Understanding Soil Health: Impacts on Plant Production and Health

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Crop Science Society of America

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“Soil Health” – the ability of land to produce healthy and nutritious crops year after year.

Photo provided by Daniel Kaiser.

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Daniel Kaiser; www.usda.gov, npr.org

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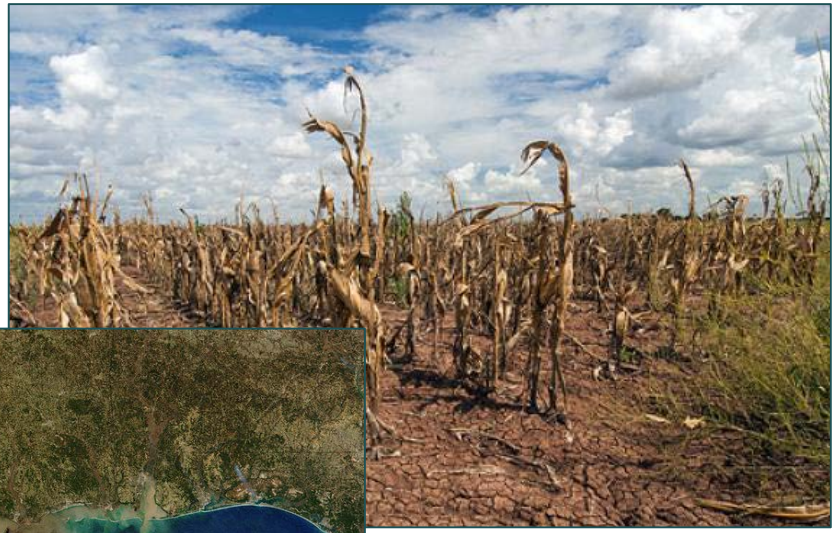

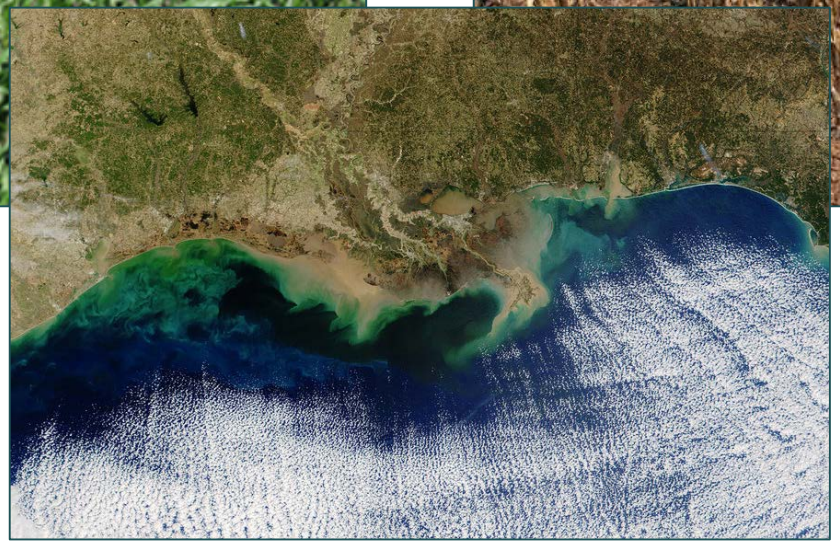

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20th century soil health was dominated physical and chemical indicators.

- Aggregate stability
- Water capacity
- Density
- Infiltration
- pH
- Soil electrical conductivity

