Ag Tech Outlook Webinar

Monday, February 9, 2026

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Joe Waddell

Industry & Innovation Officer

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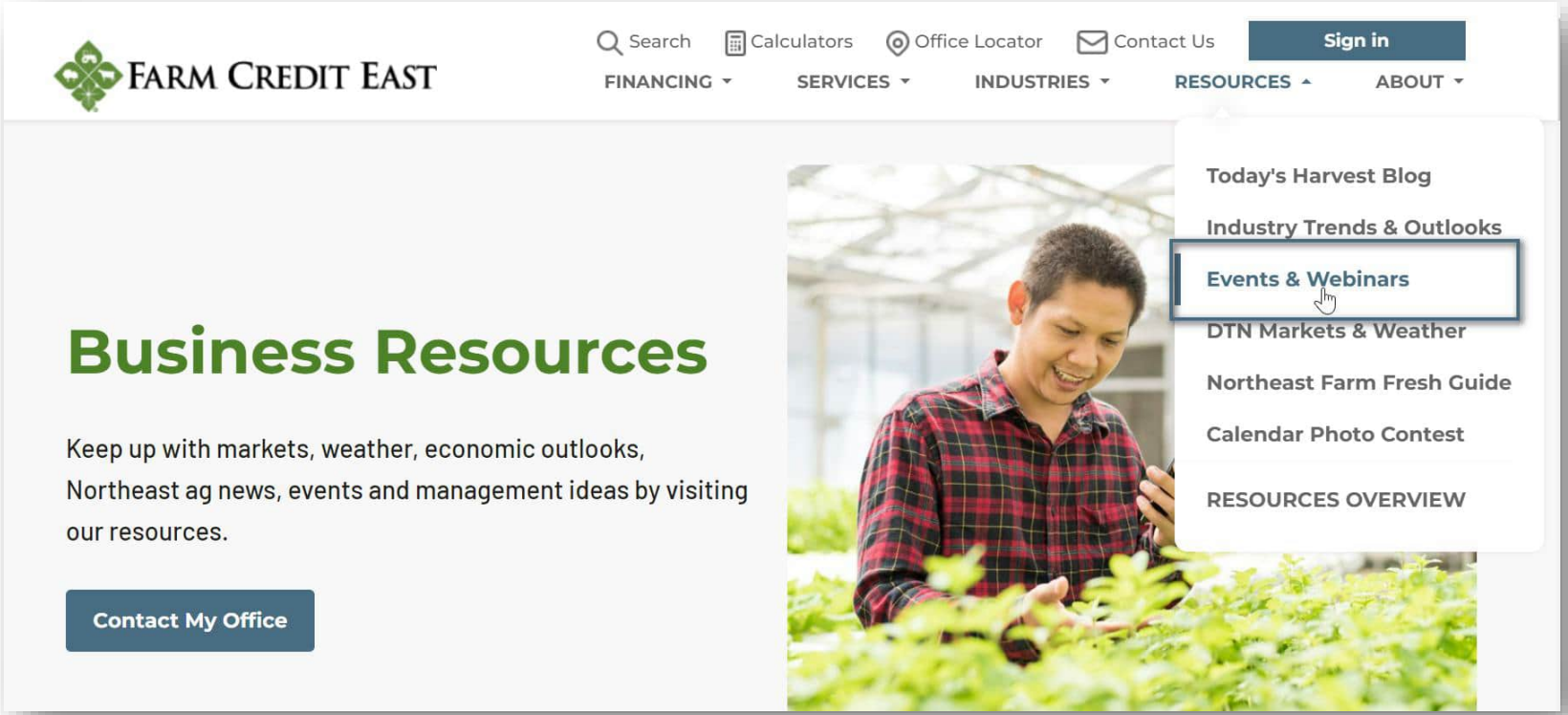


