

Ecology Intensive Farming: Breaking Rules and Using Our Food Production System to Solve Planetary Scale Problems



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Major Crises Facing the Planet



Climate change

Pollution

Human health

Civil unrest

Declines in biodiversity

Biodiversity is in Decline

Birds

Mineau and Whiteside. 2013. PLoS ONE 8(2): e57457
Hallmann et al. 2014. Nature 511: 341
Rosenberg et al. 2019. Science 366: 120

Butterflies

Swengel et al. 2011. J Insect Conserv 15: 327
Pleasants and Oberhauser 2013. Insect Conserv Divers 6: 134

Grassland habitats

Wright and Wimberley. 2013. PNAS 110: 4134
Johnston. 2014. Landscape Ecol 29: 81

Insect communities

Hallmann et al 2017. PLoS ONE 12: e0185809
Sanchez-Bayo and Wyckhuys 2019. Biol Conserv 232:8

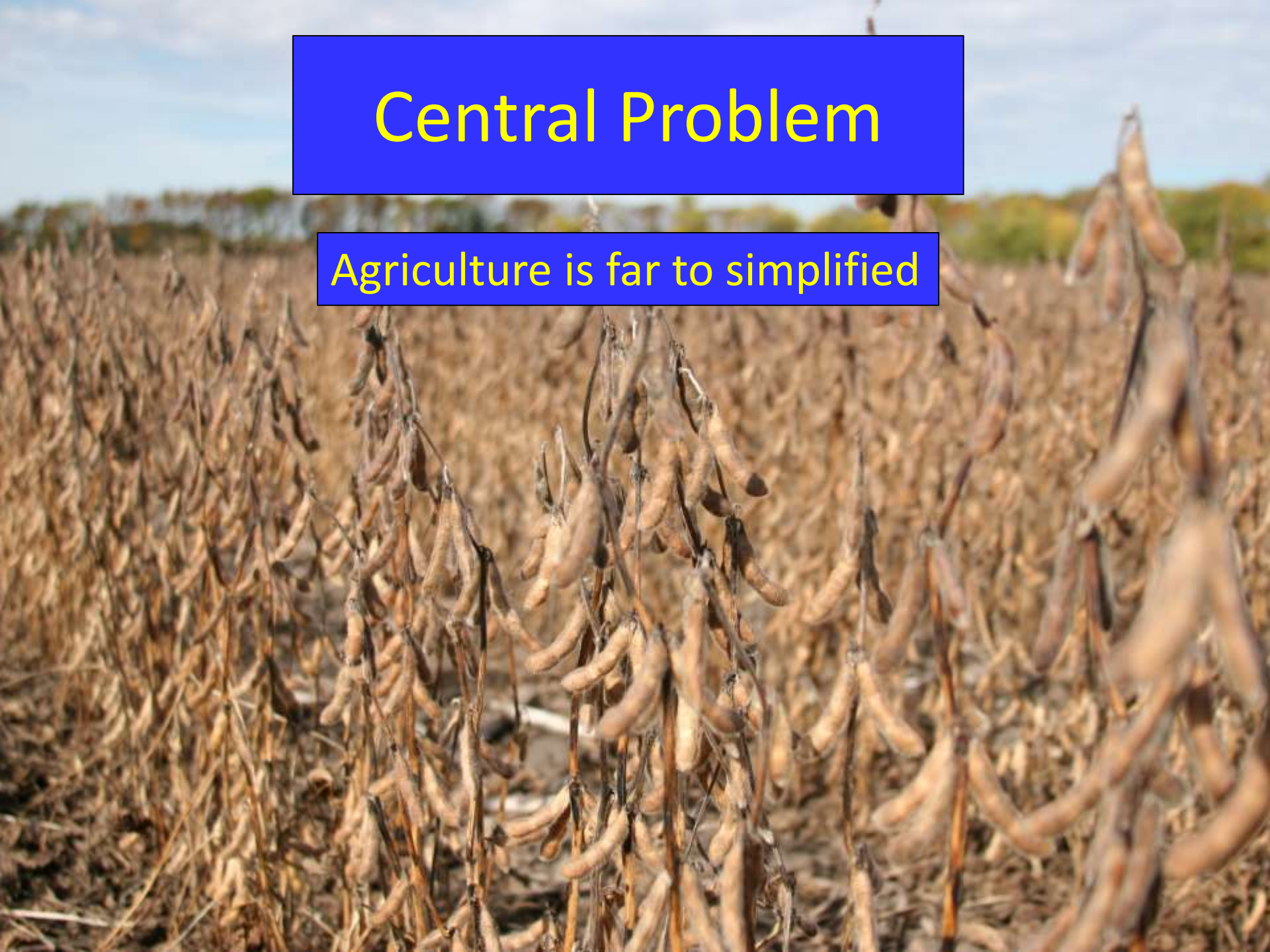
Wetland habitats

Wright and Wimberley. 2013. PNAS 110: 4134

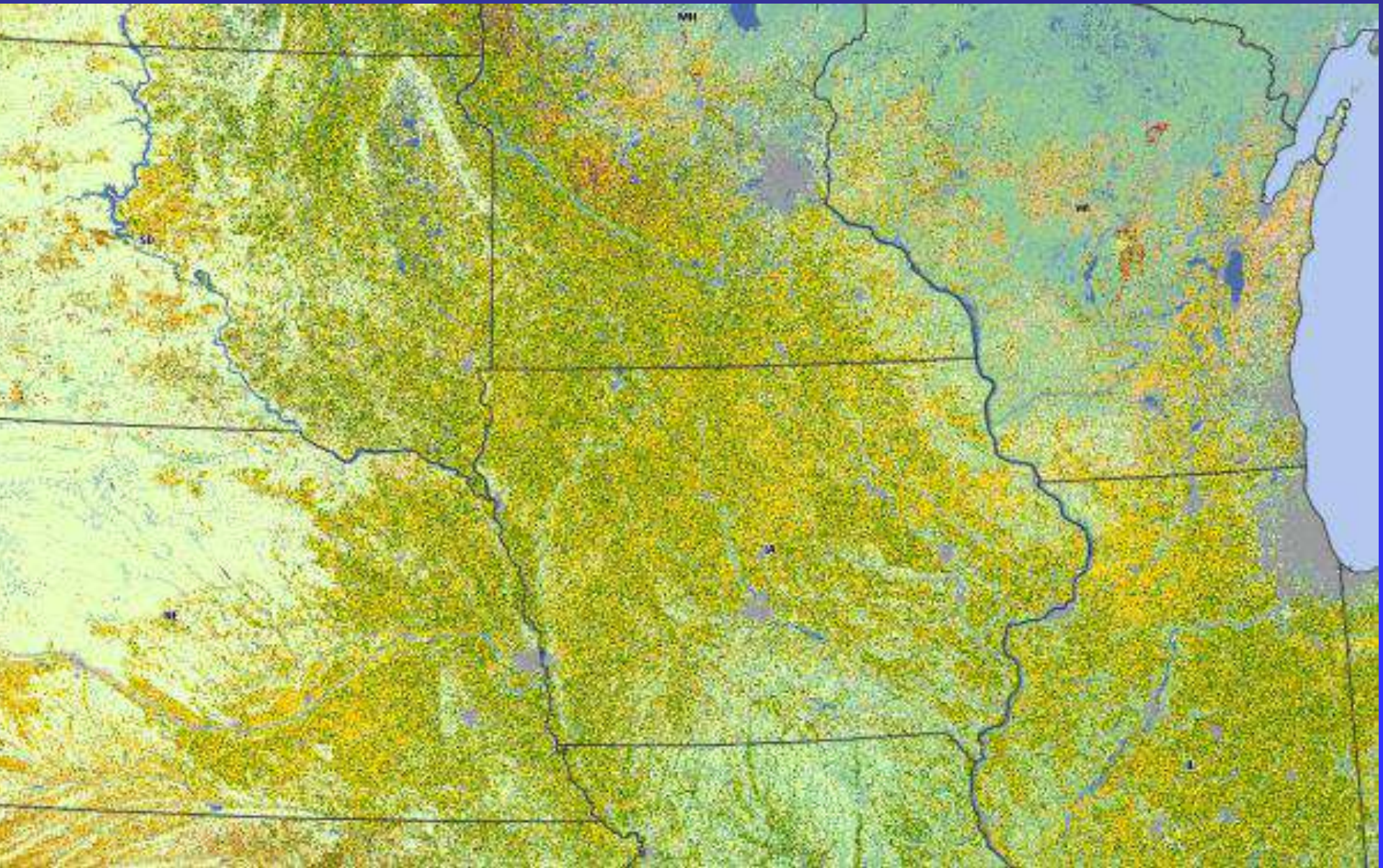
Butchart et al. 2011. Science 328: 1164
Potts et al. 2010. TREE 25: 345
Frick et al 2010. Science 329: 682
Newton 2004. Ibis 146: 579

Central Problem

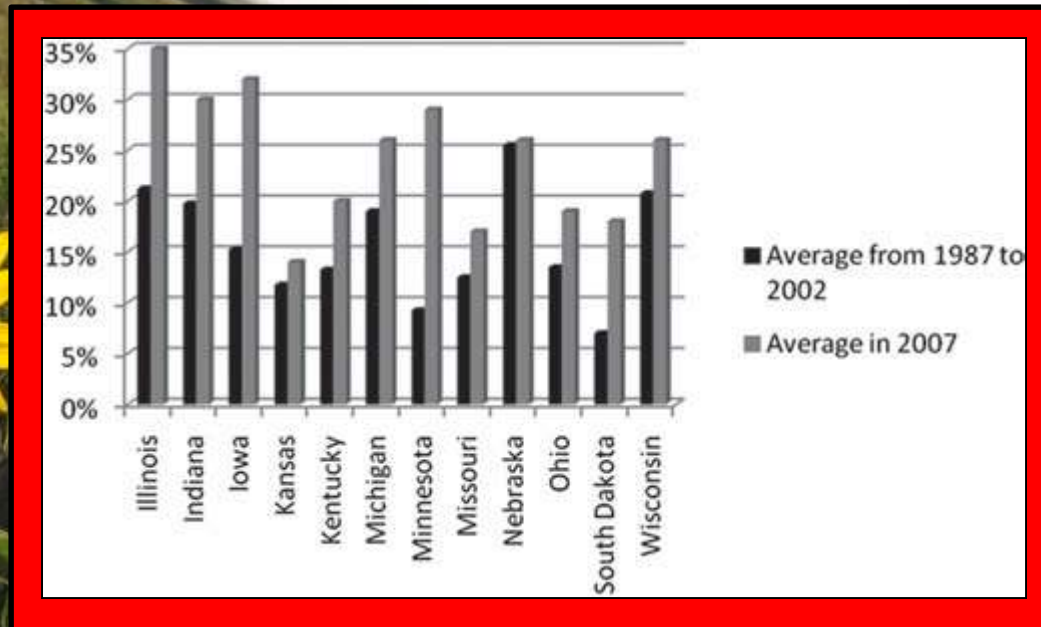
Agriculture is far too simplified



Agriculture



Rising Insecticide Use Rates



Insecticides: What pests are we shooting at?

