

The Century Project: 25 Years

An aerial photograph of a vast agricultural landscape. The fields are divided into numerous rectangular plots, some of which are planted with green crops, while others are bare or have a golden-brown hue, possibly indicating a different crop or stage of growth. A dirt road runs through the center of the field, and a small cluster of farm buildings is visible on the right side. The sky is clear and blue.

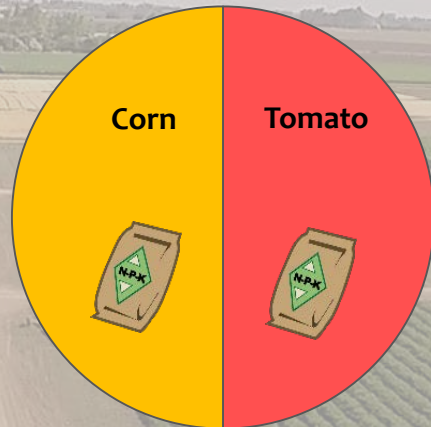
Productivity, Nutrient Management,
Soil Health

Nicole Tautges, Israel Herrera, Kate Scow – Russell Ranch
University of California Davis

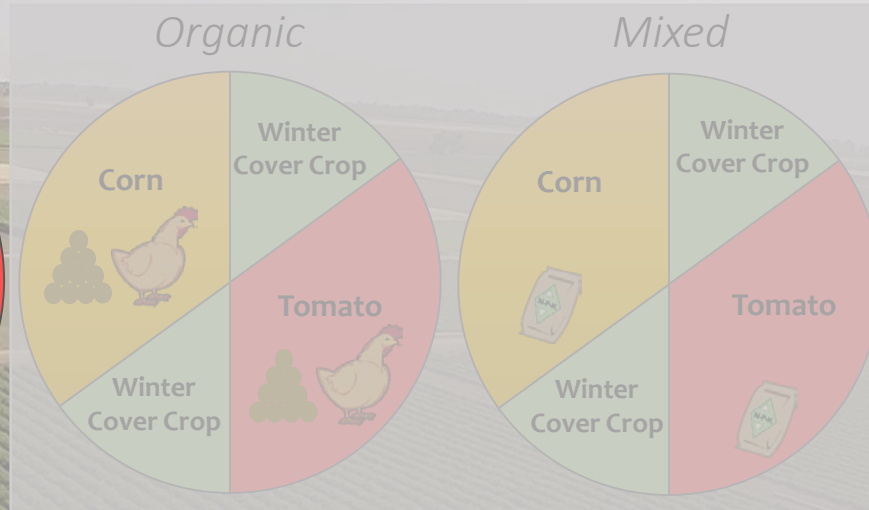
Russell Ranch Sustainable Ag Facility

- Tomato – Maize cropping systems since 1994

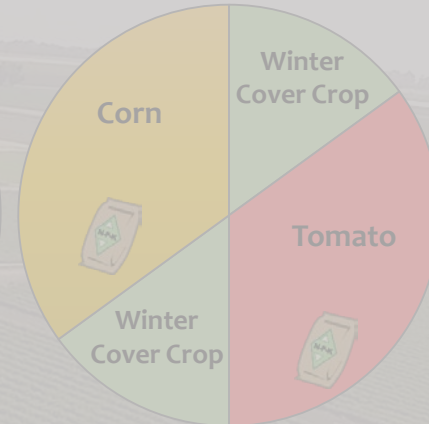
Conventional



Organic



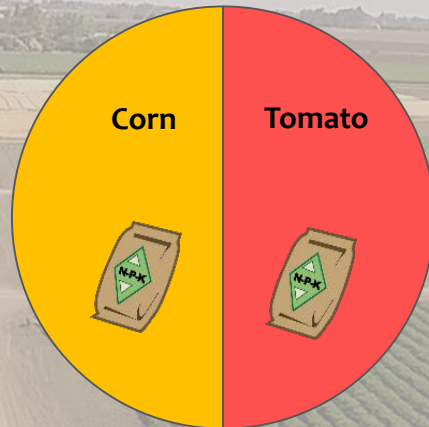
Mixed



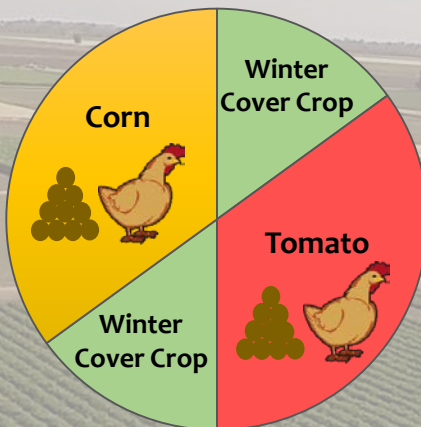
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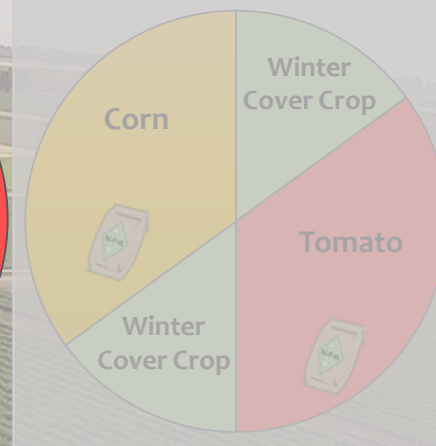
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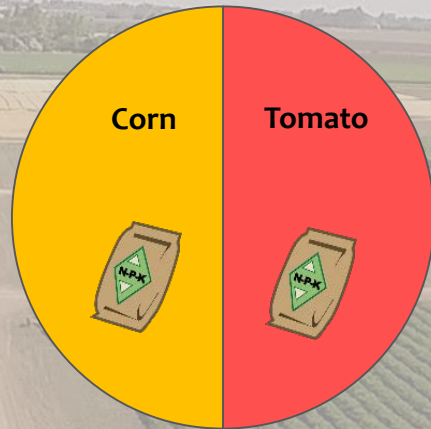
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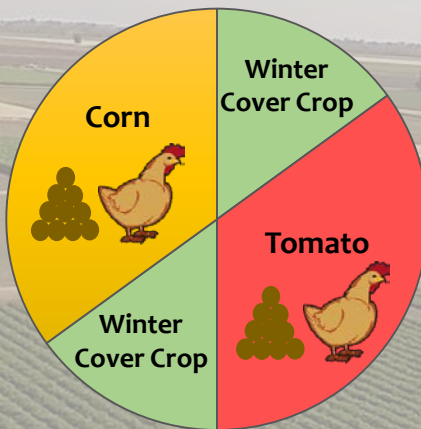
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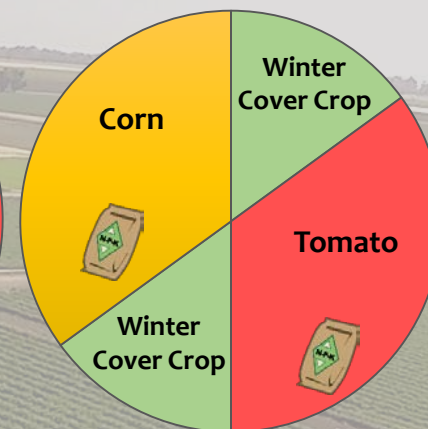
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Mixed