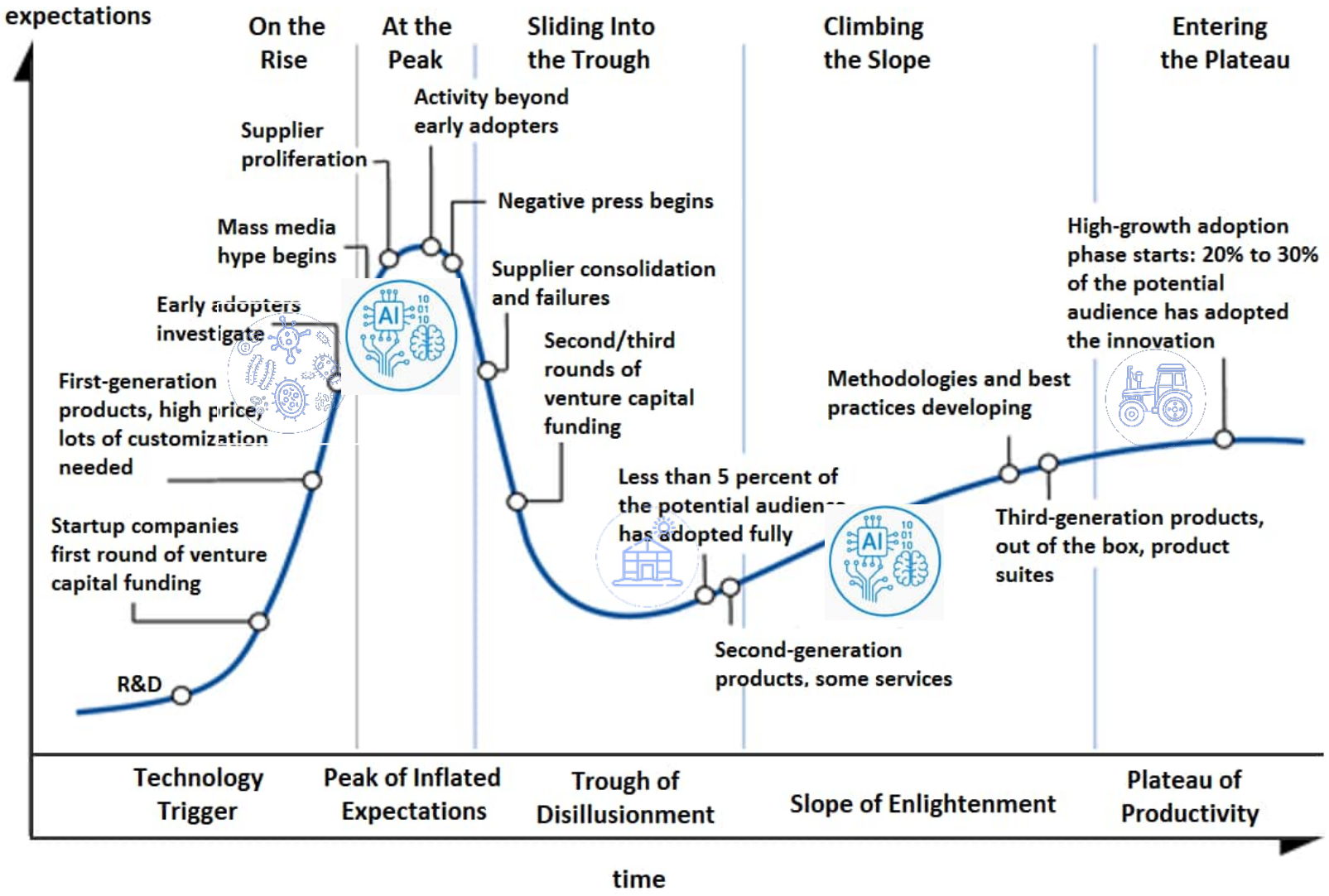
Joe Waddell
Industry and Innovation Officer
Horizon Farm Credit

Ag Tech Outlook

Innovation

- The Process of creating value by applying novel solutions to meaningful problems

