

Impact of Cover Crops on Peach in Replant Diseased Soil

Jorge Vivanco

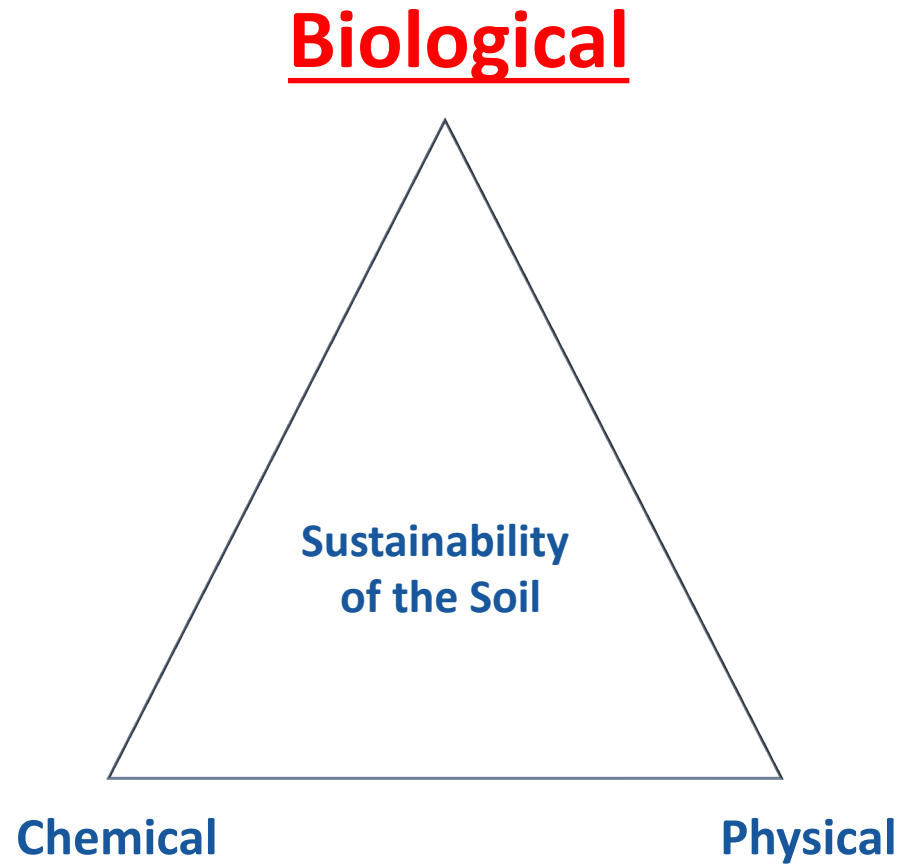
Professor

Colorado State University

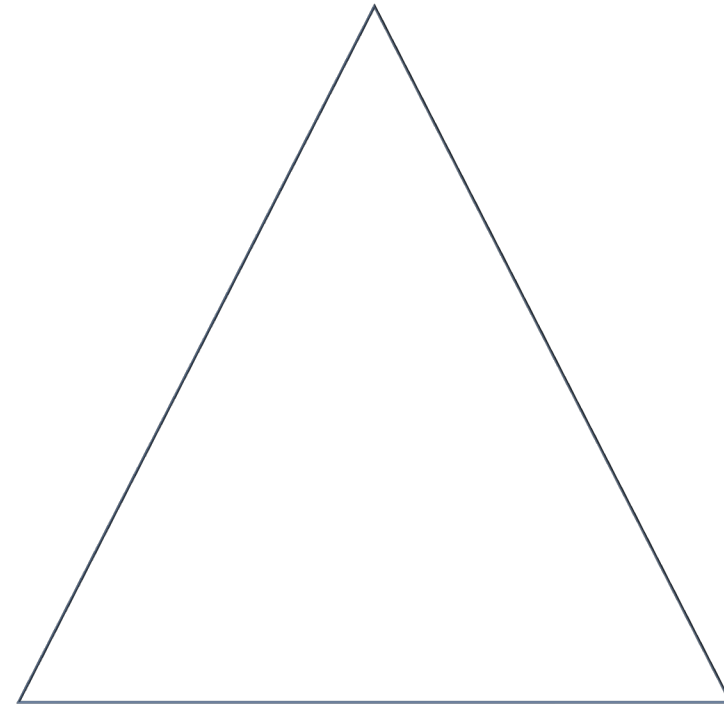
The Soil Environment



How the different soil components influence sustainability



