# Curriculum Reform and Innovation in U.S. Colleges of Agriculture, Food and Related Sciences

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# Introduction

Who are the innovators?

Who provides input?

Who wants to study agriculture?

# Who are the reformers and innovators?

- Curriculum innovation
  - It is a “bottom – up” process
  - Professors “own” the curriculum
  - Professors propose:
    - New Courses
    - New Certificates
    - New Minors
    - New Majors

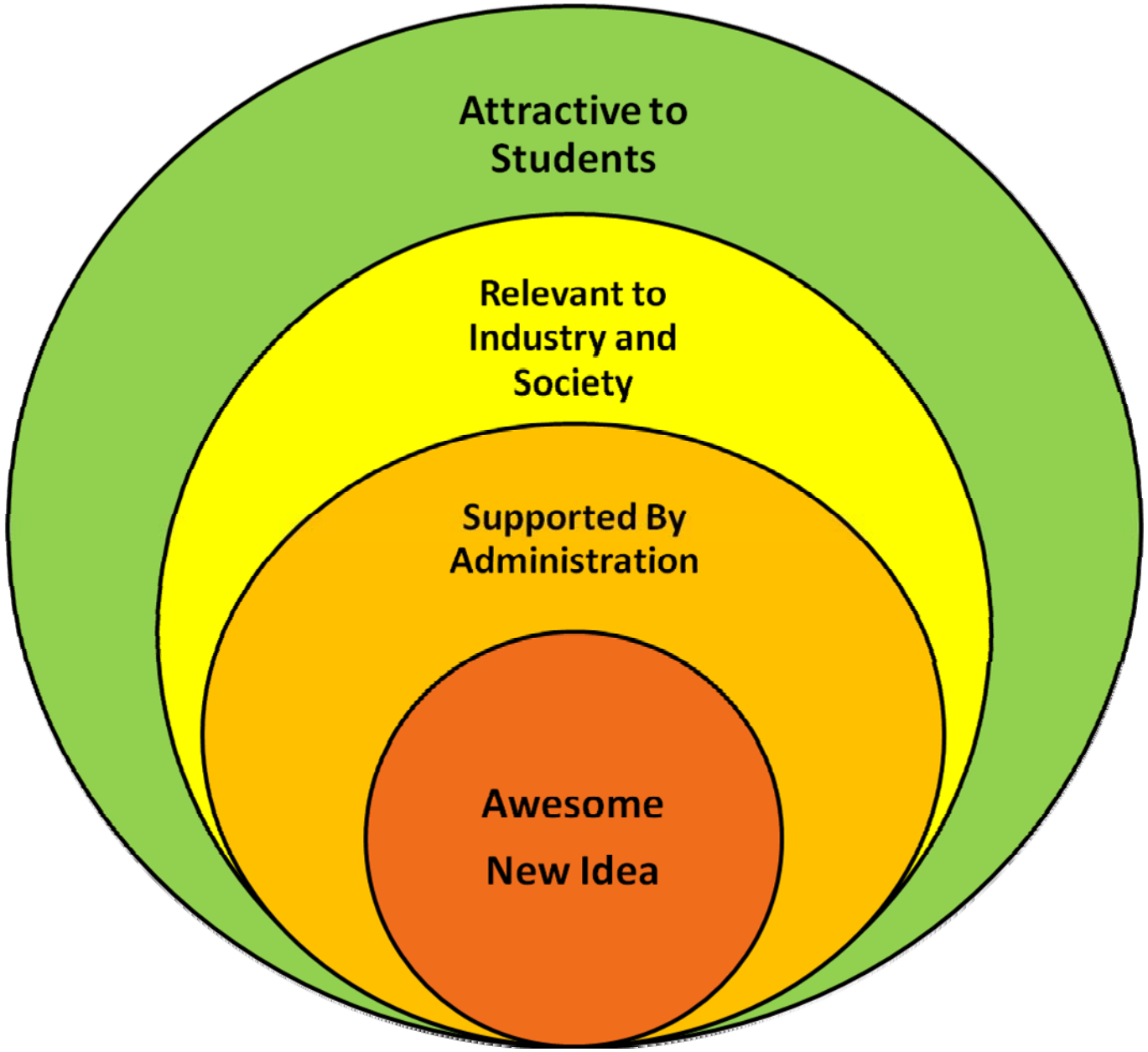
# What is the role of administrators?

- Deans, Provosts, and Presidents encourage innovation with:
  - Ideas and vision
  - Funding
  - Faculty development opportunities to learn
  - Regular faculty - private sector interaction

