

# **SESSION TWO: BUILDING CAPACITY TO OVERCOME PLANETARY LIMITATIONS**

**Round Table Meeting June 2023**

**Please remember to follow Chatham House Rule.**





# Moderator Robert L. Thompson

Professor Emeritus  
University of Illinois

# Building Capacity to Overcome Planetary Limitations

Robert L. Thompson

Professor Emeritus of Agricultural Policy University of  
Illinois at Urbana-Champaign

June 15, 2023

# Projected Population Growth to 2050

(millions)

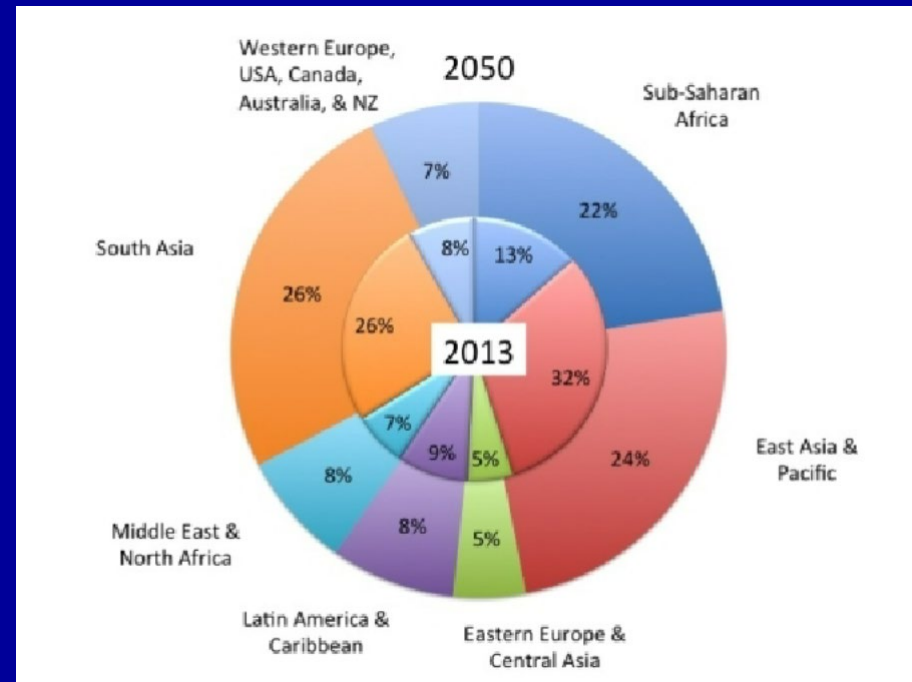
Region	2022	2050	Change	Percent
World	7,963	9,752	+1,789	+ 22
High Income	1,270	1,297	+ 27	+ 2
Low-Middle Income	6,694	8,454	+1,760	+ 26
East & S.E. Asia	2,350	2,319	- 31	- 1
South+Central Asia	2,086	2,582	+ 496	+ 24
Sub-Saharan Africa	1,168	2,122	+ 954	+ 82
Latin America/Carib	656	746	+ 90	+ 14
N. Africa & W. Asia	545	767	+ 222	+ 41

Source: Population Reference Bureau. [2022 World Population Data Sheet](#).

The world's arable land is not distributed around in the world in the same proportions as is population.