Root - Microbe

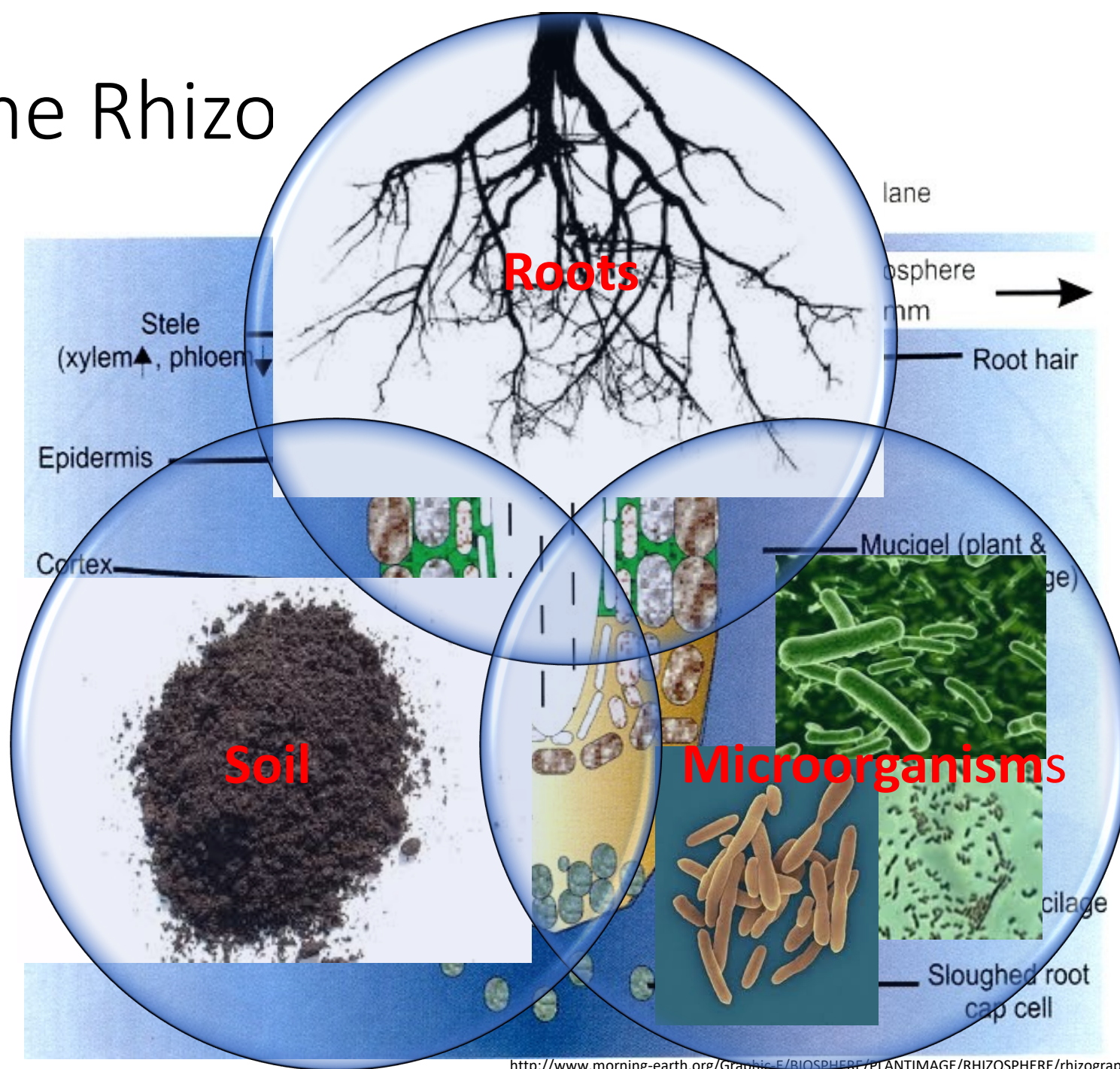


Specific

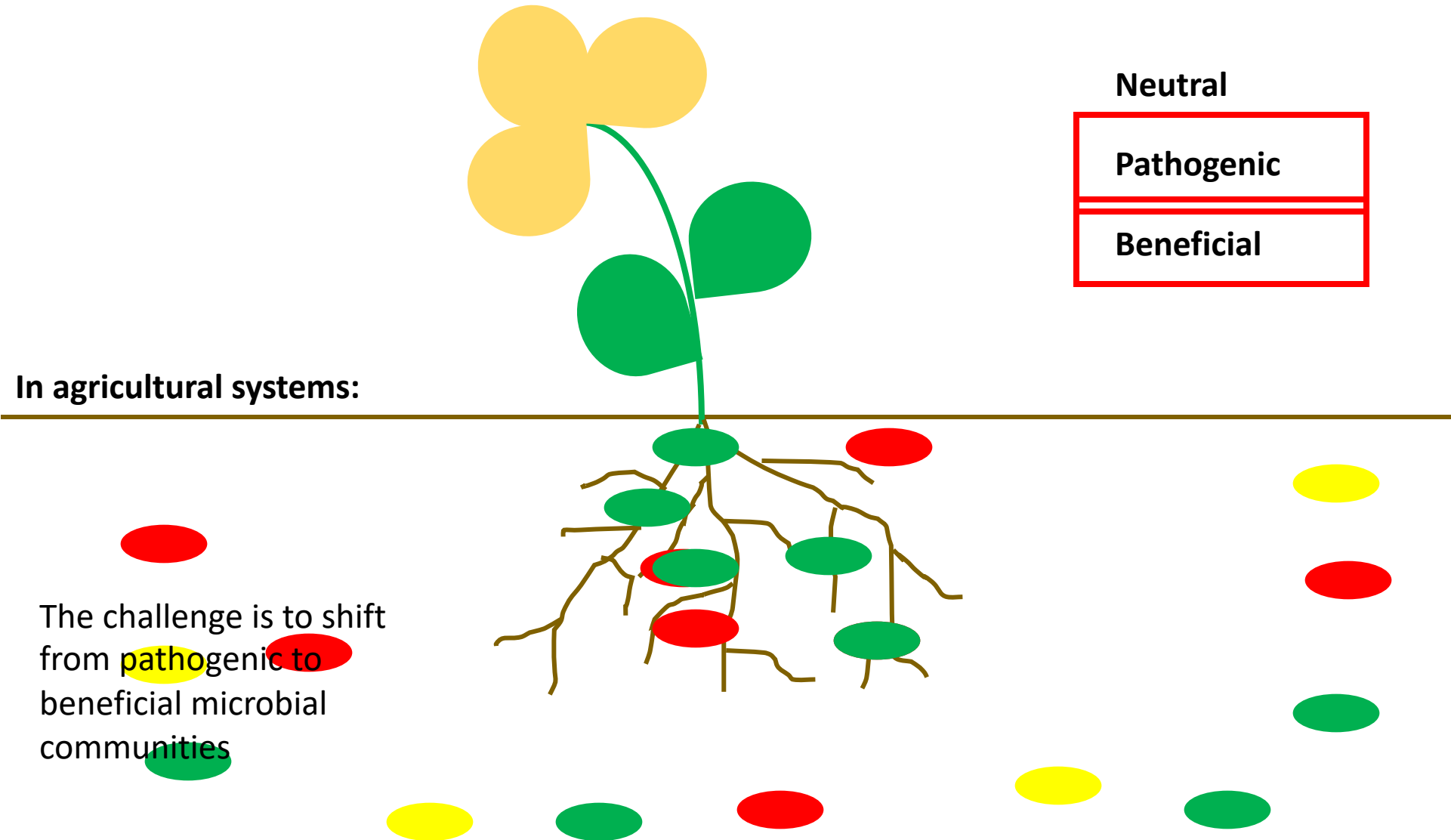
General

Root - Microbiome

The Rhizo



Plants associate with an array of microbes



San Luis Valley, Colorado
(organic and intensive potato cultivation)



