

BREAKOUT SESSION 2A: VALUE TRAITS OF PLANTS/MICROBES

Objectives

Assess which soil, plant and microbial traits could be impactful on our workshop goals.

Assess which soil traits control phenotypic expression the most.

Assess the value of the traits. Rank or tier them.

Determine cost, throughput, and invasiveness requirements of the value traits.

Determine what these traits are in a quantifiable sense

Traits of Interest

Plant and Microbial Traits and their characteristics	Field Quantifiable	Value (Economic)?	Value (ecosystem)?	Lab Quantifiable?	Depth	Resolution	Completeness? (how much of plant to image)
Profilation							
Architecture							
Photosynthate Flux							
Composition							
Developmental Cycle							
Depth							
Fine root turnover							
Root Exudates							
Viability							
Root Mass							
Nutrient Uptake							
Water Uptake							
Disease Resistance							
Microbial Diversity							
Biotic Stress							
Abiotic Stress							

Heuristically, we are filling out a table like this.

→ Determining top traits for discussion in breakout 3

Genetics Impact

- What are the most promising biological approaches to increasing carbon *sequestration* with plants.

- How much of an increase in carbon accumulation is feasible with current approaches?
- Are there specific plants ARPA-E should focus on for this effort?

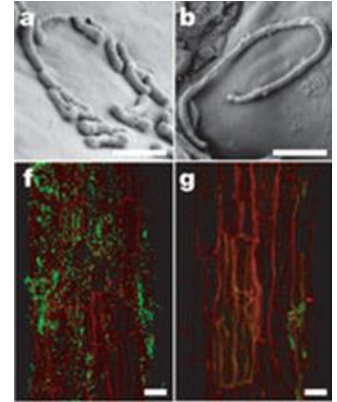


Transgenic tobacco with increased root proliferation.

Werner et al., *Plant Cell* (2010)

Plant Microbial Interactions

- Are sufficient tools available to characterize plant-microbial interactions that impact soil carbon?
- Are there promising classes of microbes?
- Can plant microbial interactions be controlled to yield desired phenotypes?
- What impact is possible?



SEM and CARD-FISH images of Arabidopsis root inhabiting bacteria.

Bulgarelli et al., Nature (2012)



Arabidopsis root proliferation in response to microbial inoculants.

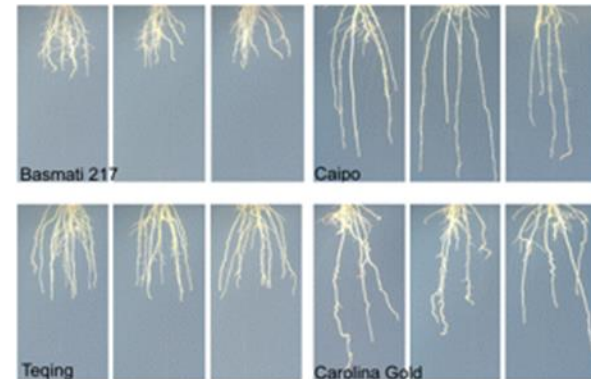
Haney et al., Nature Plants (2013)

Field vs. Lab Conditions

- How much of a correlation has been observed in characterizing root traits/ carbon sequestration in the lab compared to field conditions?
- What are key environmental components that make up the majority of plant phenotypic plasticity?



Jerry Glover and exposed roots of native prairie plants in the field.
National Geographic.



Rice roots growing in a 3-D gel based media.

Iyer-Pascuzzi et al., Plant Physiology (2010)

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