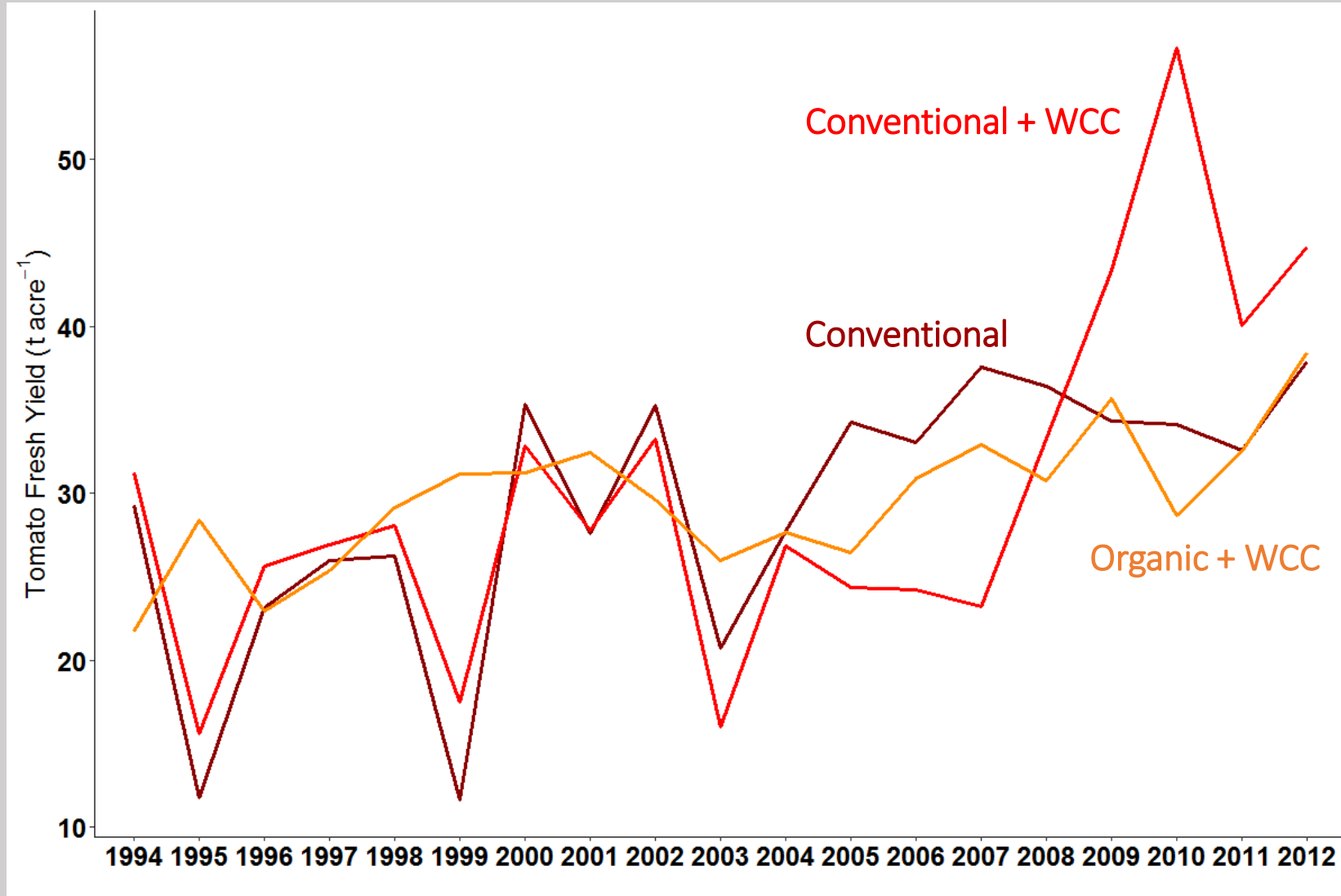




Productivity

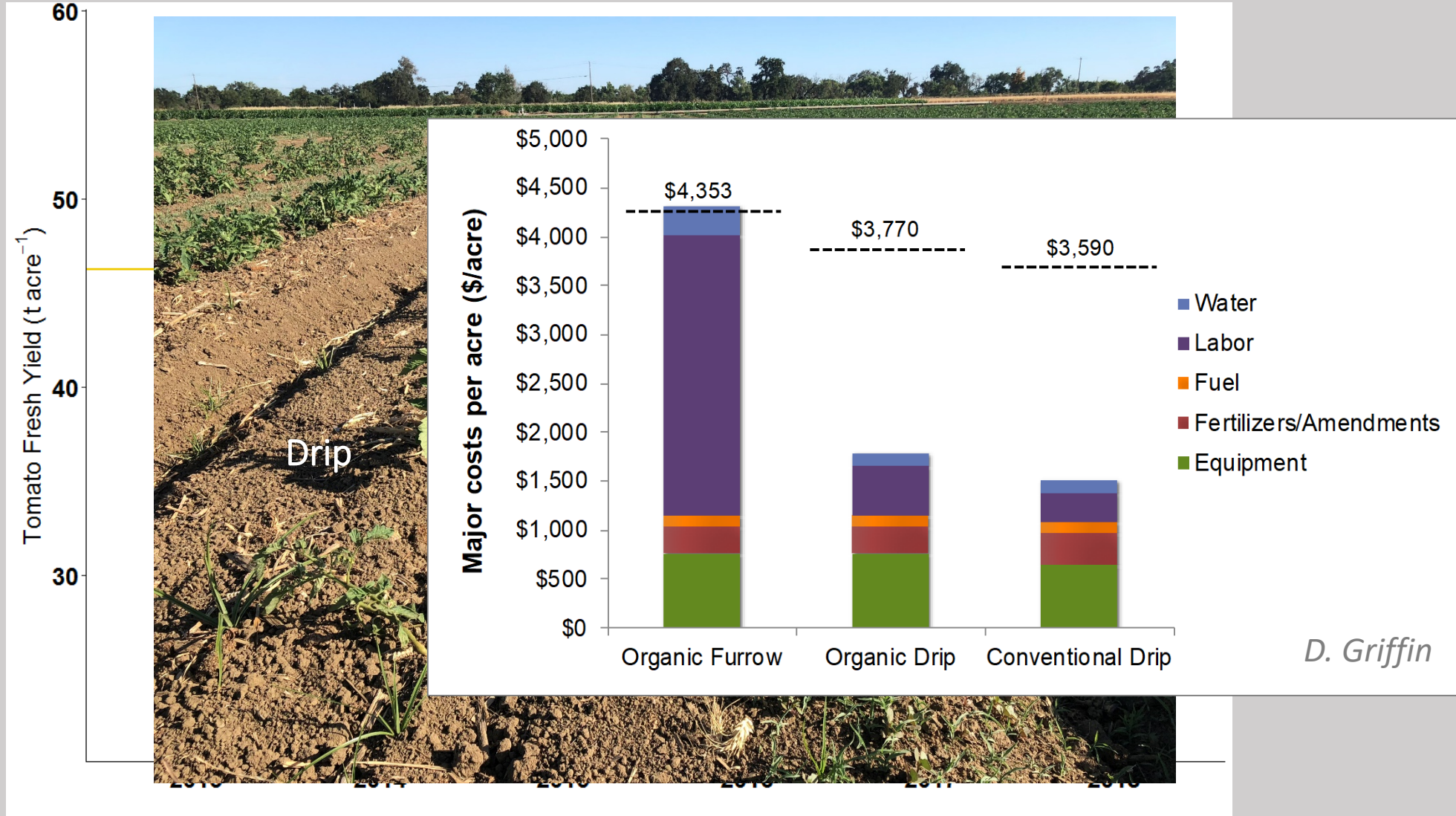
Long-Term Yield Trends: Flood Irrigation

No statistically significant difference

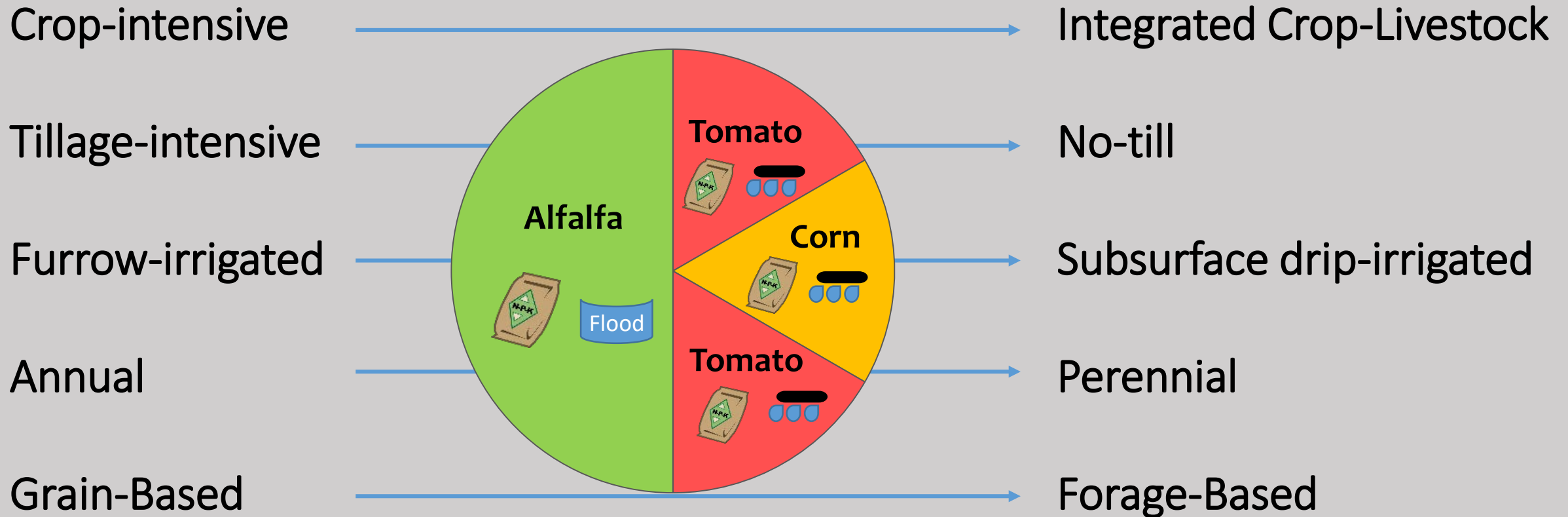


Long-Term Yield Trends: Drip Irrigation

- Conventional and Conventional + WCC similar
- Organic 9 t/acre lower on average