Sugiyama et al. (2010) Plant Disease



Broz et al. (2007) ISME

Two model plants:

Arabidopsis

Medicago

Three soils types:

Arabidopsis soil (IL)

Medicago soil (TX)

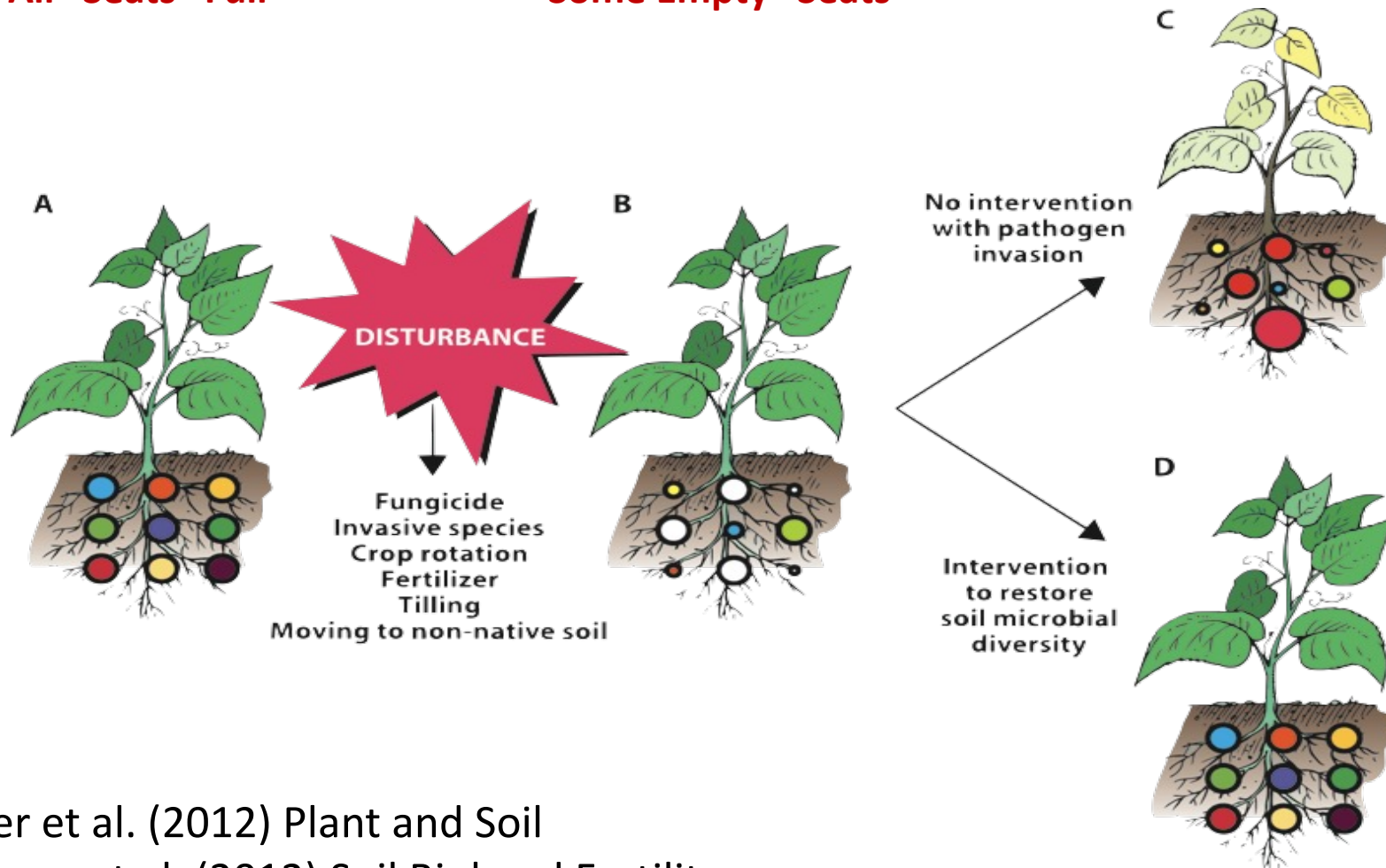
Forest soil (OR)



