Compost Application to Alfalfa

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SJC and Delta Field Crops Meeting
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UC CE

Acknowledgements

- Co-Project Leaders: Radomir Schmidt, UC Davis; Rachael Long, UCCE
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- Cooperators: Garrett Mussi and Duane Chamberlain (growers), and Suellen Witham (Westside Spreading)

Healthy Soils Program

CDFA OFFICE OF ENVIRONMENTAL FARMING & INNOVATION

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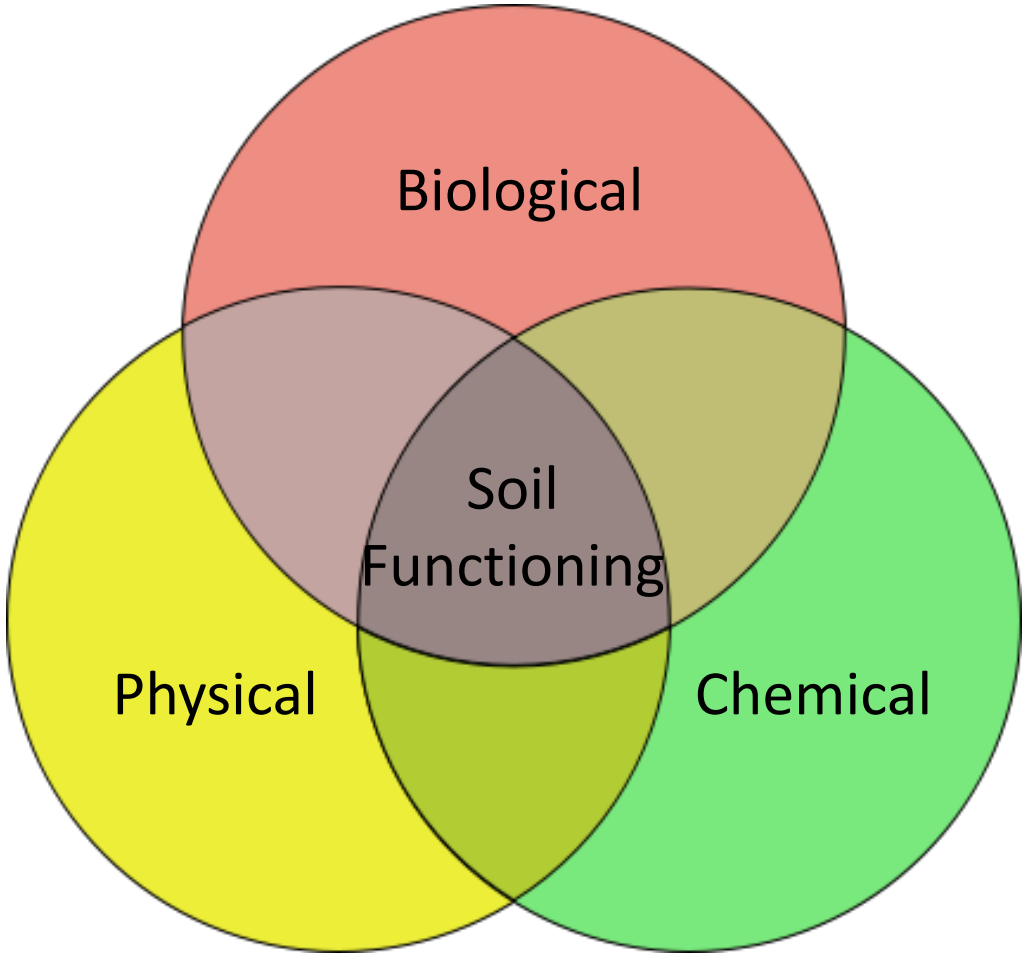
Agriculture and Natural Resources
Cooperative Extension

What is soil health, how is it influenced by land management?



Compost is decomposed organic matter from plants or animals

- Plant-derived composts have a high carbon-to-nitrogen ratio (C:N), which is the relative amount of carbon and nitrogen in the material.
- Animal-derived composts have a low C:N.
- The C:N ratio is important because it affects microbial metabolic functioning and plant-available nitrogen.

The regulatory framework for composting

- AB 1826 required businesses to recycle organic wastes and jurisdictions to set up organic waste recycling programs in order to divert green waste from landfills.
- AB 1383 established organic waste reduction targets (75% reduction by 2025, compared to 2014).
  - Also requires jurisdictions to do education and outreach.
- Green waste diversion is expected to reduce greenhouse gas emissions by 4 million metric tons per year and increase food recovery by 20 percent.
- Agricultural land could serve to receive the compost.

Project background and objectives

- Why alfalfa?
  - Large footprint on the agricultural landscape.
  - Perennial crop with a high nutrient need (particularly P and K).
  - As a ‘high-traffic’ crop, soils can have poor physical traits (e.g. compaction, water infiltration).
- Questions of interest:
  - Does green waste compost improve soil nutrient status or other soil health characteristics?
  - Does it improve alfalfa yield or quality?
  - How does compost affect greenhouse gas emissions?