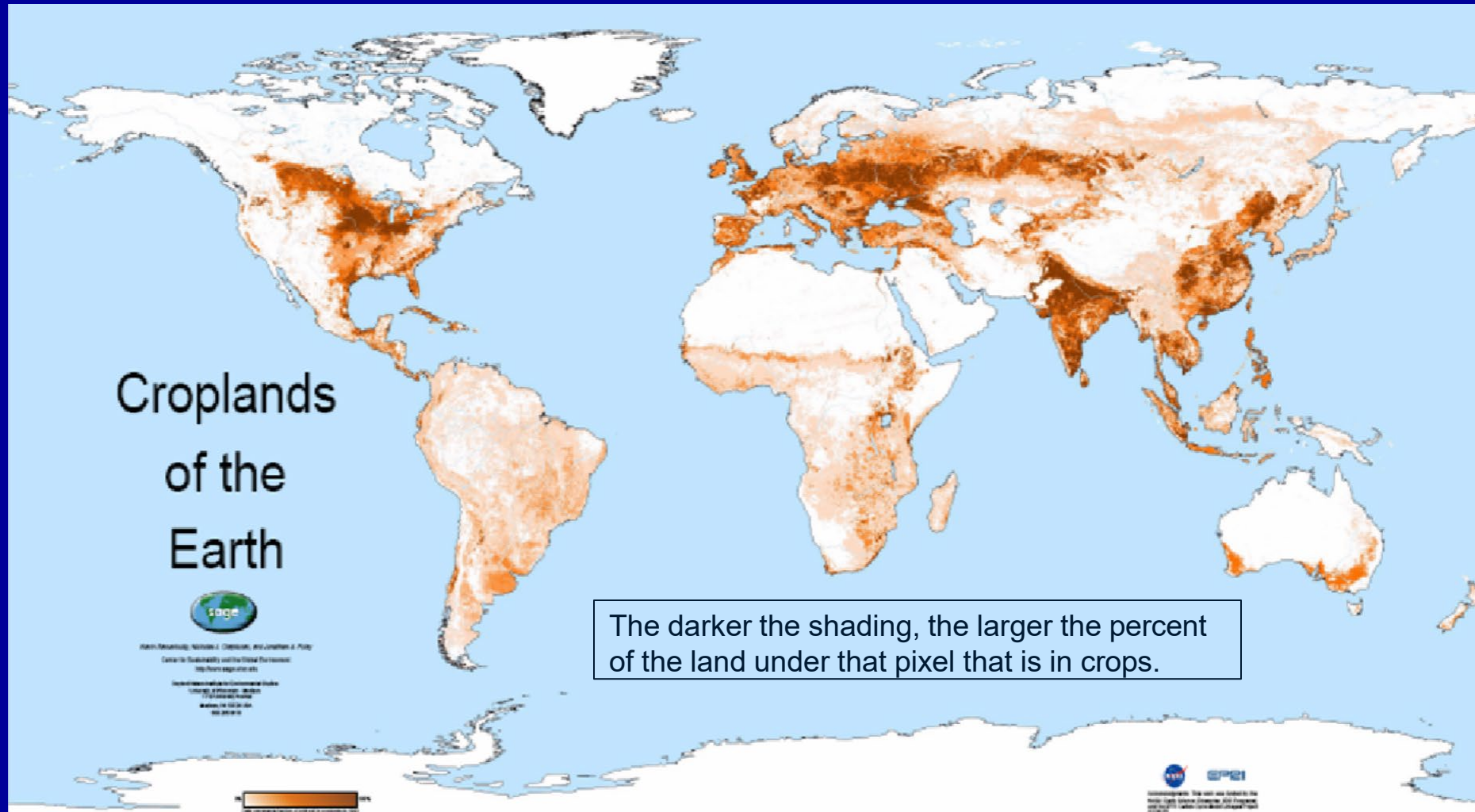
Distribution of Arable Land



Distribution of World Population

East and South Asia have more than twice as much of the world's population than of the arable land, and virtually all of their arable land is already in production. The Middle East & North Africa have land, but not water.