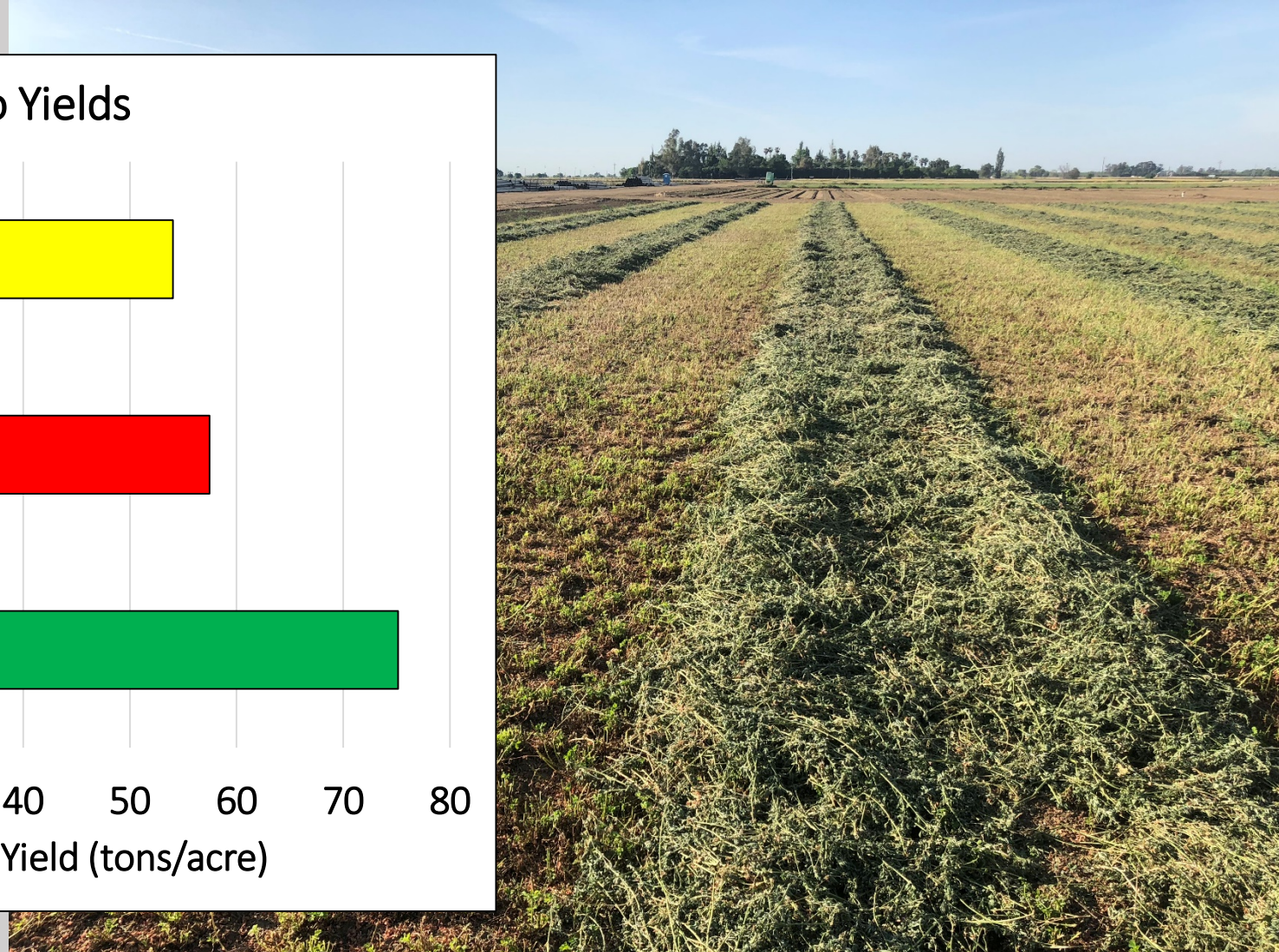
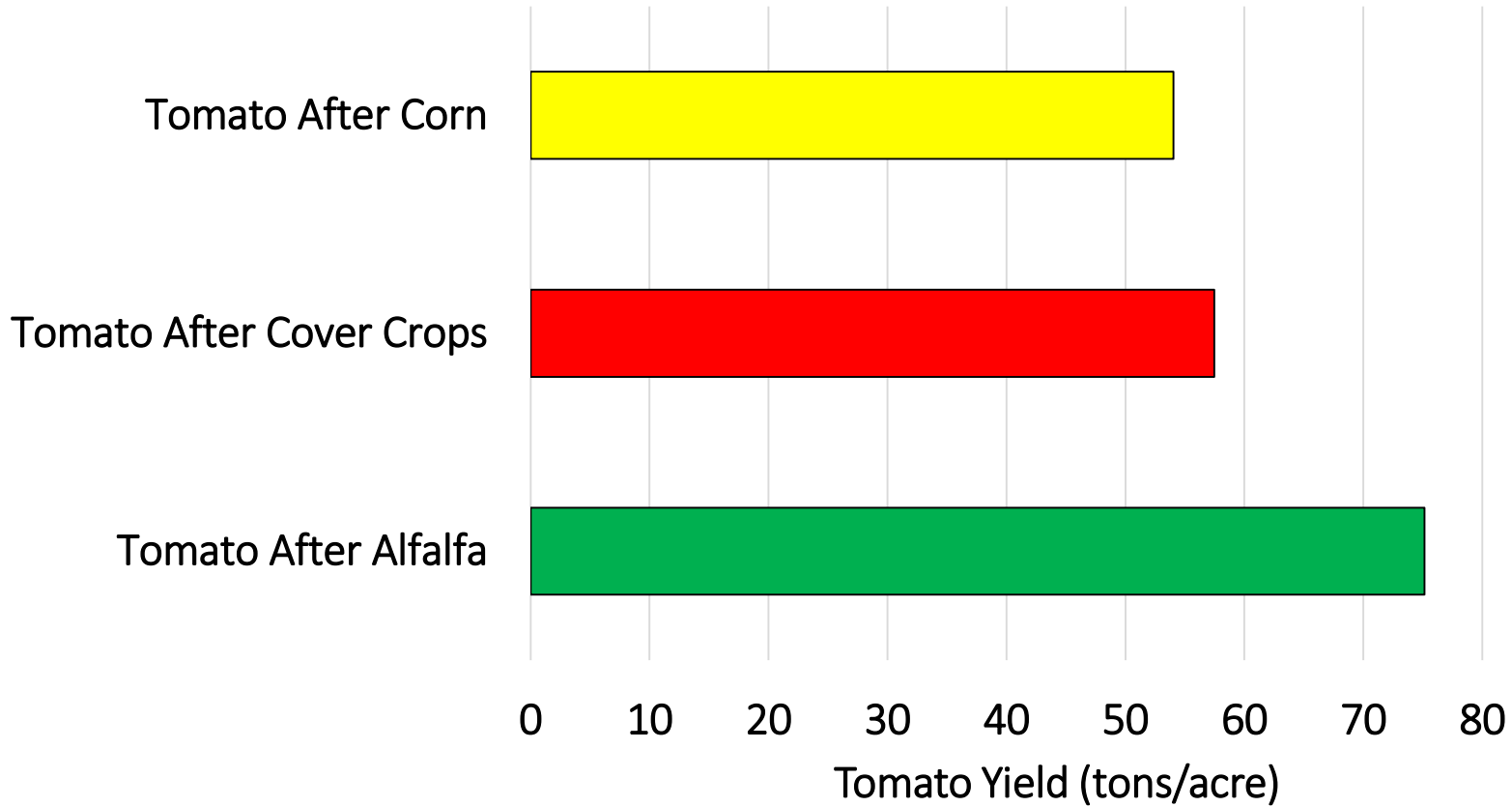


