Breakout 1 & 2 Readouts

- No consensus that roots phenotyping is the best path to long-term soil carbon sequestration
  - Management techniques, perennial crops, etc. could yield significant carbon sequestration
    - Could think about developing sensor systems to measure/manage
  - BUT area is understudied. Roots would be a good place to start
    - Unclear how much carbon could be sequestered over time through roots
    - Should combine early field/lab results with modeling efforts to estimate long term benefits
- Roots are a good focus area for NUE and water productivity
  - Doubling is a hard but achievable goal

Breakout 1 & 2 Readouts

- 3 years is a hard time timeline for biology BUT program would "raise all boats"
  - What happens if I build a great tech, low cost, scalable, root system growth/architecture, but can't demonstrate impact on carbon?
  - Hard to get something into breeders' hands in 3 years
  - Need lifecycle phenotyping—what traits are important when—and combine this with genetics and genomics
  - Developing sensors, data architecture and models takes time—5 years is accelerated
- Other parts of the world are beating the US.
  - Computational infrastructure is generally overlooked; data processing is ignored.
  - Could leapfrog if we built better data management/mining/analytic tools.

Breakout 1 & 2 Readouts

- Focus on perennials but include one or two important annuals to work on
- Good to work in different soil types but don't make people perform in all three—too difficult
- Microbes: don't neglect them
  - Lots of private sector work; need public sector too
  - Don't try to isolate microbe—assess and select for community function: promoting root growth, suppressing root disease, etc.
    - Very hard to do!

Breakout 1 & 2 Readouts

- Don’t limit yourselves: high-throughput, non-destructive field work will give you a null data set
  - Consider a range of approaches between non-destructive and in the field. Cover the spectrum!
  - Still, some liked the challenge of shooting for Pluto
- Didn’t like our trait matrix: traits listed are all good and related
  - Couldn’t prioritize a short list, but should add:
    - Plant anatomy: arenchyma, root hairs, etc.
    - Microbial community function
  - Don’t neglect rates: need tools and sensors that can measure over time.
- Depth and resolution metrics: 40 cm and 1 mm