

# Agricultural Technology Research Program

Doug Britton, Ph.D.  
Program Manager

Georgia  
Tech Research  
Institute

## VISION

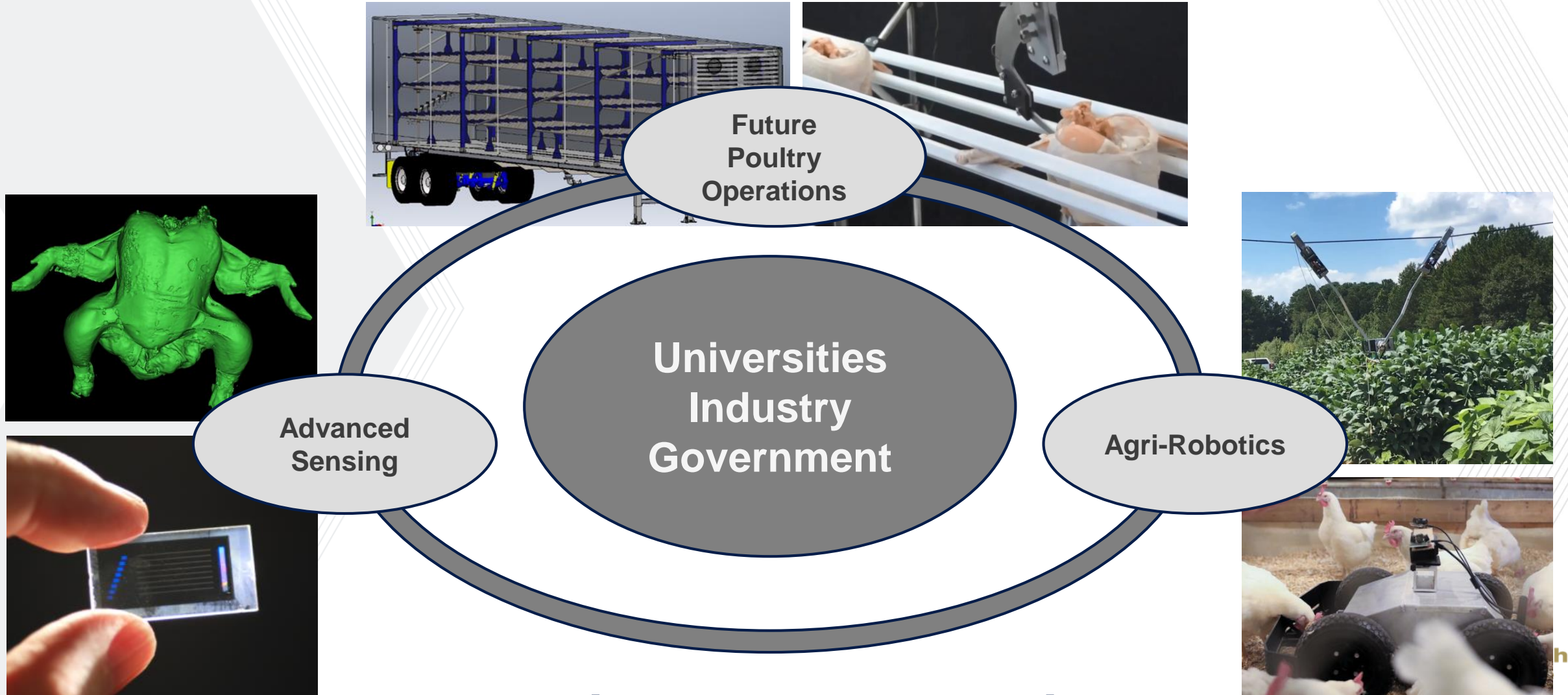
To transform ***Poultry,***  
***Agribusiness,***  
and ***Food Manufacturing***  
through ***Advanced***  
***Technologies***



Georgia  
Tech Research  
Institute

AGRICULTURAL TECHNOLOGY  
RESEARCH PROGRAM

# ATRP Strategic Research Thrusts

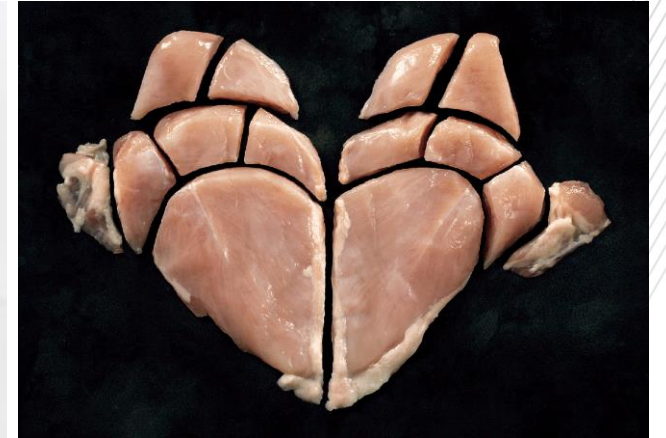


## Growing the Partnership



# Current Technologies in Poultry

- High-speed evisceration lines
- Machine vision grading system
- Xray screening systems
- Automated Deboning
- Waterjet cutting
- Data driven processes (SPC)
- In process water recycling
- Continuous food safety monitoring



# Where are we headed?

## Technology & Automation Challenges

- Natural variability of the product
- Complexity of encoding manual tasks
- Efficiency of human operators
- Necessary production flexibility
- Other factors ...