Alternative Rotations: Incorporating Perennials



Rotation Effects on Yields

Rotation Effects on Tomato Yields

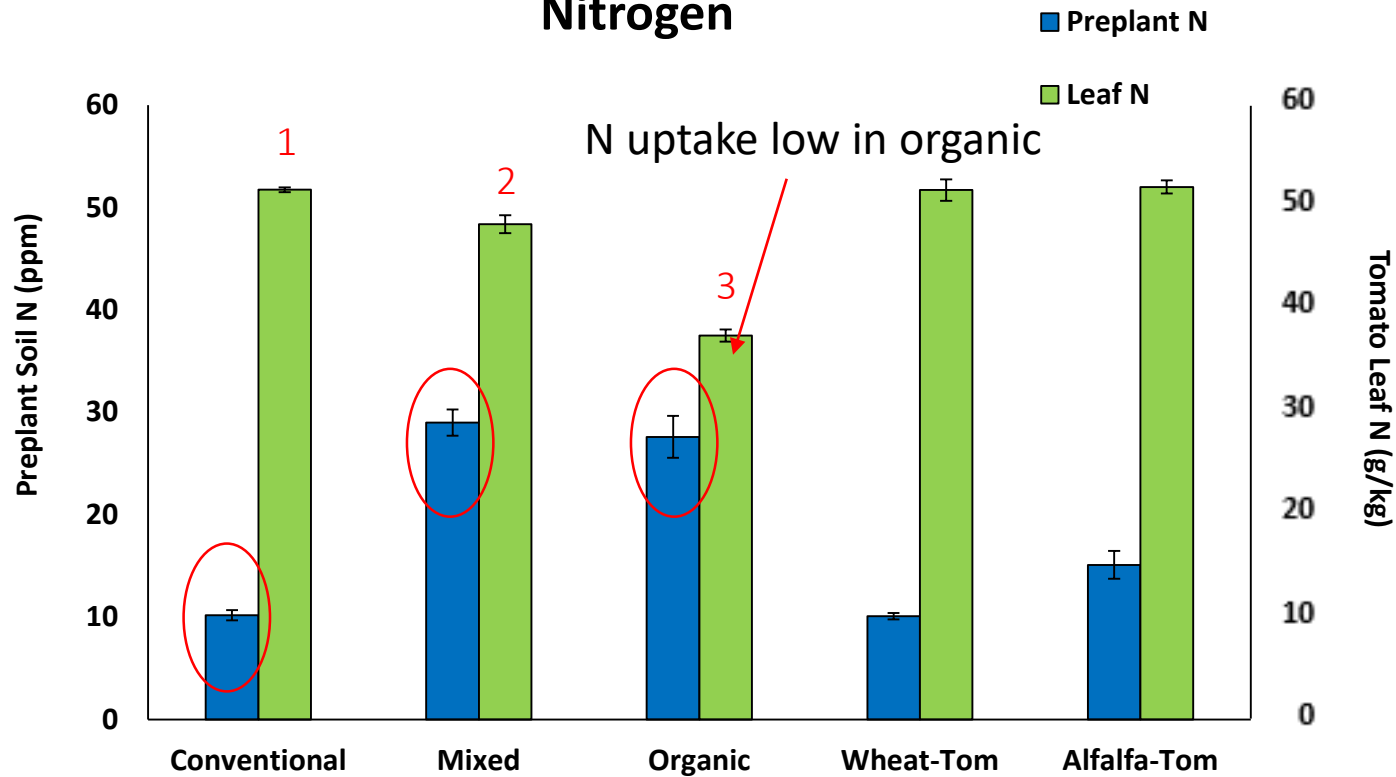


Nutrient Management

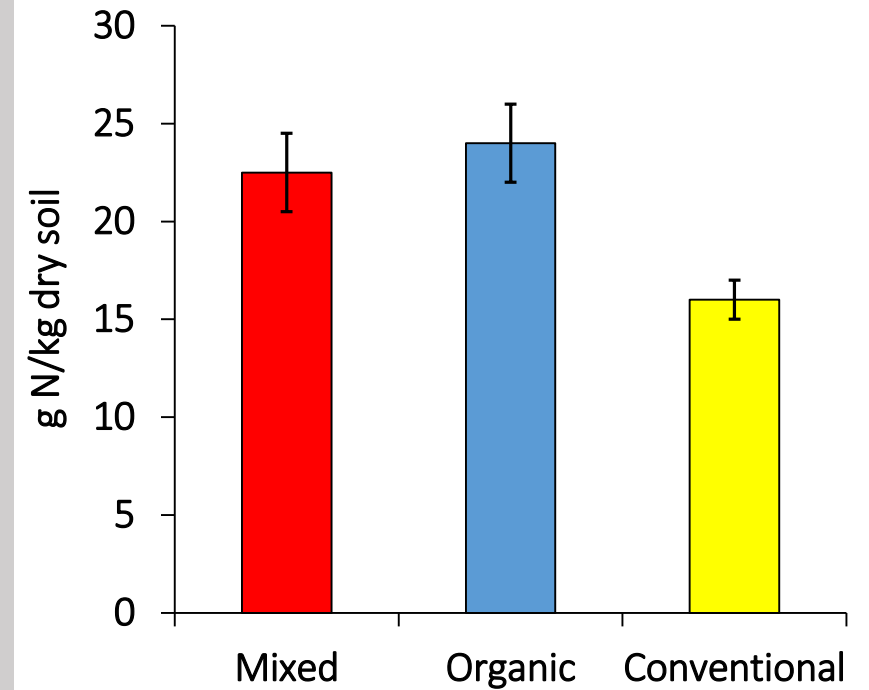


Nitrogen Cycling

Nitrogen

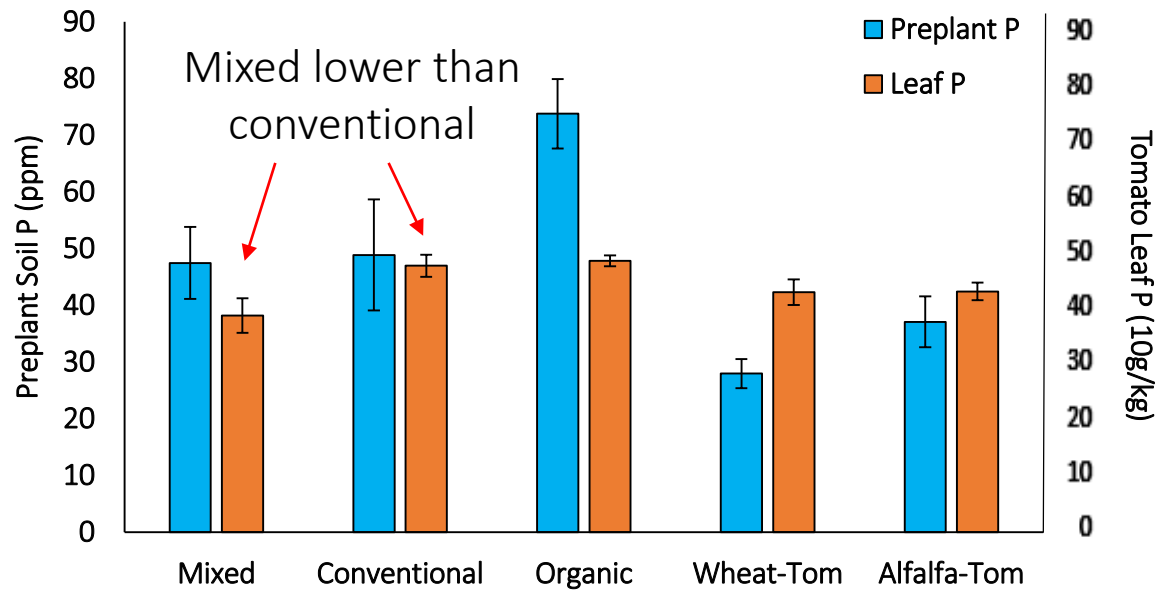


Microbial Nitrogen (0-8 inches)