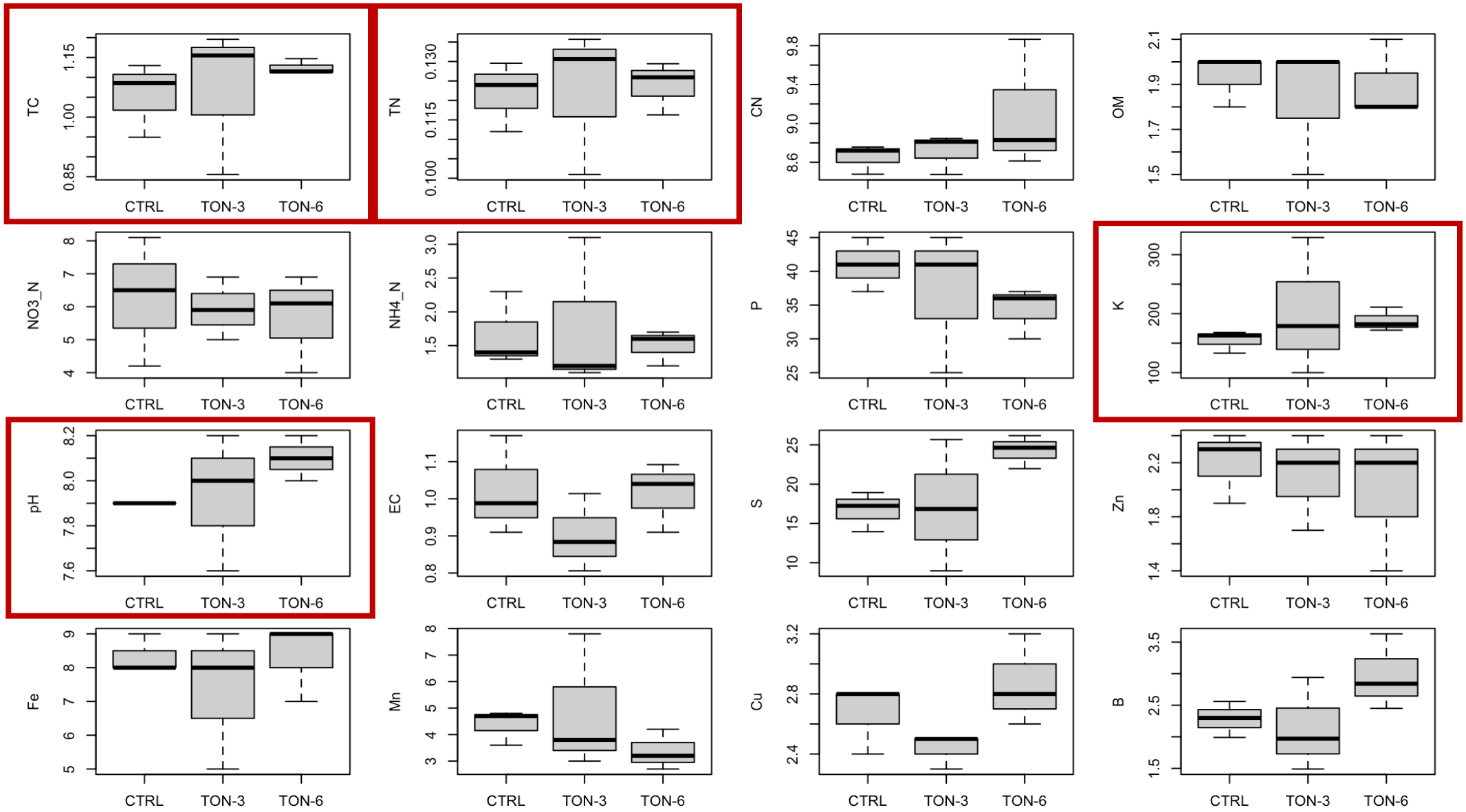
Site characteristics

- Two commercial farms
  - San Joaquin County Delta
  - Yolo County
- Soils types:
  - SJ: mucky clay loam with high organic matter (~8%)
  - Yolo: mineral soil with high clay content (~50%)
- Second-year stands at the start of the project.