Systemic insecticides are present on most crop seeds

Imidacloprid

Thiamethoxam

What effects are these insecticides having on insect communities?

Compared Soybean Plots Treated with Insecticidal Seed Treatments to Untreated

2-year, replicated study

Three treatments
(thiamethoxam, imidacloprid,
untreated)

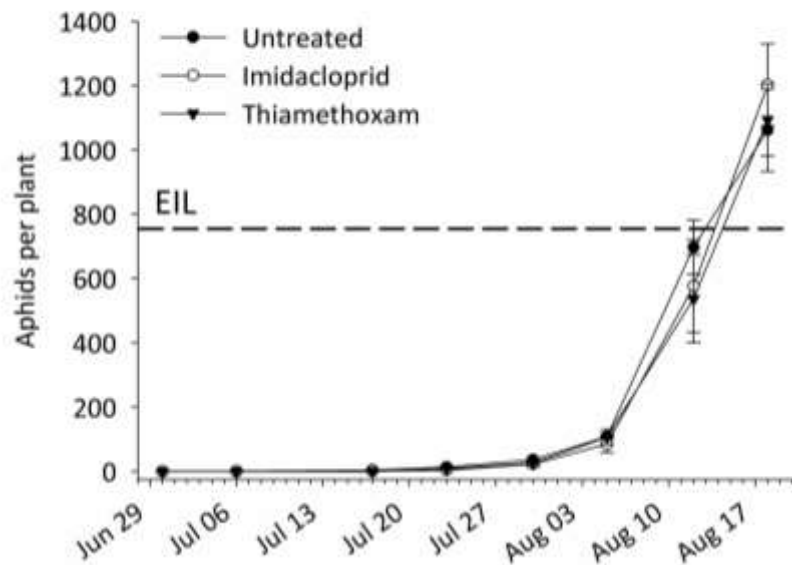


Aphid populations (other pests too)
Populations of predators
Soybean performance

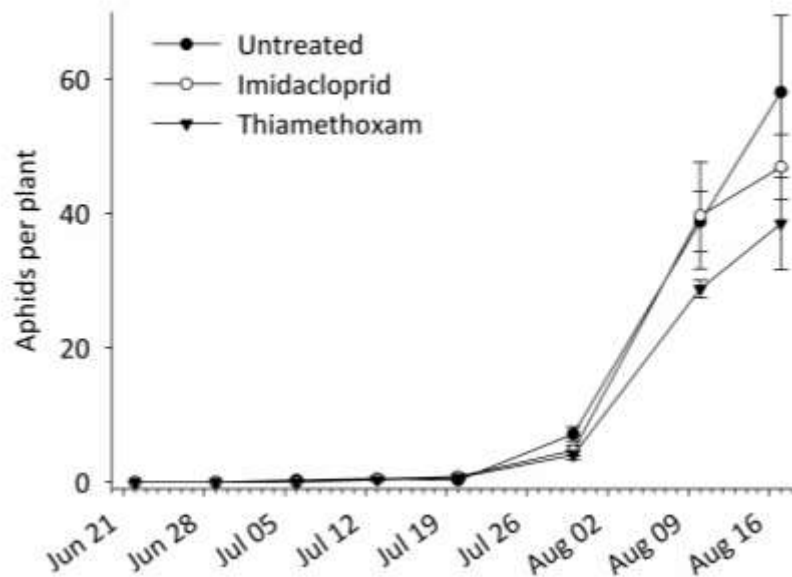
Pest Populations and Crop Performance

Soybean yields were equivalent in all treatments in 2009 and 2010

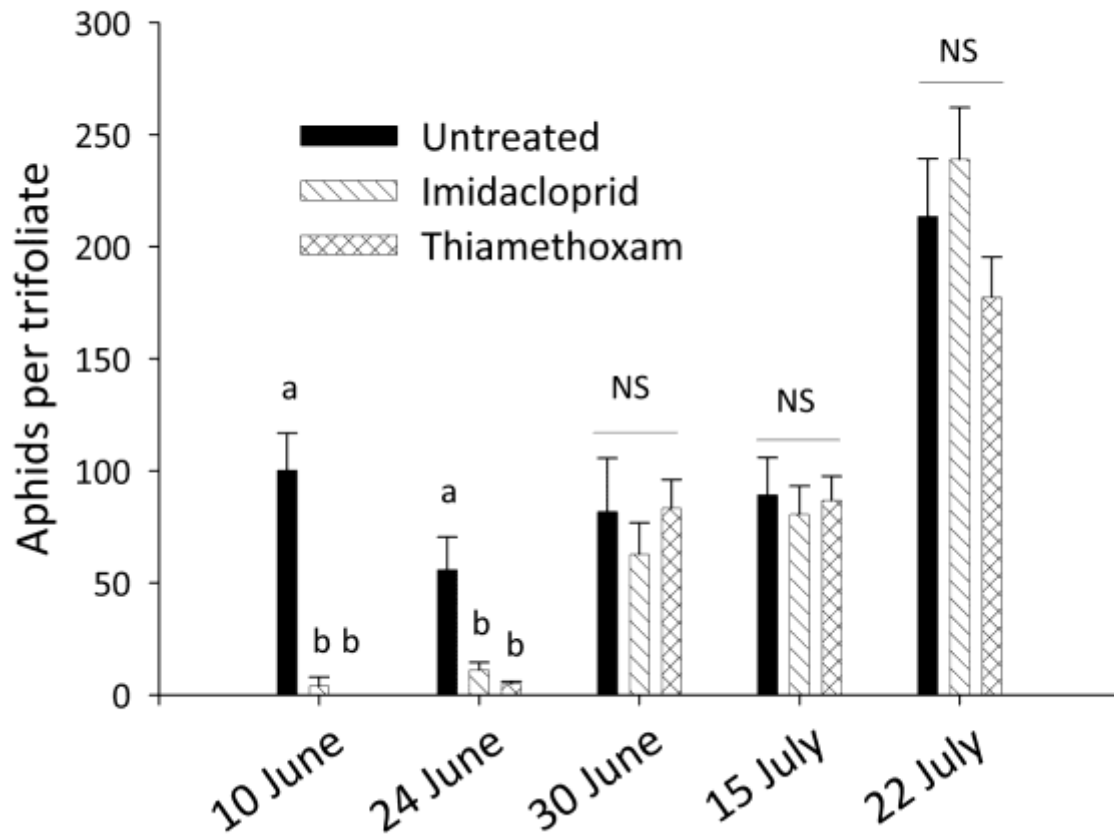
2009



2010



The Insecticides are Gone by the Time that Aphids Arrive



Neonicotinoids: Are they Helping or Hurting?

Are they controlling pest insects?

Kill natural enemies

They cost \$10-15 per acre



Public Sector Research on Soybean Seed Treatments:
McCornack and Ragsdale. 2006. Pest Management News (doi: 10.1094/CM-2006-0915-01-RS)
Cox et al. 2008. Agronomy Journal 100: 1662-1665
Ohnesburg et al. 2008. Journal of Economic Entomology 102: 1816-1826
Johnson et al. 2009. Journal of Economic Entomology 102: 2101-2108
Reisig et al. 2012. Journal of Economic Entomology 105: 884-889

Over-arching Concerns Over Neonicotinoids

They are very toxic

How are they moving
through the
environment?

Scale of exposure

They affect organisms in
unpredicted ways



Neonicotinoids are Not Staying Put

Conservation strips
adjacent to neonic-
treated cornfields
or organic cornfields

Effects of Clothianidin on Hive Health



Dr. Chrissy Mogren

Collected honey bees,
nectar, pollen, and honey
from each site

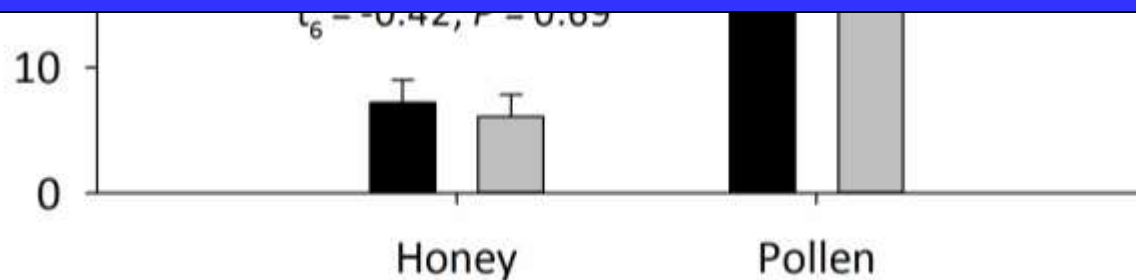


Used ELISA to quantify clothianidin

Clothianidin in Honey and Pollen



In all metrics, organic farms and conventional farms had equal contamination levels