Broeckling et al. (2008) AEM

All "Seats" Full

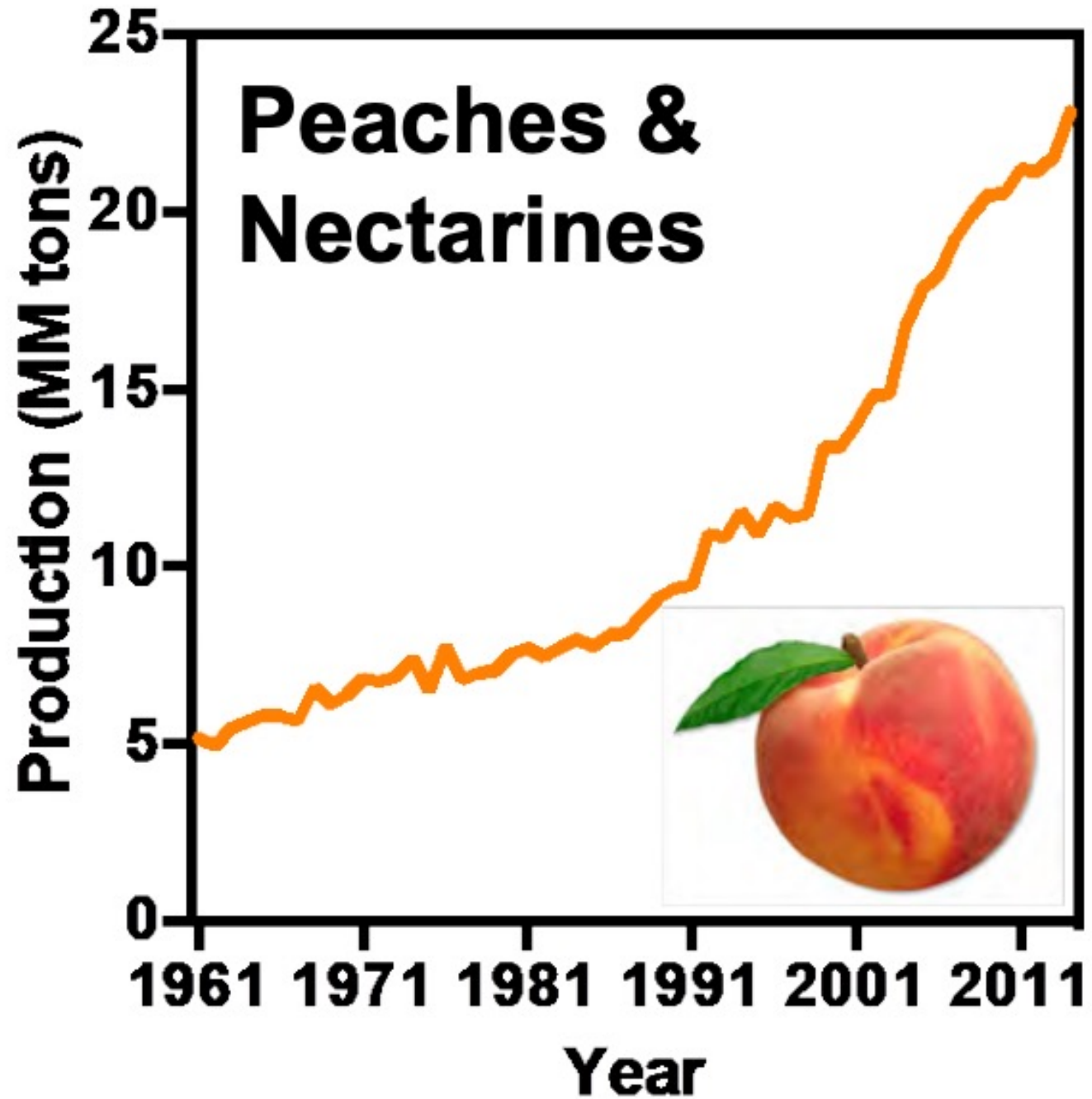
Some Empty "Seats"



Bakker et al. (2012) Plant and Soil

Chaparro et al. (2012) Soil Biol and Fertility

Badri and Vivanco (2009) Plant Cell and the Environment



Source: FAO,
2017

CSU Pomology

Peach replant disease

Non-replant site



Replant site





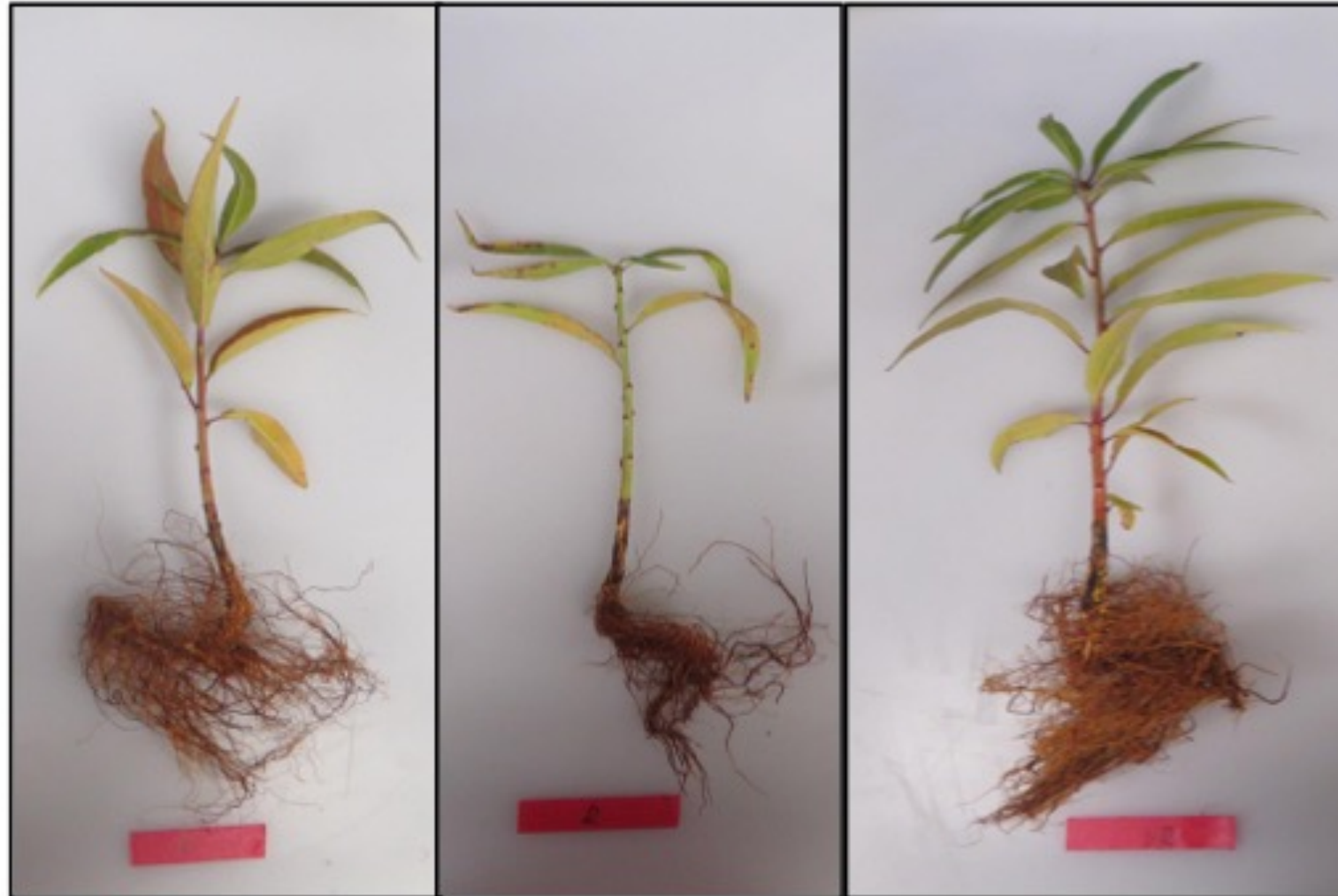
https://www.researchgate.net/figure/Soil-solarization-applied-to-control-broomrape-for-a-carrot-crop-on-an-organic-farm-in_fig1_281116015