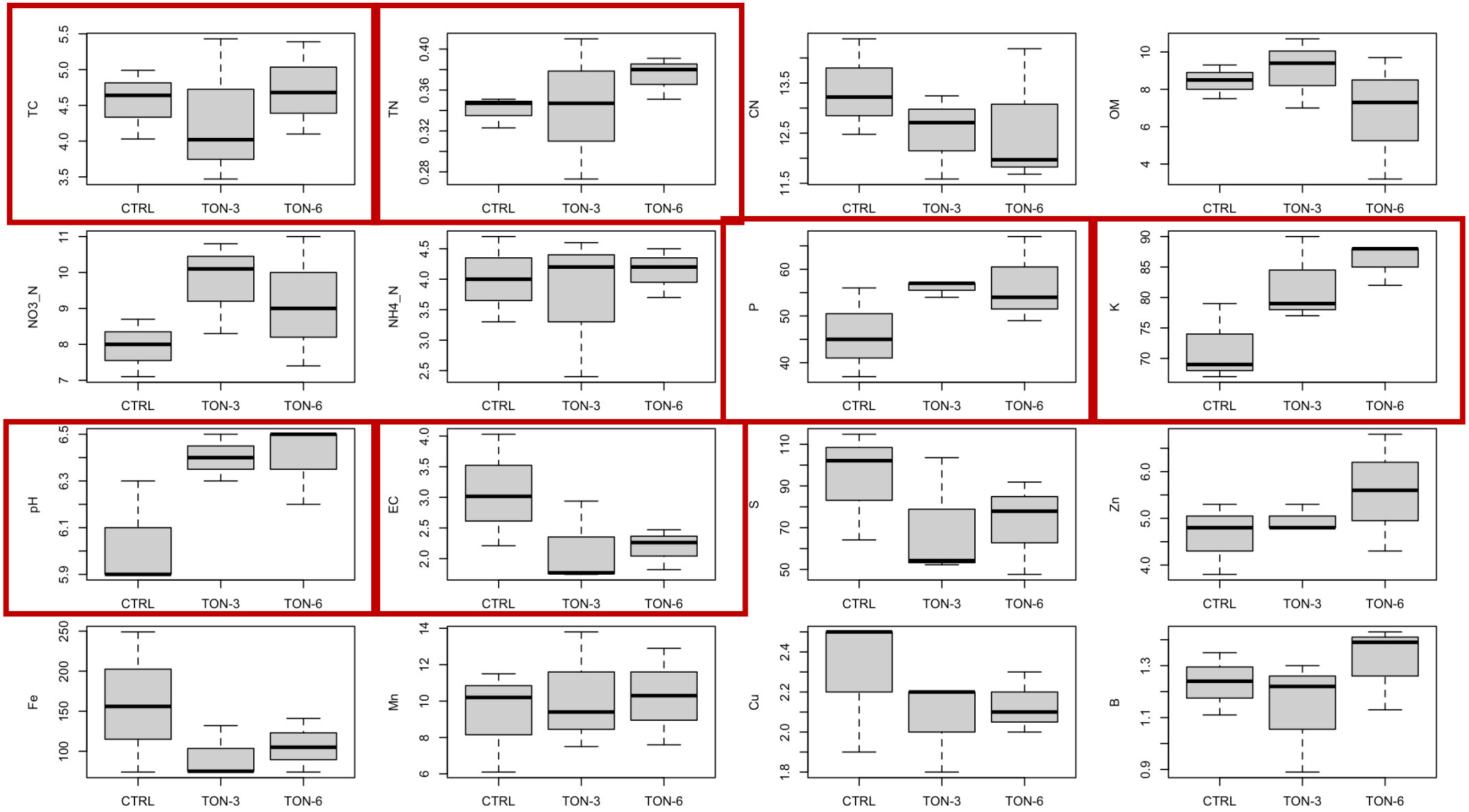
Trial design

- **Treatments:** Green waste compost treatments applied at 3 or 6 tons/acre vs. no compost control
- **Design:** 3 replicate blocks over 20 acres in commercial fields
- **Timing:** Surface-applied to established alfalfa in the fall/winter season (2020, 2021, 2022)

