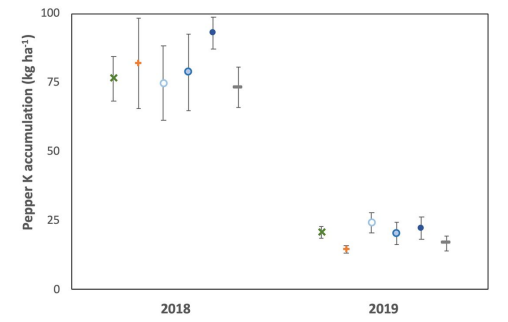
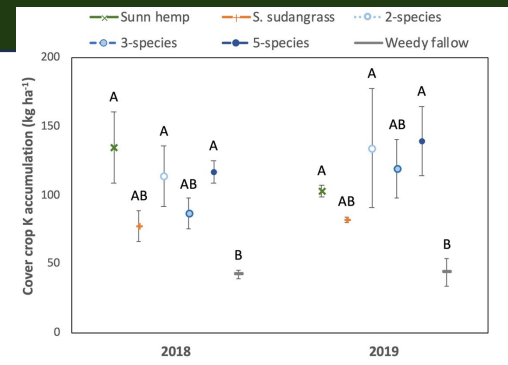
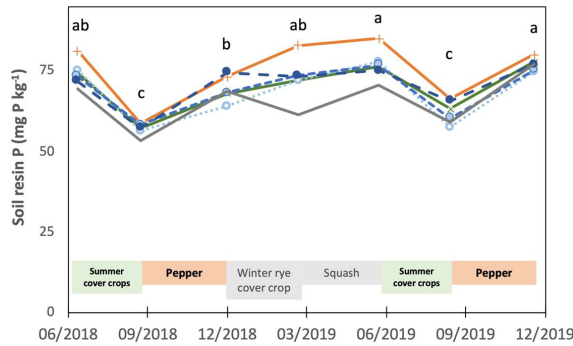
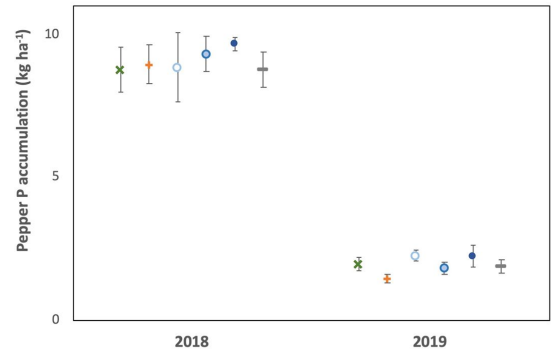
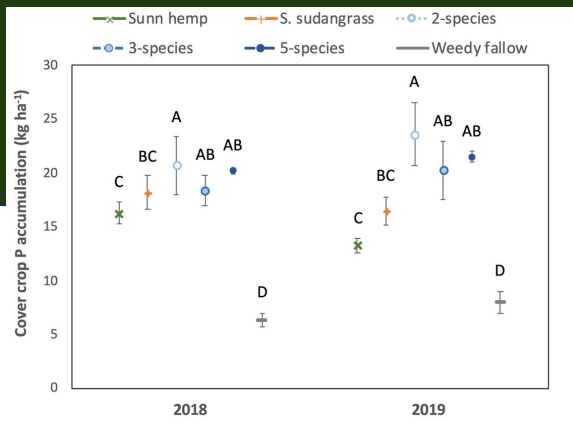
Netto-Ferreira. 2026. *Biol. Fert. Soil.* 62:203-221.

- Low percent of residue N recovered in vegetables
- <15% for pepper & <12% for squash

- Greater N credit to corn for clover (and chickpea) than rye
- Pretty low (20 lb N ac<sup>-1</sup> or less)
- High recovery in soil (esp. rye)

# What about other nutrients?

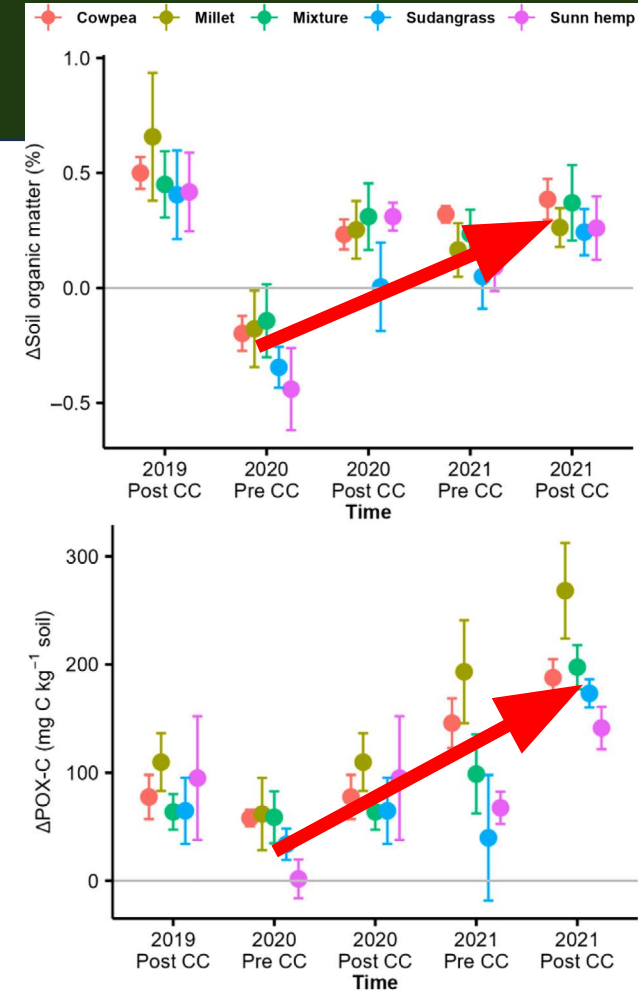
- Significant amounts of P, K accumulated in biomass
- Not recovered in pepper
- Potentially some P retention with sorghum sudangrass