# Innovation based on responsiveness to:

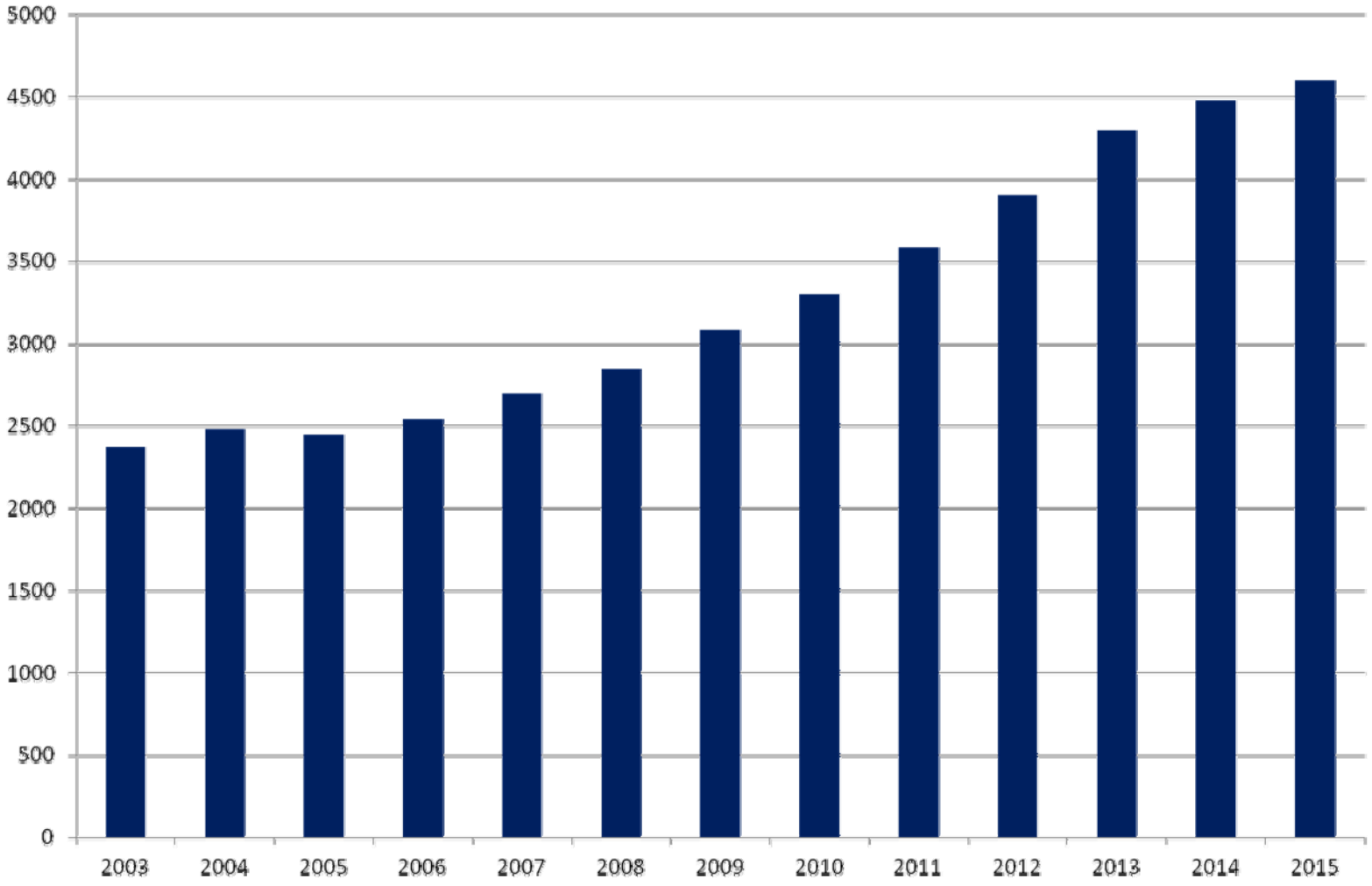
- input from external advisory groups
- signals from the labor market
- societal needs
- interests of students

# Curriculum Innovation Ecosystem



# Who wants to study agriculture?

# Undergraduate Enrollment in Agriculture Sciences at Iowa State University



# Vocabulary

Degrees: BS, MS, and PhD

BS: 4 years of study, 2000+ hours of instruction

BS Major: ~ 320 hours of instruction in their technical field

BS Minor: ~ 240 hours of instruction in their technical field

# Major Trends

What are the major trends in curriculum?

# 6 Trends

1. Basic and Applied Sciences of Agriculture
2. Global Engagement
3. Green Studies: Sustainability & Environment
4. Entrepreneurship
5. Data Sciences
6. The Food, Health and Agriculture Nexus

