Cultivator Presentations

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Remember: Round Table is off the record.

Becky Doyle

MODERATOR | THE CONTEXT NETWORK

June 2021 Farm Foundation Cultivators

- **Shweta Adhikari**
  University of Georgia
  Mentor: Gregg Doud
- **Vivian Vuong**
  University of California, Davis
  Mentor: A.G. Kawamura
- **Janeva Williams**
  North Carolina Agricultural & Technical State University
  Mentor: Jimmy Kinder
- **Laura van der Pol**
  Colorado State University
  Mentor: Bill Northey
- **Lacey Lingelbach**
  University of Florida
  Mentor: Jack Payne
- **Octavio Guimaraes**
  Colorado State University
  Mentor: John Foltz

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Shweta Adhikari

UNIVERSITY OF GEORGIA

Impact of recent policy changes on global palm oil trade: A Gravity model approach

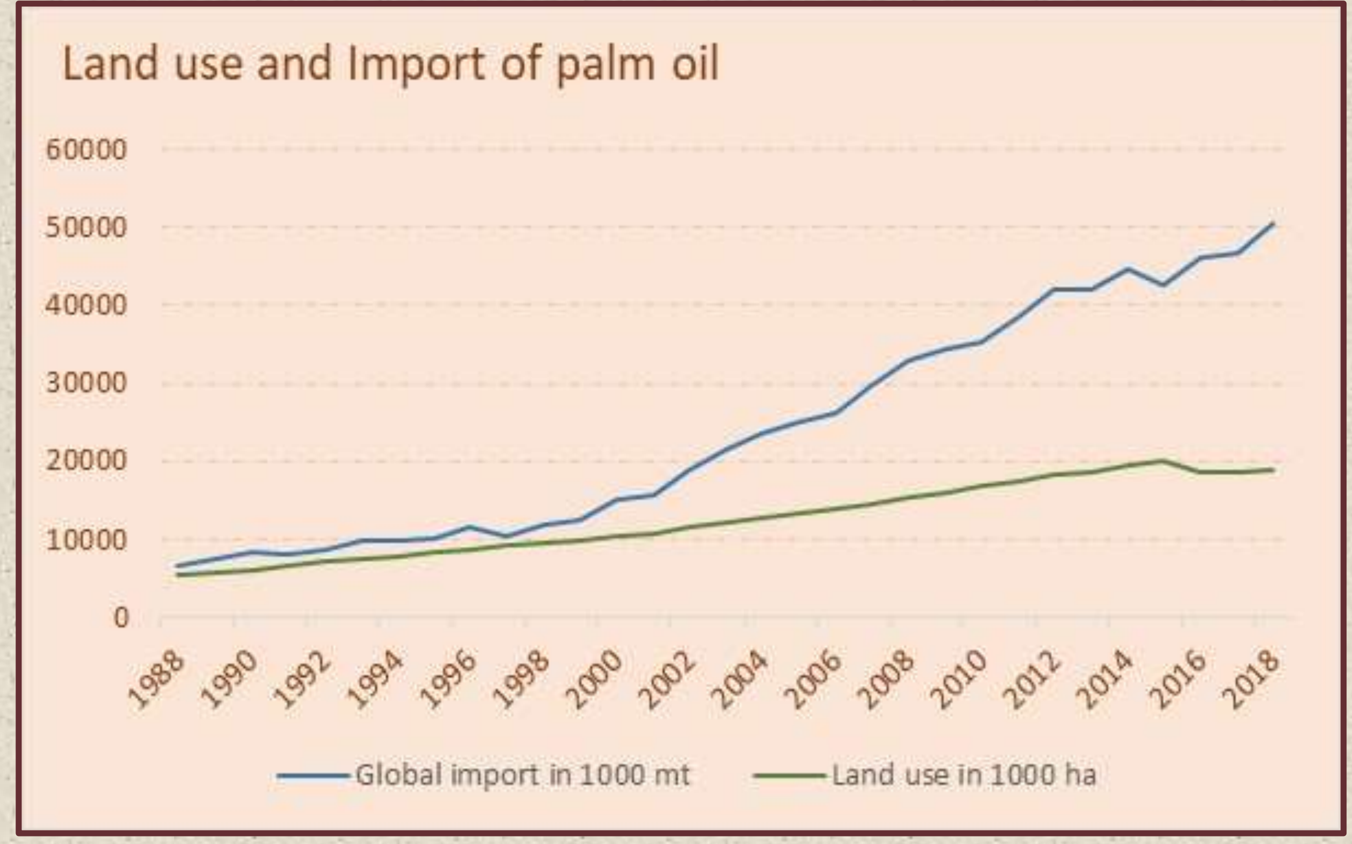
-Shweta Adhikari
MS student
University of Georgia

PALM OIL

- Major source of edible oil consumed in the world, used in processed food and major ingredient in biofuel production
- Major producers: Indonesia, Malaysia, Papua New Guinea, Guatemala
- Major consumers: China, India, European Union
- One of the top ten most traded agricultural commodities in 2019

Land Use and Trade of Palm oil 1988 -2018

Global palm oil production increased from 9.47 million metric tons in 1988 to 72.27 million metric tons in 2019. Increase in palm oil production is mainly due to the growth in the area of plantation ((Carter, Finley, Fry, Jackson, & Willis, 2007), (Basiron, 2002)).



TREMENDOUS COST OF CHEAP OIL

- Major driver of deforestation – excessive land use change
- Destruction of habitat of endangered species –Orangutan, pygmy elephant, Sumatran Rhino
- Labor right issues

A CASE OF MUTATION OF EUROPEAN COUNCIL'S DECISION

EU's Renewable Energy Directive I

A mandatory target of 20% share of renewable energy and 10% biofuel share by the member states by 2020 as part of its Renewable Energy Directive (RED I)

RED I's report: Palm-oil biodiesel processed can typically save up to 62% greenhouse gases

RED II

High risk of indirect land-use changes associated with GHG

December 2018 (RED II) launched that limited the count from food-based crops towards renewable sources at 7%, with the plan to reduce the share to 0% in case of palm oil starting from 2021

RESEARCH QUESTIONS

How has tariff impacted refined and crude palm oil trade globally in the last 32 years?