CSU Experiment

Control

Replant

Sterile-Replant



Li, K., DiLegge, M. J., Minas, I. S., Hamm, A., Manter, D., & Vivanco, J. M. (2019). Soil sterilization leads to re-colonization of a healthier rhizosphere microbiome. *Rhizosphere*, 12, 100176.



Corn

Disrupted

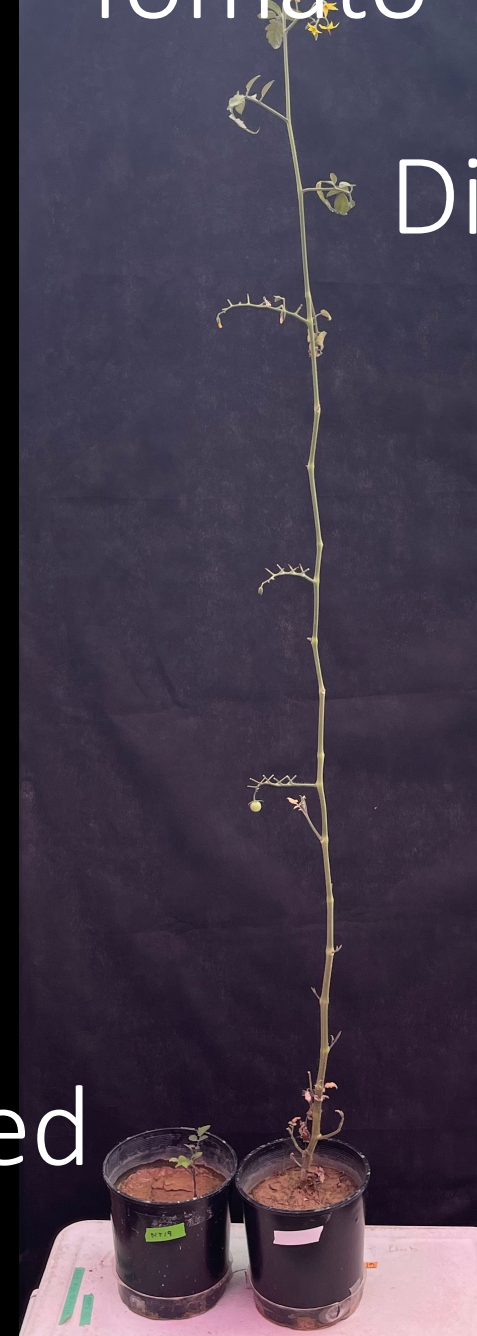


Non-Disrupted