## Lot sizes of 1

- No longer process to the averages
- Intelligent systems - adapt to each product individually
- Fully integrated data across production & processing
- Goal: Increased throughput & efficiency



# Enabling Technologies ...

- **Artificial Intelligence (AI)**
  - Google TensorFlow – ML library
  - Amazon Machine Learning – supports AWS
- **High performance computing clusters**
- **Ubiquitous sensing platforms & data**
  - Smart phones, 3D sensors, multi-spectral, etc.
  - Perception & scene understanding
- **Collaborative & lower cost robotics**
  - Universal Robotics, etc.
  - Autonomy



# My interests in AgTech



**Harald Scherm, Professor & Head, Department of Plant Pathology,  
University of Georgia; [scherm@uga.edu](mailto:scherm@uga.edu)**

- Career-long interest in using data and models to understand and predict plant disease development and spread
- Co-developer and current Coordinator of interdisciplinary graduate certificate in Agricultural Data Science at UGA (since 2019)
- Co-chair of cluster hire in Integrative Precision Agriculture at UGA (5 new faculty positions between 2021 and 2023)
- For nearly 10 years, collaborated with Georgia Tech on AgTech research proposals and developing a roadmap for AgTech in Georgia



**College of Agricultural &  
Environmental Sciences  
UNIVERSITY OF GEORGIA**





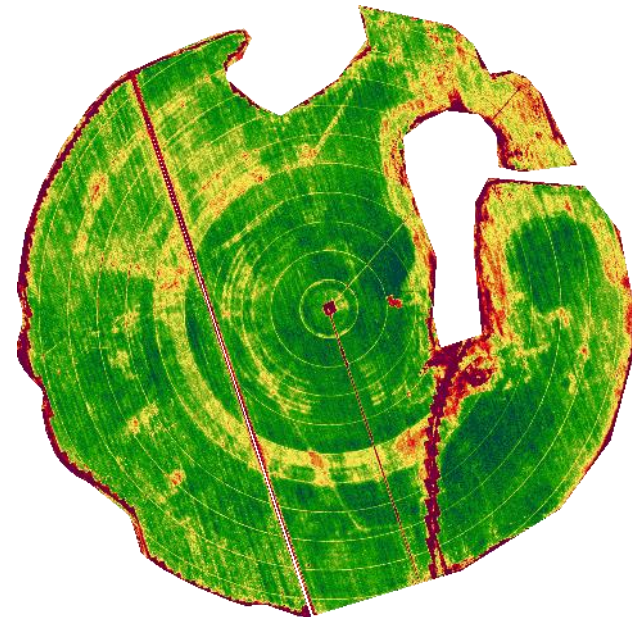
# Interdisciplinary Graduate Certificate in Agricultural Data Science

## Goals of the Program

- Using a structured curriculum, provide students with specialized training in agricultural data science
- Produces graduates who bridge the gap between the generation, analysis, and interpretation of complex data in the agri-food sector
- Builds on UGA's strength in the agricultural sciences and its campus-wide informatics initiative

## Structure of the Program

- Open to enrolled UGA graduate students in agricultural sciences and allied disciplines
- Requires 16 credits from two core courses, one seminar course, and a range of electives providing flexibility for students from various majors
- For more information:  
<https://site.caes.uga.edu/agdatascience/>