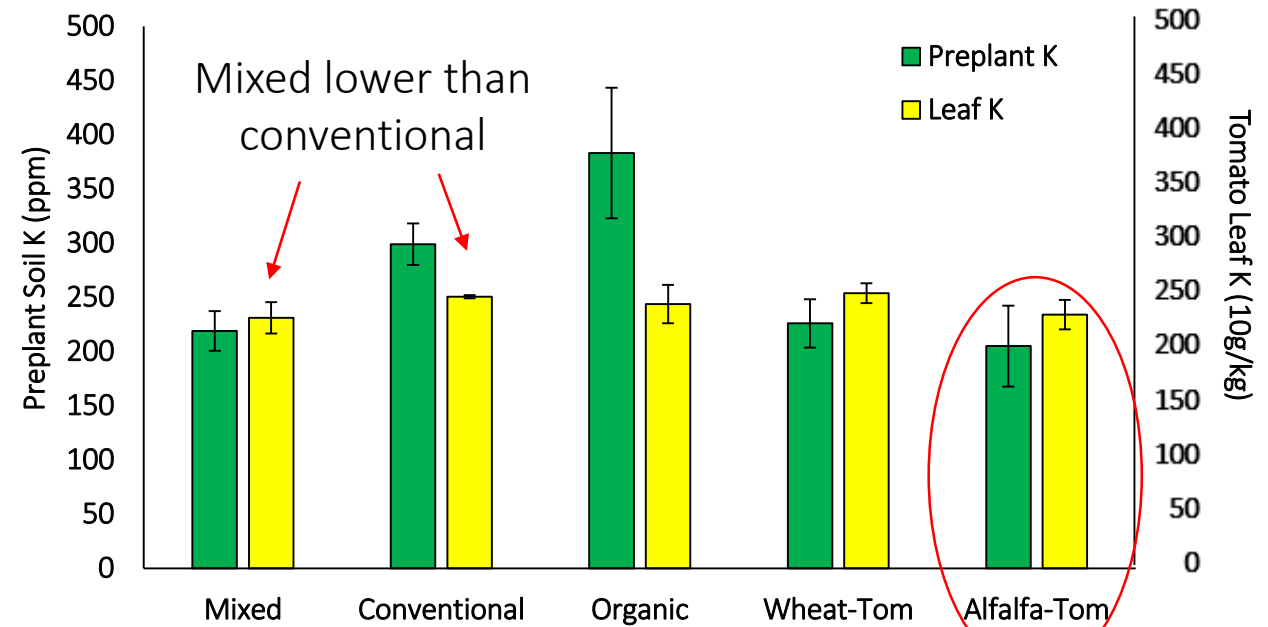


P & K Cycling

Phosphorus



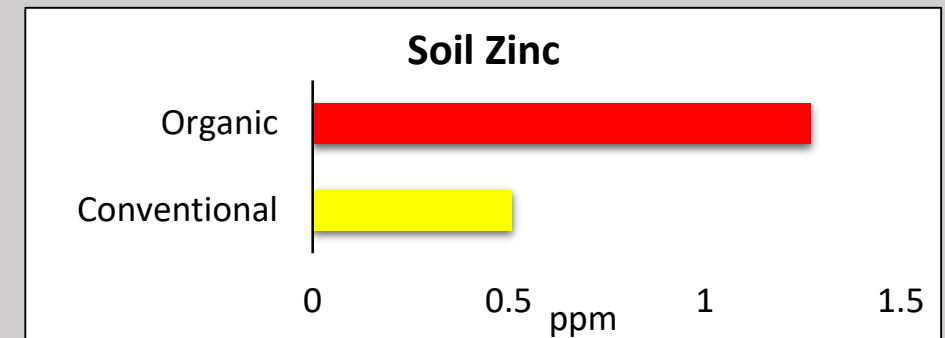
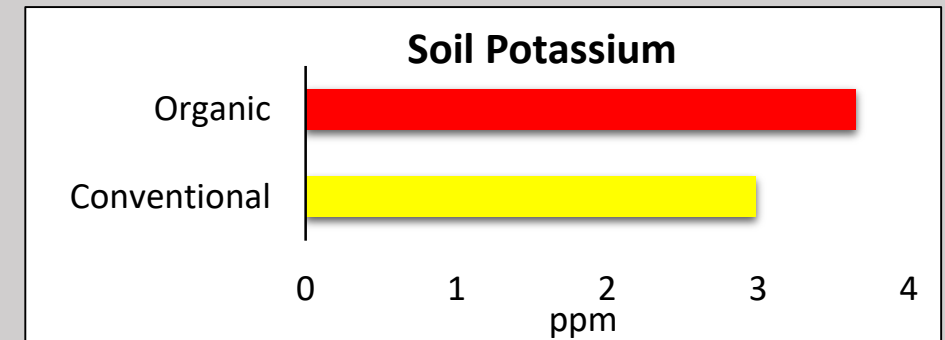
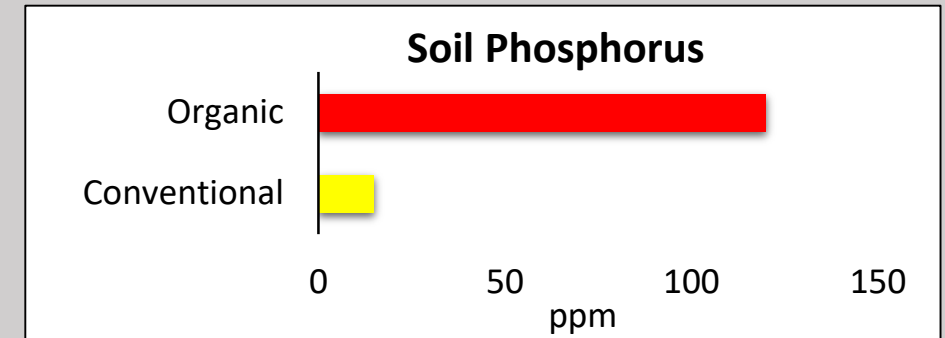
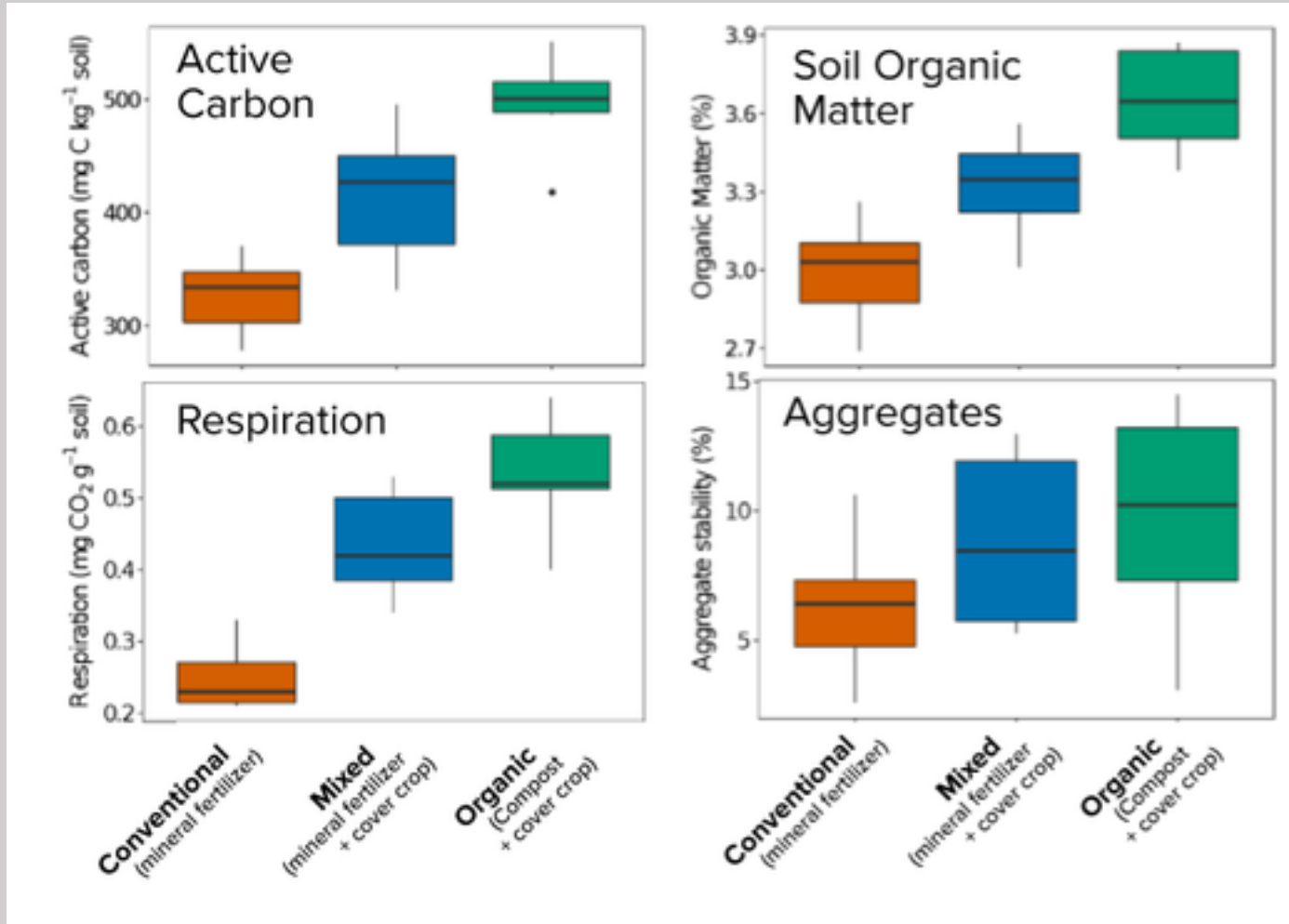
Potassium