# # 1
# Sciences of Agriculture

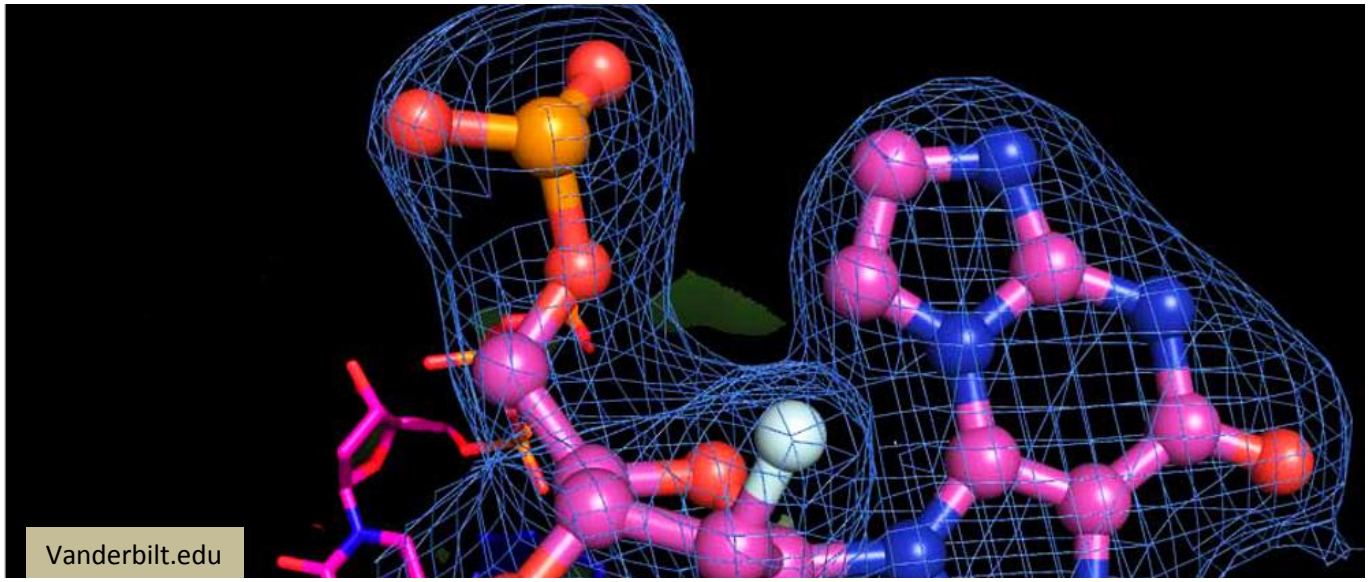
Source: ccny.cuny.edu

# Sciences Underlying Agriculture

- Biochemistry
- Microbiology
- Cell science
- Genetics
- Molecular genetics
- Biology
- Animal Biology

# The Bio-Century

- Biochemistry
- Biosciences
- Biotechnology
- Biosystems engineering
- Bioinformatics and computational biology
- Biodegradation and bioremediation
- Biosecurity
- Animal biology



# STEM Education

**S**cience

**T**echnology

**E**ngineering

**M**ath

# STEM Education

Science

Technology

Engineering

>

Math

# STEM Education

Science

Technology

Engineering

> >

Math

# STEAM Education

Science

Technology

Engineering

Agriculture

Math

# STEAM: Example

*Curriculum for Agricultural Science Education*

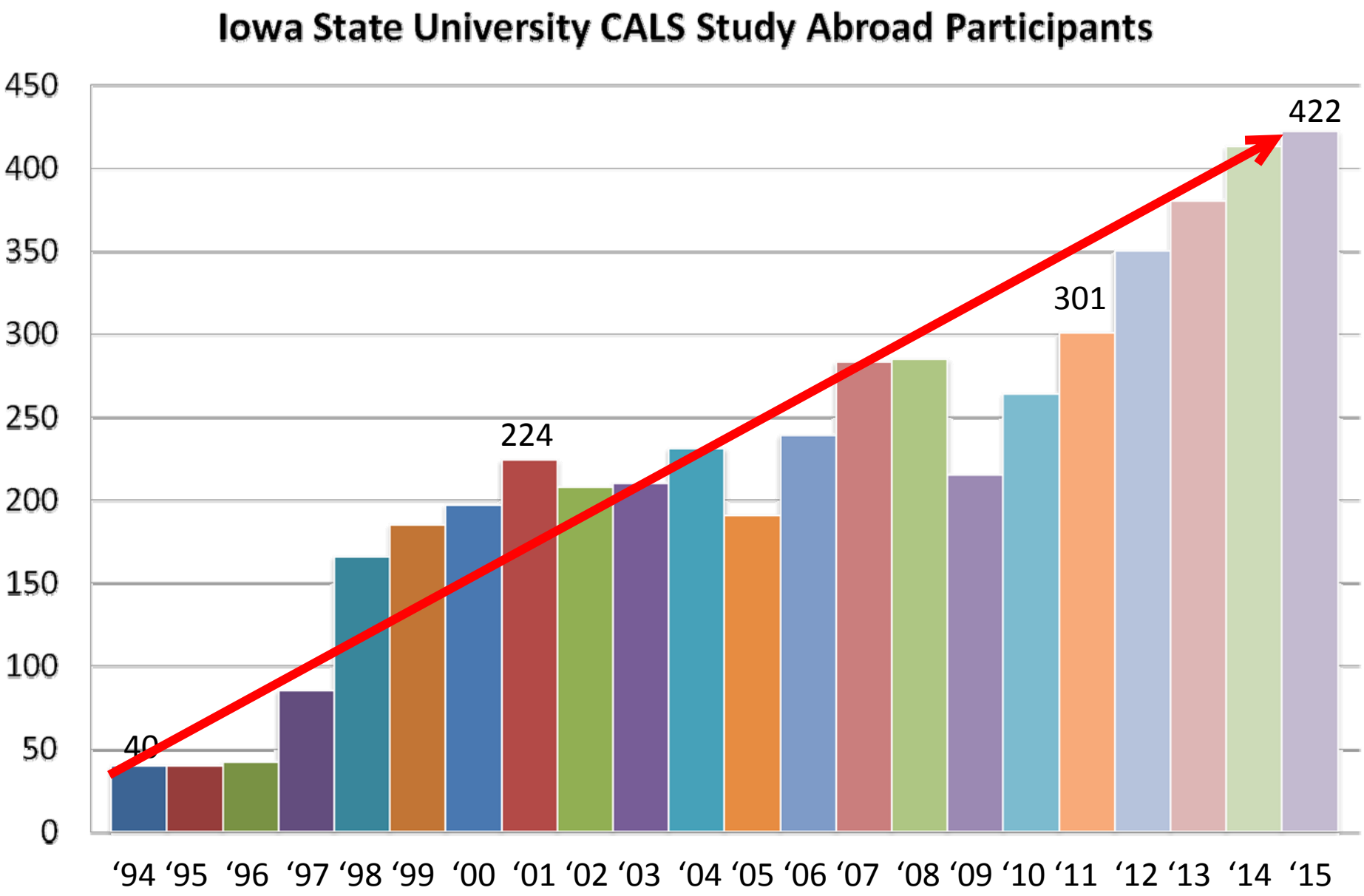
- A nation-wide curriculum overhaul
- Secondary School Curriculum
- Better science preparation for high school students studying agriculture