What are some of the recent policy changes and how can they affect crude and refined palm oil trade values?

HOW CAN COMPLETE BAN OF OIL PALM BY EUROPEAN UNION AFFECT THE TRADE?

Using the Ad-valorem equivalent of Non-Tariff Measure, effects of previously implemented NTMs on trade is calculated

NTMs have affects like the ordinary tariffs and can be proxied using ad valorem equivalents (AVEs) equivalents calculated as % value of product

World Bank provides AVE of NTMs based upon sample of NTMs data collected between 2012 and 2016. The value of EU’s AVE for NTM is 5.245

Tariff Mean EU-ASEAN	5.72
AVE of NTB	5.25
Total	10.97
% Change	91.7
Elasticity	-0.45
% Change in value of imports	-41.26
Base import from ASEAN (2010-2016)	9235.9
Change in trade value in Mil USD	-3811.02

Imposition of NTM cost more than 3 billion USD of palm oil import from ASEAN between these years

Complete ban of palm oil is likely be responsible for a higher decline in the trade value and has implications on jobs and income of millions in Indonesia, the major exporter.

CONCLUSION AND FURTHER STUDY

EU ban of palm oil from the renewable energy sources a rule that is against WTO guideline has a huge impact on the trade of palm oil impacting the livelihood of millions of farmers in palm oil producing countries

Besides, this plan is likely to increase usage of another biofuel feed that can potentially create similar environmental issue and worsen the GHG emission situation and Climate change

Further study plan is to use the tariff elasticity of crude oil palm to see the effect of Covid-19 policy changes and others

THANK YOU!

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Vivian Vuong

UNIVERSITY OF CALIFORNIA, DAVIS

IN-FIELD AUTOMATED HIGH-THROUGHPUT PHENOTYPING IN SOLANACEAE CROPS

PRESENTED BY VIVIAN L. VUONG

ADVISED BY PROF. DAVID SLAUGHTER

UNIVERSITY OF CALIFORNIA, DAVIS, DEPARTMENT OF BIOLOGICAL AND AG. ENGINEERING

WHAT CAN HIGH-THROUGHPUT PHENOTYPING DO?

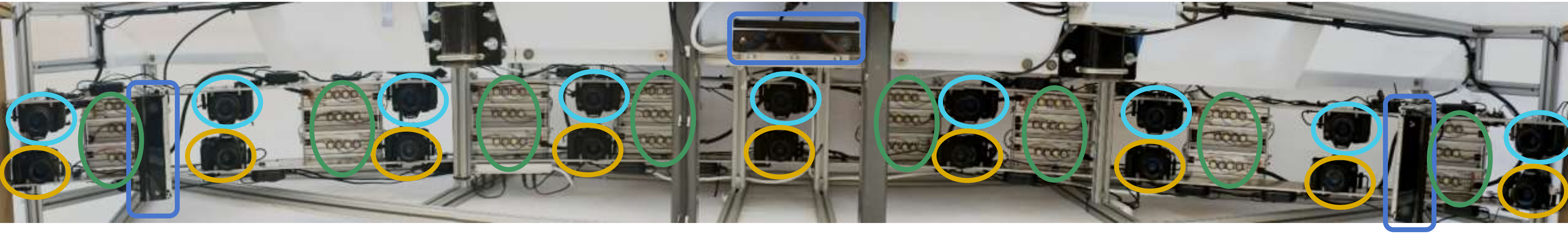
- Our changing climate necessitates breeding of new, more robust crop cultivars

- Development of cultivars based on high-throughput genotyping is bottlenecked by current phenotyping methods
  - Labor intensive
  - Time intensive
  - Cost intensive

HIGH-THROUGHPUT PHENOTYPING SYSTEM

HIGH-THROUGHPUT PHENOTYPING SYSTEM SENSOR SUITE

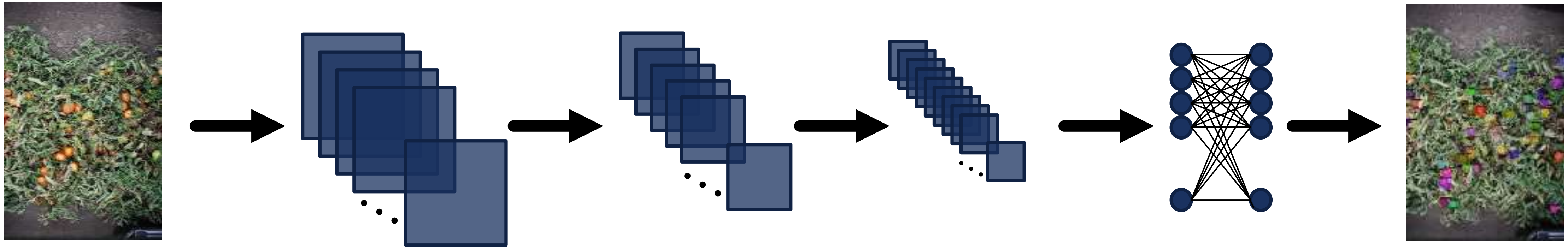
- 18 Digital Single Lens Reflex (DSLR)
  - 9 full color cameras
  - 9 modified Normalized Difference Vegetation Index (NDVI) cameras
- Custom LED modules
- 3 Microsoft XBOX Kinects
- 2 APOGEE temperature sensors (not pictured)



DRIVING EXAMPLE

WHAT DO WE DO WITH THE DATA?