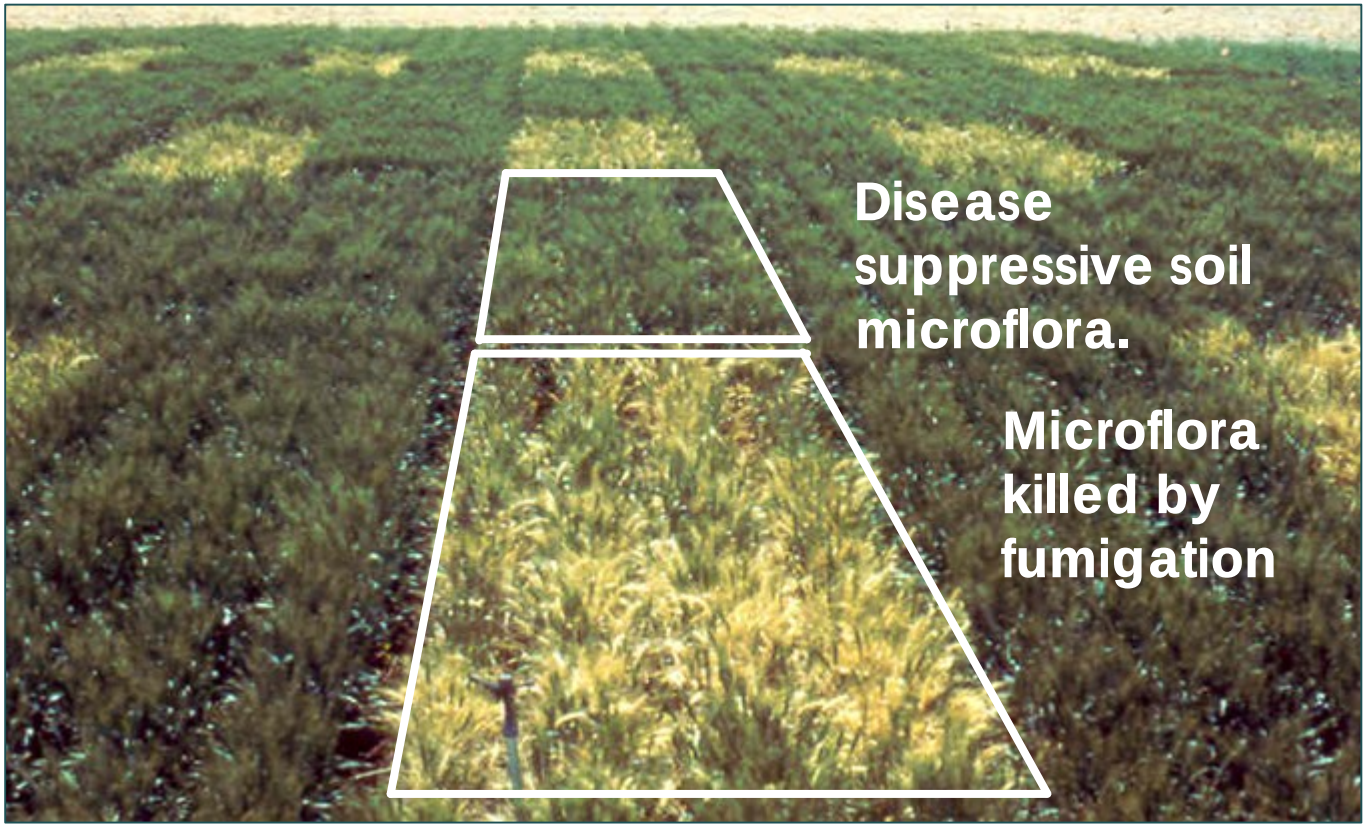
Many of these indicators are directly related to microbial activity.

Hot topic in soil health: microbes.

- Scientists have known that soil has a microbiological component since the 1890s.

https://www.qaseeds.com.au/inoculants.php, eXtension.org

Soil microbes can be useful.



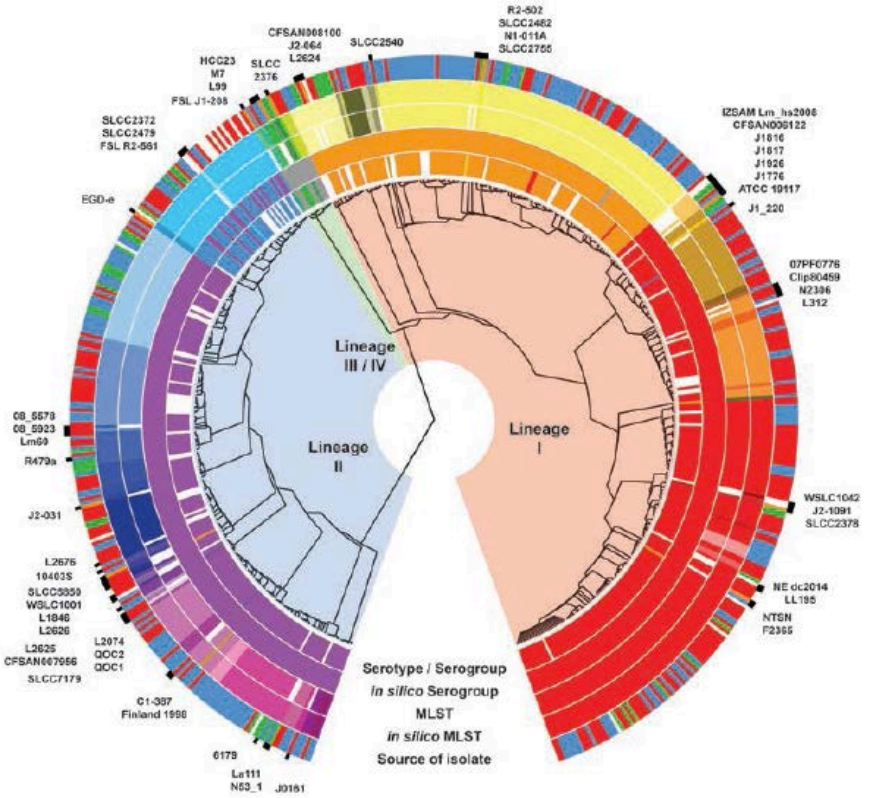
http://slideplayer.com/slide/6281987/, Photo courtesy of James Cook