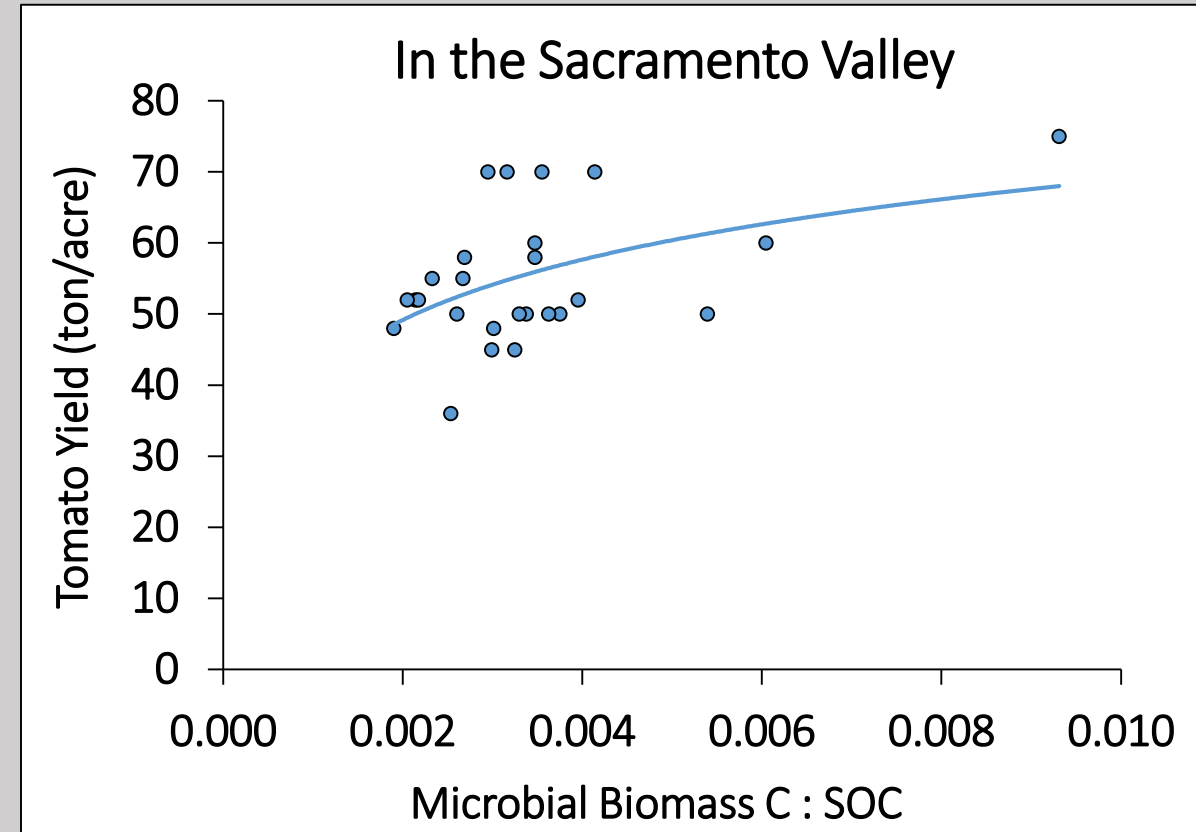
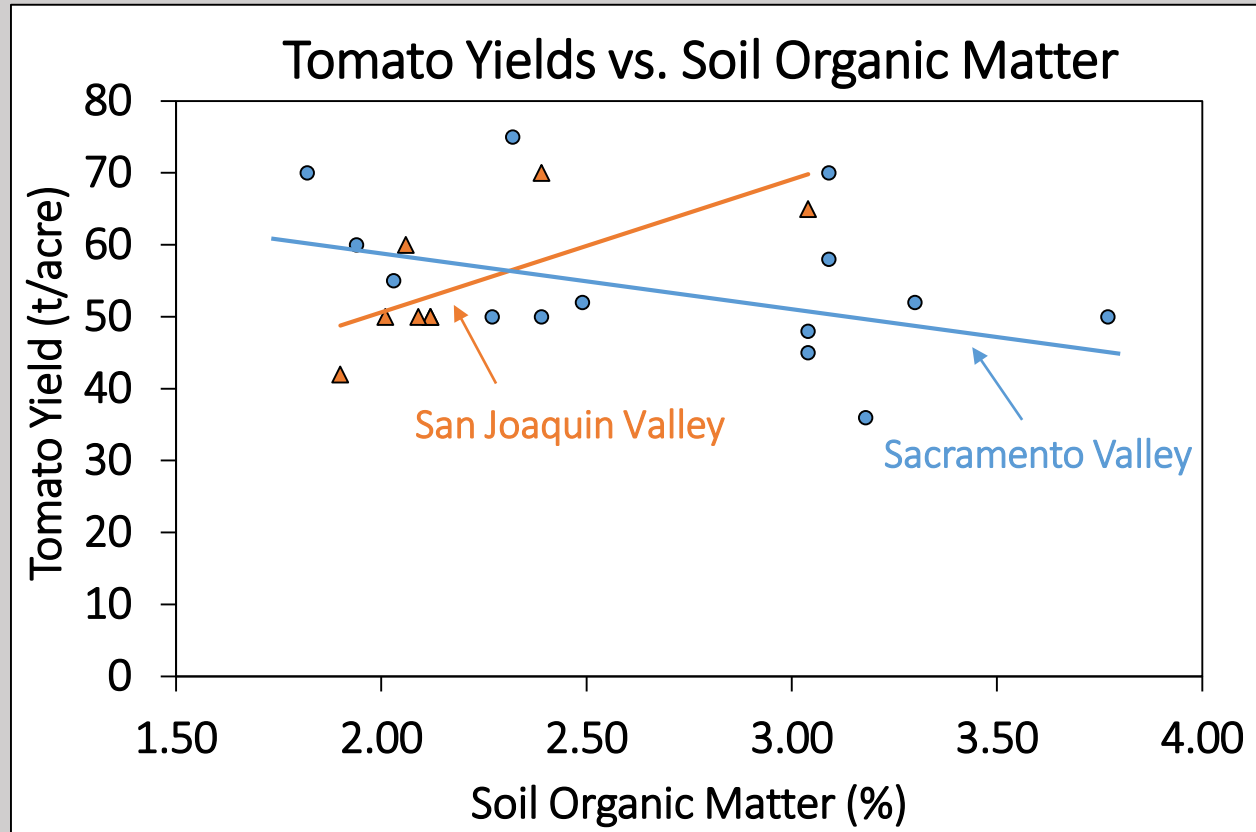


Soil Health

Soil Health Indicators Increase with WCC and Compost



Soil Organic Matter Correlated with Increased Yields



SUMMARY

- Maintaining productivity with compost and subsurface drip is challenging; in-season N may be needed
 - 40% yield boost – alfalfa rotation effect
- Incorporating WCC could increase NPK input requirements
- Compost and cover crops increased soil microbial populations, soil aggregation, and soil organic matter

THANK YOU

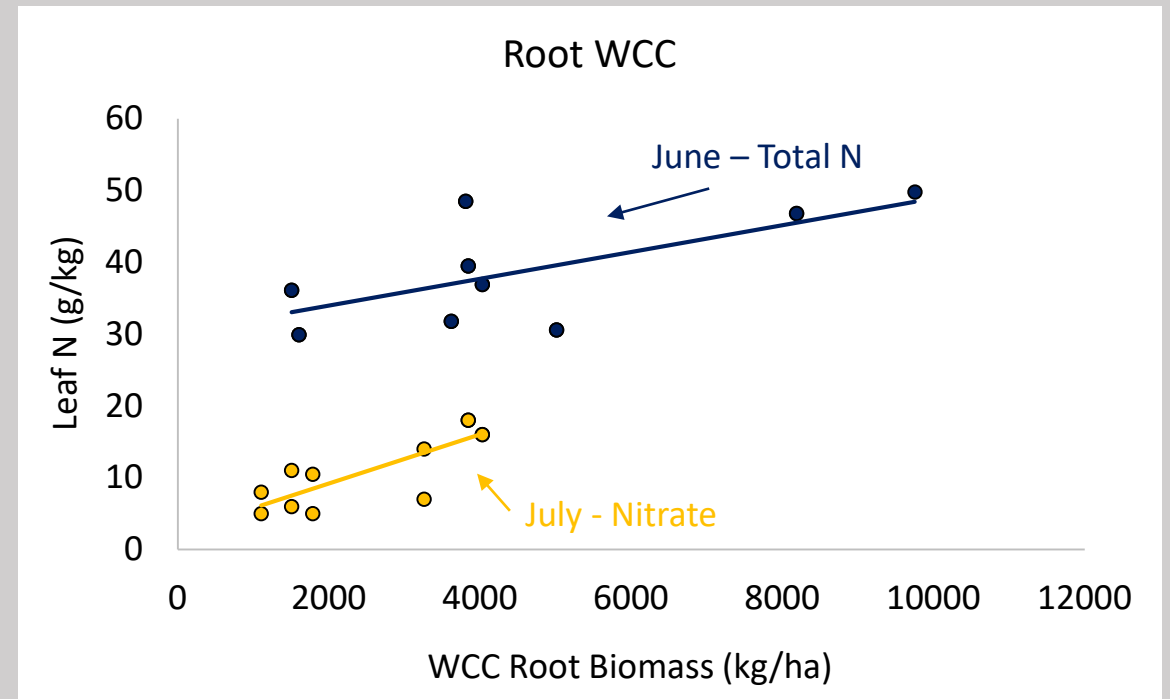
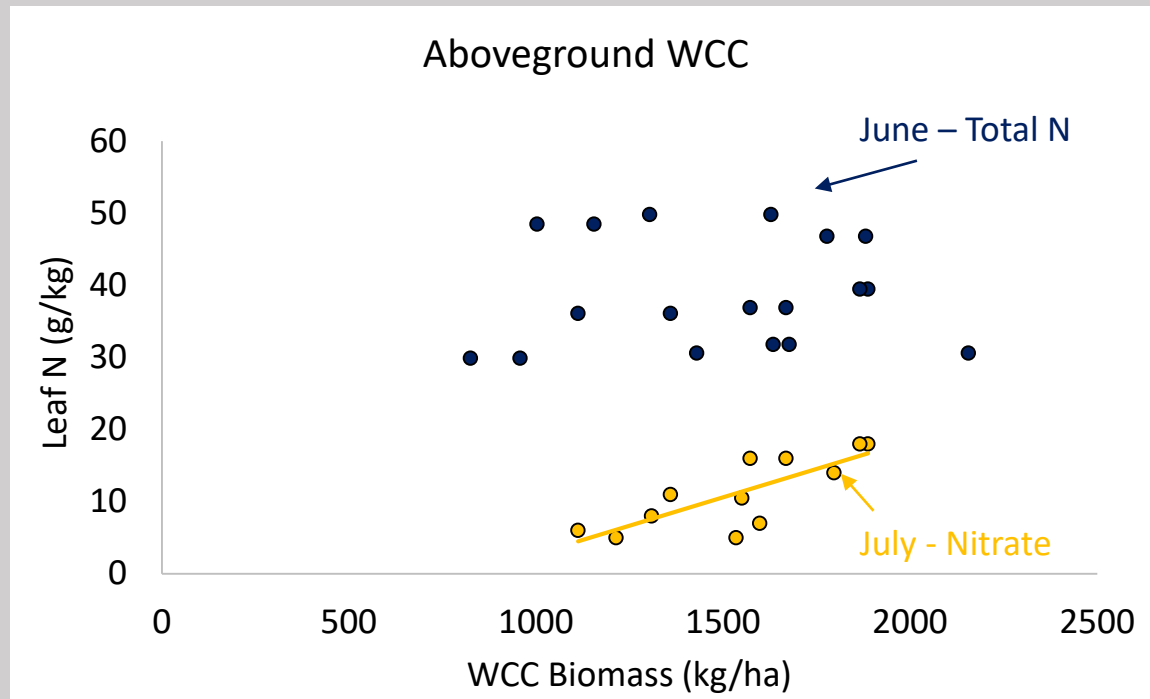
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SUSTAINABILITY INSTITUTE