Neonicotinoids Affect Organisms in Ways We Don't Understand



70% of deer in MT
had genital
deformities and jaw
deformities

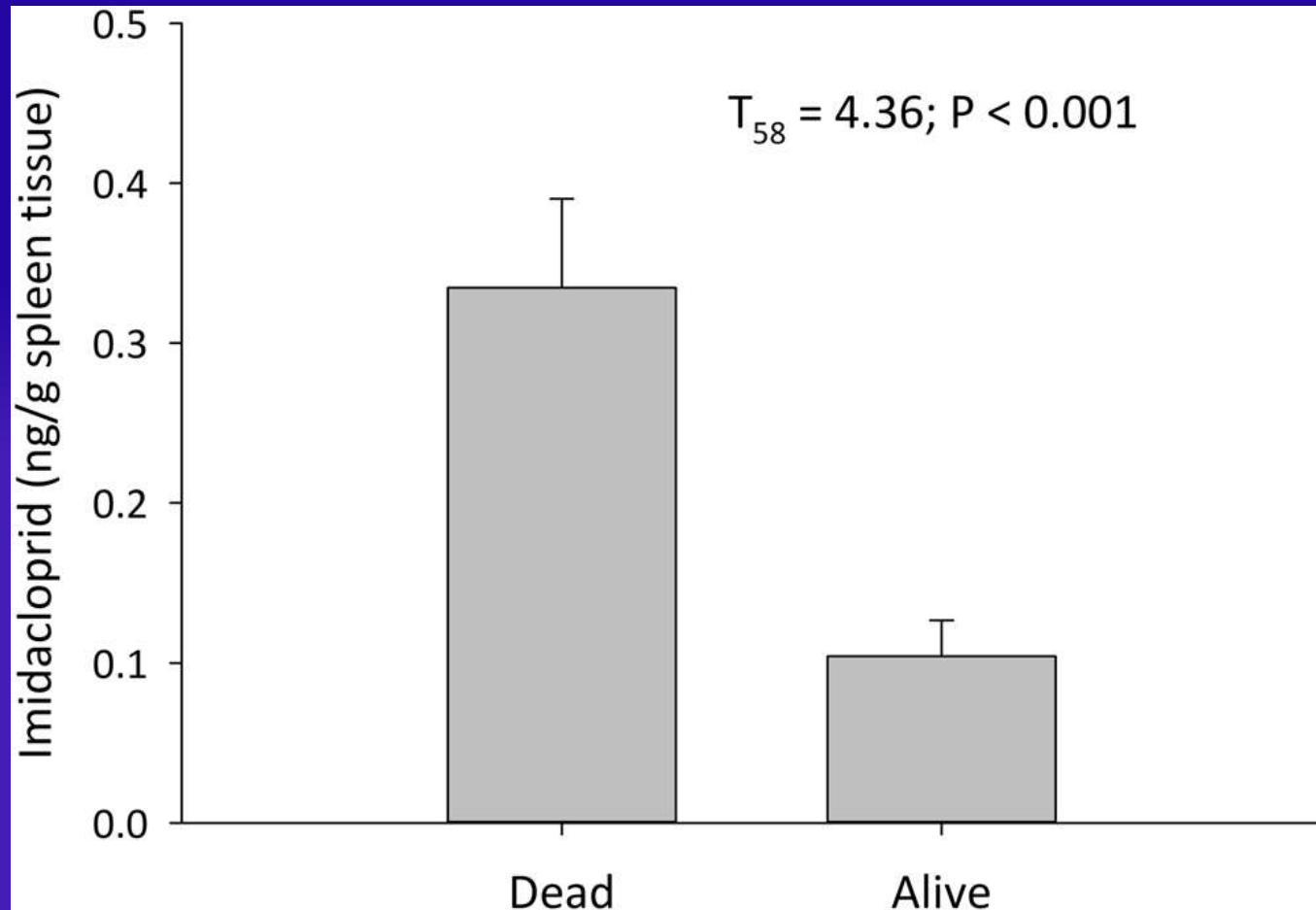
Does Imidacloprid Harm Deer?

A 2-year captive
deer study

3 doses
administered
weekly in their
water



Imidacloprid and fawn mortality



More Imidacloprid in Spleens were Associated With Reduced:

fawn body weight

fawn thyroid hormone levels

fawn organ weights

fawn jawbone length

activity levels in adult deer



What are Spleen Imidacloprid Levels in Wild Deer?