Soil microbiology was interesting, but when did it become *important?*

Cheap.

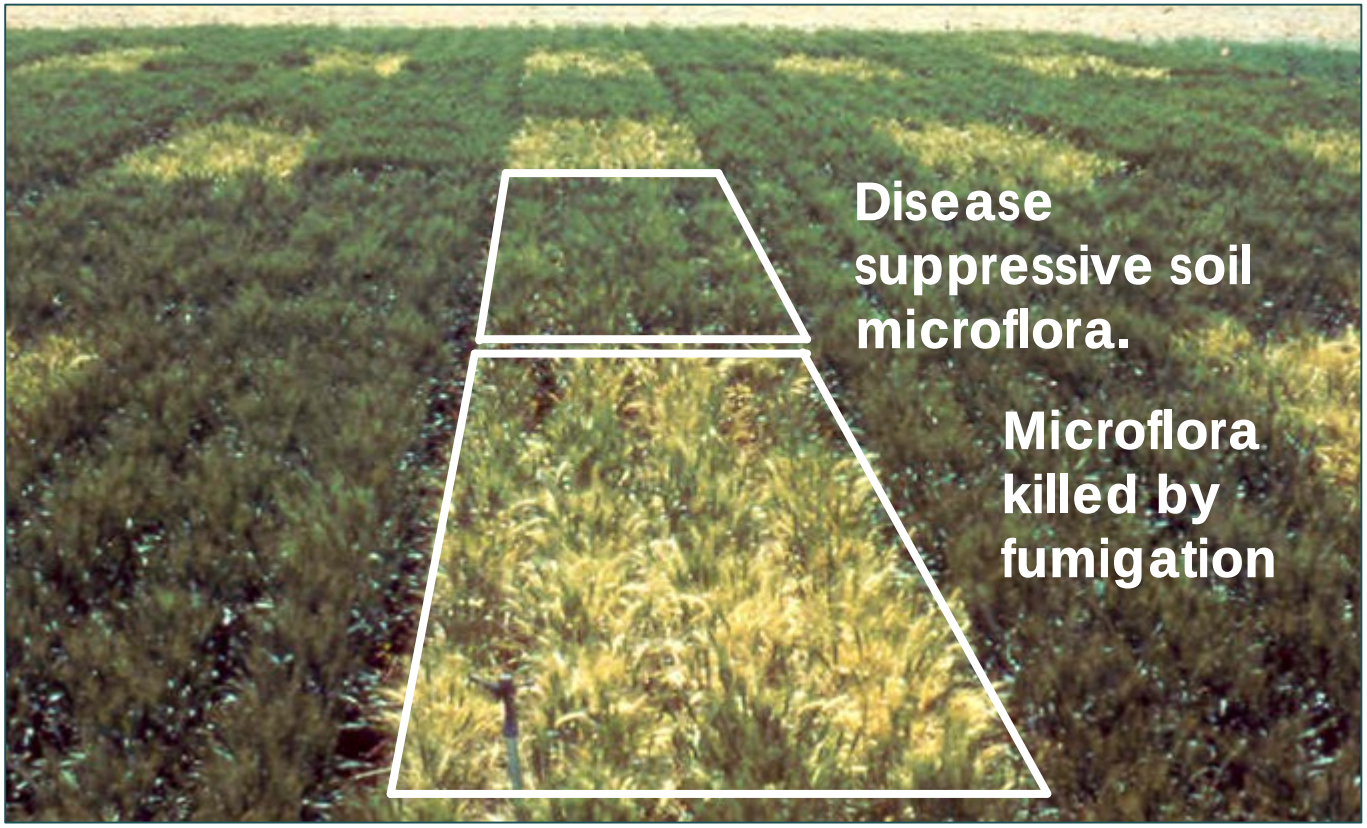
Genetic.

