Food from Thought: Agricultural systems for a healthy planet

Using bioinformatics to examine the impacts of agro-ecosystems on soil ecosystem services

Meet the Scientific Leadership Team

UNIVERSITY of GUELPH

the food institute
OF THE UNIVERSITY OF GUELPH

Food from Thought

The University of Guelph has received $76.6 million from the federal government to start a "digital revolution" in food and agriculture.

The government is investing in U of G's Food From Thought research project, which will use high-tech information systems to help produce enough food for a growing human population while sustaining the Earth's ecosystems.

The funding, announced today by Lloyd Longfield, MP for Guelph-Wellington on behalf of Kirsty Duncan, minister of science, will come from the Canada First Research Excellence Fund (CFREF), which supports world-leading research at universities and colleges.

Interdisciplinary teams

Food from Thought's strength is its interdisciplinary nature.

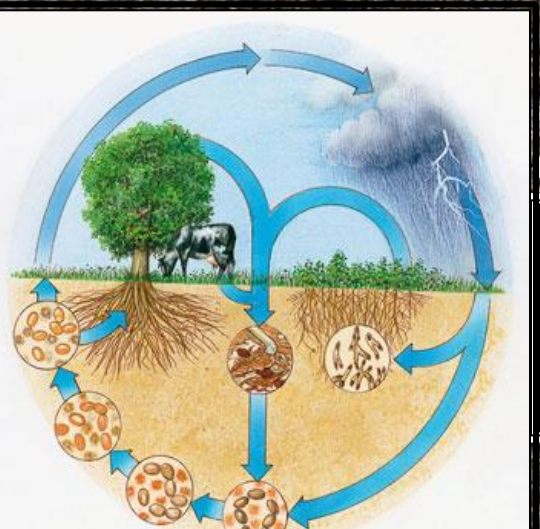
CFREF & Soil Health

- **Food from Thought means producing food while protecting ecosystems, without reducing productivity.**
- By conducting environmental monitoring and modelling, U of G will study how to manage agriculture and ecosystem interactions safely, without harming agriculture's productivity or efficiency.

