

Breakout # 1

- Question #1

- A breeder really only needs a simple set of measurements for phenotyping.
- No imaging technology exists that quantifies the total carbon in a volume of soil
- It is the flux from the soil to the atmosphere (of CO₂+N₂O) that really matters.
 - Soil:atmosphere gradient of >100ppm
- “Setting a doubling goal is fine, but we don’t know what doubling means”
- What is the trade-off between marketable crop yield and sequestered carbon?
- “If we have deeper roots, have we then sequestered carbon?” A: it’s not clear.

- Question #2

- If it is just delivering measurement tools, then yes, these can be developed and validated in three years.
- New strains of plants need more time.

Breakout #1 (cont)

- Question #3

- Immediately root depth and structure measurements should be available,
 - But this still requires assumption/model of how related to sequestration
 - How long is soil respiration timescale?
- Could only demonstrate phenotype behavior in lab, not yet in field, but could validate measurement technique in lab and field
- A measurement tool of below-ground biomass should be 2x better at predicting than “above ground biomass”

- Question #4

- Need to demonstrate a trajectory from lab to field
 - Arpa-e would need to pick test-bed field
- The microbiome is >3yrs (20yrs?)
 - Too little is known and controllable
- Final comments
 - Two camps:
 - Best way to modify plants
 - Best way to measure and verify
 - Nottingham system might define SOA
 - How do we benchmark against it?

Breakout #2

- Question #1

- Proliferation does not necessarily lead to sequestration
 - Depth and distribution of recalcitrant carbon is most important
- Must be able to control the distribution of carbon in plant
- As part of GHG program N₂O measurement would be crucial
 - May not need separate focus, as deeper roots yield improved nitrogen efficiency
- Loblolly pine is promising
 - Terpenes are relatively stable compounds stored deep in the roots

- Question #2

- Insufficient tools exist for measuring root:microbiome:soil interactions
 - However important role in N₂O production, this is a necessary development
 - Spatial resolution to capture physiochemical processes doesn't exist (micron scale underground)
- No correlation from lab to field when it comes to microbiome
- Even if you knew where every microbe was does it matter for carbon?
 - “We don't know”

Breakout #2 (cont)

- Question #3
 - Correlation is poor and different trait to trait
 - # of soil types needed depends of crop and where it is grown successfully (at scale).