- We collected ~1 TB of data each day
  - 2 years of data collection
  - 15 days/year of total data collection
- Neural networks were trained to find different objects in a tomato plant



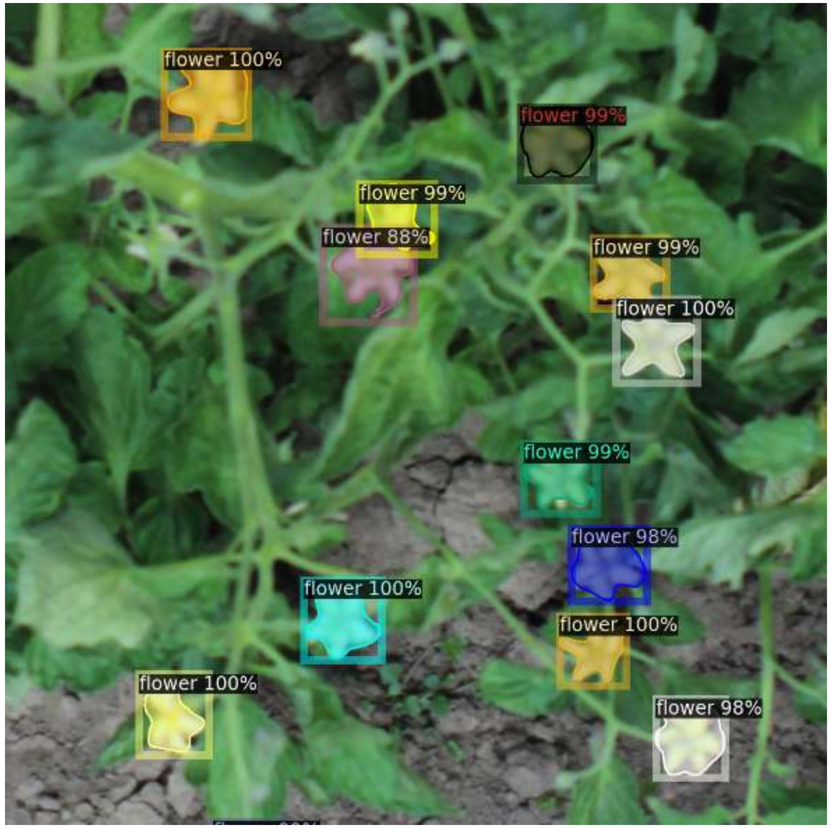
OBJECT DETECTION – FRUIT

Original image from HTPP System

Image after object detection

OBJECT DETECTION – FRUIT

OBJECT DETECTION – FLOWERS



OBJECT DETECTION – GREEN FRUIT USING NDVI

3D POINT CLOUD - KINECT

Janeva Williams

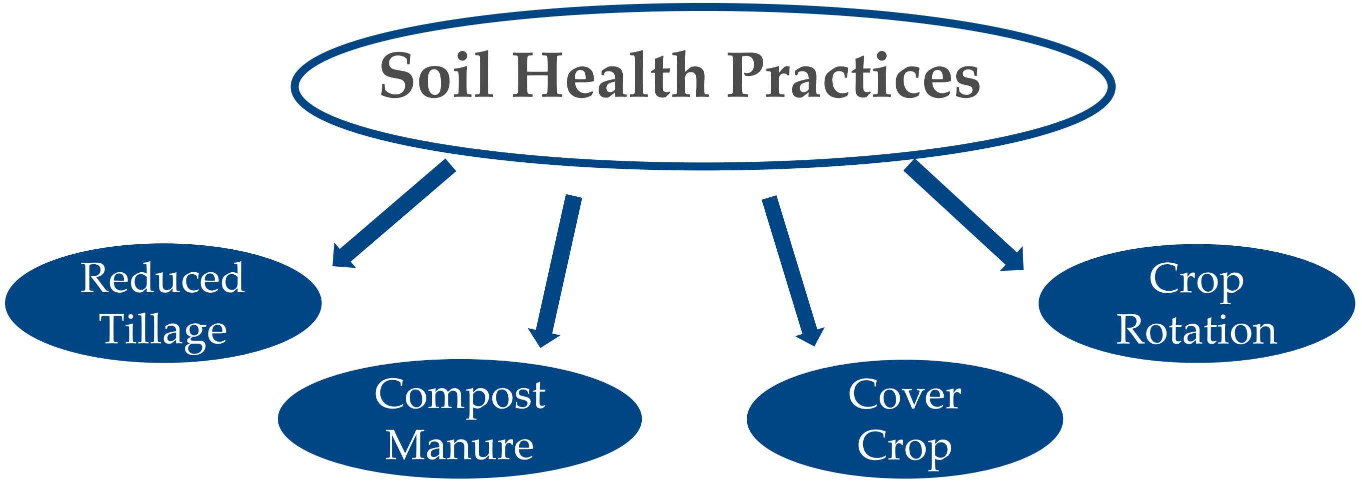
NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