Captive deer spleens
0.18 ng imidacloprid/g
of spleen

ND wild deer spleens
0.60 ng imidacloprid/g
of spleen



FARMERS
Lead
THE WAY



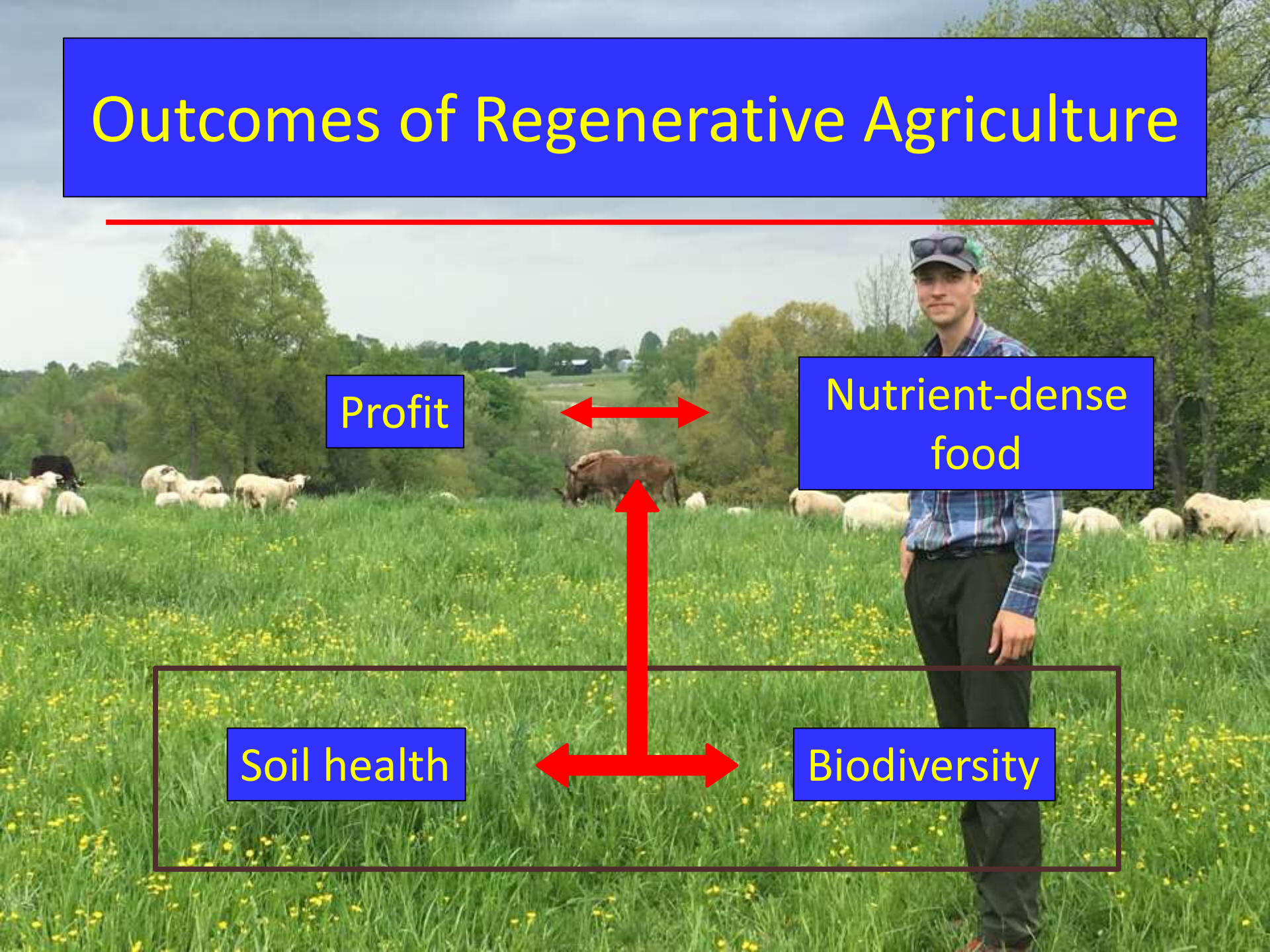
Outcomes of Regenerative Agriculture

Profit

Nutrient-dense
food

Soil health

Biodiversity



A Better Way to Farm



Best management
practices
Regional focus
Systems level

Claire LaCanne, MSc

Regenerative
No insecticides

Conventional
Insecticides

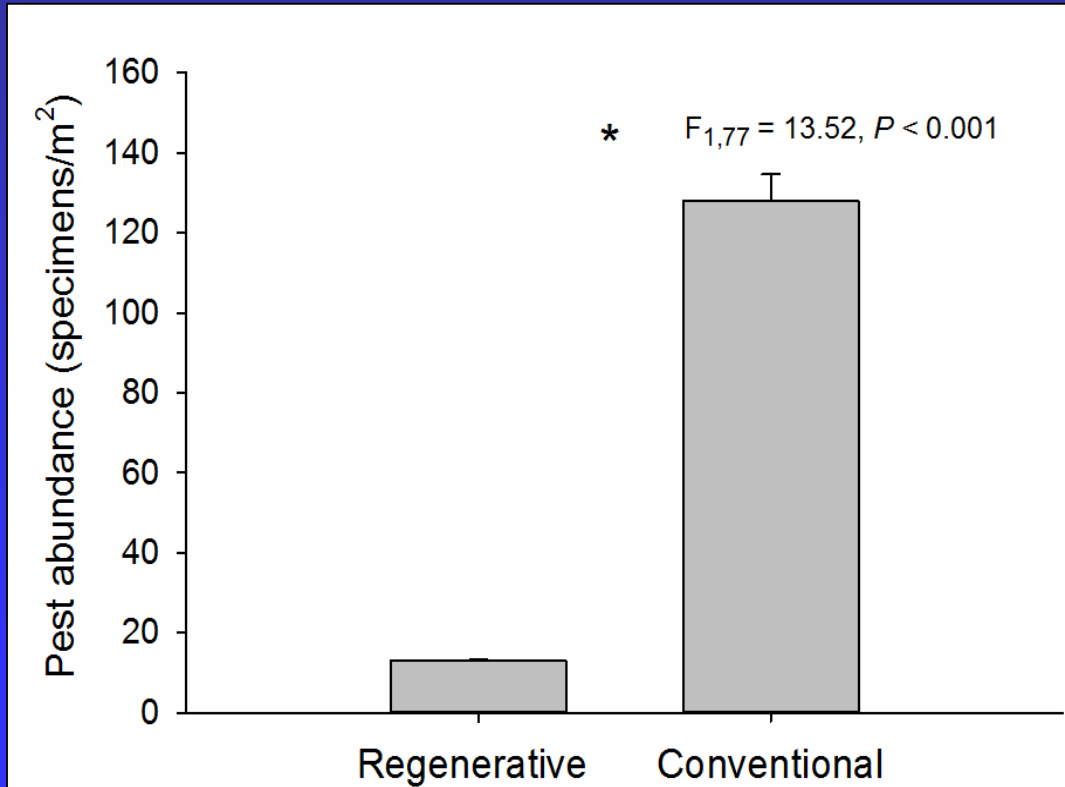
Approach