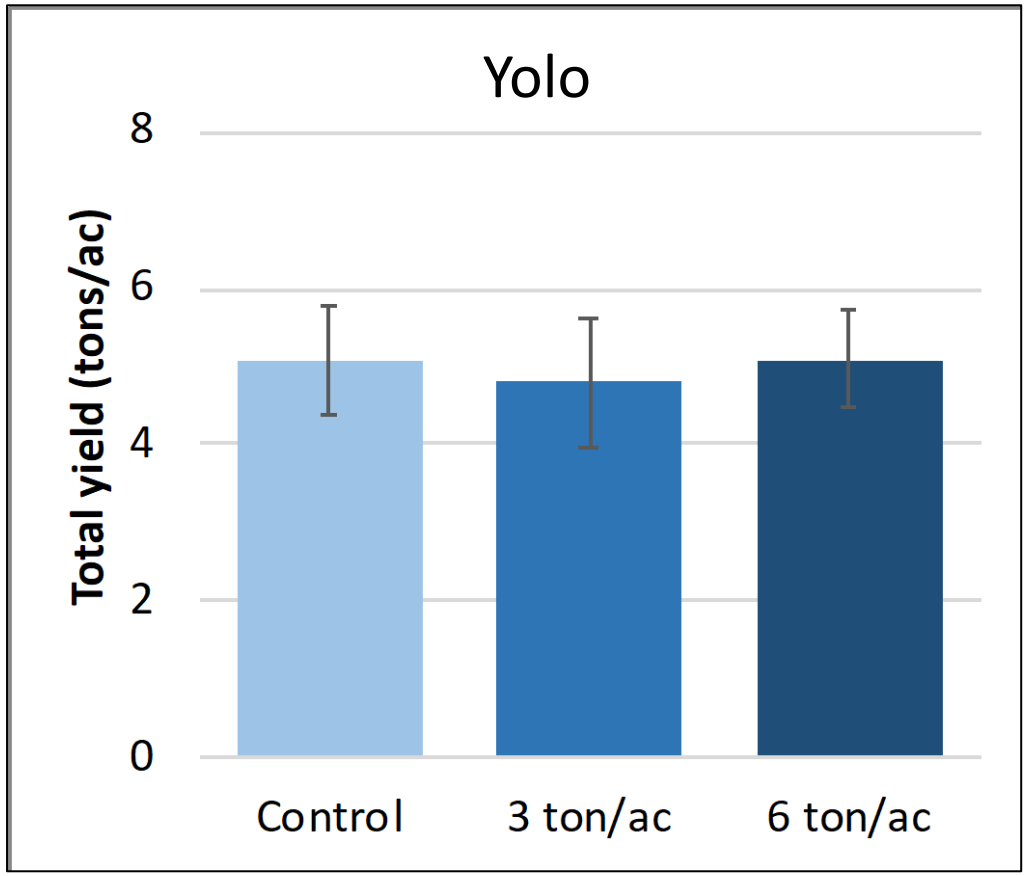
Soil Data – Yolo

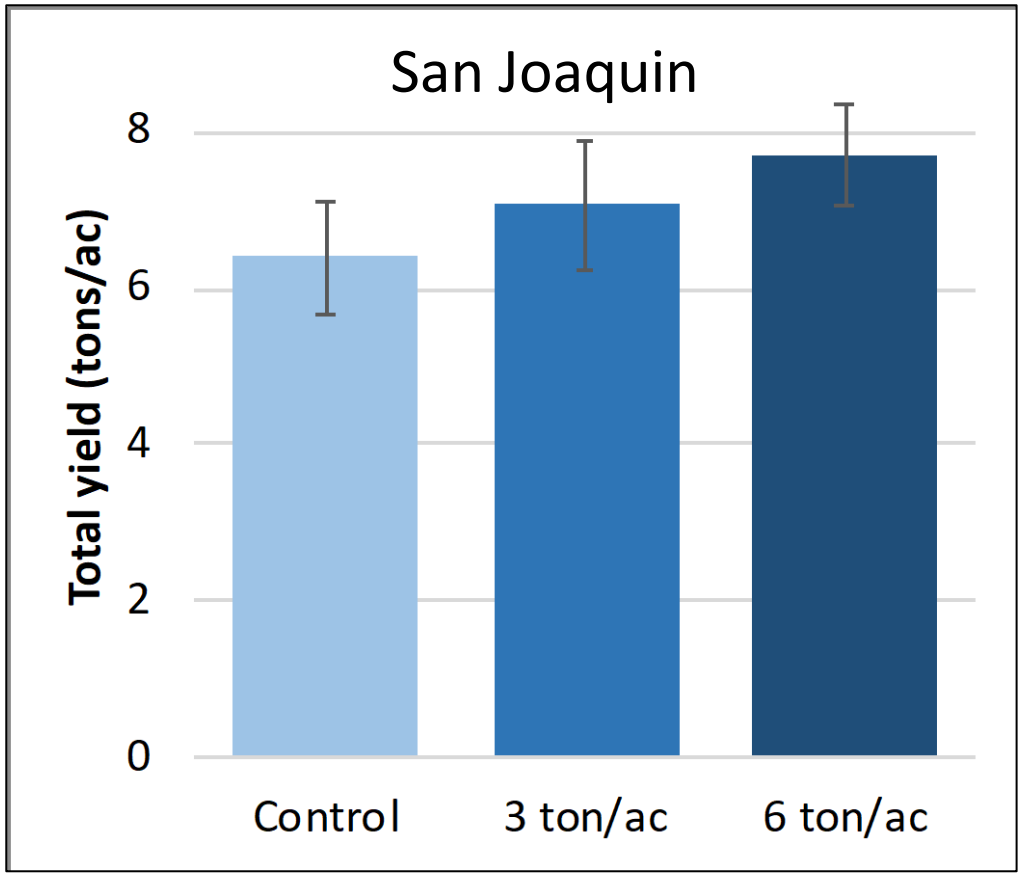


Soil Data – San Joaquin