Impact of Cover Cropping and Manure Application on Nitrous Oxide Emissions

Ms. Janeva Williams

NCAT Department of Natural Resources and Environmental Design

06/2021



Advantages and Challenges Of Using Cover Crop and Manure

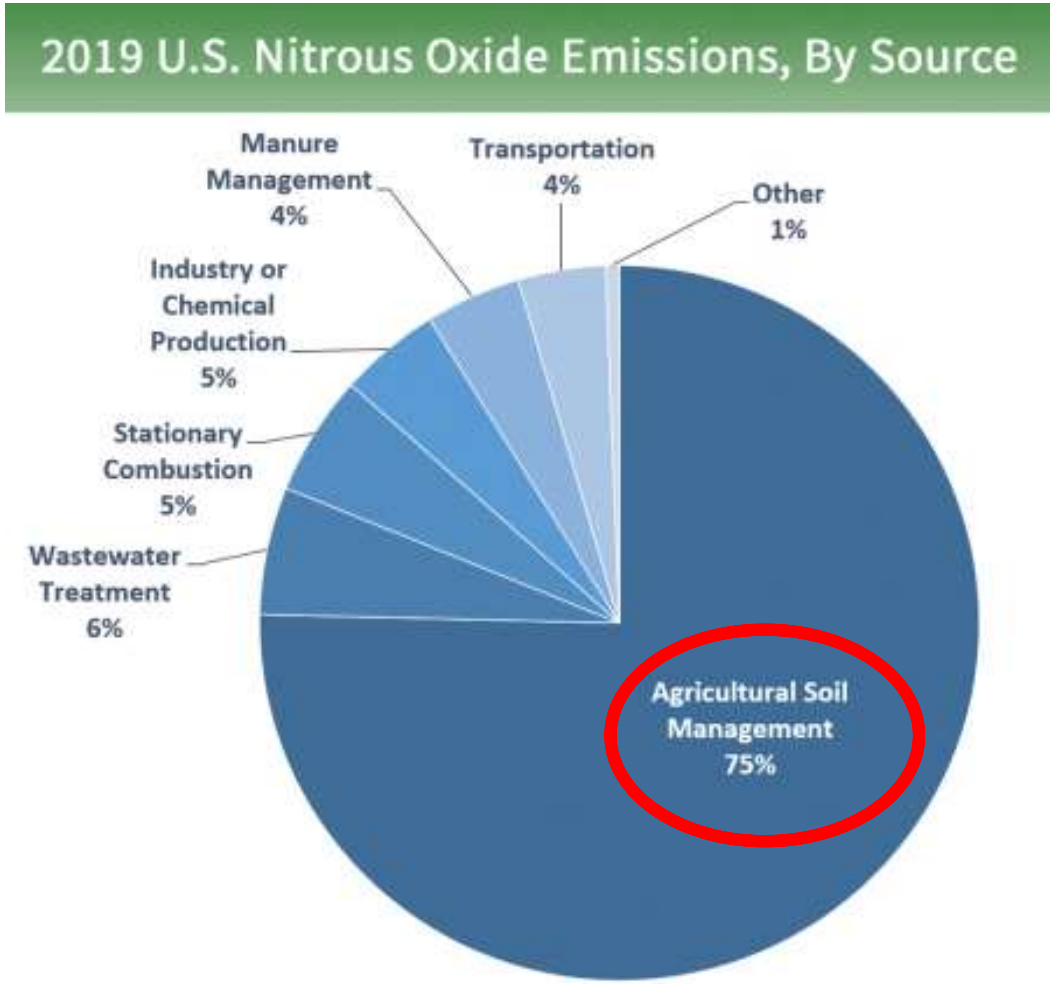
Advantages

- Improved carbon accrual
- Increased soil biodiversity
- Increased soil microbial activity

Challenges

- Synchronizing nutrient release with plant up take
- Increased nitrous oxide emissions (N_2O)