Gartner Hype cycle



Decision making on farm

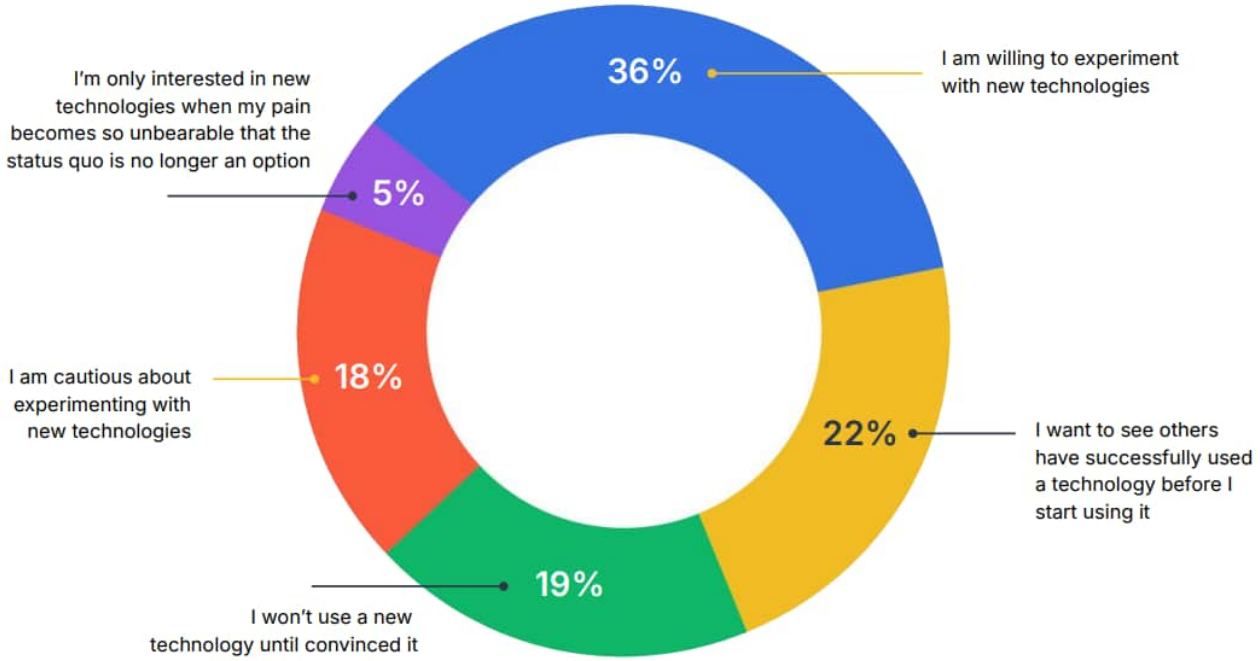
New Technology

- 36% are willing to experiment with **new technologies.**
- Those **31-40** are willing to experiment with new technologies, 56% the most, when compared to other age groups as well as overall, 40%.
- Those **61-80** are less likely to use a new technology until they are convinced it will solve the problem (when compared to other age groups).

Average number of software programs used for farm business

3

Which one of the following statements best describes your willingness to adopt new technology?



sample size = 767

Bushel finds "aggressive adoption" of technology by young farmers

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Record-Keeping Tools

Pen and paper sees significant fall. It is used by just **21%** of respondents (in 2024, it was at 54% and in 2023, it was at 65%).

76% use a **farm management software tool** (does not include Excel spreadsheets, pen and paper, and none of the above) for record keeping (up 6% from the previous year and up 11% from 2023).

31% use **more than one farm management software tool** for record keeping.

This year, **spreadsheets** are used by **39%** of respondents—last year it was 61%.

Which of the following record-keeping tools do you use?