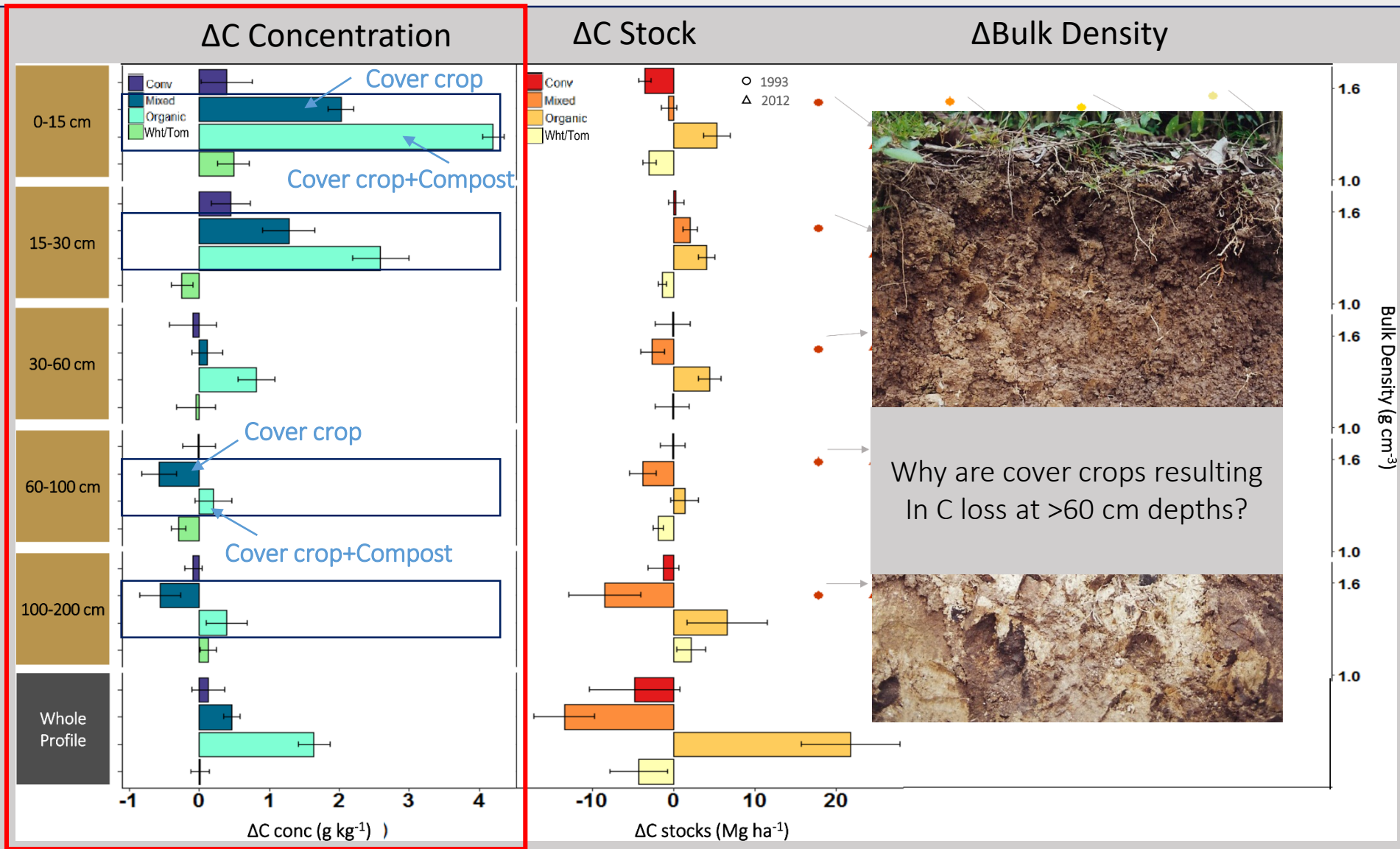
@russellranchucd

<http://asi.ucdavis.edu/programs/rr>

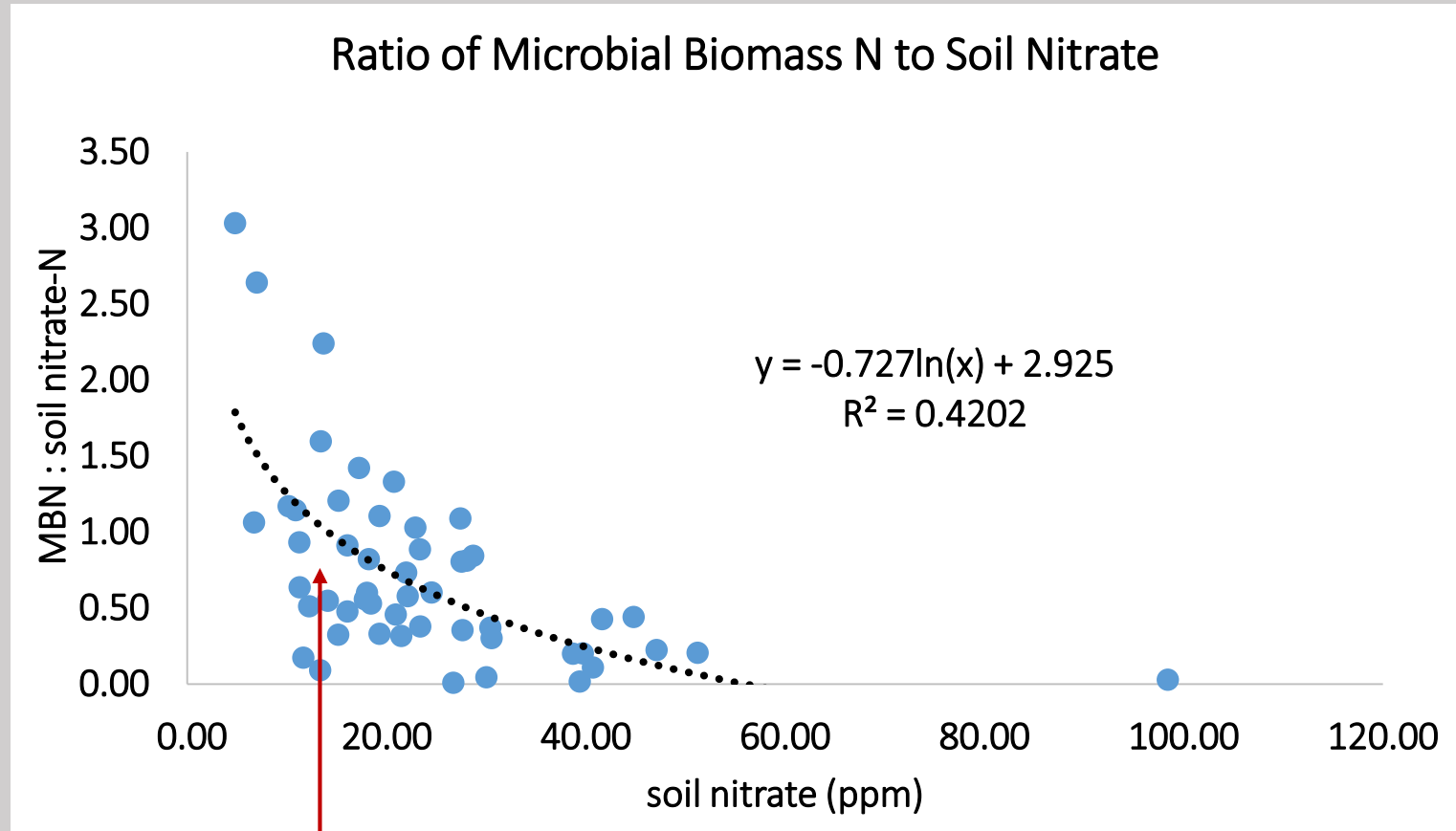
Nitrogen Cycling



Soil Carbon Sequestration: $\Delta\text{Soil } C_{t19-t0}$

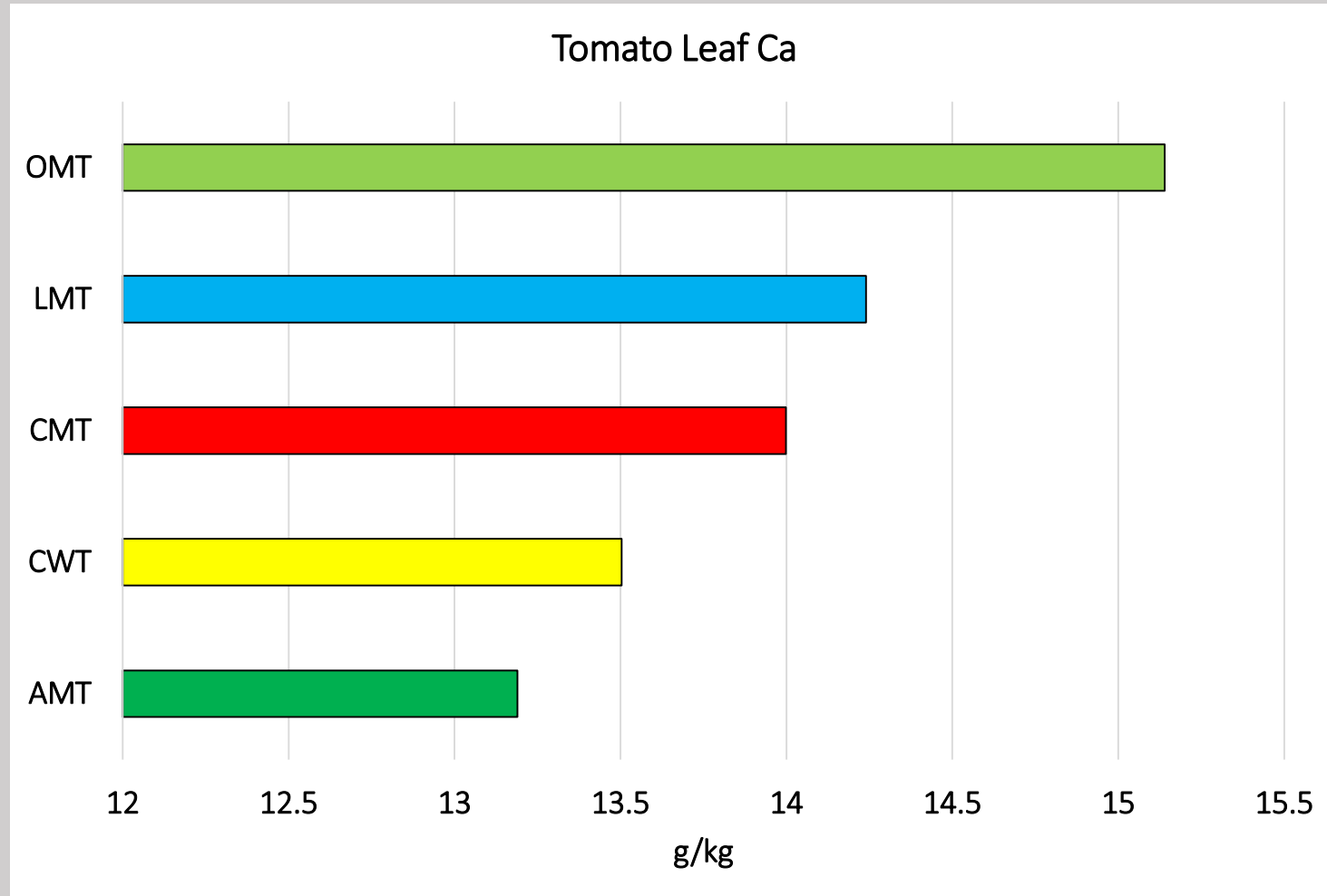


Nitrogen Cycling



Ratio of microbial biomass nitrogen (MBN) and soil nitrate (MBN/NO_3), versus soil nitrate levels, across all soils measured. There was a logarithmic relationship observed between these parameters; equation shown on figure. The red arrow indicates the soil nitrate level at which competition for nitrate between soil microbes and crop plants likely decreases.

Calcium Cycling



Turn of the Century

Sustainable Agriculture Research and Education Program

1990 Proposals for Long-Term Sites

Cover Page

Project Title

Long Term Research on Agricultural Systems: Crop Diversity and Input Level as Determinants of Function and Evolution of the Agroecosystem

Principal Investigator

“annual, perennial, and rangeland”

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Ted Hsiao, Dept. LAWR, UCD
Tom Kearney, UC Coop Ext., Yolo County
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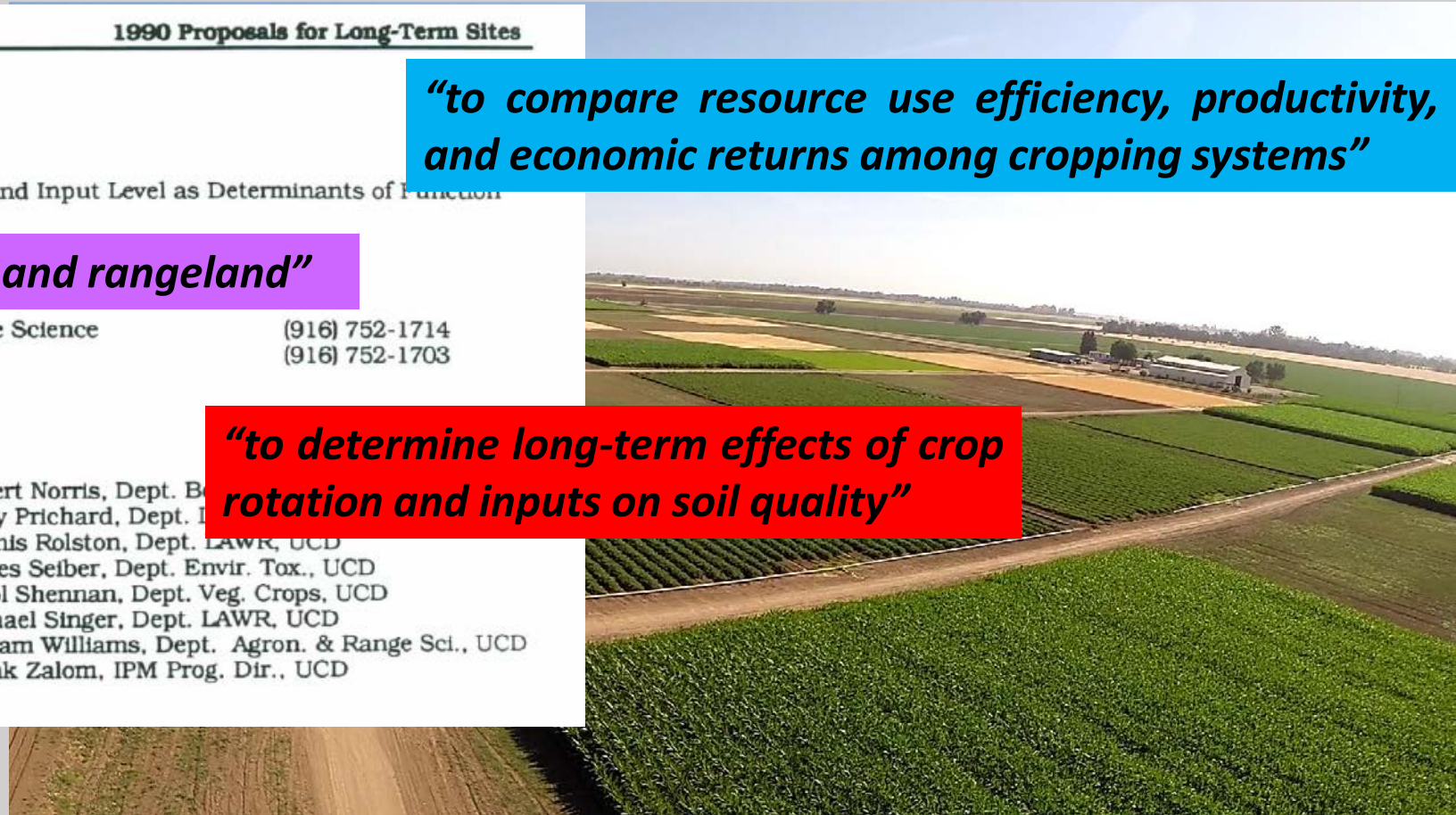