Full bioinventory
of corn community



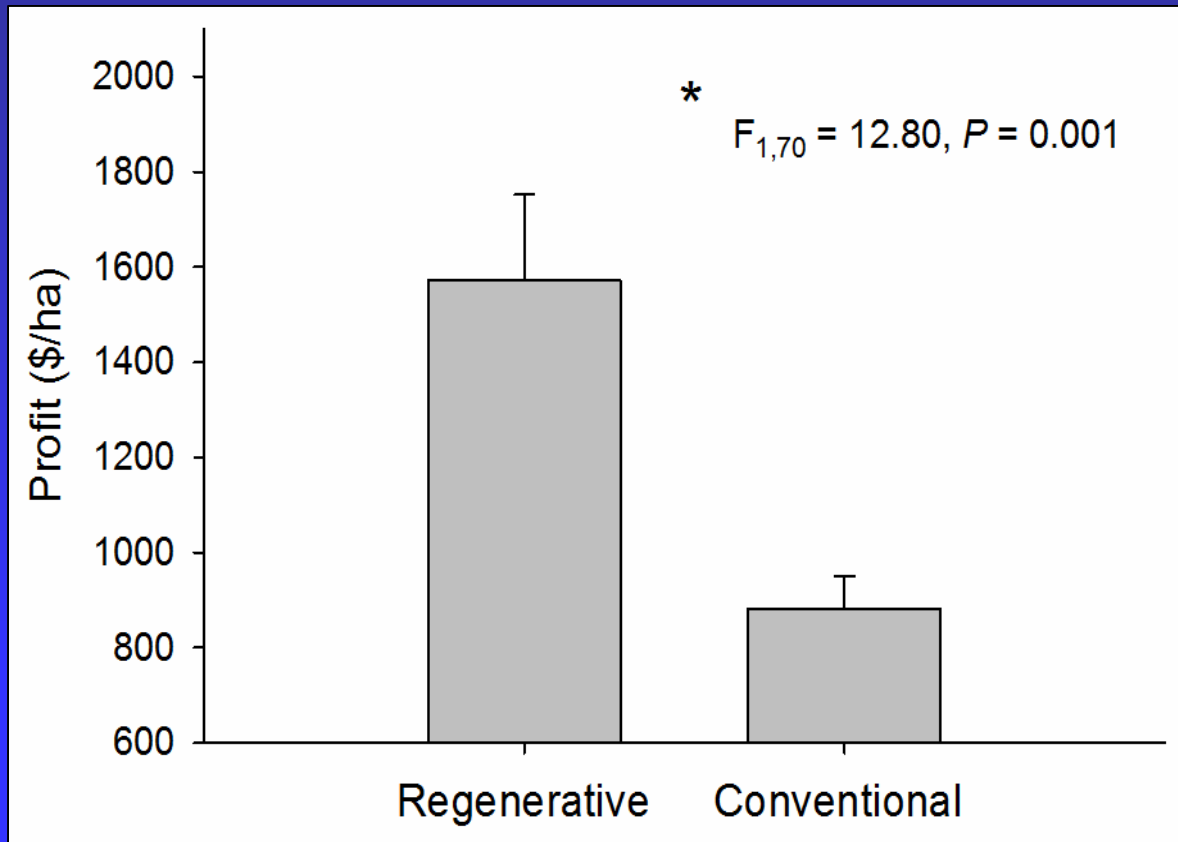
Yields and profit

Pest Populations



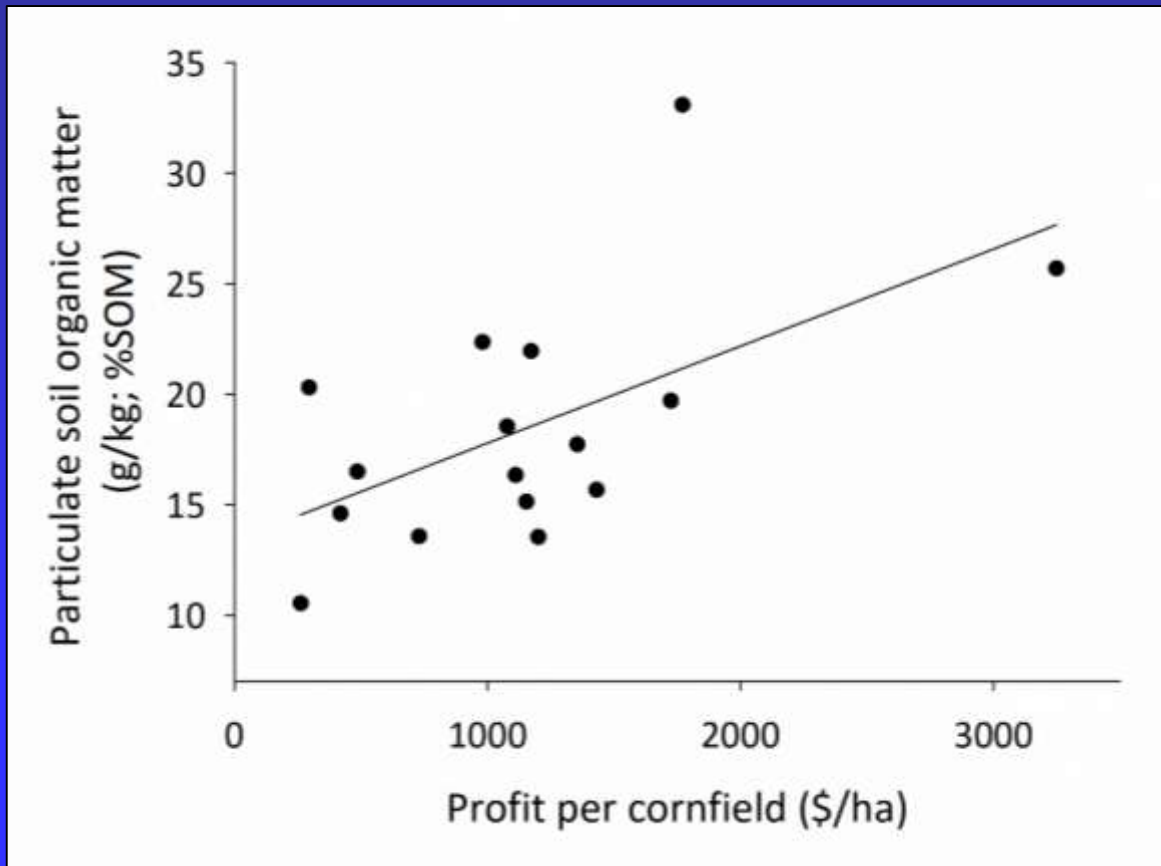
Regenerative systems
had 10-fold fewer pests
than insecticide-treated
systems

Profits



Regenerative systems were twice as profitable

Soil Health and Profit



Field profitability was
**NOT RELATED TO
YIELD**

Corn profitability is
directly related to
particulate organic
matter of the soil

Why isn't Regenerative Farming Mainstream?