Record Keeping Tool	2023	2024	2025
Excel Spreadsheets	50%	61%	39%
Pen & Paper	65%	54%	**21%**

sample sizes =
2025: 906
2024: 651
2023: 1186

2025

Record Keeping Tool	%	Count
Excel spreadsheets	39%	350
QuickBooks	38%	342
Bushel Farm	30%	269
Climate FieldView	21%	190
Pen and paper (a.k.a. Shoe Box)	21%	189
John Deere Operations Center	17%	152
None of the above	11%	96
Others - Other Software Selections	10%	90
Others - Write In	14%	127

sample size = 906

Bushel finds "aggressive adoption" of technology by young farmers

Precision Ag tech Adoption Trends

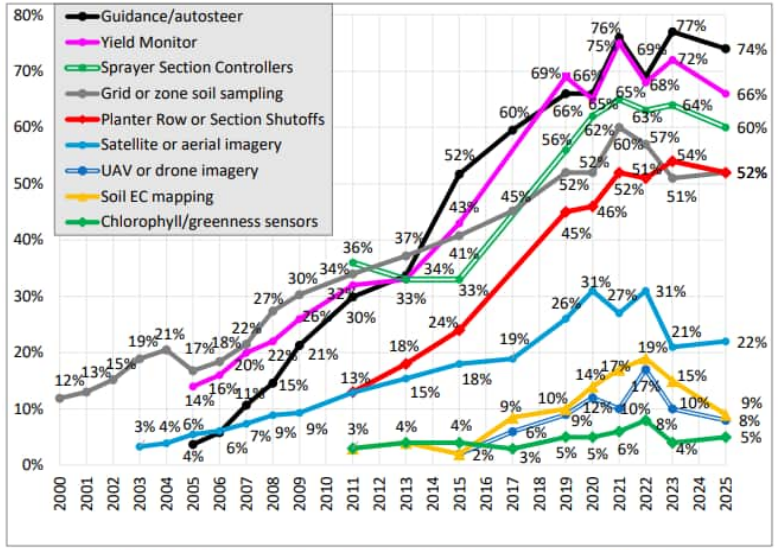


Figure 16, Q11: Producer use of precision technologies, retailers estimate of their market area.