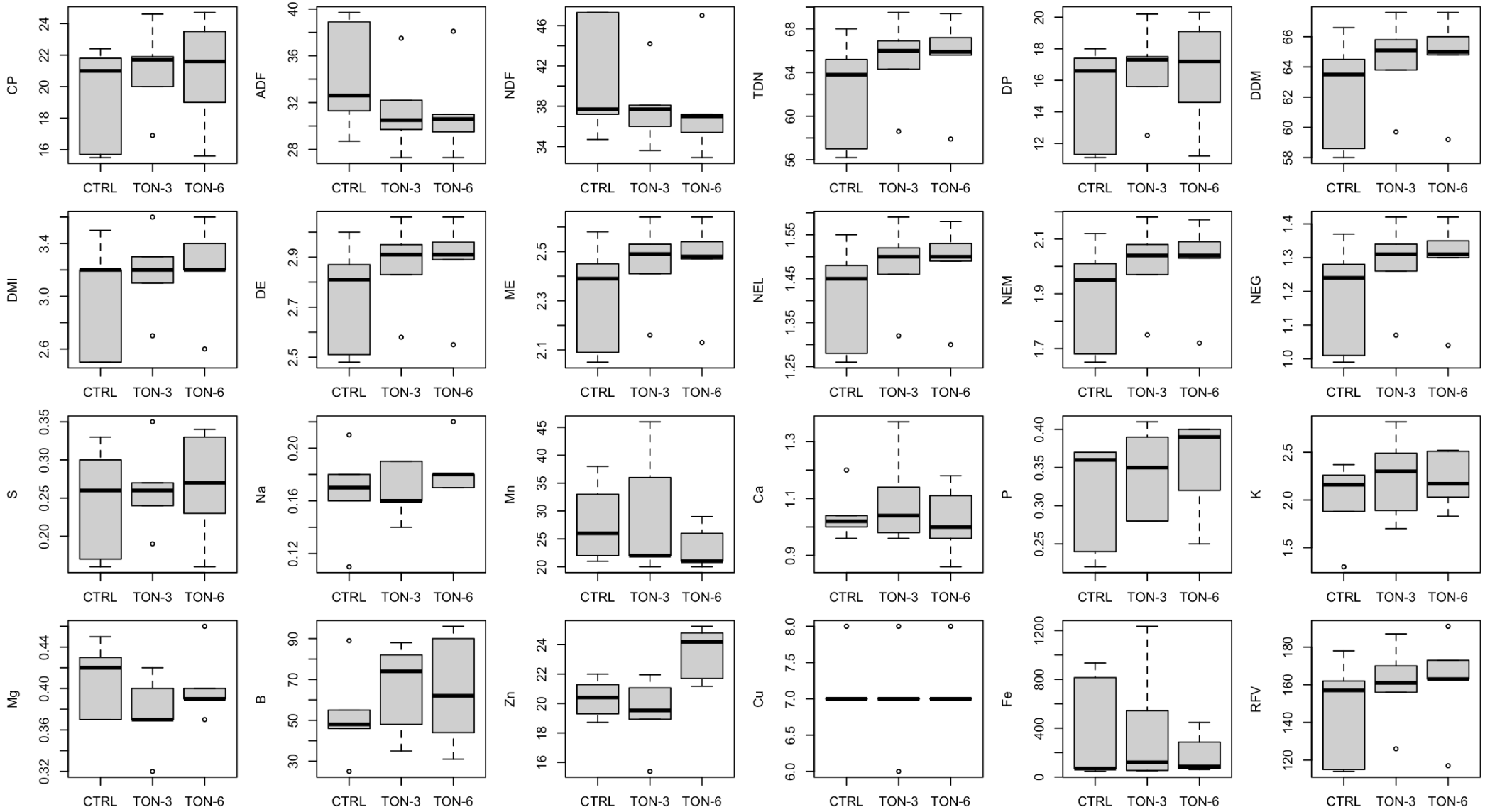


No statistical improvements in yield, but there is a trend for compost to improve yield at the SJ site