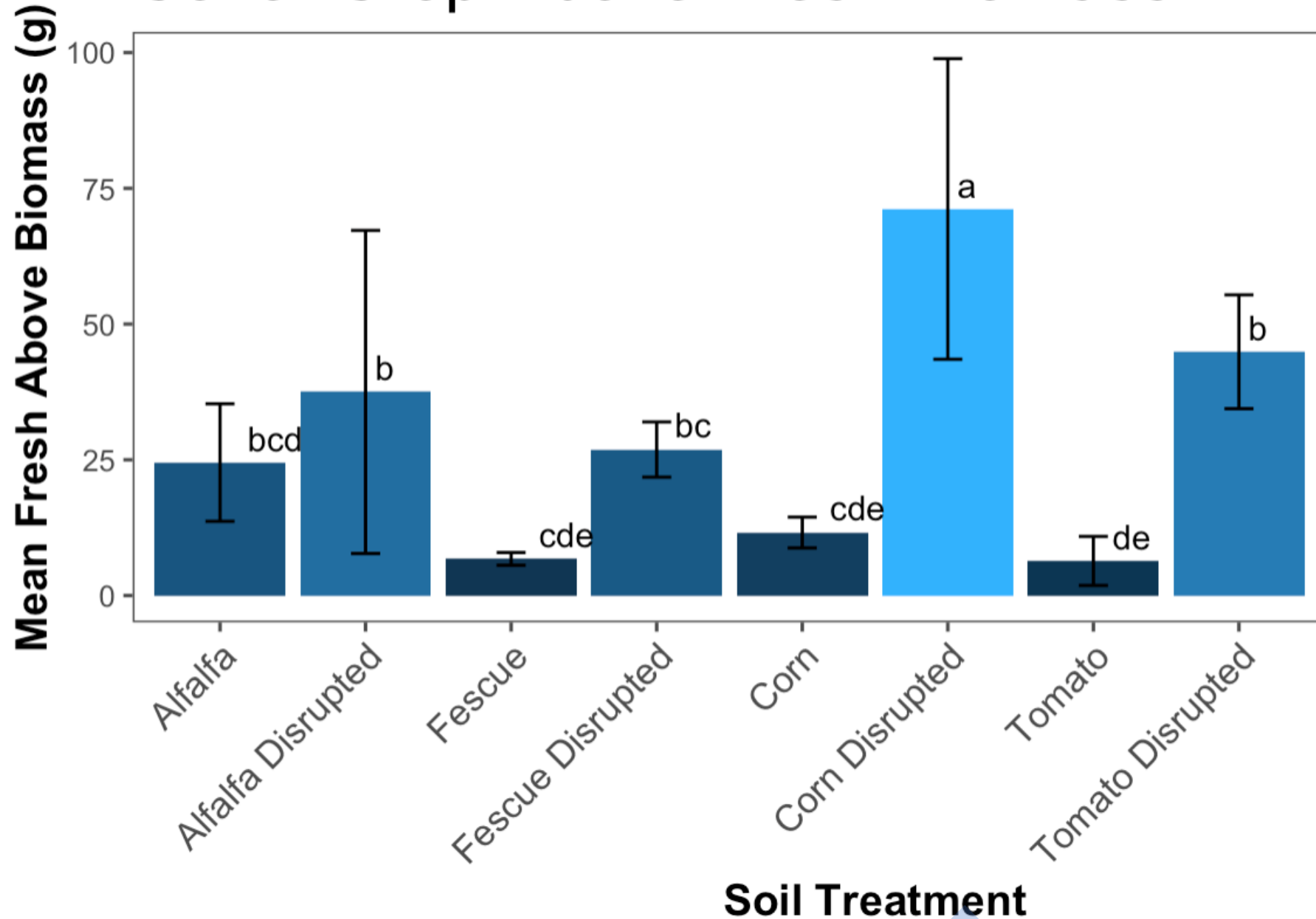
Non-Disrupted

Tomato

Disrupted



Cover Crop Above Fresh Biomass



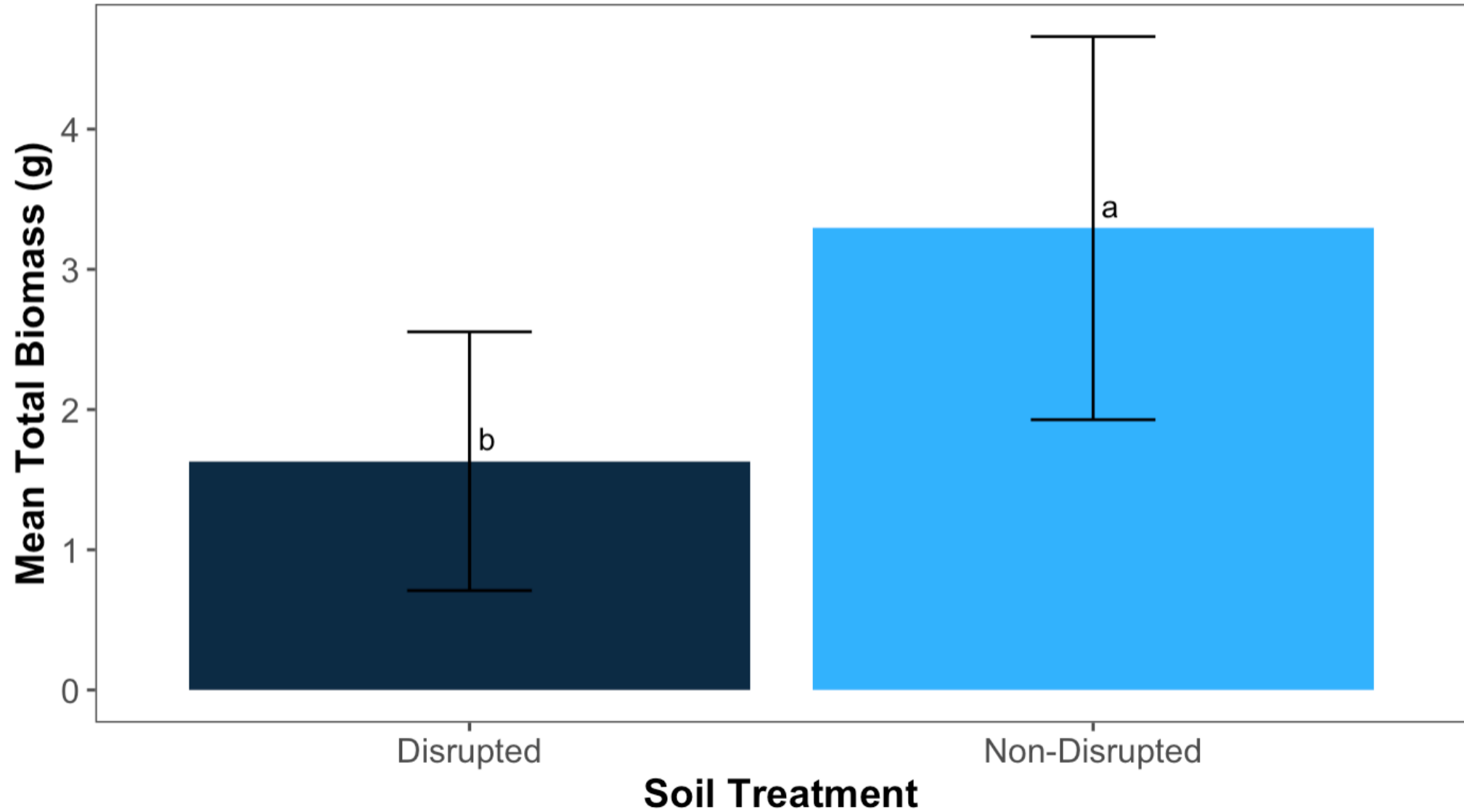
Disease Symptoms

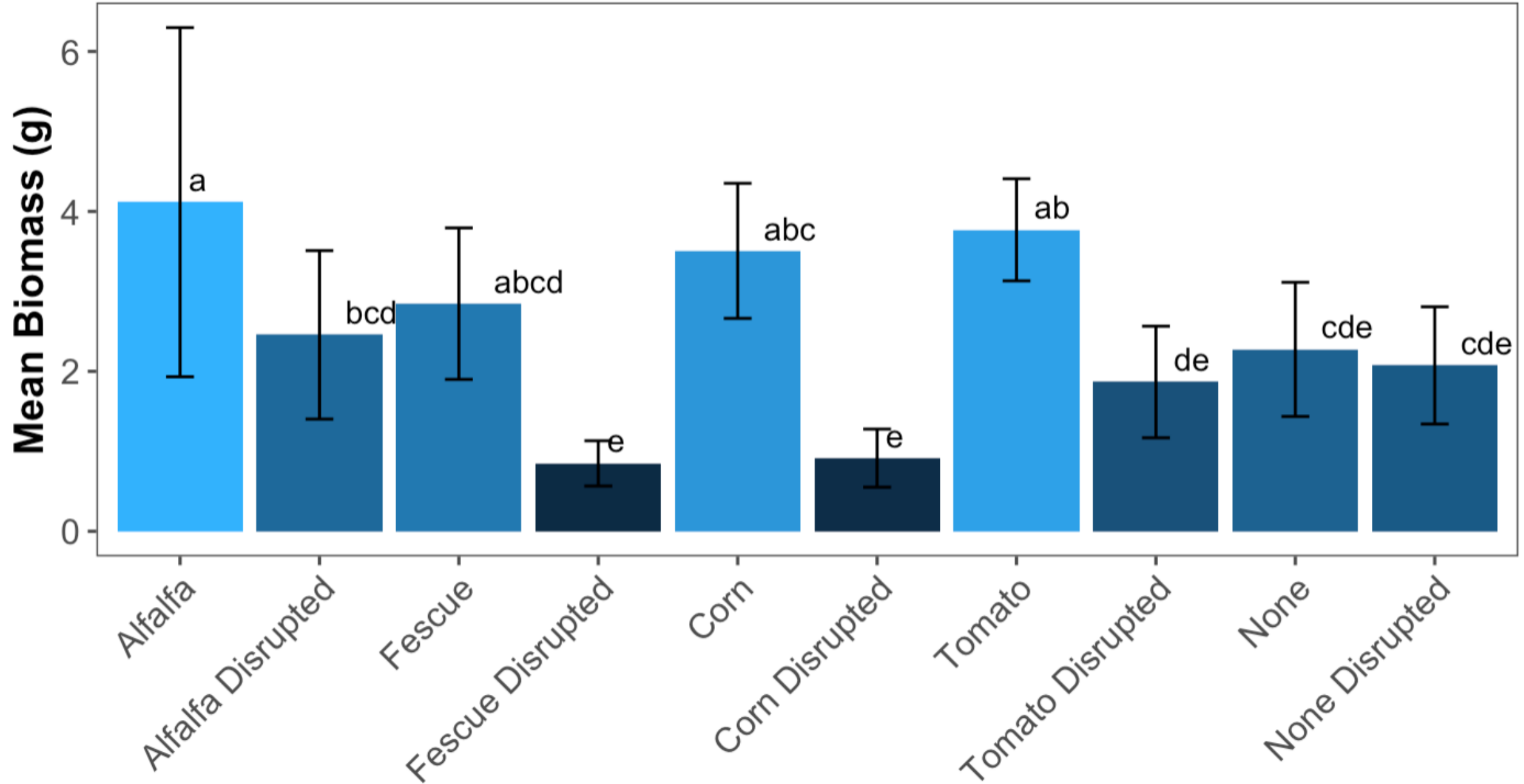


Alfalfa

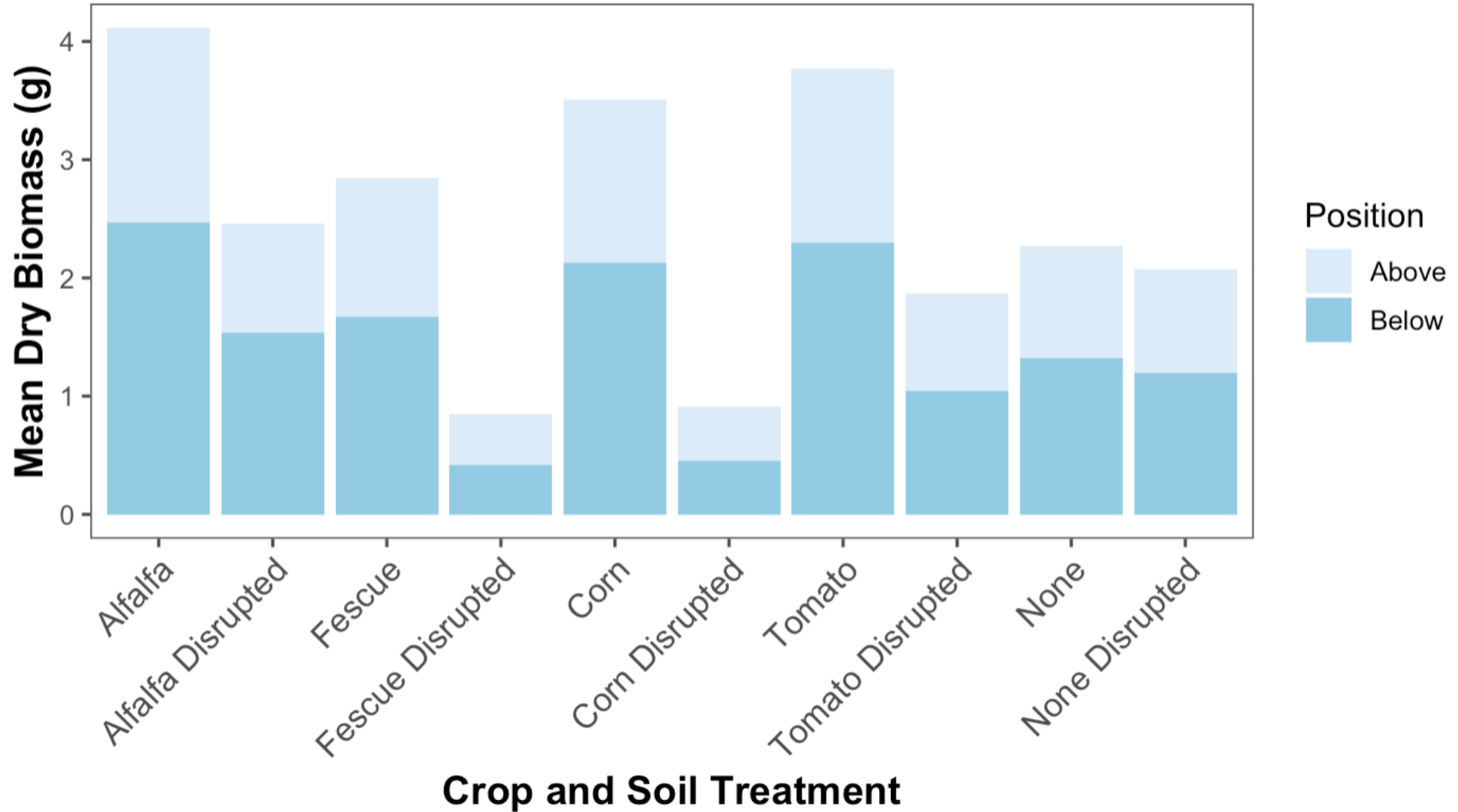


Peach Dry Biomass By Soil Treatment





Dry Root and Shoot Peach Biomass



Alfalfa