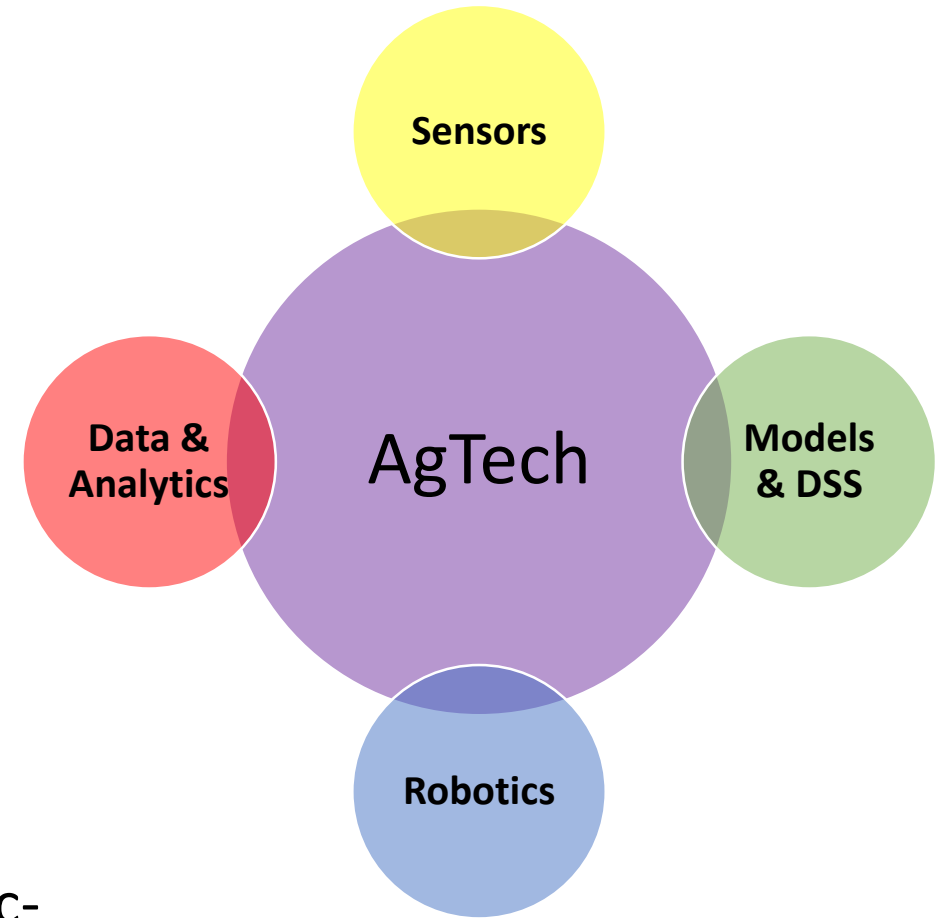
# UNIVERSITY OF GEORGIA

# Where I see opportunities for AgTech in Georgia

Georgia as the hub of the “next green revolution” driven by sensors, data, models, and automation

## Goals:

- Farmer: improve production efficiency & reduce losses through better decision-making
- University: high-impact research area at interface between agricultural sciences, engineering, and informatics
- State: economic and workforce development; public-private partnerships

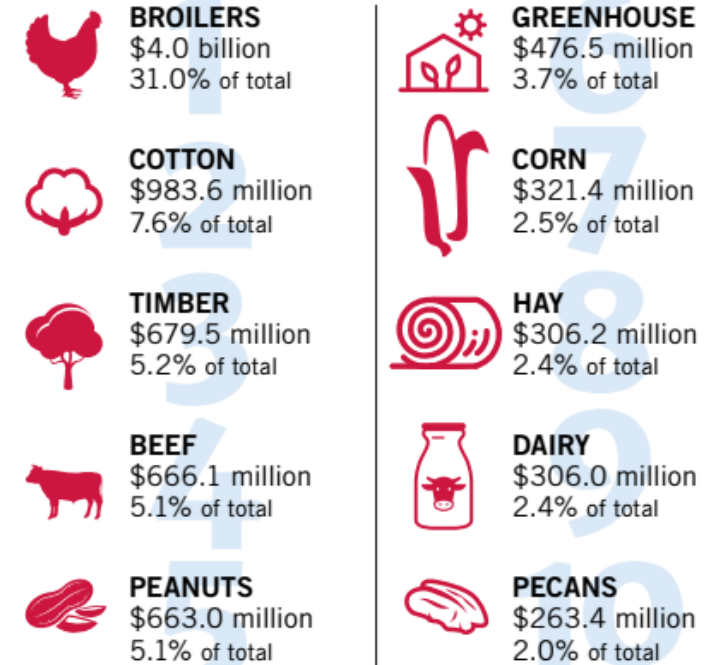




# Where I see opportunities for AgTech in Georgia

- Agriculture continues to be the top sector of the economy (\$70.1 billion economic contribution)
- Diverse and unique crop portfolio - including major row crops and specialty crops - requires unique technologies, different from what others are doing
- High labor demand of specialty crops provides impetus for automation and robotics
- Georgia's position as a major transportation hub – air- and seaports
- World-class agricultural sciences and engineering programs at UGA, GT, FVSU

## Top 10 Georgia Commodities by Value



## Food and fiber production

plus directly related processing and indirect sectors

*Contributes...*



# Examples of AgTechnologies that get me excited

- **Multimodal sensing, sensor fusion** – combining data from imaging, volatiles, plant/soil-embedded sensors
- **More robust predictive models through AI**, e.g. machine-learning for improved image classification, dealing with small samples and data shifts
- **Precision pest management (PPM)**
  - Warm and humid climate, long growing season, and sandy soils increase pest pressures, which makes PPM attractive in the Southeast
  - Technologically challenging because pests are difficult to distinguish and highly mobile – combination of advanced imaging and modeling
- **Belowground crop imaging** - both scientifically challenging and practically relevant (e.g., peanut yield estimation, root disease detection)