# Croplands of the Earth

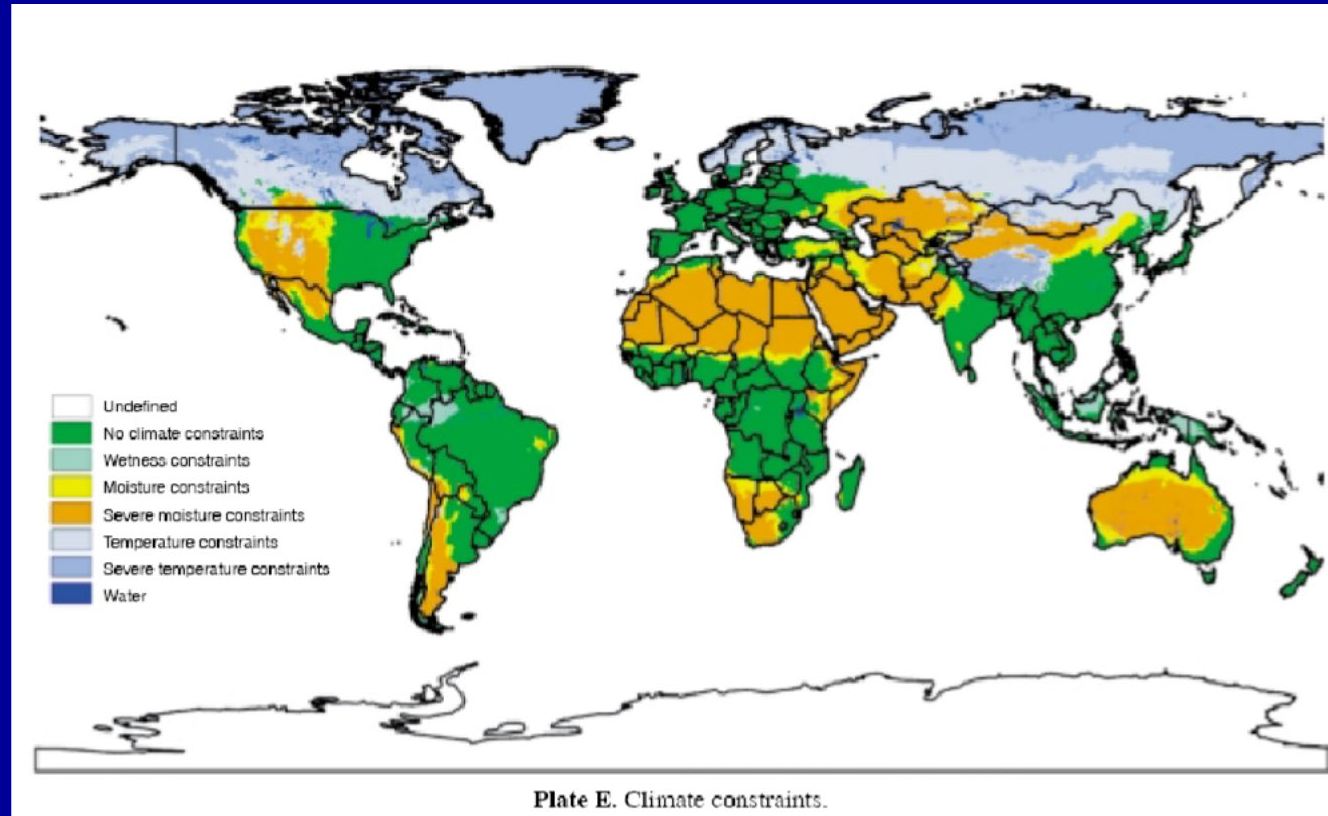


Source: Center for Sustainability and the Global Environment (SAGE), University of Wisconsin.





# Climate Constraints Changing



- Warming greater over land than over water and greatest at higher latitudes.
- Changing spatial distribution of precipitation
- Increased frequency of extreme climatic events



# Thank You

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**Stephen Long**  
Chair of  
Crop Sciences and Plant Biology  
University of Illinois



**Ronald Meeusen**  
Managing Director  
Cultivian Sandbox



**Gebisa Ejeta**  
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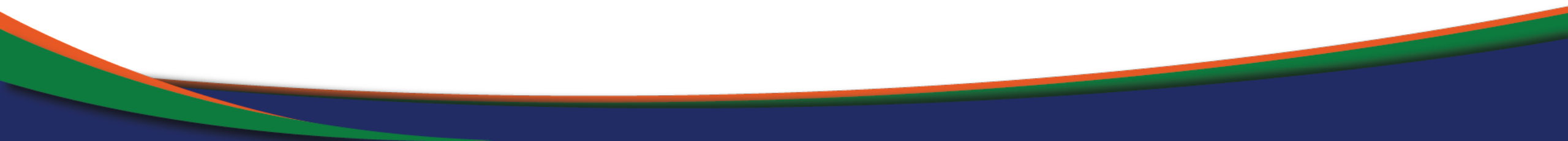
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*Accelerating people & ideas since 1933*





# Ronald Meeusen

**Managing Director  
Cultivian Sandbox**



Chicago, IL

June 15<sup>th</sup>, 2023

# Meeting Planetary Limitations: Agriculture Has Answers

RON MEEUSEN, PH.D.

