

ARPA-E Straw Model Terrestrial Biosequestration

And Breakout Instructions

August 20, 2015

Terrestrial Biosequestration Hypothesis

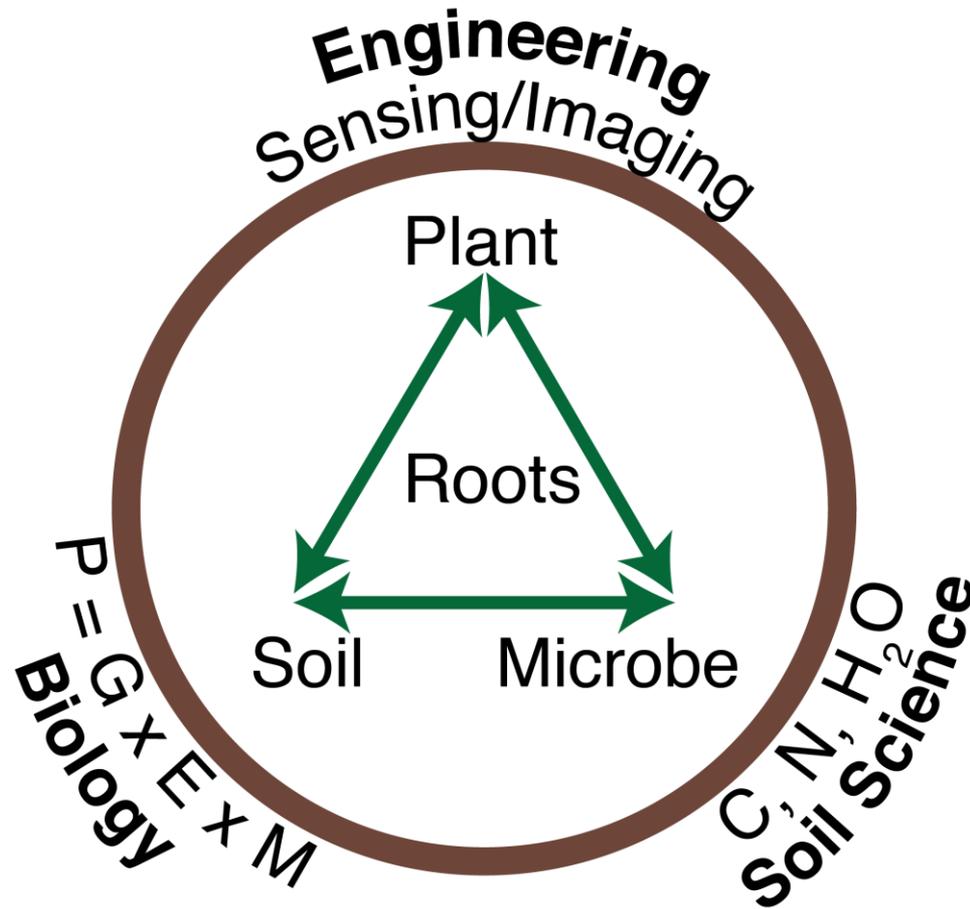
Engineering Biogeochemical Systems

- **Opportunity:** **Harness Agriculture & Forestry for Terrestrial GHG Mitigation and Soil Resilience**
- **Breakthrough:** **Advanced Belowground Sensing Platforms (Direct? Non Destructive?)**
- **Approach:** **Integrated Teams for Rapid Technology Development**

Objective

**Reliable Emissions Reduction Platform
(Deployable, Economical, Policy-Neutral)**

Engineering Biogeochemical Systems



Agriculture and Forestry Tracks

Innovation Track I: Technology to be De-Risked

Project Deliverables

- Systems Integration
- Automation and Analysis
- Productivity Gain
- Field Deployment

e.g., GPR,
Above-Ground C flux,
Abiotic Stress Traits

Innovation Track II: Technology New to the Space

Project Deliverables

- Proof of Principle
- Re-Engineered Hardware
- Data Analysis Package
- Field Test

e.g., Endoscopy,
Thermoacoustics,
Carbon Partitioning Traits

Advanced Soil/Root Analysis Program

Straw Model for Breakout Group Discussion

GOAL: Doubling Carbon per unit time/space/water/nutrient input

Phenotypic Traits of Interest:

Photosynthate Flux, Root Depth, Branching Rate and Extent, Fine Root Turnover/Exudates, Root Mass, Microbial Biomass

Ag/Bio Requirements:

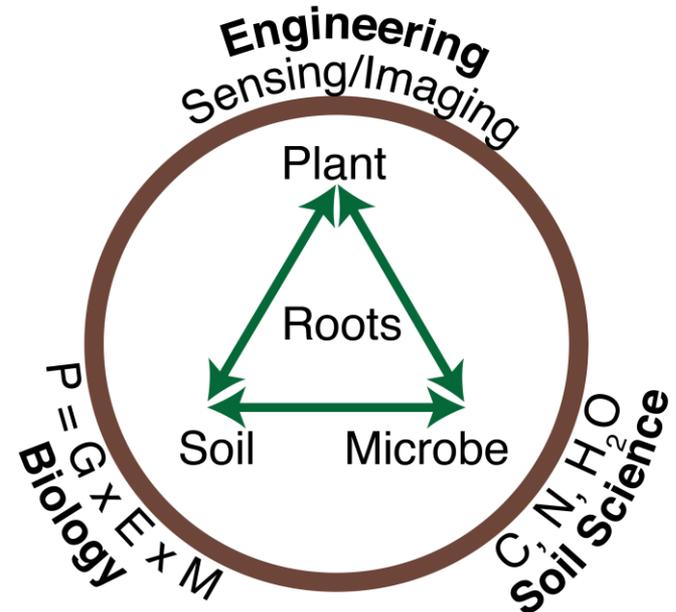
- Environment Diversity: 3+ Soil Types.
- Crop Choice: Economically Important
- Genetics: Characterized Genome
- Selectivity: Discriminate top 10%