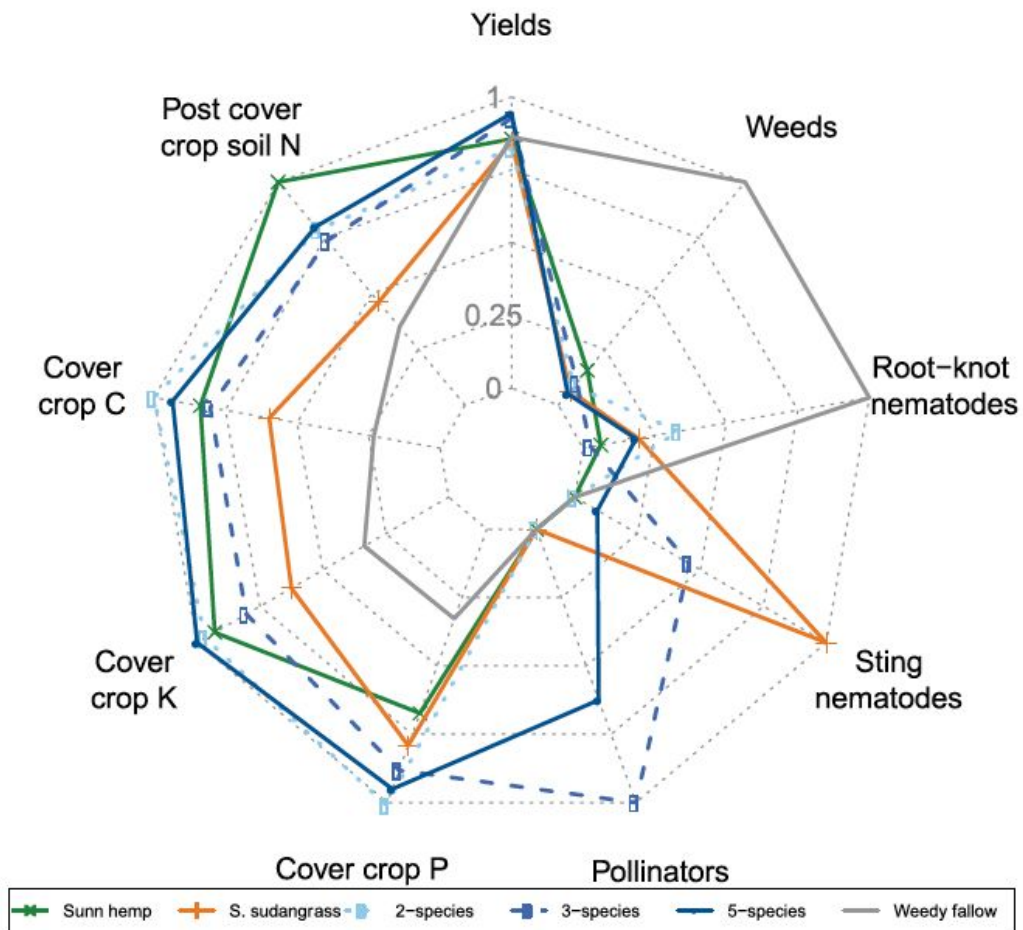
Allar et al. 2023. *Front. Sust. Food Syst.* 7:1148866.

# Other cover crop benefits

- Cover crops provide soil health/C benefits
- Weed suppression, linked to biomass
- Other benefits: nematodes, erosion, etc.



# Cover crops as multifunctional crops



# Summary

- Cover crops can accumulate large amounts of N
  - Often, greater soil N availability after termination (esp. legumes)
  - Limited impacts on subsequent crop (yield, N credit)
- Potentially some benefits for other nutrients like P and K
- Cover crop benefits are most likely
  - Stackable with other practices (e.g., 4Rs) for N reductions
  - Stackable for multiple benefits beyond nutrients

# Acknowledgements

- Graduate students, postdocs, technical support crew
- Farm crews and collaborating farmers
- Funding provided by Southern SARE (GS22-262, LS21-353) and USDA-NIFA (OREI: 2020-51300-32184)



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