MANAGING DIRECTOR, CULTIVIAN  
SANDBOX VENTURES



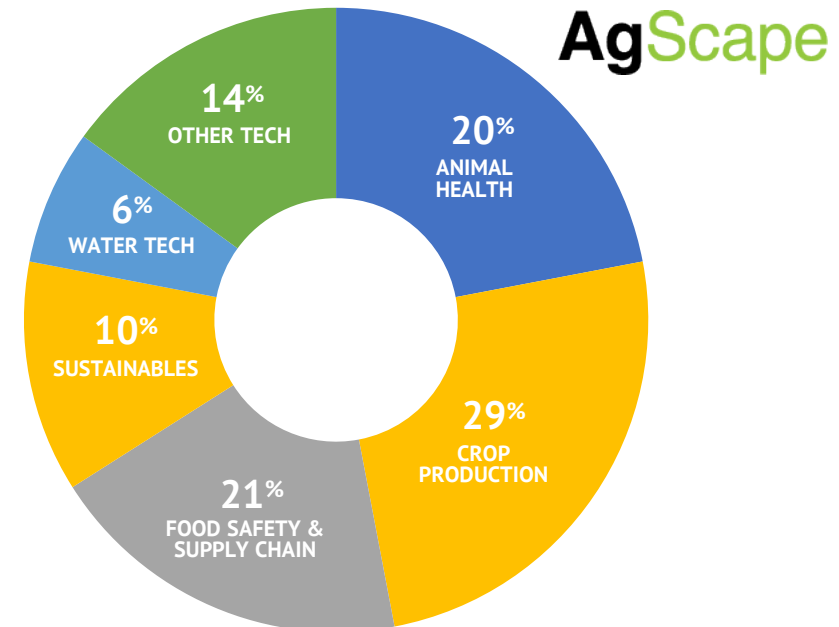
# One Sees a Lot as a Venture Investor!

Cultivian Sandbox Ventures 

**\$284 MM** → **36 Investments**

**Exclusively investing in  
AgTech since 2008**

**Over 4,800 in Database**



# Planetary Limitations: Ag Gets a Bad Rap!

## The Bad Raps

### Climate

- **CO<sub>2</sub> Emissions**
- **Livestock methane**
- **Water Usage/Pollution**
- **Climate Adaptation**

### Soil Depletion

- **Erosion**
- **Fertilizer Intensity/Runoff**

## Ag's Answers

### Climate

- **Capture CO<sub>2</sub> in soil**
- **Turn into fertilizer**
- **Use less H<sub>2</sub>O**
- **> Resilient crops, New Crops**

### Soil Depletion

- **Cover crop to Cash crop**
- **Replace chemical fertilizers**

# CO<sub>2</sub>: Capture in the Soil – Raise Soil OM

**Soils hold 3x the carbon in the atmosphere.**

**Raising soil organic matter 1% captures 8 tons/acre.**

**Ag is Already Pursuing This with Existing Approaches:**

- **No Till.**
- **Breeding crops which leave more organic matter in the soil.**
- **Cover Crops.**

**And New Tool are on our Doorstep!**

# CO<sub>2</sub>: Capture in the Soil – Replace Lime

**Replace Limestone with Olivine (Most abundant rock on Earth).**

**Absorbs 1 ton of CO<sub>2</sub> per ton in 12 months.**

**Stores CO<sub>2</sub> for > 100,000 years.**

• EIONCARBON.COM

An aglime replacement that permanently removes carbon & fits into your current farming practices



Adjusts pH just like aglime ✓

No practice changes ✓

# Livestock Methane: Stop it Naturally

- SYMBROSIA.COM



**Red Seaweed in feed  
reduces CH<sub>4</sub> by < 90%.**

**1 oz/day for 400 lb animal.**

**Company works with ranchers to measure and apply for carbon offset payments. Other approach – vaccinate against methanogenic microbes (Arkea Bio).**

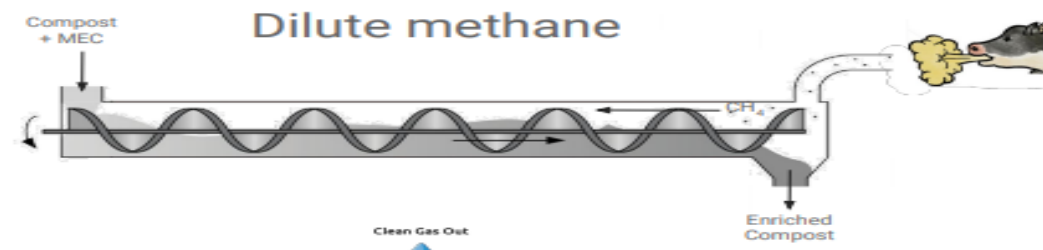
# Livestock Methane: Feed to Microbes to Create Fertilizer



*Using natural microbes to turn methane into fertilizer.*



Methane eating microbes sprayed onto compost capture methane from dairies, manure ponds, compost piles and fix atmospheric nitrogen to simultaneously stop GHG emissions and provide valuable farm nutrients.