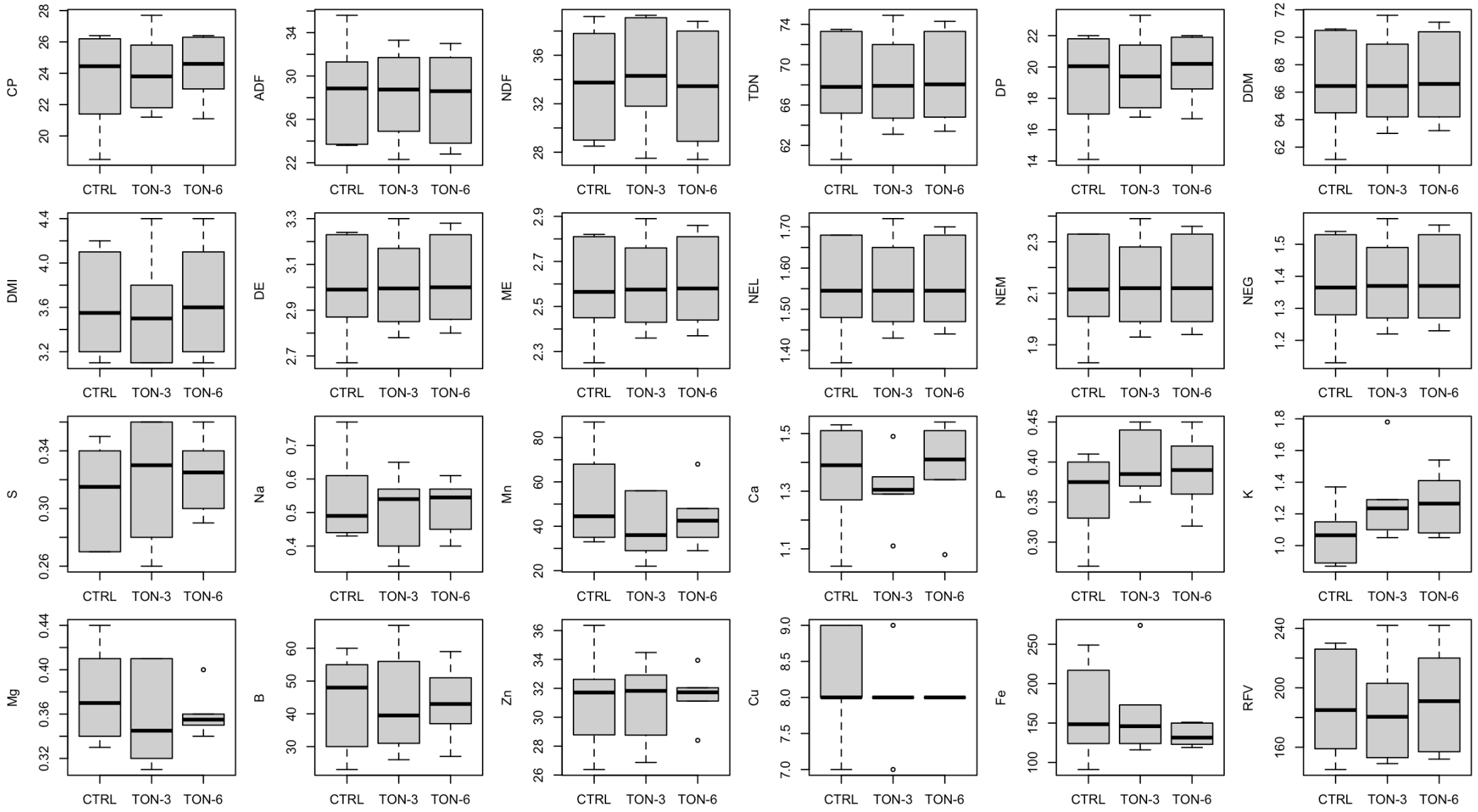


Alfalfa Forage Quality – Yolo



Acronym	Analysis
CP	crude protein
ADF	acid detergent fiber
NDF	neutral detergent fiber
TDN	total digestible nutrients
DP	digestible protein
DDM	digestible dry matter
DMI	dry matter intake
DE	digestible energy
ME	metabolizable energy
NEL	net energy of lactation
NEM	net energy for maintenance
NEG	net energy for gain
RFV	relative feed value index
S	sulfur
Na	sodium
Mn	manganese
Ca	calcium
P	phosphorus
K	potassium
Mg	magnesium
B	boron
Zn	zinc
Cu	copper
Fe	iron