CASE

*Curriculum for Agricultural Science Education*

# EMPOWERING TEACHERS FOR STUDENT SUCCESS IN STEM

# 2
# obal Engagement


Iowa State University CALS Study Abroad Participants
450
400
350
300
250
200
150
100
50
0
40
224
301
422
'94 '95 '96 '97 '98 '99 '00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15

Iowa State University - Our Newest Major:

# GLOBAL RESOURCE SYSTEMS

- Select a region of the world for an in-depth study
- Identify an area of technical expertise in agriculture
- Learn a language relevant to the chosen world region
- Complete an international internship
- Conduct a senior project with faculty mentoring

GLOBE
Global Resource Systems
Iowa State University

# Global Resource Systems Internships: 2010-15

112 students, 5 continents, 35 countries

# Penn State University:
## International Agriculture and Development

- Post-graduate students earn 2 degrees simultaneously
  - Technical agriculture degree
  - International Agriculture and Development degree
- Graduates are well suited to apply technical knowledge and skills to agriculture and development issues throughout the world

# Studies

Source: greenschool.org

# Green Studies: Sustainability

- University-wide minors in Sustainability
- Organic Agriculture (Colorado State)
- Sustainable Agriculture (Iowa State, Missouri)
- Agroecology (Florida)
- Sustainable Food & Farming Systems (Purdue)
- Sustainable Biomaterials (Purdue)
- Climate Change

# Green Studies: Environment

- Captive Wild Animal Management (Missouri)
- Wildlife and Outdoor Enterprise Management (Kansas State)
- Envir. Management in Agriculture & Natural Resources (Florida)

# 4
# Entrepreneurship

Source: fetna2015.org

# Entrepreneurship

- Normally offered as a university-wide minor
- Focus is on business entrepreneurship
- Growing interest in social entrepreneurship

# Entrepreneurial Team Competitions

- Student Challenge:  Create a new product or service using biological materials from Hawai`i
- Locally grown food, fiber, agriculture, and other bio-products
- First prize = $ 1,000

College of Tropical Agriculture and Human Resources

- University of Hawai`i

CIE | CAL POLY center for innovation & entrepreneurship

- Hatchery
  - Provides students with guidance and resources in early stages of company formation

- Hothouse Incubator
  - Space for students to launch their companies

# Public – Private Partnerships for Entrepreneurship

- University - Private Sector Collaboration to:
  - develop entrepreneurship learning activities across the curriculum
  - provide faculty development in entrepreneurship