Sequencing.



http://jcm.asm.org/content/early/2015/11/20/JCM.02344-15.full.pdf+html

Step 1: Knowing something's there.



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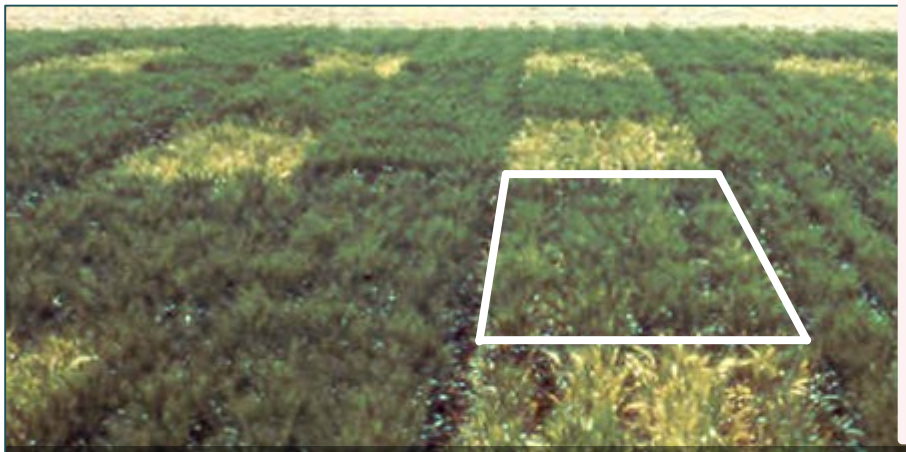
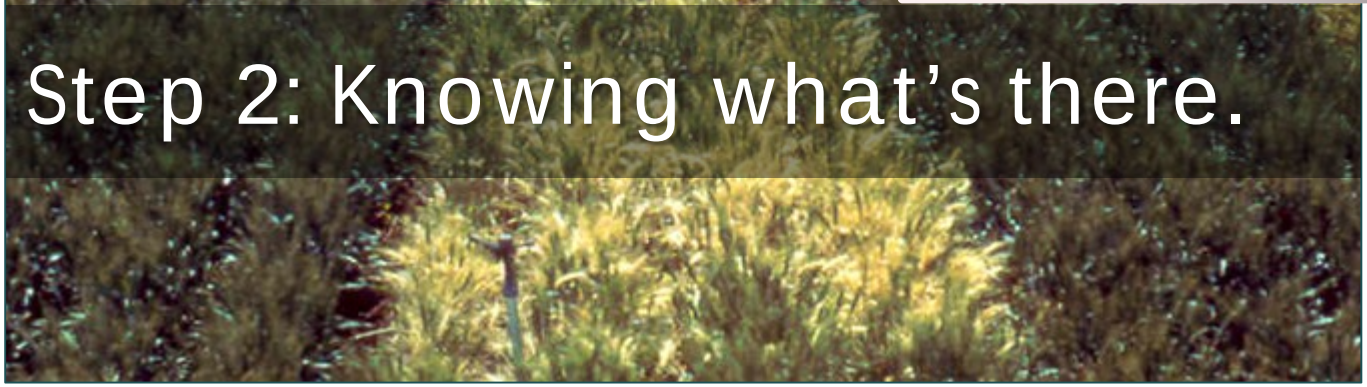


Step 2: Knowing what's there.



http://slideplayer.com/slide/6281987/, Photo courtesy of James Cook
https://exploringtheinvisible.com/2015/03/13/soil-culture/

Step 3: How to apply what we know.

- How do you alter a whole microbial community?
  - Add microbes that are not present.
  - Help communities persist through agronomic practices and pre-biotics.
  - What are the regulatory issues that must be considered?

www.npr.org

Step 3: How to apply what we know.

- Some agronomic practices are important for soil health.
- But different systems work well in different places and with different crops.

Step 3: How to apply what we know.

- Data collection is crucial.
- There is too much data for ordinary humans to process.

