

BREAKOUT SESSION 2: VALUE TRAITS OF SOILS, 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.

Soil Traits and their characteristics	Plant Traits Impacted	Value?	Quantifiable ?	Analyzable in the field?	Measurement Precision required	Sampling Frequency Required	Soil Traits and their characteristics
Hydrological Permeability							
Percolation Rate							
Horizon Depth							
pH							
Nutrient Capacity							
Compaction							
Soil Organic Matter							
Soil Inorganic C							
Texture							
Structure							
Compaction							
Microbial Diversity							
Microbial Activity							
Hydrological Permeability							
Percolation Rate							
Horizon Depth							

Heuristically, we are filling out a table like this.

→ Determining top traits for discussion in breakout 3

Measuring Impact

- How can we demonstrate improved water productivity, nutrient use efficiency, and carbon deposition?
- What is soil resiliency?
- What accuracy on measurements is needed?

Plant Traits

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

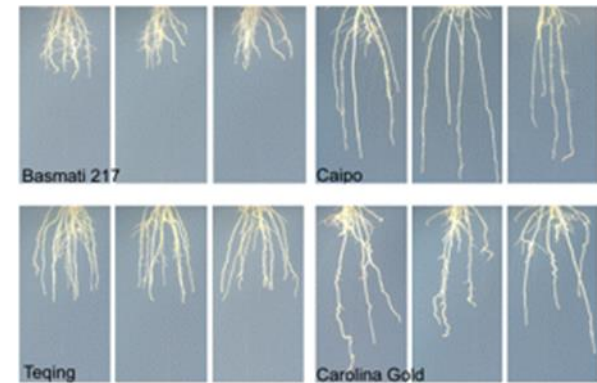
- How much of an increase is feasible with current approaches?

Soil-Plant Interactions

- What soil health traits should be measured as a baseline?
- What environmental traits are plant phenotypes plastic to?
- Are there root-chemical or root-microbial interactions to monitor?
- How invasive/destructive can measurements be?
- What is the financial value to these measurements?

Field vs. Lab Experiments

- How well can soil conditions be simulated in the lab?
- What variation in soils is needed for a good experiment?
- Are there model systems ARPA-E should consider?



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

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

Appendix Plant 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)
Profileration							
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							