Paradigm shifts take time

Science has been misdirected

Its Not Always Easy Being a Scientist...



Copernicus



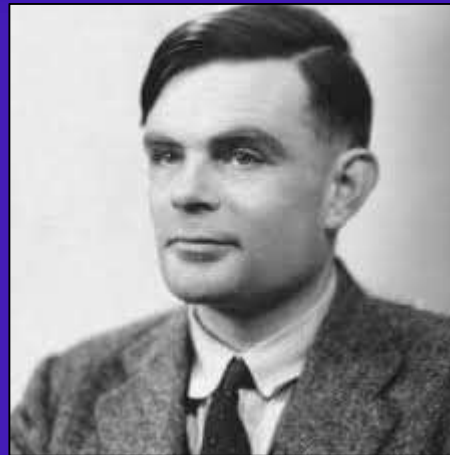
Galileo



Alfred Wegener



Barbara McClintock



Alan Turing



Lynn Margulis

Science is Fallible, But it is the Best We've Got

Science provides
understanding, not truth

No amount of
experimentation can
ever prove me right; a
single experiment can
prove me wrong.



Albert Einstein

German Theoretical-Physicist
(1879-1955)

QuoteHD.com

Science is Manipulated

The tobacco industry helped revolutionize the art of obscuring data-driven discussions

World Health Organization. 2008. Tobacco industry interference with tobacco control. Report available on-line.

1. Obscure inconvenient studies.
2. Fund a preponderance of supportive evidence.
3. Discredit and intimidate inconvenient scientists.

Science is Necessary But Not Sufficient to Solve Problems

Data does not change behavior

Scientific Career

Grants

Students and
Post-docs

Publications



Federal advisory positions



Beekeepers

Seagraves and Lundgren 2012. J Pest Sci 85: 125

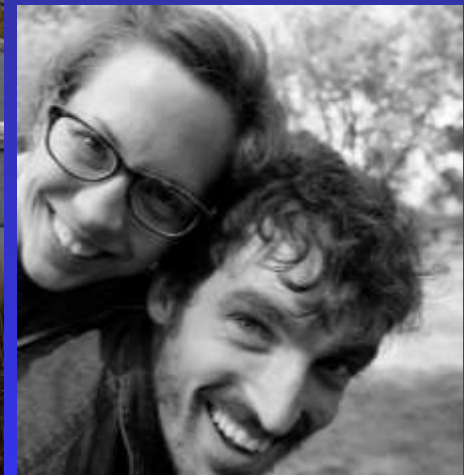
Pecenka and Lundgren 2015. Sci Nature 102: 19

Bredeson and Lundgren 2016. J Econ Entomol 108: 2665

Lundgren, J. G. and J. J. Duan. 2013. Bioscience 63(8): 657-665

Mogren, C. L. and J. G. Lundgren. 2017. PeerJ 5: e4131.

Fausti and Lundgren. 2015. The causes and unintended consequences of a paradigm shift in corn production practices. Environ Sci Pol 52:41



Why?

The Washington Post

Was a USDA scientist muzzled because of his bee research?

By Steve Delaney



- 1. Learn right to be published by USDA's government and industrial sector of science
- 2. New York's State Attorney General filed suit to force disclosure of records
- 3. Thousands of state employees in the Department of Environmental Conservation

The Washington Post

Suspended USDA researcher alleges agency tried to block his research into harmful effects of pesticides on bees, butterflies

the salt WHAT'S ON YOUR PLATE

How Free Are USDA Scientists to Speak Their Mind?

March 4, 2016 · 1:53 PM ET

GAR CHARLES

Mother Jones

POLITICS ENVIRONMENT FOOD MEDIA CRIME & JUSTICE

This Scientist Uncovered Problems With Pesticides. Then the Government Started to Make His Life Miserable.

TOM PHILPOTT DEC. 4, 2015 6:00 AM



Is the USDA Silencing Scientists?

"There's a message: if you want to prosper, don't make wa

BRANDON KEIN · NOV 3, 2015 · SCIENCE



MPRnews

Bee expert: USDA punished me for research on pesticides

Dan Gunderson · Oct 28, 2015



The Blue Dasher Farm Initiative



A national network of centers for excellence in
Regenerative Agriculture

A house
Three bare buildings
25 acres of perennial grass
28 acres of wetlands and prairie

Goals

Scientific research to remove barriers for farmers

Education: training the next generation of scientists and farmers in regenerative principles

Demonstrating regenerative principles





Solution to the Problem

Change agriculture

Anything less, and the planet will continue to decline

WHY?

Thanks!

Hundreds of donors



A New Way for Science to Help Bee Keepers and Farmers



www.ecdysis.bio



www.bluedasher.farm



Jon.Lundgren@bluedasher.farm