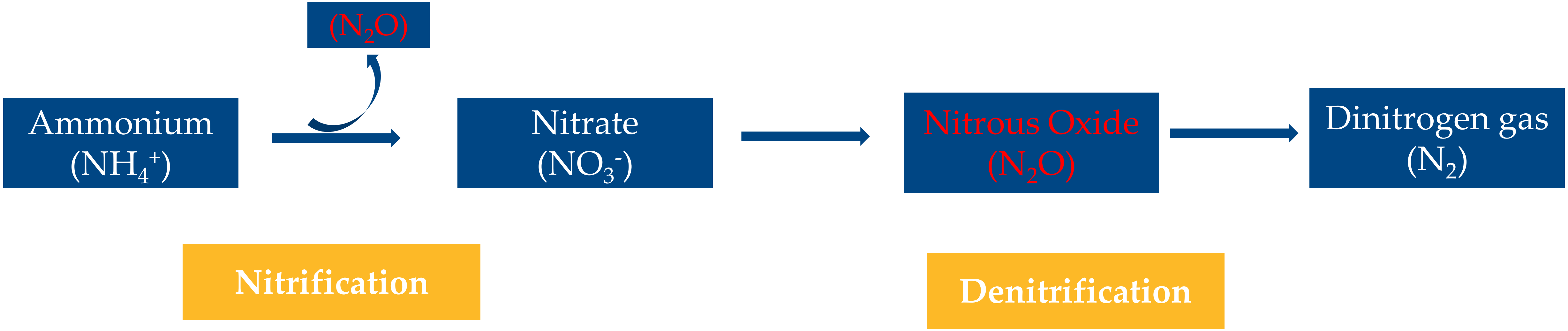
Sources of N_2O Emissions



N_2O is 300 times more potent greenhouse gas than CO_2

Source: EPA, 2019

Microbial processes contributing towards soil N_2O emissions



Soil management and conditions influencing N_2O emissions

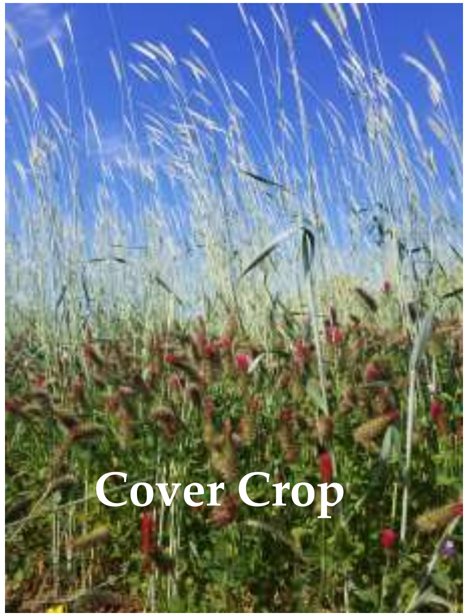


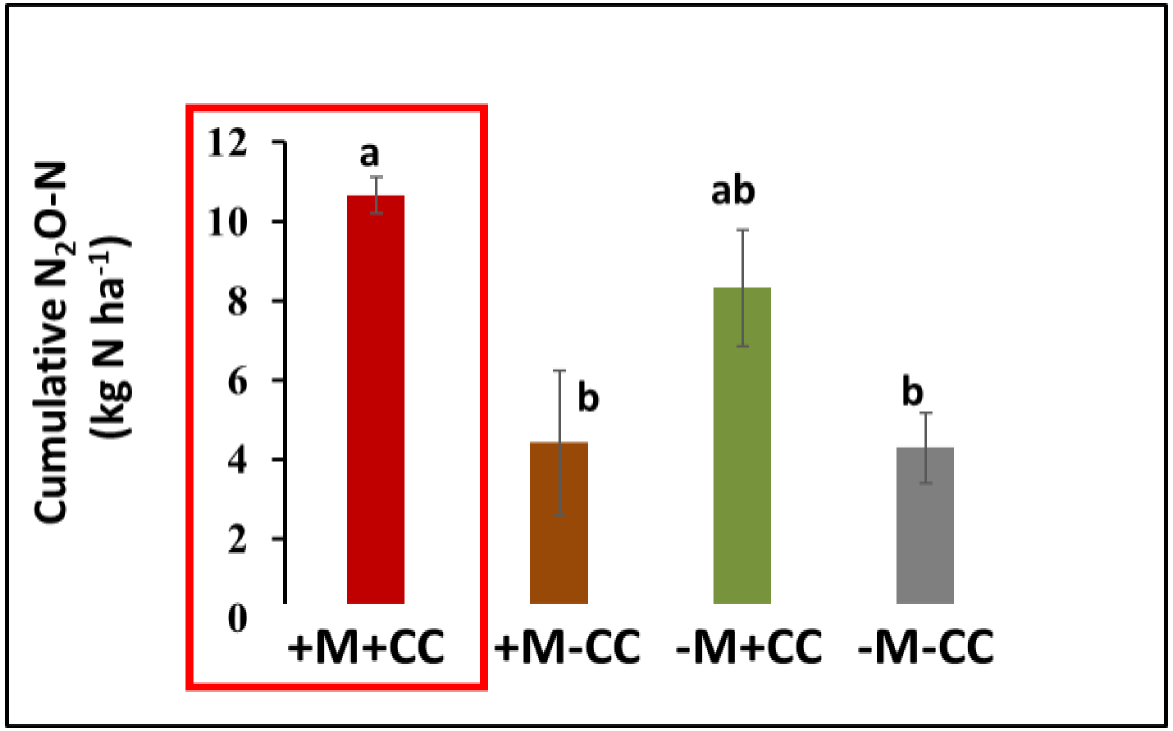
Photo courtesy: Janeva Williams

Soil oxygen content

Soil carbon and nitrogen content

→ N_2O

Recent studies have found that avoiding above ground cover crop incorporation caused 60% N_2O reduction



Saha et al 2021; Ecological Applications and Bhowmik et al 2017; Soil Biology and Biochemistry

i) Accelerated microbial oxygen consumption along with

ii) increased available carbon and nitrogen in manure and cover crop residues are responsible for increased nitrous oxide emissions

What is being explored?

Cover Crop Residue and Manure seclusion experimental treatments

- **Cover crop residues** + **manure** (surface/broadcast)
- **Cover crop residues** + **manure** (sub-surface plowed/applied)
- **Cover crop residues** (surface) + **manure** (sub-surface applied)
- **Cover crop residues** (sub-surface plowed) + **manure** (broadcast)

Implications

Identification of optimal application method of organic amendments/residues to minimize N_2O emissions and build soil carbon with minimal tradeoffs.

Acknowledgements

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University of Georgia
Clemson University

Laura van der Pol

COLORADO STATE UNIVERSITY

Returning to our Roots:
Assessing the Potential for Grain Agroecosystems to Enhance Soil Organic Matter and Become Sustainable Food Systems

FOOD+WATER+SHELTER

Returning to our Roots: Assessing the Potential for Grain Agroecosystems to Enhance Soil Organic Matter and Become Sustainable Food Systems