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“to compare resource use efficiency, productivity, and economic returns among cropping systems”

“to determine long-term effects of crop rotation and inputs on soil quality”

“to determine how soil quality affects pollution movement”

“use Russell Ranch as an educational facility”



Turn of the Century

Cash Crop Base	Management	Crop Rotation	Irrigation	Fertilizer Source	Annual N Rate
					kg ha ⁻¹
Tomato	<i>Conventional</i>	Tomato – Maize	Furrow	Chemical Fertilizer	168
	<i>Mixed</i>	WCC/Tomato – WCC/Maize	Furrow	Chemical Fertilizer + Winter Cover Crop	168
	<i>Organic</i>	WCC/Tomato – WCC/Maize	Furrow	Poultry Manure Compost + Winter Cover Crop	150-200†
	<i>Conventional</i>	Tomato – Wheat	Furrow	Chemical Fertilizer	168
Wheat	<i>Conventional</i>	Wheat – Fallow	None	None	0
	<i>Conventional</i>	Wheat – Fallow	None	Chemical Fertilizer	146
	<i>Conventional</i>	Wheat – WCC/Fallow	None	Winter Cover Crop	0
	<i>Conventional</i>	Wheat – Fallow	Supplemental Flood	None	168
	<i>Conventional</i>	Wheat – Fallow	Supplemental Flood	Chemical Fertilizer	168



Compost Mixed Tomato-Maize Poultry Manure Compost +