Windfall.bio



# Water: Recycle on Site

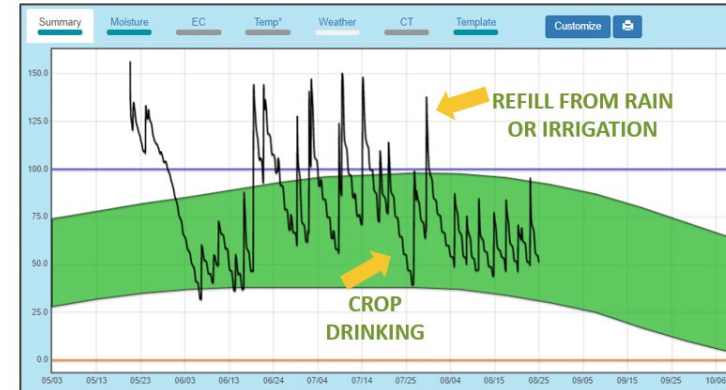
*Dairies are turning manure into clean water and green ammonia*



The Varcor system transforms cow poop into clean water and dry organic fertilizer, reducing greenhouse emissions and creating a closed-loop farm system. Turns manure into clean water, electricity, green ammonia and 3:3:3 dry organic fertilizer. Reduces GHG by 33%

# Water: Use Water More Efficiently

- **CONSTANT SOIL MOISTURE MONITORING**
  - Across depth to 48"
  - Allows irrigation to root zone, not through it.
  - Tells root depth throughout season.
  - Real time data. 5 year battery life.



## What you can see

- Moisture at the Root Level
- EC / Salinity
- Growing Days
- Root Depth
- Temperature
- Humidity
- Last Irrigation
- Weather Data
- Precipitation

AQUASPY.COM

# Planetary Limitations: Ag Gets a Bad Rap!

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# Climate Adaptation: Protect vs Heat

What Ag is Doing About Climate Change?



*Power Pollen is protecting pollination against heat*



**powerpollen**

**AT POWERPOLLEN WE'RE DEDICATED TO REVOLUTIONIZING AGRICULTURAL PRODUCTION BY CREATING SUSTAINABLE AND PROFITABLE SOLUTIONS FOR FOOD, FEED AND FUEL.**



**WITH POWERPOLLEN'S IN-SEASON CONTROL, FARMERS HAVE THE ABILITY NOT ONLY INCREASE YIELD BUT ALSO DELIVER HIGH VALUED TRAITS VIA POLLEN, TRANSFORMING #2 YELLOW CORN ACRES INTO A HIGHER VALUE, MORE IDEAL FEEDSTOCK FOR DIFFERENT END USER MARKETS.**

**PROTECT VS. HEAT**

PowerPollen offers a solution that helps combat climate change by allowing pollen to be applied under optimal conditions, enabling full productivity potential even when under drought and heat stress.

Nearly all the crops we rely on need to be pollinated to produce food - the increasing prevalence of extreme drought and heat places serious stress on pollination and can prevent fertilization.

**CLIMATE**

PowerPollen's technology is being used to create a more sustainable world and combat climate change.

- It increases the energy density produced/acre acre with the same amount of inputs.
- Lowers the carbon footprint at the farmgate to produce an acre of corn.
- Offsets 78% of CO2 emissions generated from 1 acre of corn production, advancing corn towards being a carbon neutral crop.