Alfalfa Forage Quality – San Joaquin



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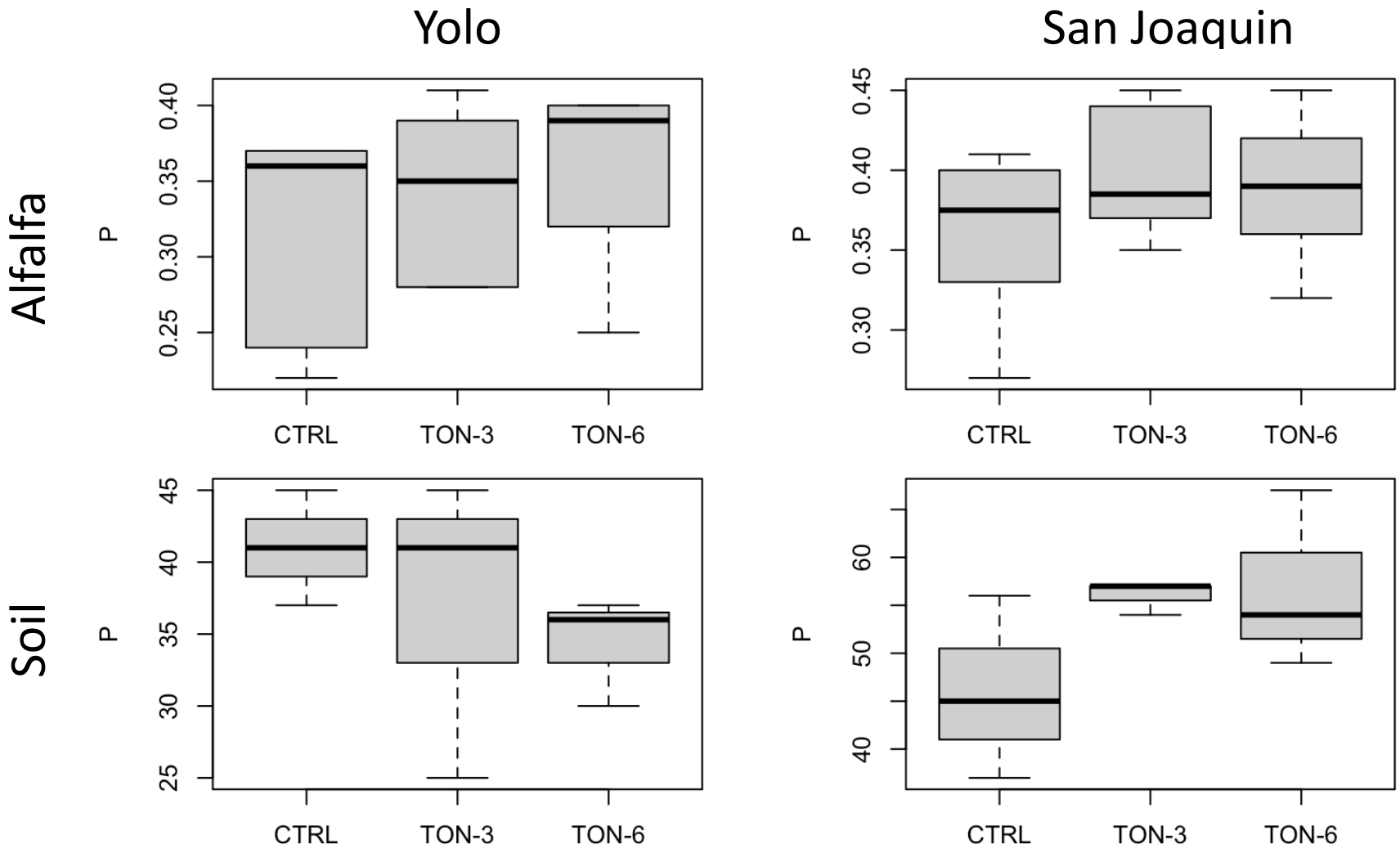
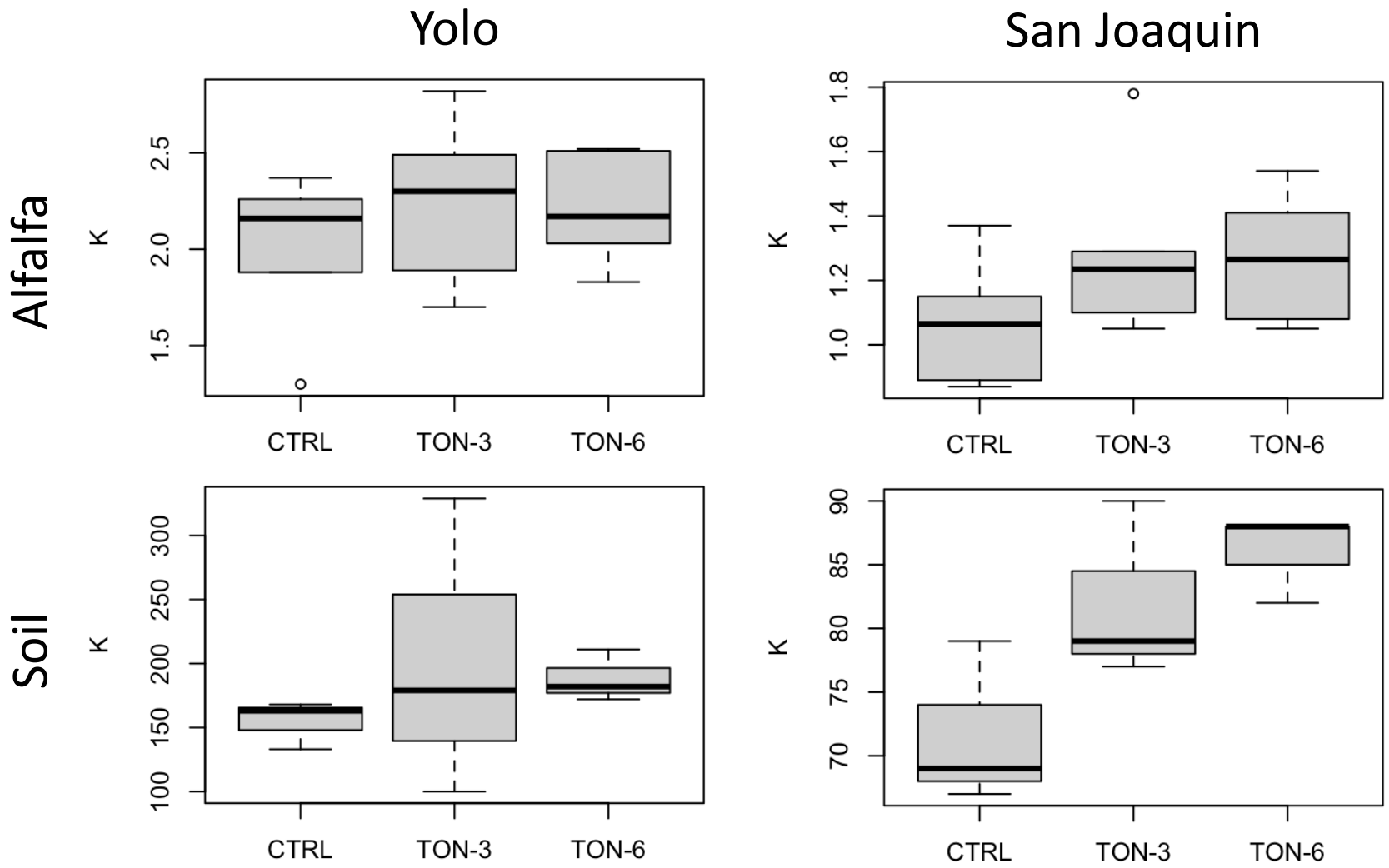
Slight trends for improved P status