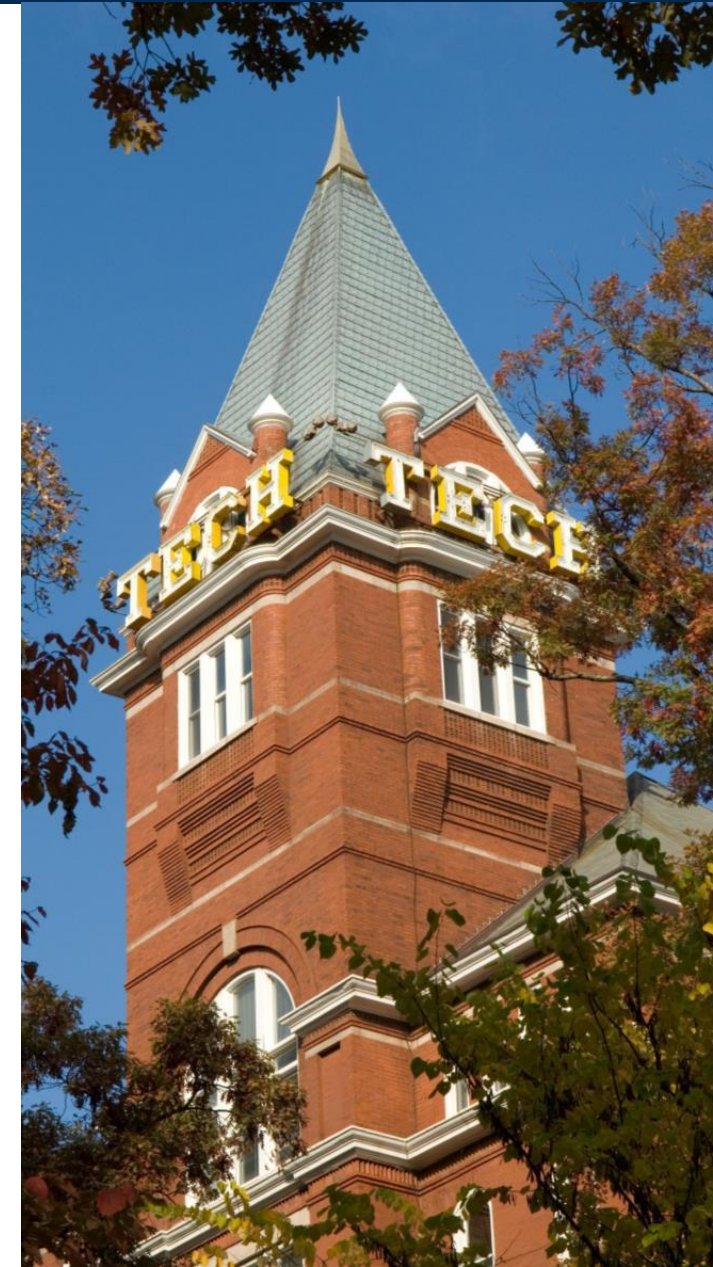


# **Sound of Silence: Deciphering What Our Leafy Friends are Trying to Tell Us**

**May 20, 2021**

**Jie Xu**

**Intelligent Sustainable Technology Division  
Georgia Tech Research Institute**





# Volatile Organic Compounds Emitted from Plants



- Plant volatiles comprise thousands of low-molecular weight, hydrophobic molecules.
- They are classified as 'secondary' (specialized) metabolites, but are closely related to 'primary' (general) metabolites.
- Plants emit VOCs from leaves, flowers, fruits, roots and stems
- An average plant produces over 100,000 chemicals, of which 1700 are known to be volatile.

# ~1700 Plant VOCs

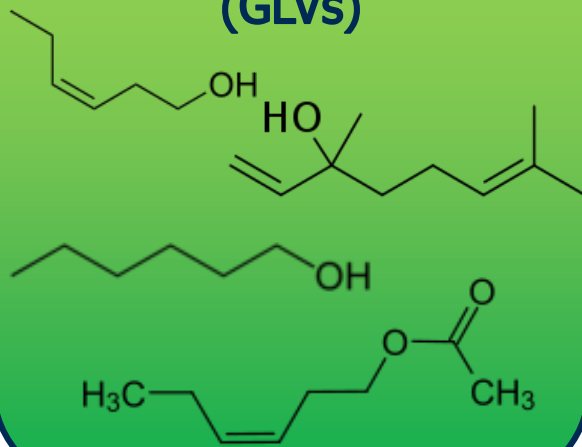
## Acetate Pathway

## MVA Pathway

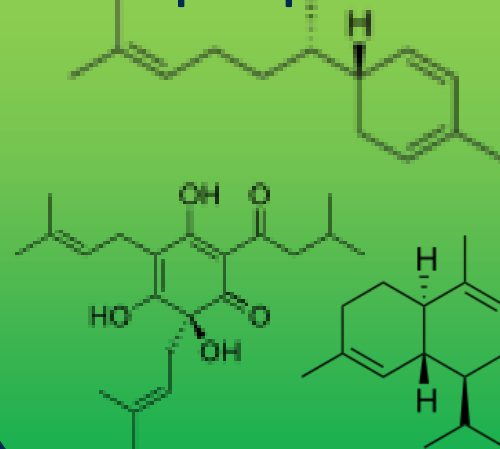
## MEP Pathway

## Shikimate Pathway

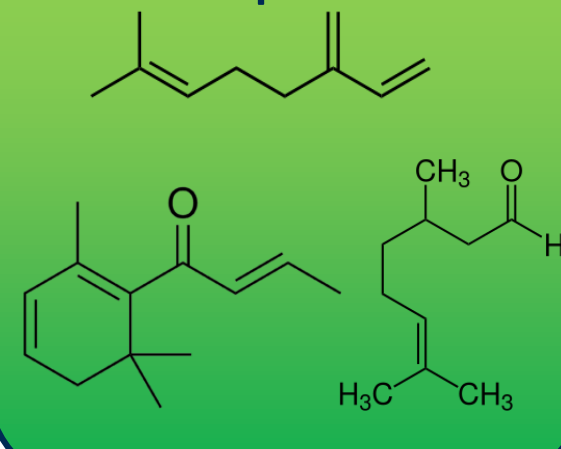
### Fatty acid derivatives (GLVs)