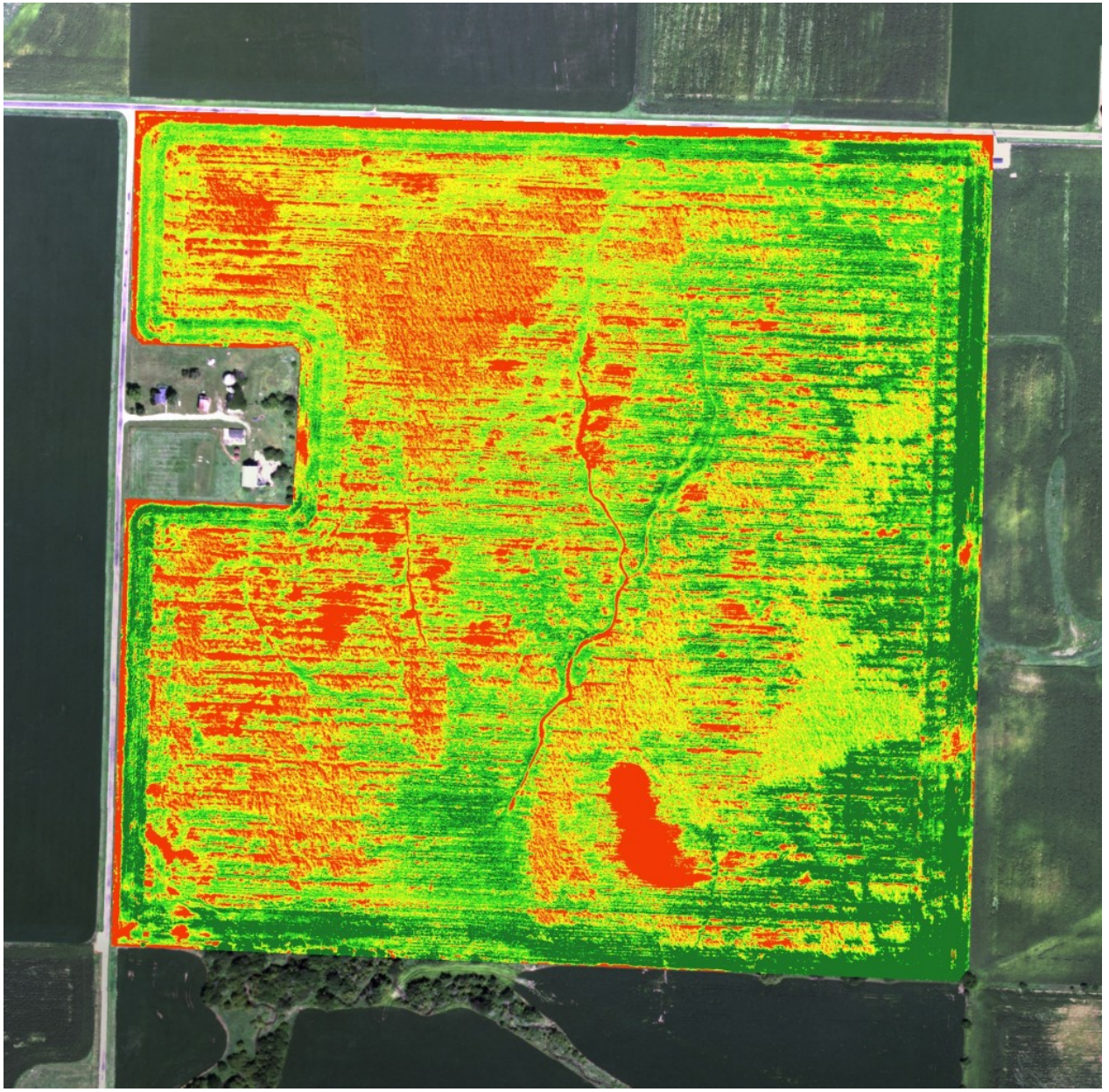
Source: Southeast Missouri State University
Missouri State University
University Tennessee – Martin
Murray State University

cience

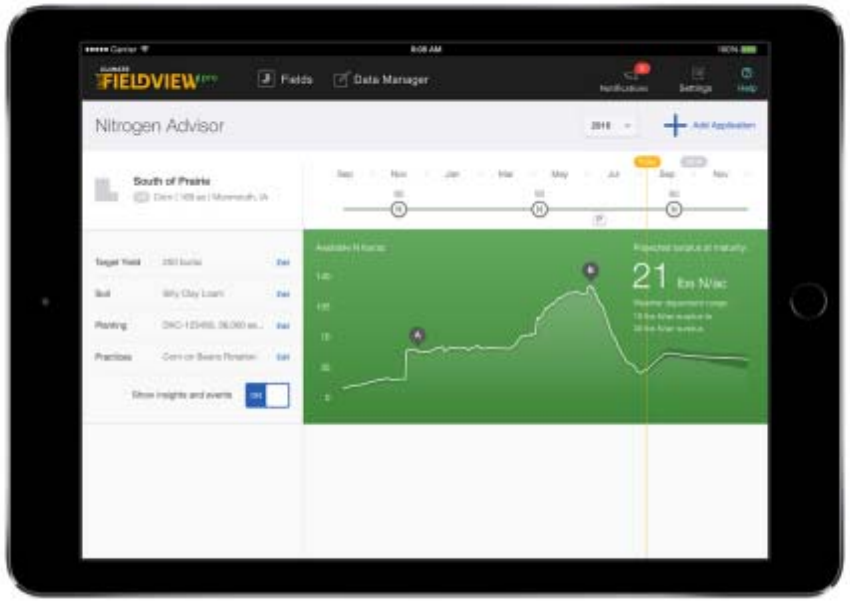
Source: Youtube.com

# Data Sciences for Big Data

- Data Sciences
- Bioinformatics
- Computational Biology
- Climate Science
- Agronomic Modeling
- Socio-economic Modeling