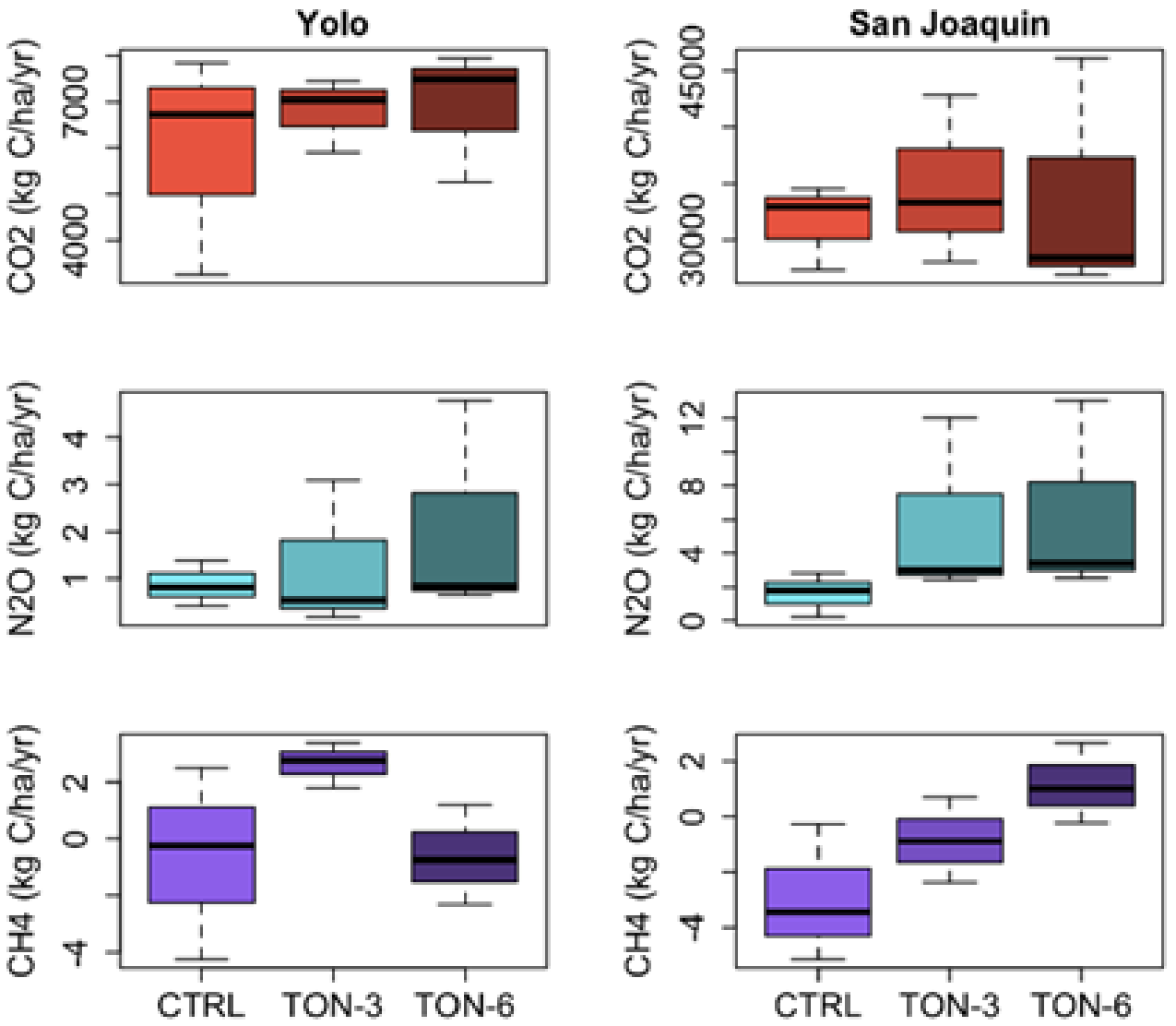


Compost improved K status at SJ site



Greenhouse gas emissions have not differed across treatments

- This indicates that the carbon that is added from compost is not being respired from the system.
- Higher CO_2 emissions at the SJ site are attributed to the inherently higher carbon of the soil.
- Soils are a methane sink.



Lessons learned and grower guidance

- Green waste compost is a relatively cheap input, but transport cost can be high.
  - Material plus hauling: approximately $27/ton
  - Spreading: $10/ton
- Highest demand for compost is in the fall. To ensure availability, growers should aim to purchase it in the spring/summer and store it on-site until fall.
  - Also tends to be higher quality (i.e. less trashy) when purchased in spring/summer
- Timing compost application can be a challenge (i.e. after all harvests but before soil gets too wet).
- The potential benefits may not be immediately realized, and this can inhibit adoption.

Thank you!

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http://ucanr.edu/sites/deltacrops/

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