Phytobiomes and the International Alliance for Phytobiomes Research

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From Simple to Complex

Traditional Sciences

• Reductionism

• World is linear – understanding parts individually
  – Soils
  – Plant genetics
  – Microbiomes or
  – Weather and environment

Real World Situation

• Complex system, non-linear organization

• Governed by multiple nonlinear interactions and multiple environmental variables

We need a global approach to elucidate, quantify, model, and potentially reverse engineer biological processes & mechanisms for their geophysical context

Decipher Phytobiomes
Phytobiomes: A Complex System

Crop plants, their environment, and their associated micro- and macro-organisms.

**Micro- and Macroorganisms**

- Viruses
- Archaea
- Bacteria
- Amoeba
- Oomycetes
- Algae
- Fungi
- Nematode

**Plants**

**Soils**

**Arthropods, Other Animals and Plants**

- Insects
- Arachnids
- Myriapods
- Worms
- Birds
- Rodents
- Ruminants
- Weeds

“Biome” - Site specific environment

**Climate**
Who We Are

An international, nonprofit alliance of industry, academic, and governmental partners
Structure

- Board of directors establishes overall vision
- Scientific Coordinating Committee sets priorities and strategic plans
- Topical working groups implement strategic plans
All farmers have the ability to use predictive and prescriptive analytics to choose the best combination of crop/variety, management practices, and inputs for a specific field in a given year taking into consideration all physical (climate, soil...) and biological conditions (microbes, pests, disease, weeds, animals...).
Establish a science and technology foundation for site-specific, phytobiome-based enhancement of sustainable food, feed, and fiber production.
Strategy and Implementation

- Focus on pre-competitive science to empower growth and profitability
- Identify research, resource, and technology gaps (e.g., model development)
- Facilitate linkages within and between industry and academia
- Identify scientific leaders for priority areas
- Work to secure project funding for academic units and the Alliance
- Coordinate and manage projects to address gaps
- Link with existing initiatives and efforts
Fundamental Research Priorities

- Determine the universal, common, and environment-specific trends in phytobiome composition and the key drivers of microbiome composition and development
- Ascertain the mechanisms by which distinct phytobiome components interact
- Determine the genetic linkages that connect phytobiome components
- Identify how multitrophic interactions modulate host phenotypes
- Detect the full range of impacts of phytobiome components on plant health
- Determine the multidirectional feedbacks that influence phytobiome components
Scientific Coordinating Committee

- Alliance sponsors
- Project leaders

Alliance working groups

- Overall topical leader
- Involved in projects aimed at filling gaps in knowledge, resources, or tools

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