Soil ecosystem services

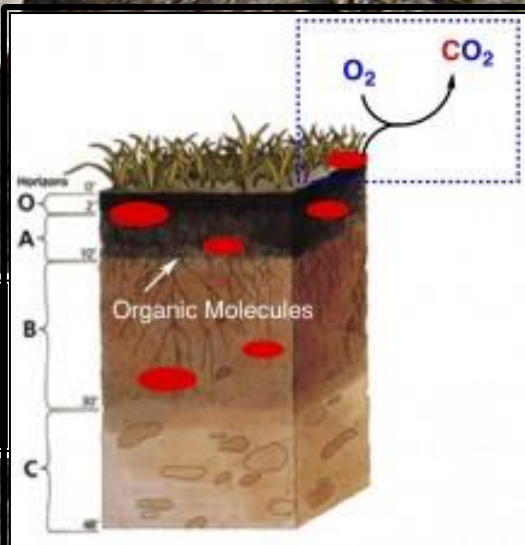
Plant production

Soil structure



N,P, S cycling
GHG emissions

Carbon sequestration



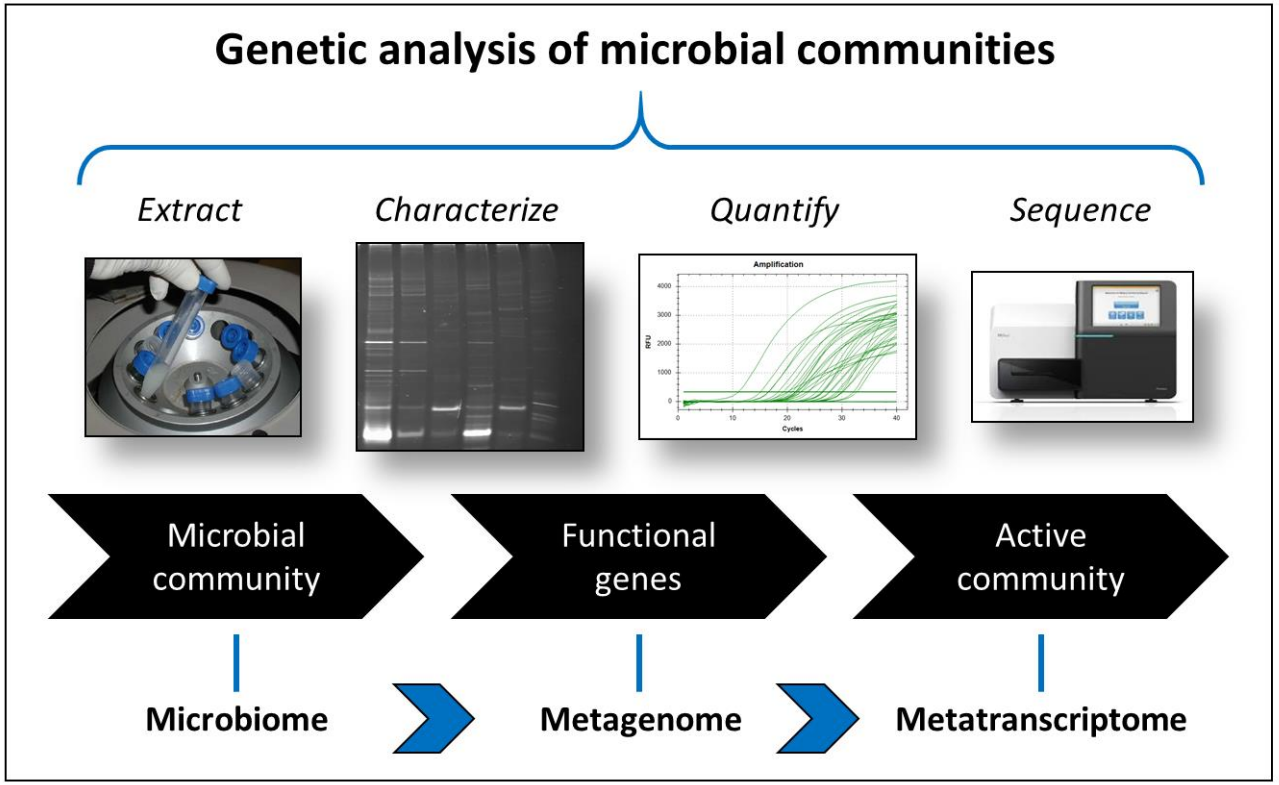
Food and Agriculture Organization of the United Nations

World Soil Day
5 December

THERE ARE MORE ORGANISMS IN ONE TABLESPOON OF HEALTHY SOIL...

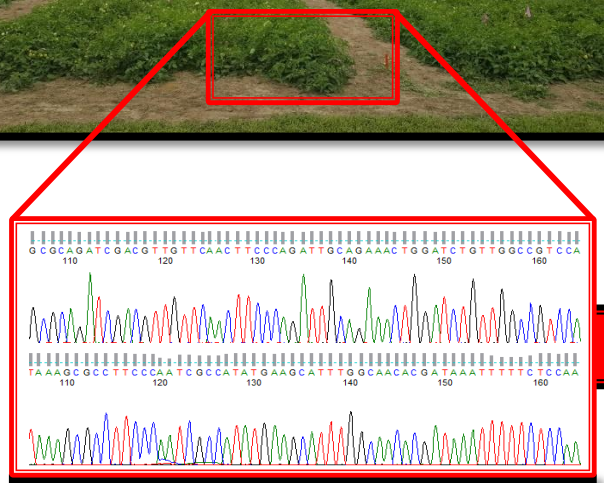
...THAN THERE ARE PEOPLE ON EARTH

We utilize a variety of advanced, culture-independent molecular techniques, looking at DNA and RNA, to investigate soil microbial communities.

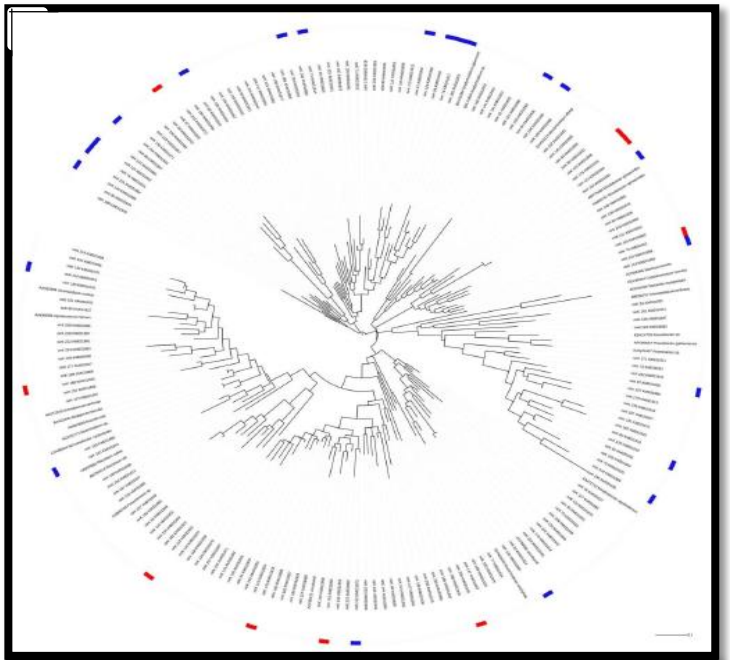


It is believed that a microbially diverse soil is a healthy soil. We aim to better understand the impact of agricultural production practices on the diversity of soil microbial communities, and overall soil health.