**FOSSIL FUELS**

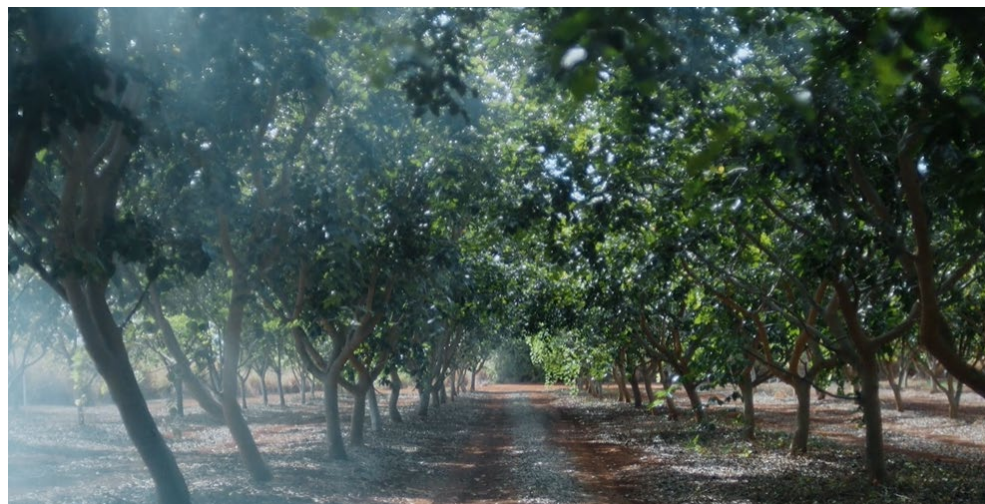
PowerPollen's solution addresses large markets and shifts towards sustainable farming practices with increased productivity.

Producing a high oil bushel with PowerPollen's technology allows an ethanol plant to double their corn oil production per bushel, therefore an additional 4.3 billion lbs of low carbon feedstock can be produced annually without increasing corn acres and with limited infrastructure required.

**POWERPOLLEN.COM**

# Climate Adaptation: New Crops

## *Adopting New Crops Resilient to Heat and Drought*



**Pongamia**

Regenerative Agriculture

**Ponova™**

Food Ingredients

- Nuts with oil/protein content equal to soy
- Harvested with existing tree nut equipment
- Replacing Citrus orchards lost to disease in FLA.
- Sustainable US replacement for imported palm oil

**Others: Equinom bringing sesame to US.**

**Stoney Creek bringing Indigo to US.**

<https://www.terviva.com/>



# Soil Depletion: Turn Cover Crops into Cash Crops

*Covercress Inc. is Turning Cover Crops from a Grower Expense to Revenue*



Breeding Pennycress to mature in the window between corn harvest in the Fall and soy planting in the Spring.

Uses existing equipment.

Oil suitable for biodiesel.


Improves both soil *AND* grower ROI.

*(Acquired by Bayer in 2022)*

[info@covercress.com](mailto:info@covercress.com)

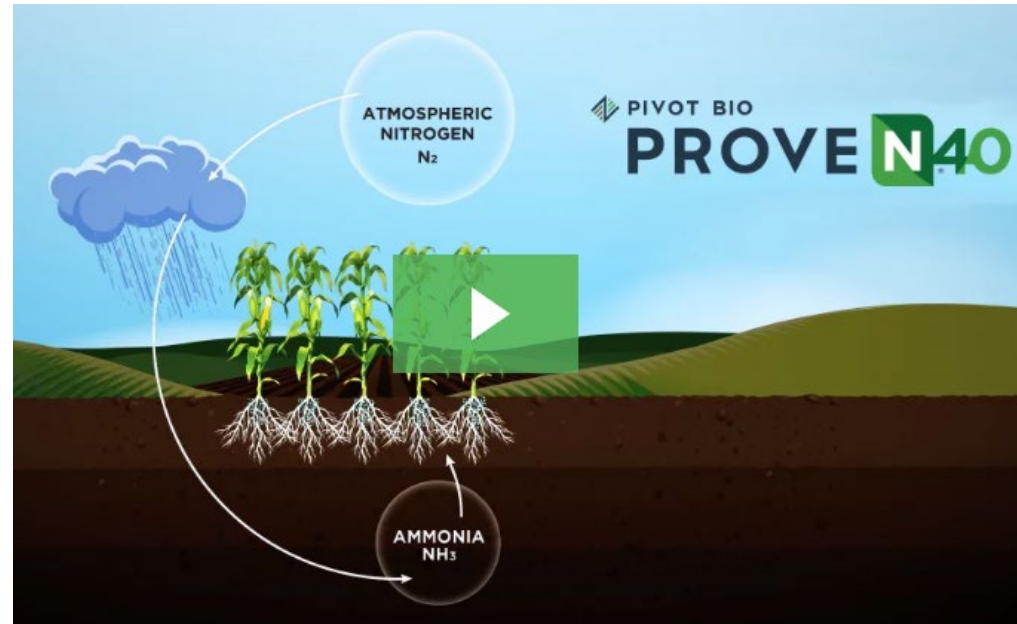


# Fertilizer Reduction: Add Soil Microbes to Fix N.



**Produce Nitrogen**

Sensing the nutrient needs of the crop, our reprogrammed microbes reliably produce the right levels of nitrogen in any weather and throughout the growing season.