~50% OM lost upon cultivation

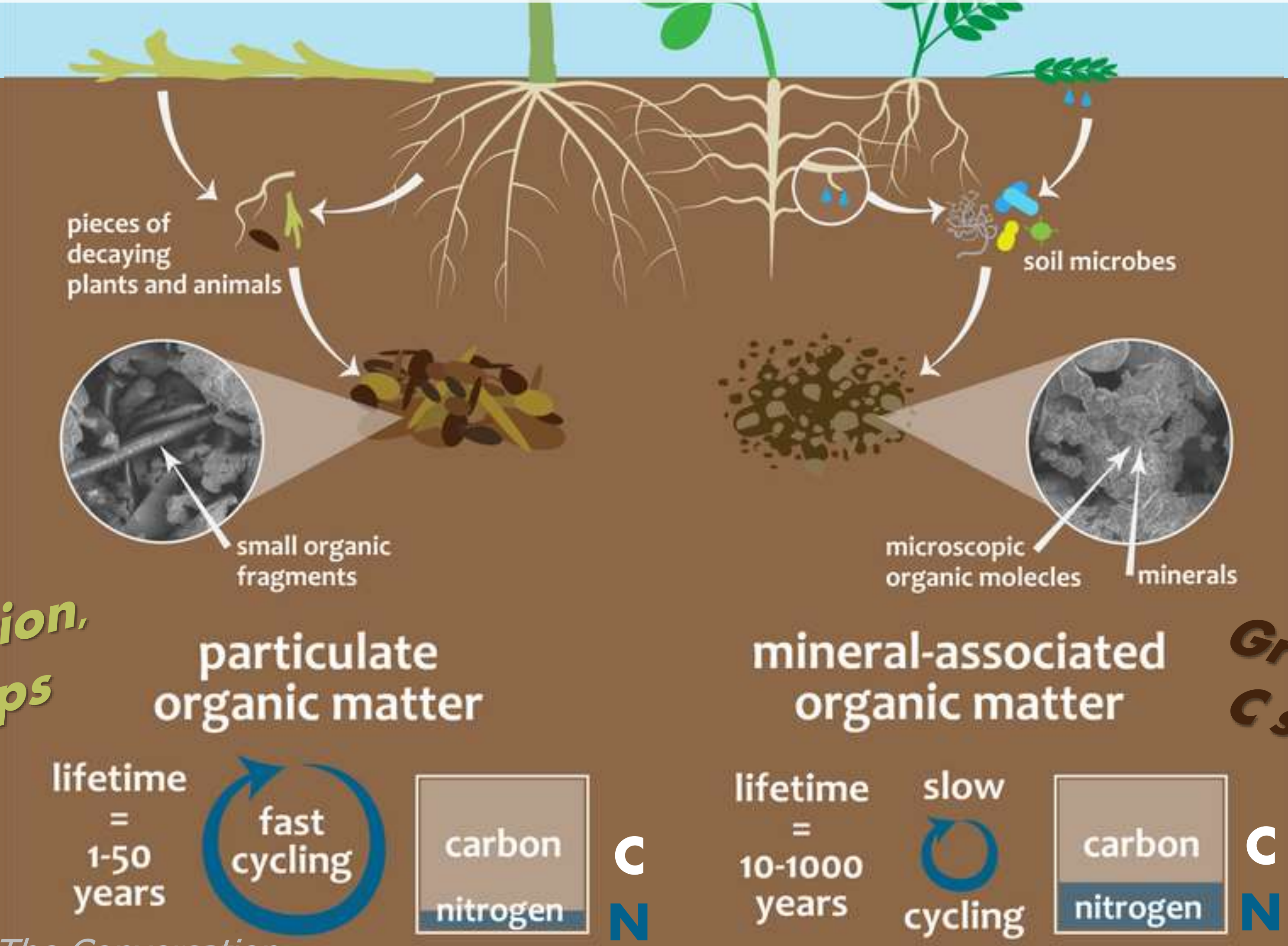
116 Pg C lost from soils globally, mostly in past 100 years

<u>(Sanderman et al., 2017)</u>

An amount that accounts for 13% of today's atmospheric CO_2

<u>(IPCC AR5)</u>

Understanding forms of organic matter can improve our ability to rebuild OM in ag soils