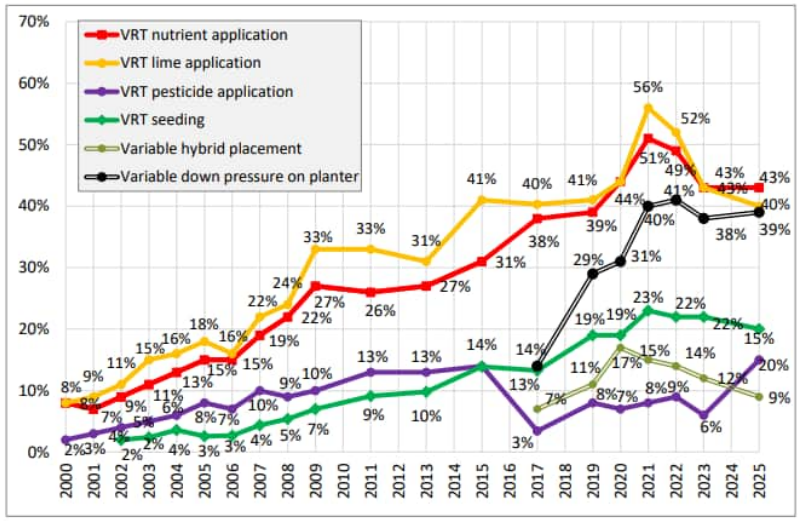


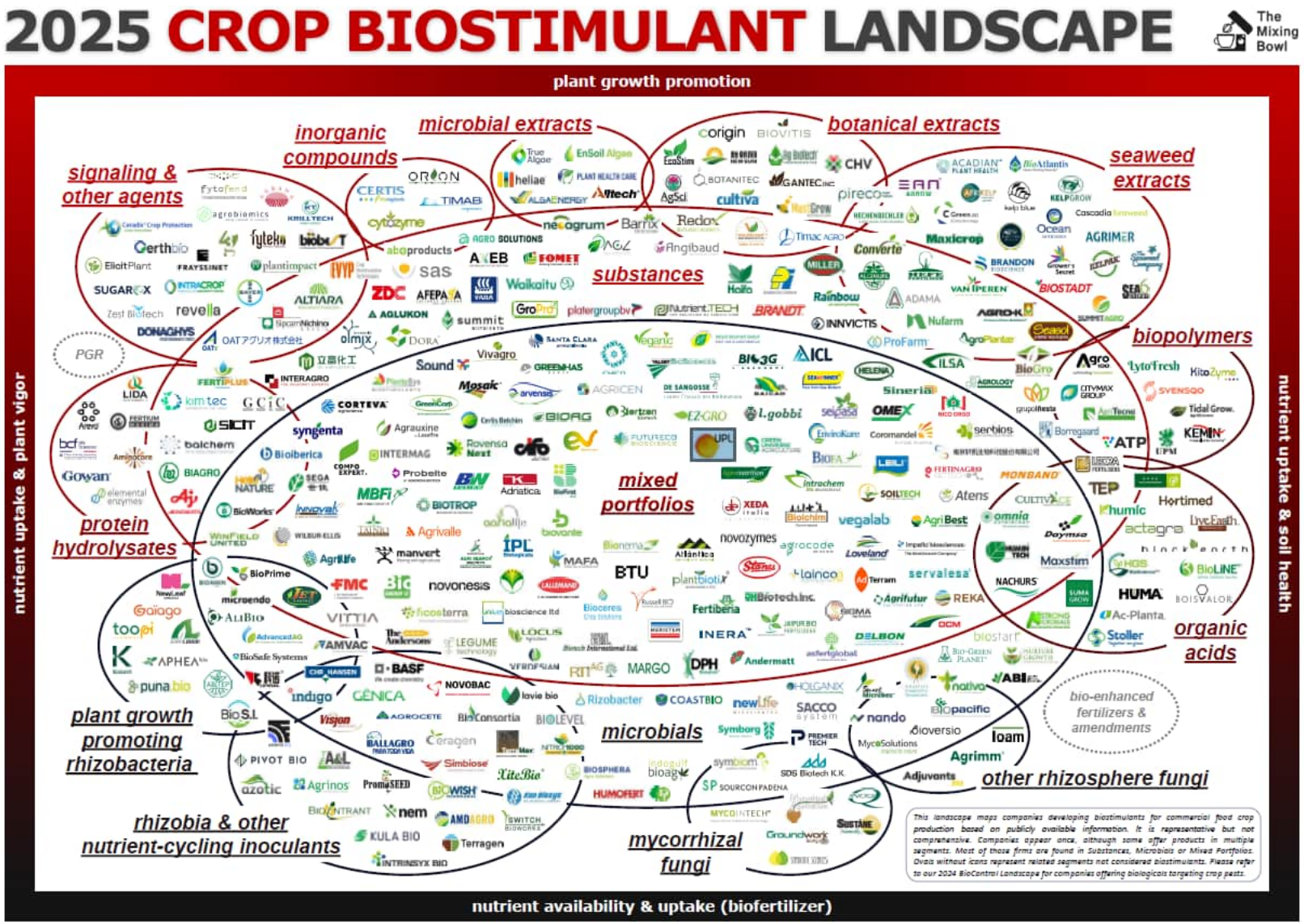
Figure 17, Q11: Producer use of variable rate technologies (VRT), market area estimated by retailers.

Table 4. Q11: Farmer use of precision technologies, local market area estimated by retailers, ranked for 2025. Color shading shows green most, yellow middle, and orange lower.