Source: geovantage.com

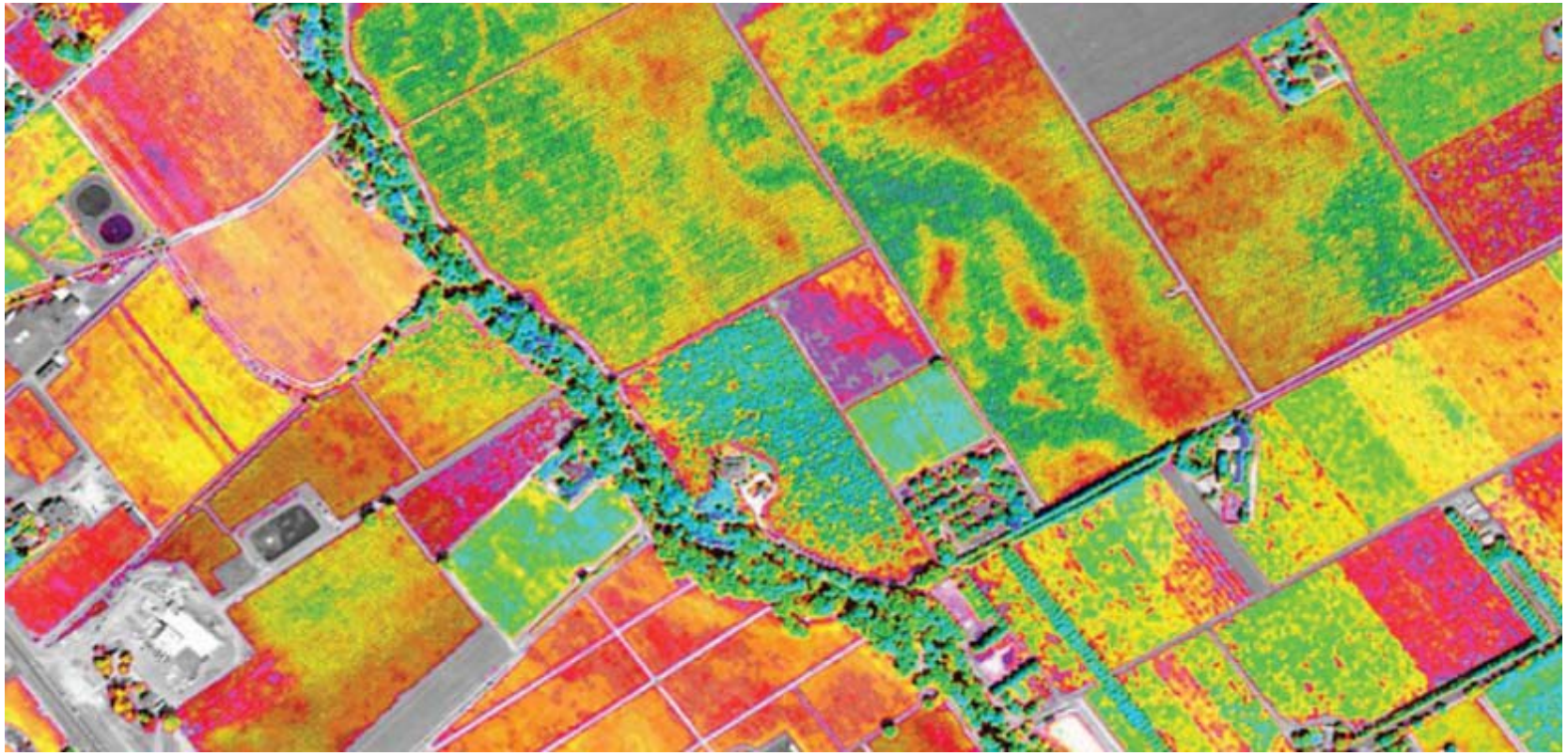



THE CLIMATE CORPORATION

# Drone Technology

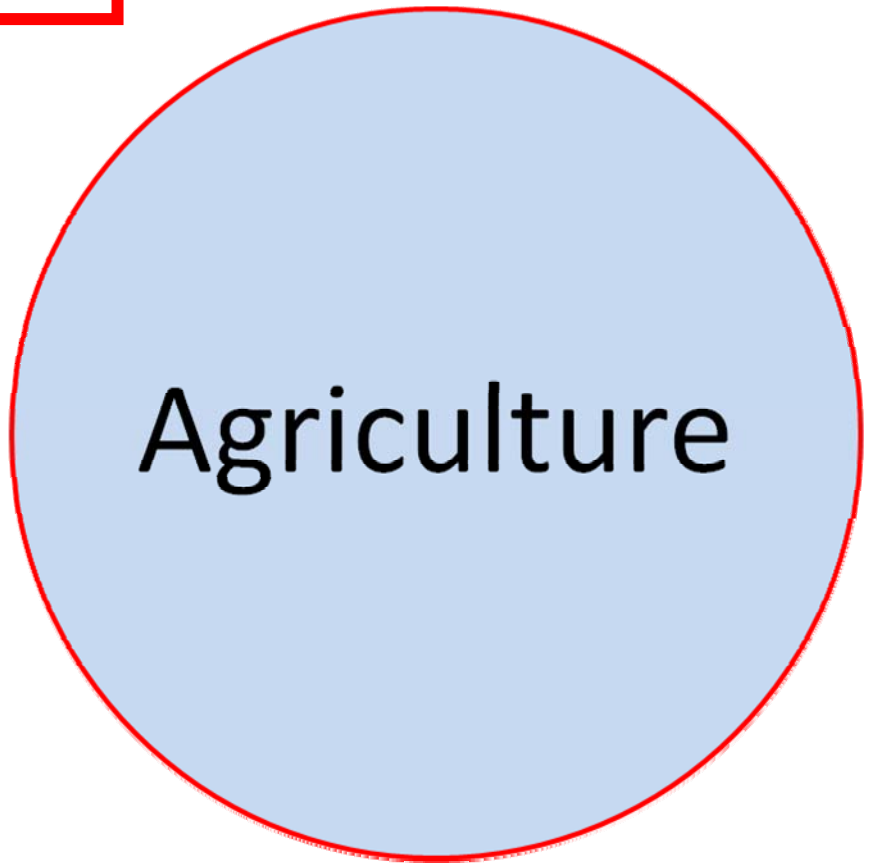
Source:
Sustainableamerica.org

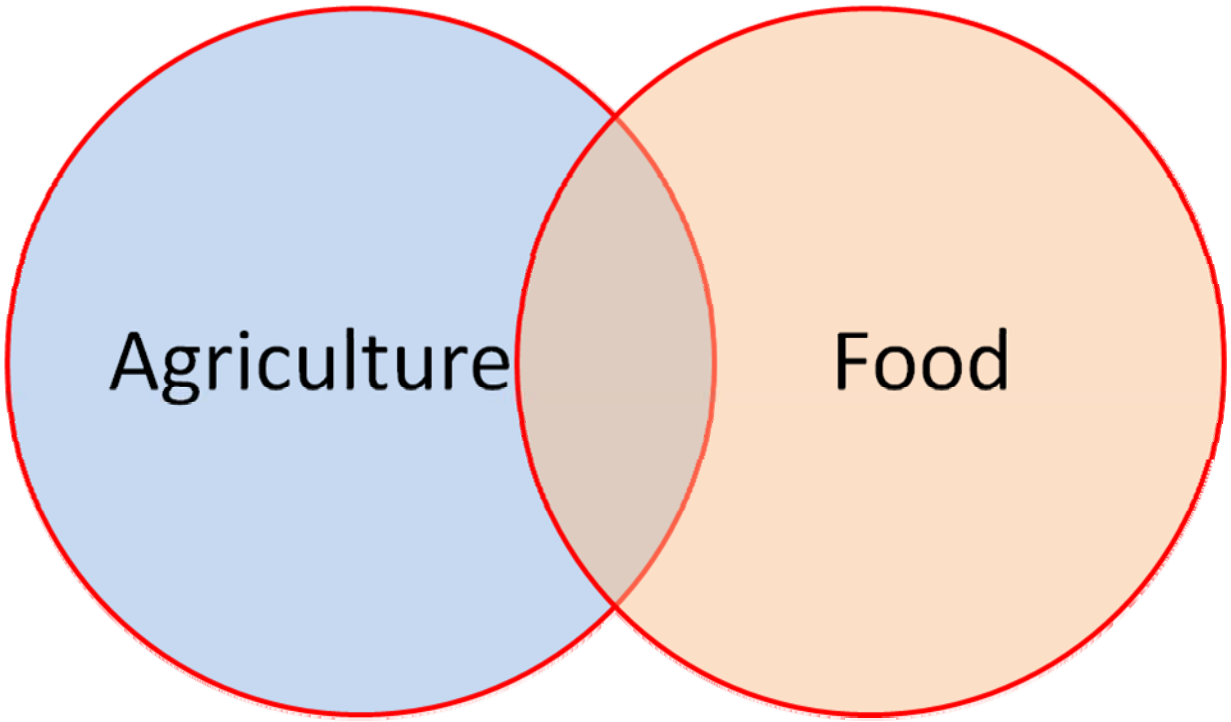
# Satellite Imagery

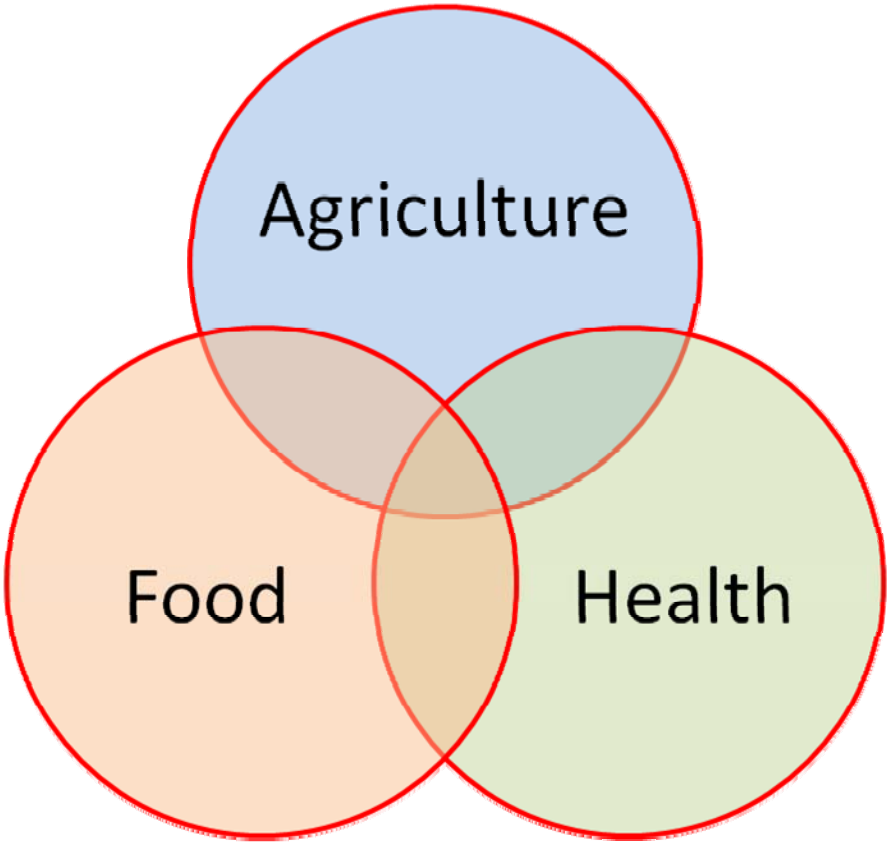


Source: xyht.com

# 6
The Nexus

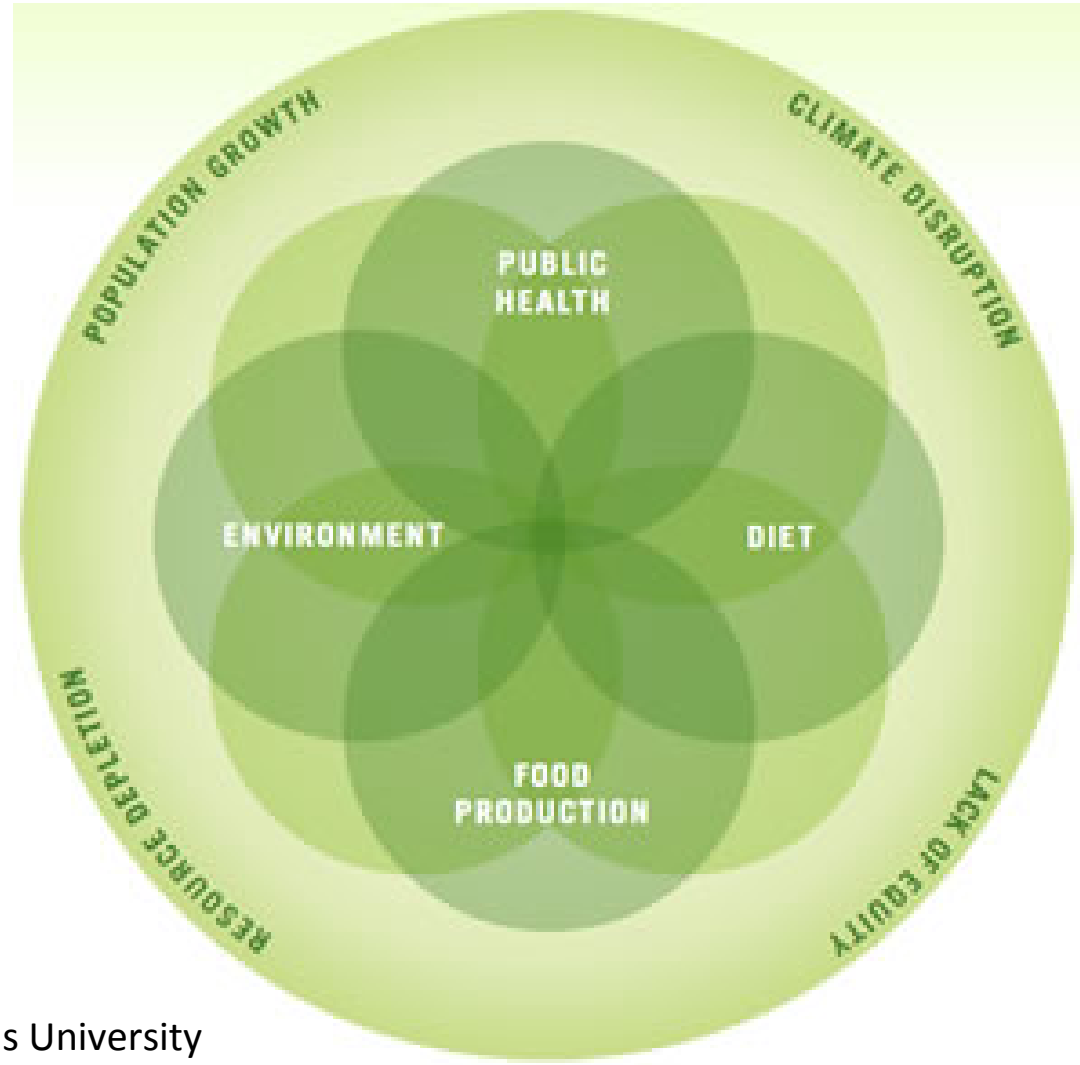



Agriculture
Food


Agriculture
Food
Health

# Transdisciplinary examination of the

# The Food **System**




Source: Johns Hopkins University

# New Actors in Food & Agriculture Teaching

# Friedman School of Nutrition Science and Policy
# Tufts University

Programs in:

- Agriculture, Food and Environment Program
- Sustainable Agriculture and Food Systems

Thank you
AGRICULTURE

# Other Trends:
# Communicating with the public

- Science & Agricultural Journalism (Missouri)
- Agricultural Communications (Iowa State)

# Other Trends: Value Added Processing

- Viticulture and Enology (U.C. Davis, Missouri)
- Fermentation Science (Colorado State, Oregon State)
- Grain Science for Bakery Science (Kansas State)
- Pet Food Science (Kansas State)