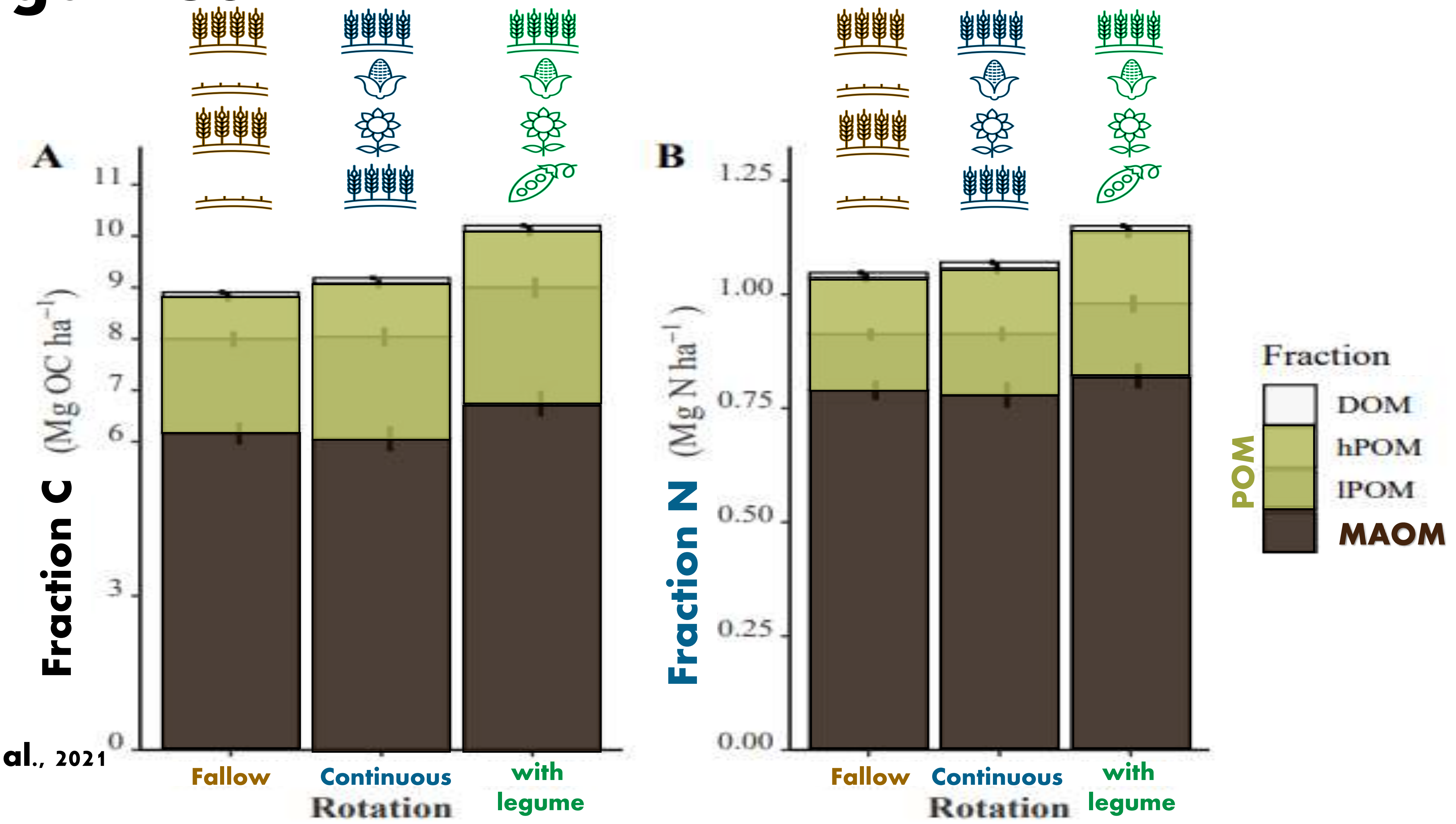


POM
Rapid decomposition, feeds soil & crops

MAOM
Greater stability, C sequestration

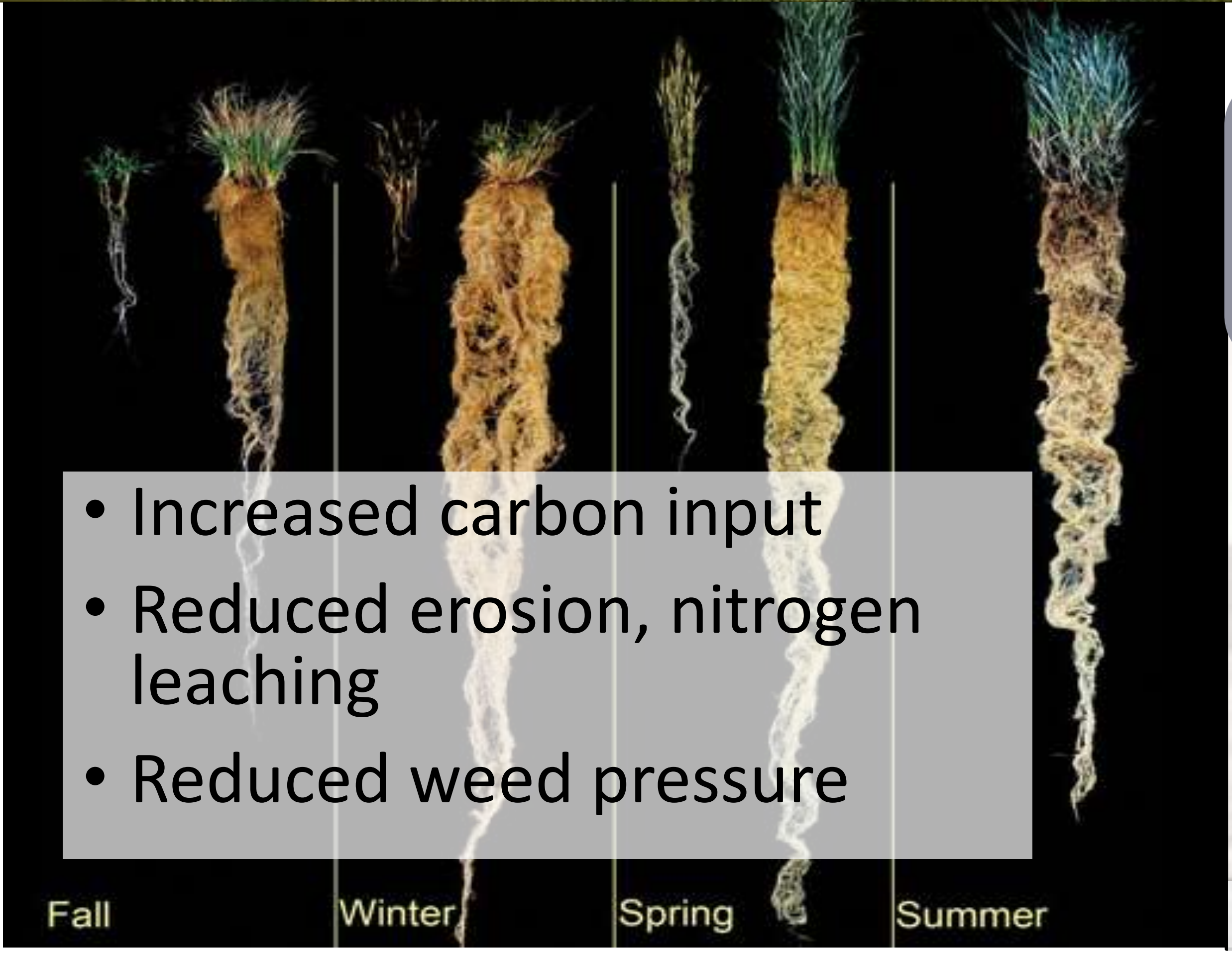
Figure by Jocelyn Lavallee, *The Conversation*

More MOAM & POM in rotation with legumes



van der Pol et al., 2021
In review

Perennial grains have potential to transform ag system & enhance soil carbon



- Increased carbon input
- Reduced erosion, nitrogen leaching
- Reduced weed pressure

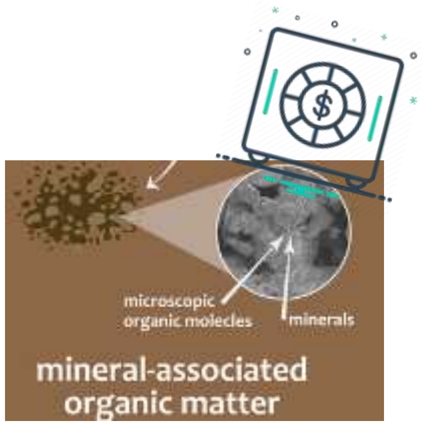
Eric Engellant:

Over past 3 years, I had an average fuel burn of **1.8 gal ac^{-1} yr^{-1} for Kernza** and **4.9 gal ac^{-1} yr^{-1} for annuals**. I estimate I saved roughly **20,746 lb CO_2** from being emitted!

Montana Kernza and annual grain farm of Engellant family

Conclusion

- Consider increasing both POM and MAOM when looking to rebuild soil carbon



- Perennial agriculture has the potential to transform US agriculture by improving sustainability and prosperity

My work is funded by:

Lacey Lingelbach

UNIVERSITY OF FLORIDA

Why is there a gap in rural climate action?