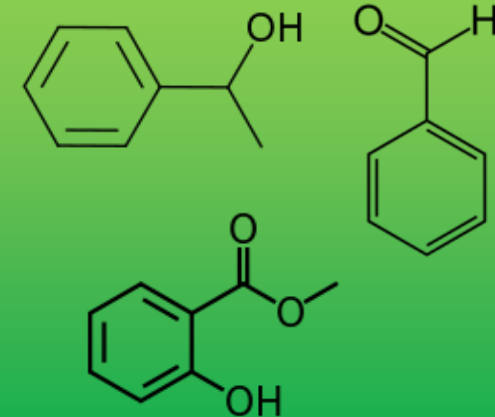
### Sesquiterpenoides



### Terpenes

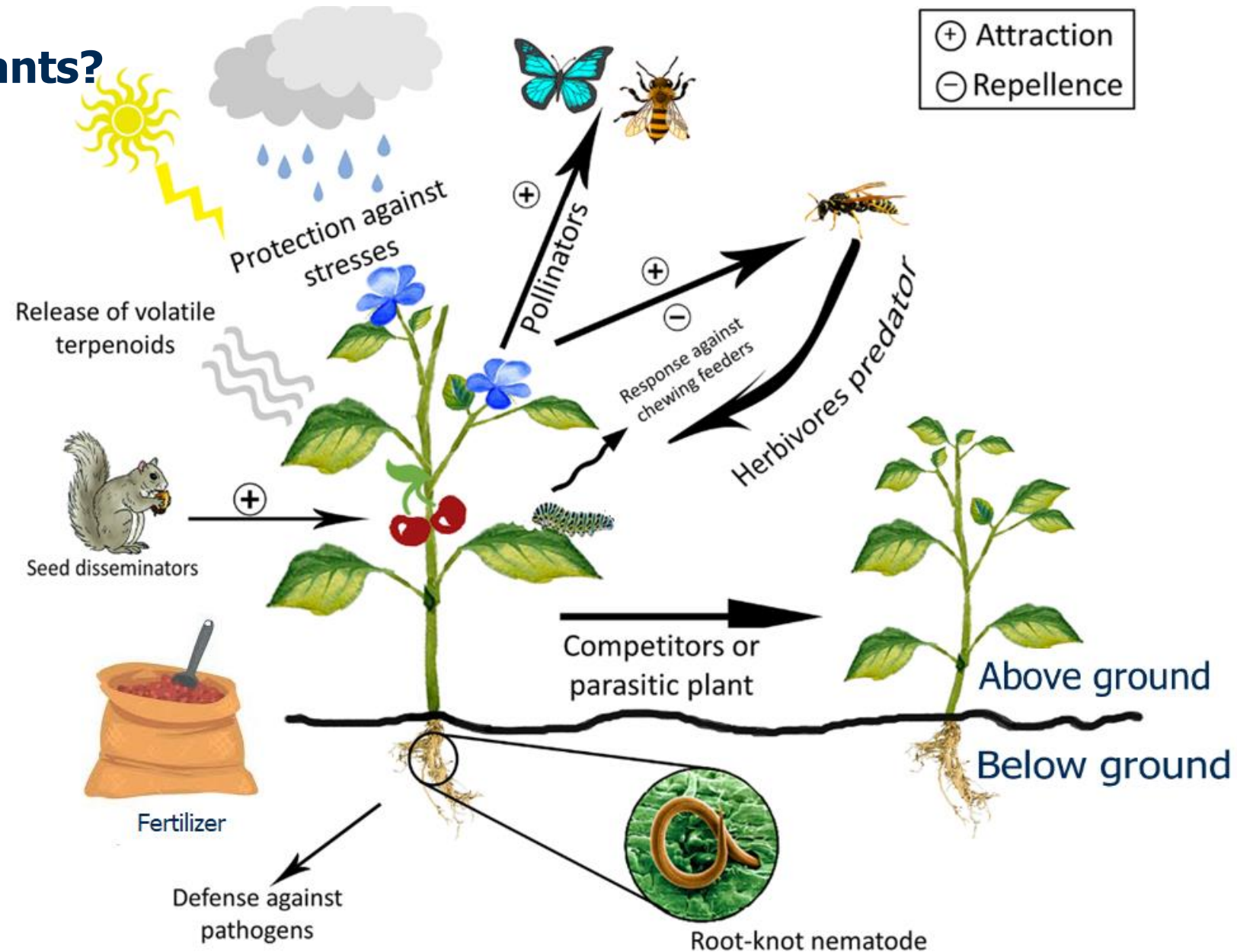


### Benzenoides, phenolics



## Who's Listening to Talking Plants?

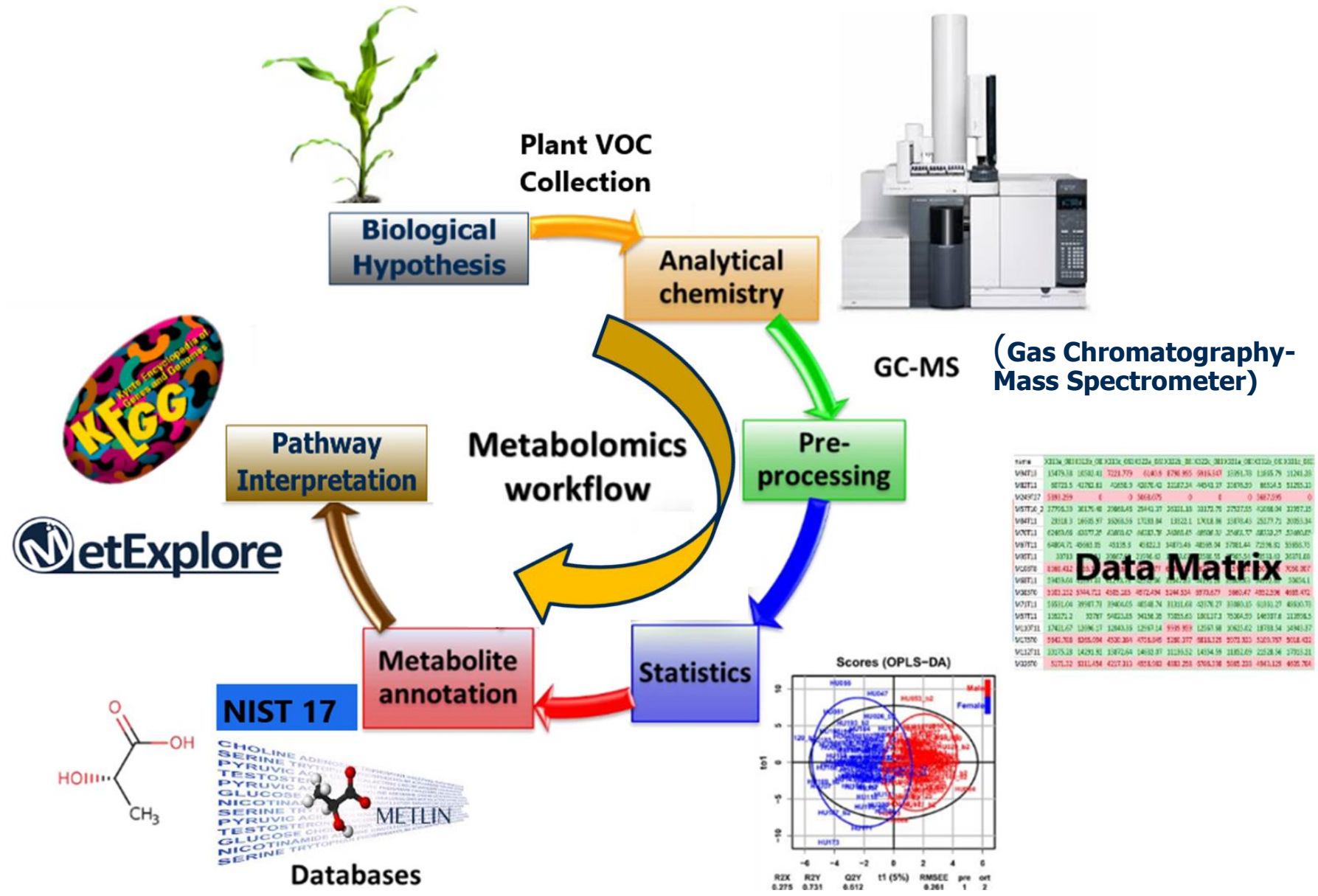
- To leverage the plant VOC based communication signals in applications.....



Ref: "Volatile terpenoids: multiple functions, biosynthesis, modulation and manipulation by genetic engineering", *Planta*, 2017, 246, 803-816