- [PIVOTBIO.COM](http://PIVOTBIO.COM)

# Fertilizer Reduction: Activate Soil Microbes to Fix N and Solubilize P.

## ACTIVATES THE SOIL

First of its kind foliar-applied microbiome activator that helps you get more nitrogen and phosphorus from your soil.



Enhanced by precision placement

+7.2 bu uplift / 89% win rate

4.2x ROI to grower <sup>1</sup>

• [SOUND.AG.COM](https://SOUND.AG.COM)

# Planetary Limitations: Ag Can be the Solution!

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# Livestock Methane: Feed to Microbes to Create Fertilizer

- **DAIRY METHANE & AMMONIA CONVERTED TO HIGHER VALUE COMPOST FERTILIZER**

**Proprietary bacterial consortia (MEC)**  
without IP restrictions or licenses

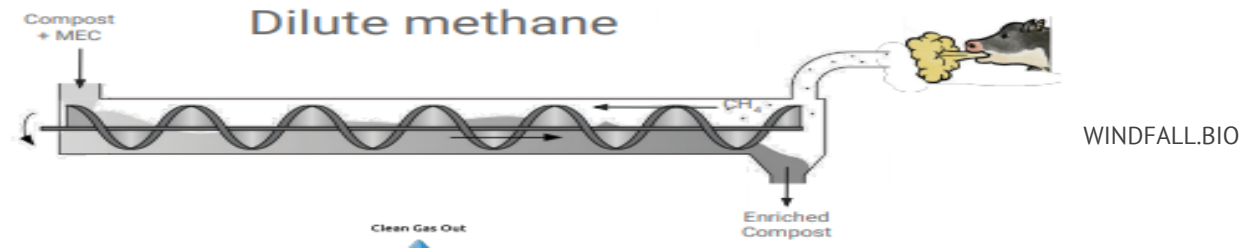
Metabolize methane at **atmospheric concentrations**

**Nitrogen-fixing**, produces fertilizer as a by-product of methane destruction

<\$1 per ton CO<sub>2</sub>e cost at dairies

<\$50 per ton CO<sub>2</sub>e cost at atmospheric

Generates >\$90 of fertilizer value over total lifetime in soil from \$1 input





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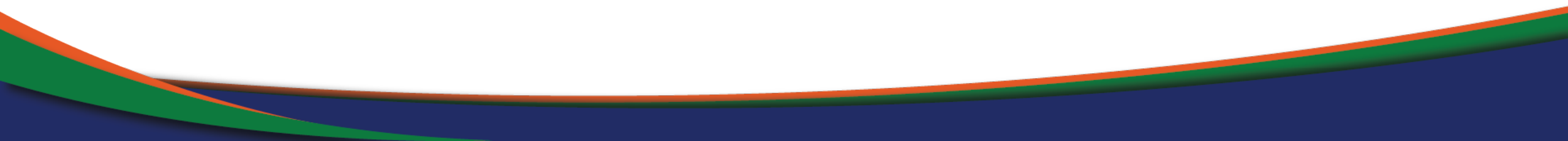
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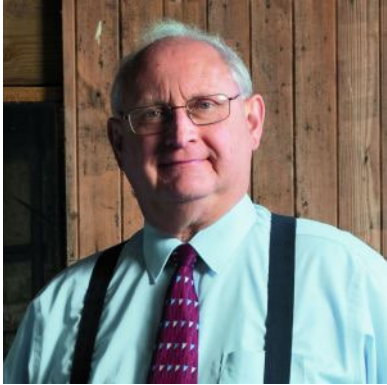


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# QUESTIONS AND ANSWER

*Please submit your questions on the meeting app or use one of the microphones.*



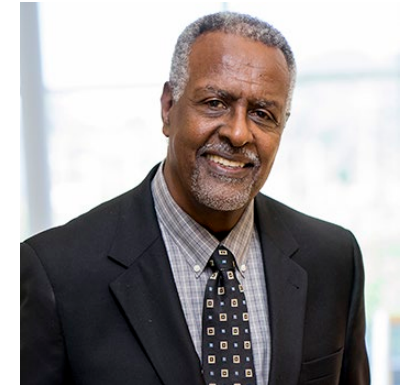
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