Previously
Disrupted



Never
Disrupted

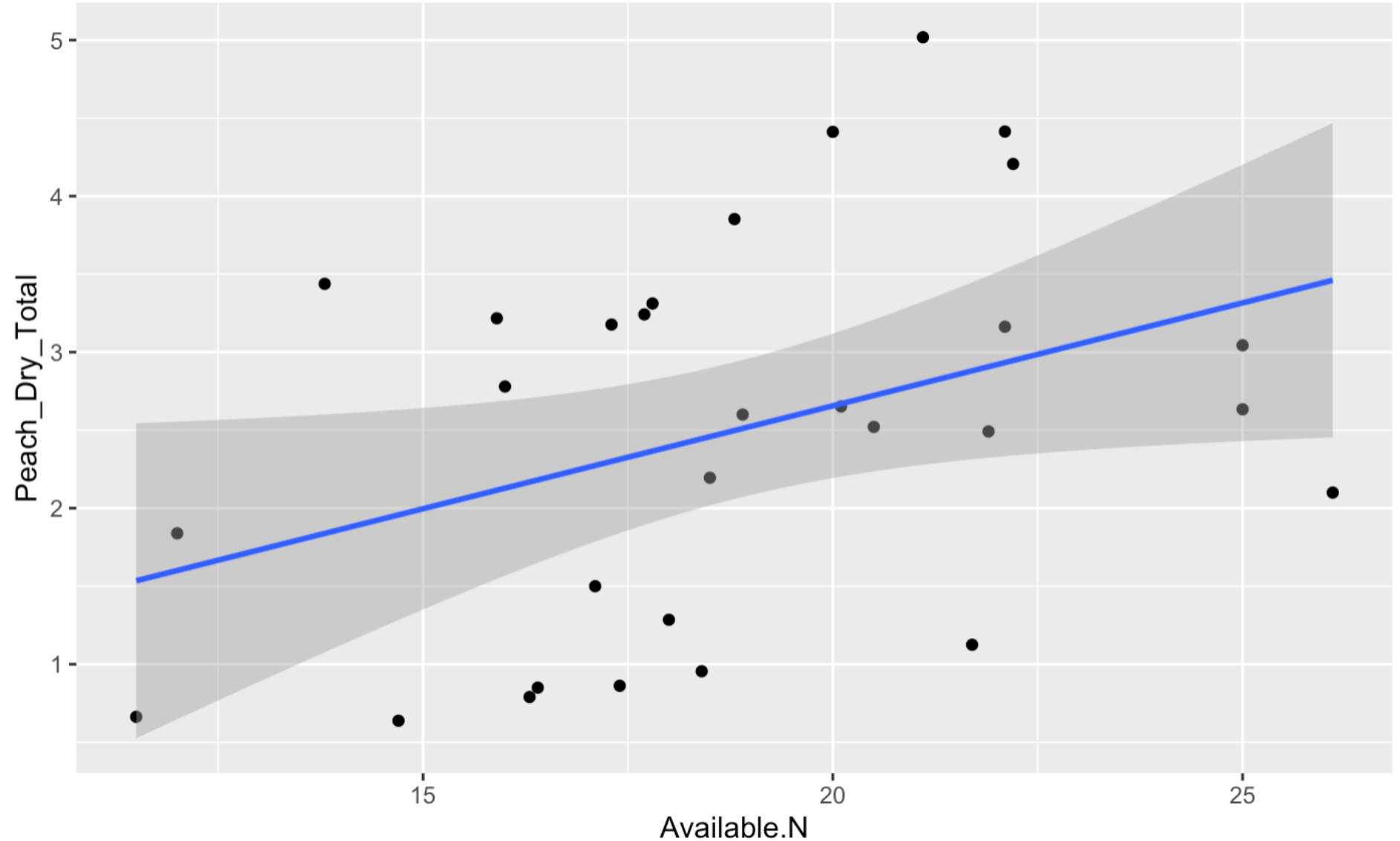
Significant or Predictive Variables (Fresh)

- Available N
- Total Nitrogen
- Nitrate
- Organic Matter
- Inorganic N



Available organic nitrogen in correlation with total dry peach biomass

Correlation was positive ($R^2=0.1443$, $P\text{-Value}=0.03841$). Of the samples with the highest available nitrogen, the top 8 soils samples previously had either alfalfa or tomato from both soil treatment types (disrupted/ non-disrupted).



Summary

- Soil disruption great ⁺ for one generation
- Soil disruption effects do not last
- Not all cover crops are equal
- Nitrogen Cycling
- Story is in the microbes