Challenge One: Community Sentiment

Rural areas are concerned, but climate is not a high priority issue.

Why?

- Distance from the coast
- Disconnect from science

Challenge Two: Investment Capacity

With strained rural human and financial resources, there is little capacity to invest.

Why?

- Socioeconomic issues
- External Aid
- Available Climate Solutions

Challenge Three:
Gaps in Climate Literacy

Rural climate knowledge is lower concerning anthropogenic influences, climate models and tools, and starting solutions.

Why?

- Inaccessible resources
- Uncertain local projections

Challenge Four: External Connections and Coordination

Rural areas feel omitted from climate conversations.

Why?

- Physical and Digital Isolation
- Mistrust of outsiders
- Misperceptions of attitudes

What can you and your group do?

Thank You!

Special thanks to Cynthia Barnett, Bob Graham Center for Public Service, Florida Climate Institute, and UF/IFAS Extension.

For more information or questions, you can contact me at LaceyL716@gmail.com.

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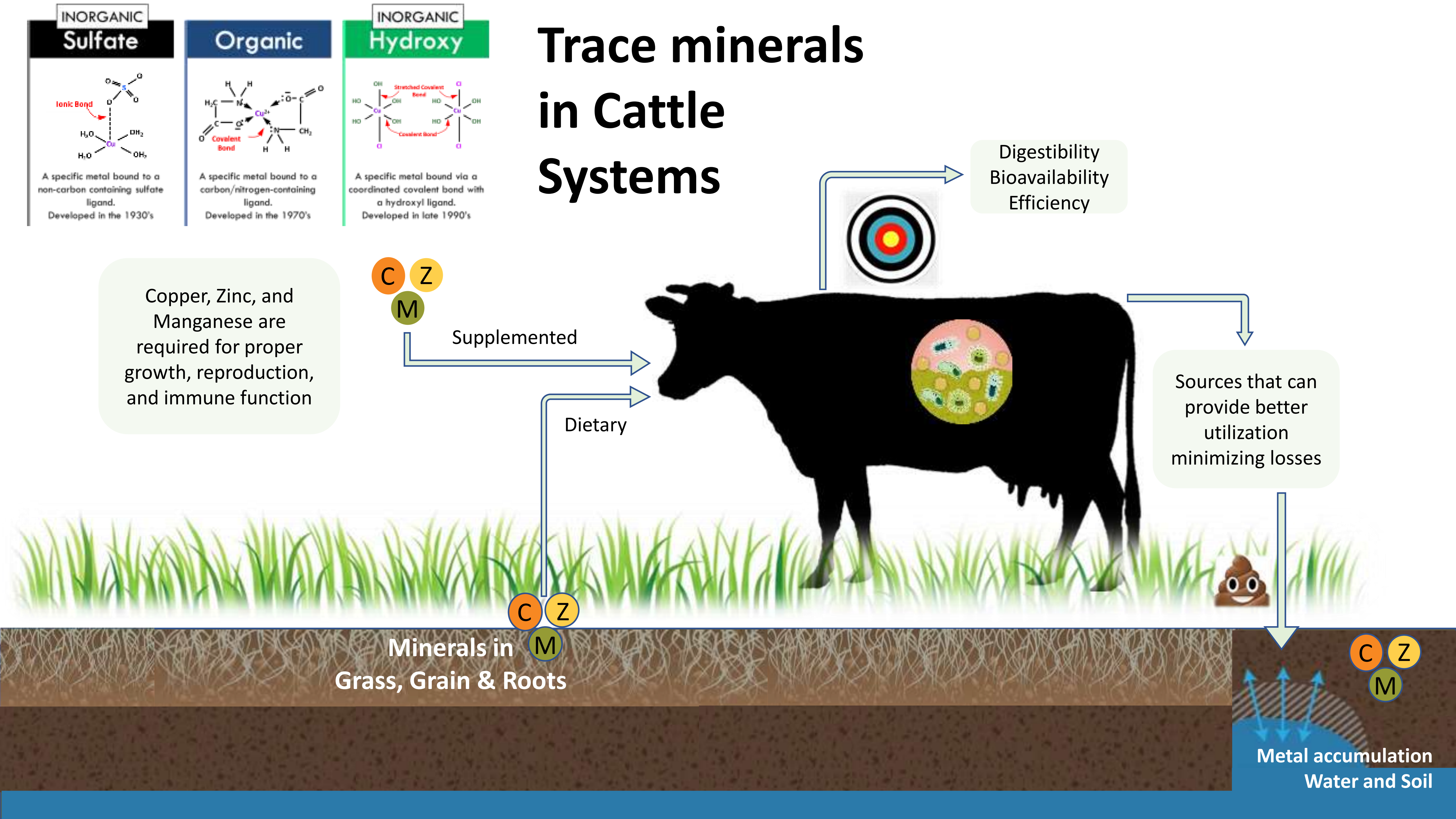
Octavio Guimaraes

COLORADO STATE UNIVERSITY



INORGANIC
Sulfate
Ionic Bond
A specific metal bound to a non-carbon containing sulfate ligand.
Developed in the 1930's
Organic
Covalent Bond
A specific metal bound to a carbon/nitrogen-containing ligand.
Developed in the 1970's
INORGANIC
Hydroxy
Stretched Covalent Bond
Covalent Bond
A specific metal bound via a coordinated covalent bond with a hydroxyl ligand.
Developed in late 1990's
Trace minerals in Cattle Systems
Digestibility
Bioavailability
Efficiency
Copper, Zinc, and Manganese are required for proper growth, reproduction, and immune function
C
Z
M
Supplemented
Dietary
Sources that can provide better utilization minimizing losses
C
Z
M
Minerals in Grass, Grain & Roots
C
Z
M
Metal accumulation Water and Soil

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