Instrument Requirements:

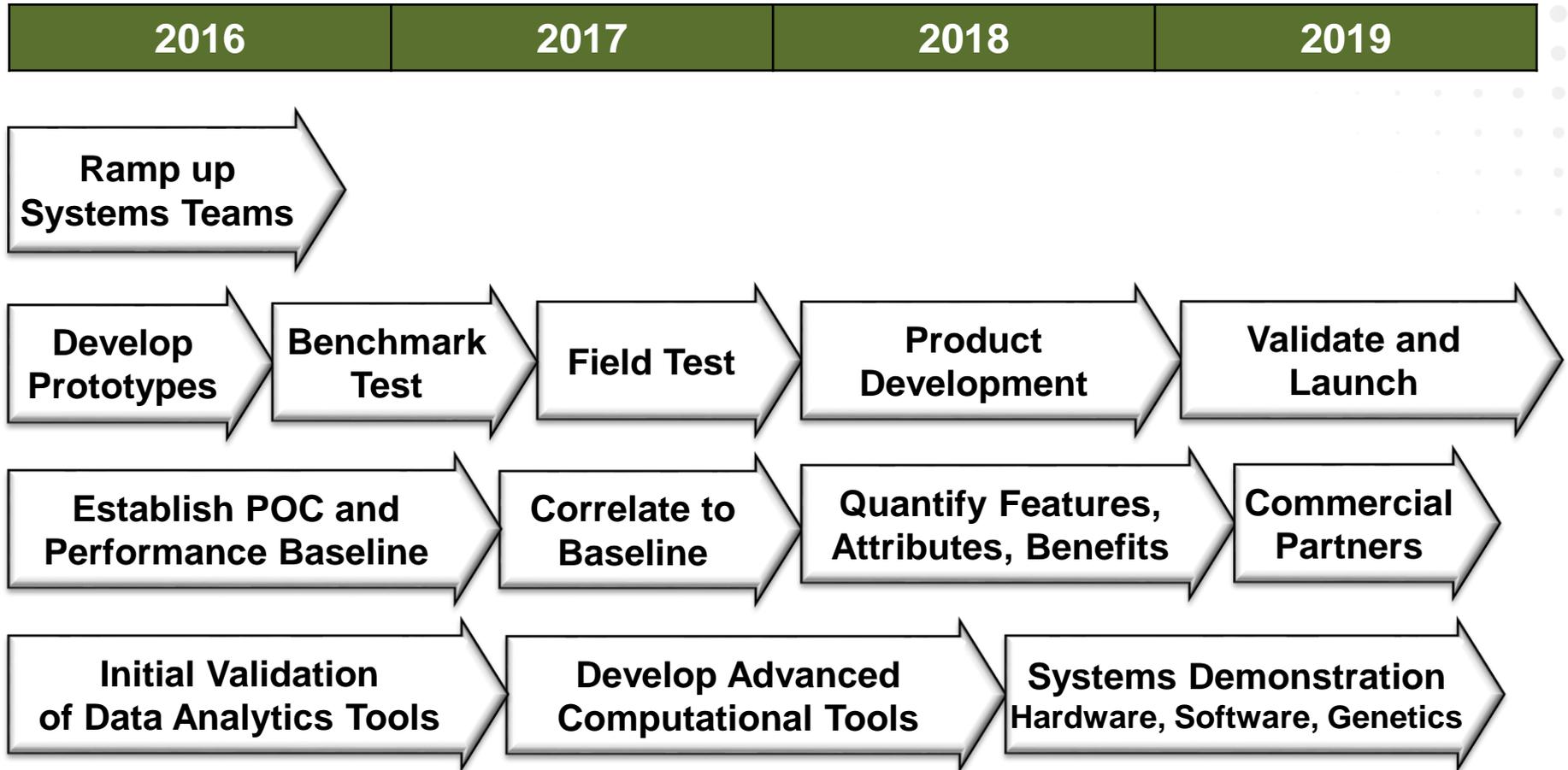
- Platform: In-Field & Maintains Root/Soil Viability.
- Data Turnaround Time: 48 hours
- Accuracy: Validate to 10% against ground truth
- Sample Rate: 1x/day, once per week, over 1 acre.
- T2M: Deployable Cost (TBD)

Soil Traits of Interest:

C Stocks at Depth, Organic Matter, Respiration Rate, Nitrogen Cycling, Water-Holding Capacity



Potential Program Stages and Timeline



Breakout Instruction:

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