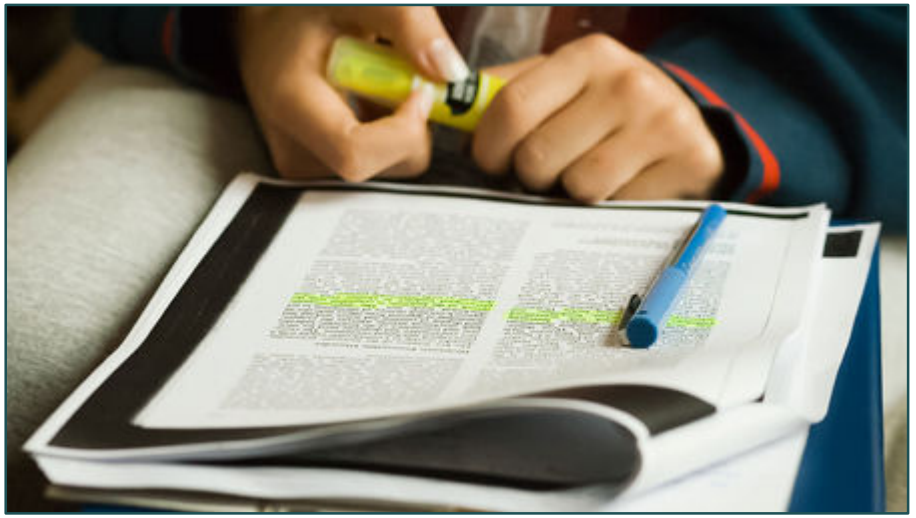
http://terraref.org/

Millions of papers *might* be relevant

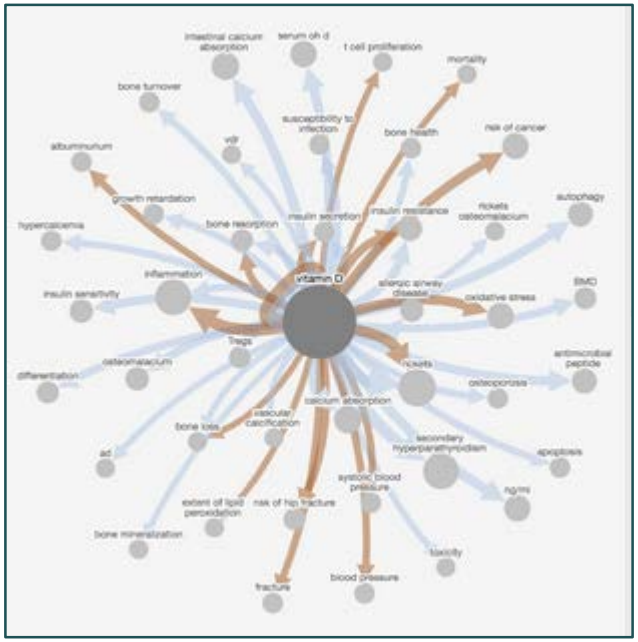
https://asjeditors.com, http://www.sciencemag.org, http://www.genome.jp/kegg-bin/show_pathway?hsa05200

Automated tools for data processing

- Natural language processing
- Machine Learning



Lum.ai is a start-up that can create association maps from publications.



Societies' data partnership with Lum.ai

Soil Health Institute, lum.ai and Tri-Societies Partner to Accelerate Soil Health Research

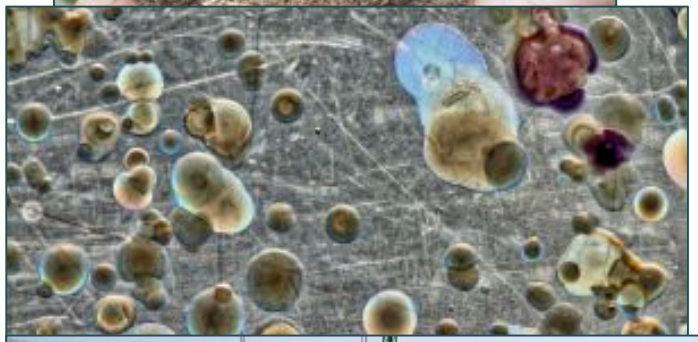
Leaders use natural language processing and machine learning to accelerate soil health research.

Submitted by: **The Soil Health Institute**
Categories: Environment, Research, Reports & Publications
Posted: Oct 24, 2017 – 09:50 AM EST

SOIL HEALTH INSTITUTE

Summary

- Soil health is tied to the yield and nutritional quality of crops, to the sustainability of their production, and to their associated microbes.
- Figuring out how to utilize microbes to enhance plant health and production, and to do it safely, is the next big challenge.
- An entrepreneurial spirit is needed to process and utilize the massive data researchers are gathering.



Introducing:

Sanjun Gu Extension Specialist in Horticulture at North Carolina A&T's College of Agriculture and Environmental Sciences.

Diane Wu Co-founder and CEO of Trace Genomics.

Terry Stone Vice President of Regulatory Affairs and Sustainability Programs at Agrinos.

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