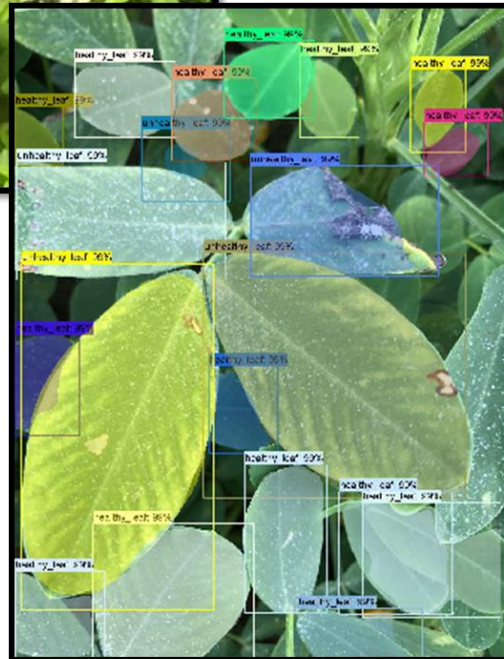


## Information Extraction from Plant VOCs



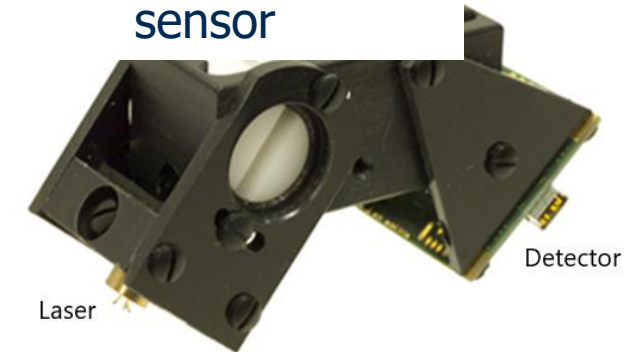
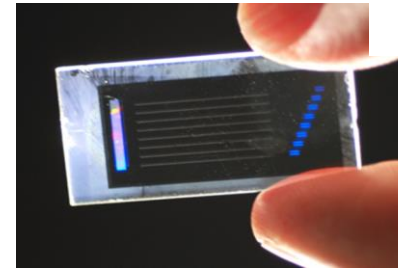
# Enabling Technologies

## Robotic arms for tissue collection & sensing



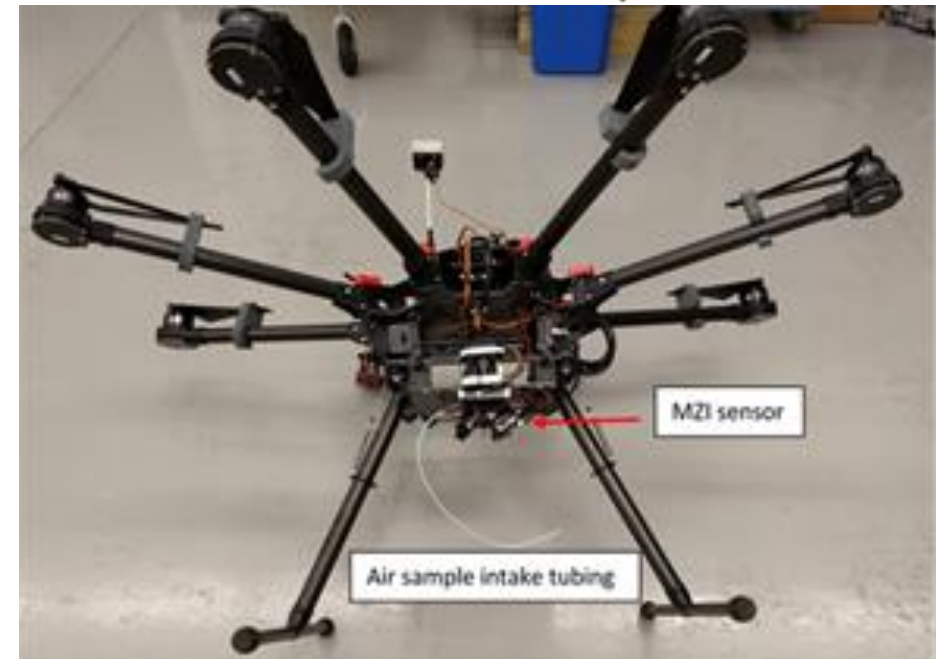
## VOC sensors for field diagnostic

Interferometric sensor



Laser

Detector











# **AGCO AND AG-TECH**

**RAVI GODBOLE**

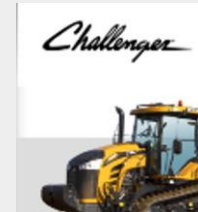
**MAY 20, 2021**



A Global Ag OEM with HQ Based in Duluth, GA  
**20000+** employees with 2020 Revenue **9.1B**

**FUSE**  
SMART FARMING. SYNCHRONIZED.

Fuse encompasses  
all core brands



# OUR CHALLENGE: SUSTAINABLE PRODUCTIVITY GROWTH



## **SUSTAINABILITY**

ENVIRONMENTAL, SOCIAL, FINANCIAL ASPECTS  
OF CROP PRODUCTION AND LIVESTOCK MANAGEMENT



## **PRODUCTIVITY**

DELIVER FOOD, FEED, FUEL, FIBER  
FOR A GROWING POPULATION



# FARMER FIRST – AT THE HEART OF EVERYTHING WE DO

## Exceptional Customer Experiences



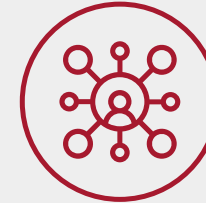
Creating a consistently exceptional experience for our farmers

## High Quality, Smart Solutions



Maximize farmers' outcomes with innovative, full-line offering of digitally-enabled solutions