Field Trials (Ridgetown, Ontario)



DNA sequencing of microbial communities



Evaluating microbial community diversity in soil between field treatments

What production practices may impact the soil ecosystem?

Shifts from annual and perennial cropping systems

SOIL, 2, 523–535, 2016
www.soil-journal.net/2/523/2016/
doi:10.5194/soil-2-523-2016

SOIL Open Access EGU

Soil denitrifier community size changes with land use change to perennial bioenergy cropping systems

Karen A. Thompson[1], Bill Deen[2], and Kari E. Dunfield[1]

ELSEVIER

Soil Biology and Biochemistry

Volume 103, December 2016, Pages 262–273

Soil microbial communities as potential regulators of *in situ* N_2O fluxes in annual and perennial cropping systems

K.A. Thompson, E. Bent, D. Abalos, C. Wagner-Riddle, K.E. Dunfield

Primary Research Article

Micrometeorological measurements over 3 years reveal differences in N_2O emissions between annual and perennial crops

Diego Abalos, Shannon E. Brown, Andrew C. Vanderzaag, Robert J. Gordon, Kari E. Dunfield, Claudia Wagner-Riddle

Global Change Biology

View issue TOC
Volume 22, Issue 3
March 2016
Pages 1244–1255

Removing crop residues and shifting to conservation tillage

ELSEVIER

Applied Soil Ecology

Volume 108, December 2016, Pages 288–299

Residue management leading to higher field-scale N_2O flux is associated with different soil bacterial nitrifier and denitrifier gene community structures

Elizabeth Bent, Deanna Németh[1], Claudia Wagner-Riddle, Kari Dunfield

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Soil Biology and Biochemistry

Volume 73, June 2014, Pages 1–9

Abundance and gene expression in nitrifier and denitrifier communities associated with a field scale spring thaw N_2O flux event

Deanna D. Németh[1], Claudia Wagner-Riddle, Kari E. Dunfield

Including cover crops in the rotation

Journal of Environmental Quality TECHNICAL REPORTS
ENVIRONMENTAL MICROBIOLOGY

Effects of 30 Years of Crop Rotation and Tillage on Bacterial and Archaeal Ammonia Oxidizers

Jake W. Munroe, Ian McCormick, William Deen, and Kari E. Dunfield*

Laura VanEerd, Ridgetown, Long term cover crop trial

Organic production systems

Geoderma 257–258 (2015) 115–122

Contents lists available at ScienceDirect

Geoderma

journal homepage: www.elsevier.com/locate/geoderma

Linking alkaline phosphatase activity with bacterial *pho*D gene abundance in soil from a long-term management trial

Tandra Fraser [a], Derek H. Lynch [b], Martin H. Entz [c], Kari E. Dunfield [a,*]

Soil Biology & Biochemistry 88 (2015) 137–147

Contents lists available at ScienceDirect

Soil Biology & Biochemistry

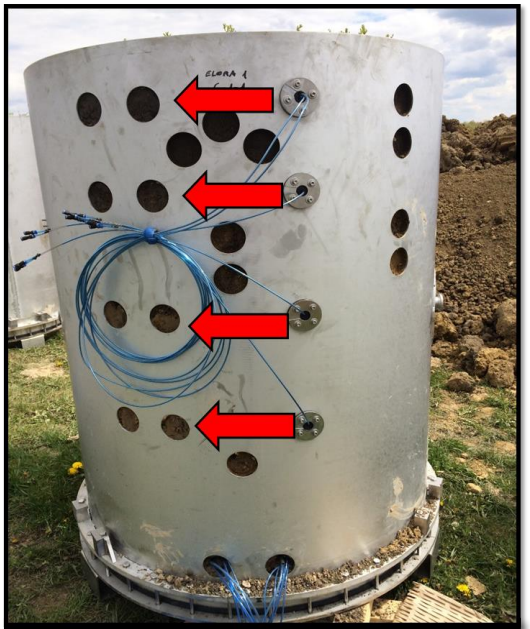
journal homepage: www.elsevier.com/locate/soilbio

Soil bacterial *phoD* gene abundance and expression in response to applied phosphorus and long-term management

Tandra D. Fraser [a, b], Derek H. Lynch [b], Elizabeth Bent [a], Martin H. Entz [c], Kari E. Dunfield [a, *]

Glenlea long-term rotation, Winnipeg MB

We will monitor how soil bacterial diversity and key bacterial functional groups involved in nitrogen and phosphorus turnover influence soil health and resilience under different crop rotations, soil types and under warming/thawing conditions.



Soil sampled from a lysimeter at increasing depths for microbial analysis

Comparing soil bacteria associated with soybeans grown in sandy vs. silty loam

Thank-you!

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NSERC CRSNG

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