PHYTOBIOMES ALLIANCE

# System-Level Knowledge of Phytobiomes Will lead to More Environmentally Friendly Agricultural Production and Healthier Food, Feed, and Fiber


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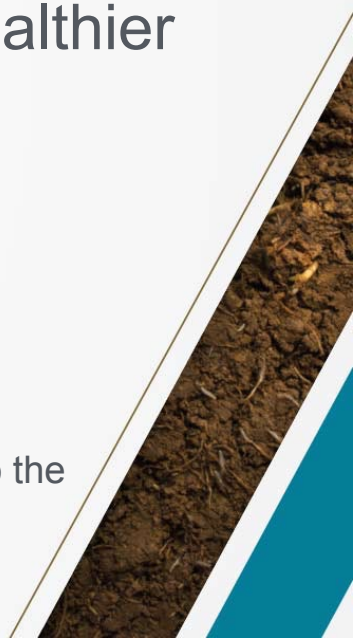
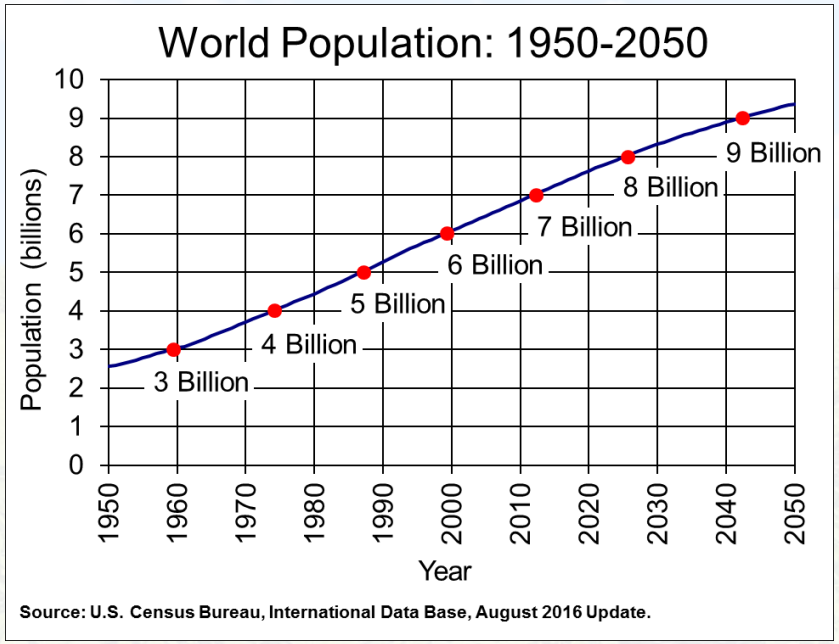
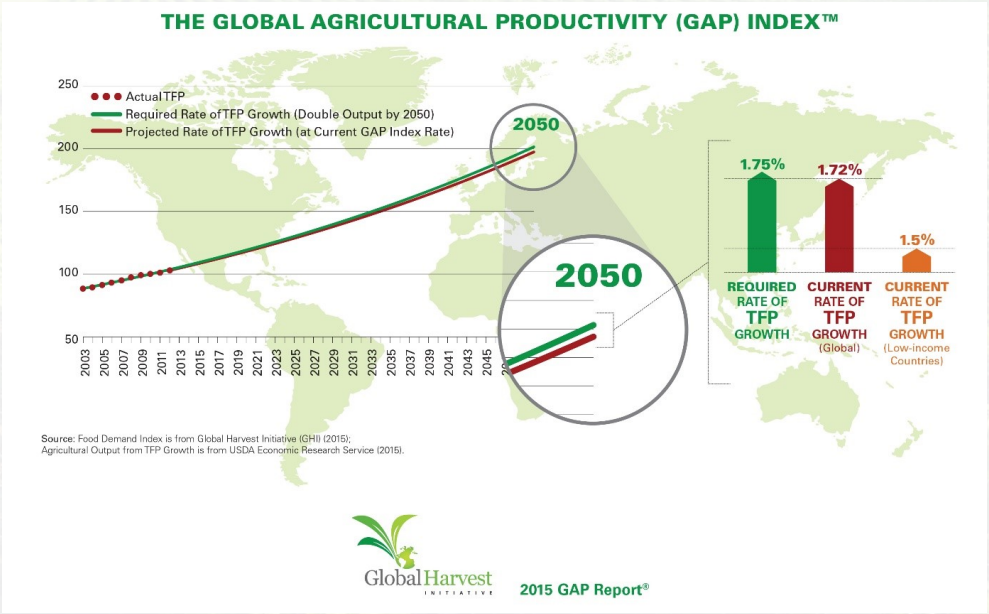


# Global challenges




## Expanding population


## Declining productivity



# Simplicity to complexity

Traditional Agricultural 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

Climate

Micro- and Macro-organisms

Viruses
Archaea
Bacteria
Amoeba
Oomycetes
Algae
Fungi
Nematode

**Site specific environment**

**Plants**


Arthropods, Other Animals and Plants

Insects
Arachnids
Myriapods
Worms
Birds
Rodents
Ruminants
Weeds

**Associated organisms**

# Holy grail of phytobiomics

To understand, predict, and control emergent phenotypes for sustainable production of food, feed, and fiber on a given farm.

**How?**

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# The International Alliance for Phytobiomes Research

# Who we are

A nonprofit Alliance of industry and academic partners










# Vision

All growers 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….).

# Strategy and implementation

- Industry leadership in identifying research, resource, and technology gaps (e.g., model development)
- Focus on pre-competitive science
- Facilitate linkages within and between industry and academia
- Coordinate projects to address gaps
- Empower industry growth and profitability in the phytobiomes space – connecting site specific biological and physical information for agriculture

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# Initial priorities

- Develop, validate, and optimize accurate models that include all physical & biological components and their interactions
- Enable simple, simulation models that are functionally accurate to real world complex conditions – e.g., greenhouse studies that reflect field conditions
- Design systems level predictive and prescriptive analytics for on-farm/site implementation
- Create databases of near real-time environmental and biological data

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# Immediate needs

- Farm, field, orchard, grassland, or forest specific weather measurements linked to plant productivity, environment, and management practices
- Temporal or spatial models of phytobiome that quantify environmental differences and measure stress (e.g., drought..)
- Site specific environmental timing and episodic intensity measurements
- Identification of minimum instrumentation necessary for accurate predictions of microclimates on small, medium, and large tracts
  - 100 acre apple orchard, 400 acre corn or 800 acre wheat farm, or 2,500 acre ranch
- Instrumentation cheap enough for wide scale deployment
- Phytobiomes network within weather community

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# How to become involved

- Scientific Coordinating Committee
  - ✓ Alliance sponsors
  - ✓ Project leaders
- Alliance working groups (weather, data, standards….)
  - ✓ Overall topical leader
  - ✓ Involved in projects aimed at filling gaps in knowledge, resources, or tools

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# Acknowledgements

Board of Directors:

- Gwyn Beattie, Iowa State University
- Kellye Eversole, Eversole Associates
- Magalie Guilhabert, Bayer CropScience
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