## Customer-Connected Distribution



Serve farmers in the way they choose along the entire life cycle

**PASSION FOR OUR**  
**FARMERS**  
**IS AT THE HEART OF**  
**EVERYTHING WE DO**

# FULL LINE SMART FARMING PORTFOLIO

## Strategic Focus

- ✓ **Connectivity**  
Enabling remote accessibility, visibility, and management via the Cloud
- ✓ **Autonomy/Automation**  
Building out autonomous capability
- ✓ **Robotics**  
Developing machine vision & spray drift management technology
- ✓ **Electrification**  
Converting from mechanical to electrical power
- ✓ **Edge Computing**  
Harness agronomic potential on equipment in real-time

## Today's Smart Machines

IDEAL Combine



Momentum Planter



Fendt 700 Series



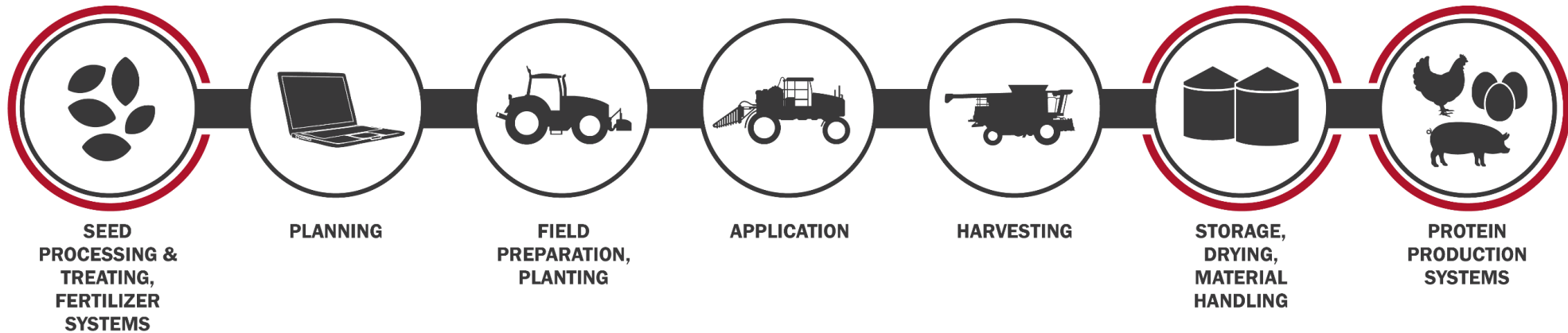
## Tomorrow's Smart Machines



**XAVER**

Autonomous Concept

# OUR NEWEST GRAIN AND PROTEIN DIVISION MAKES US A **FARM TO FORK** AG-TECH SOLUTIONS PLAYER







GrainViz lets customers see moisture content of the entire grain mass





Sensor technology that measures  
conditions at the animal level.





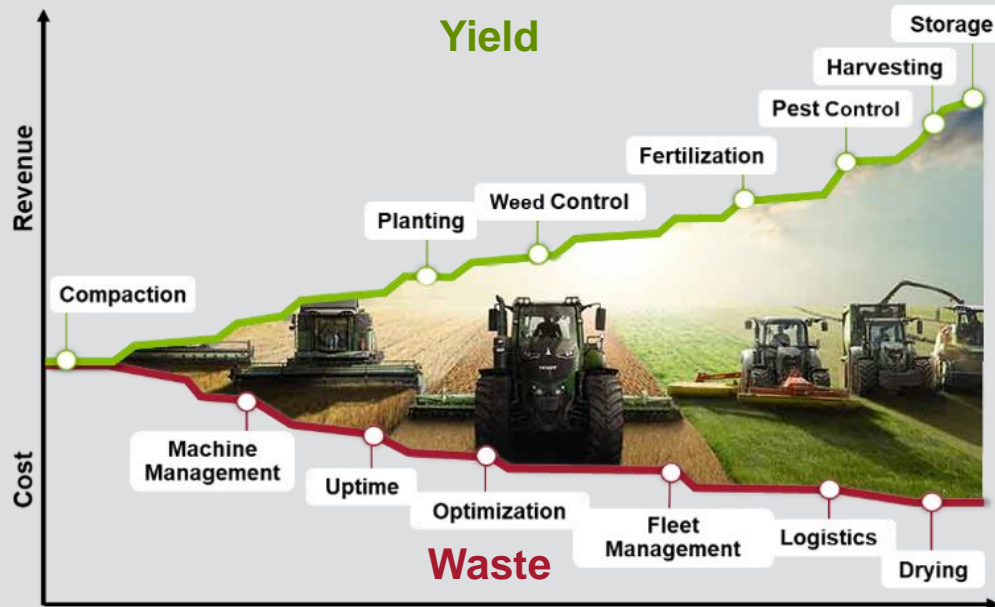
Remote monitoring that provides insights  
on equipment performance.



# CREATING VALUE FOR FARMERS BY DELIVERING IMPROVED OUTCOMES INCLUDING **GEORGIA FARMERS!**



## Crop Cycle Opportunities



## AGCO's Goal is to Enable:

**20%**



**Improvement  
in net farm  
income**

**Productivity – Reliability – Ease of Use - Innovation**

**Thank You.**

**Questions are Welcome.**

RAVI.GODBOLE@AGCOCORP.COM