	2017	2019	2020	2021	2022	2023	2025
Guidance/Autosteer	60%	66%	66%	76%	69%	77%	74%
Yield Monitor	-	69%	65%	75%	68%	72%	66%
Sprayer Section Controllers	-	56%	62%	65%	63%	64%	60%
Planter Row or Section Shutoffs	-	45%	46%	52%	51%	54%	52%
Grid or Zone Soil Sampling	45%	52%	52%	60%	57%	51%	52%
VRT Fertilizer Application	38%	39%	44%	51%	49%	43%	43%
Cloud Storage of Farm Data	14%	21%	29%	36%	42%	40%	43%
VRT Lime Application	40%	41%	44%	56%	52%	43%	40%
Variable Down Pressure on Planter	14%	29%	31%	40%	41%	38%	39%
Electronic Records/Mapping for Quality Traceability	-	20%	21%	21%	34%	31%	39%
Any Data Analysis Service	13%	26%	25%	33%	38%	30%	31%
Satellite or Aerial Imagery	19%	26%	31%	27%	31%	21%	22%
VRT Seeding	13%	19%	19%	23%	22%	22%	20%
VRT Pesticide Application	3%	8%	7%	8%	9%	6%	15%
Grid or Zone Plant Tissue Sampling	-	-	-	-	-	-	13%
Soil EC Mapping	9%	10%	14%	17%	19%	15%	9%
Variable Hybrid Placement Within Fields	7%	11%	17%	15%	14%	12%	9%
UAV or Drone Imagery	6%	9%	12%	10%	17%	10%	8%
Crop Inputs Applied with a UAV/Drone	-	-	-	-	-	5%	8%
Wired or Wireless Sensor Networks	-	-	-	-	18%	9%	7%
Autonomous Support Vehicle (grain cart) for Harvest	-	-	-	0%	5%	6%	5%
Selective Harvest for Quality Improvement	-	4%	7%	7%	15%	5%	5%
Chlorophyll/Greenness Sensors for N Management	3%	5%	5%	6%	8%	4%	5%
Machine Vision Weed Detection on Sprayer	-	-	-	-	-	2%	5%
VRT Irrigation	-	4%	5%	4%	6%	15%	4%
Robotics/Automation on Harvester	-	0%	1%	1%	3%	3%	4%
Robotics/Automation for Scouting	-	-	-	1%	3%	1%	3%
Robotics/Automation for Weeding	-	0%	0%	0%	3%	1%	2%

Ag Biologicals

- Fast-growing, highly fragmented market
- Real on-farm wins exist, but performance is context-dependent
- Innovation velocity is high, evidence quality is uneven



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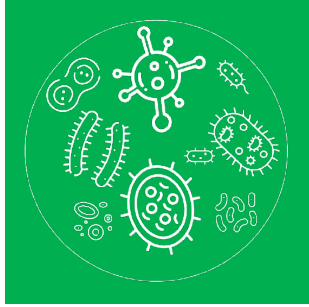
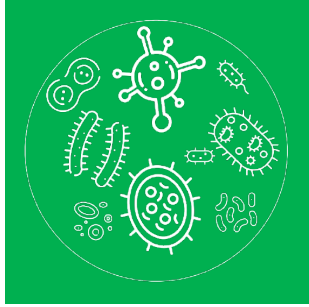
Ag Biologicals - Key Challenges and Barriers



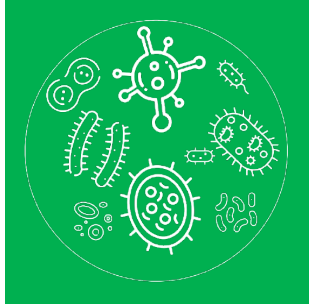
- **Consistency & predictability**
  - Variable response across environments; narrow “windows” where ROI shows up
- **Product clarity**
  - Messy category definitions
- **Manufacturing & shelf-life**
  - Live biology stability, contamination risk, viability drift, storage/handling sensitivity
- **Compatibility friction**
  - Tank-mix interactions, water quality sensitivity, and application timing competing with operational realities
- **Economics**
  - ROI is often “risk-reduction / resilience” rather than yield upside every year
- **Regulatory & labeling variability**
  - Different frameworks by geography; claims limited by registration path and data requirements

Ag Biologicals vs. Synthetic Chemistry



- **It's should be "AND," Not "OR"**
  - Best outcomes increasingly come from integrated programs
  - **Biologicals:** amplify efficiency, improve stress tolerance, support nutrient cycling, enhance plant signaling
  - **Synthetics:** deliver baseline control and reliability
- **Practical reality**
  - Biologicals are commonly used to reduce variance, enhance nutrient-use efficiency, and complement chemistry rather than fully replace it

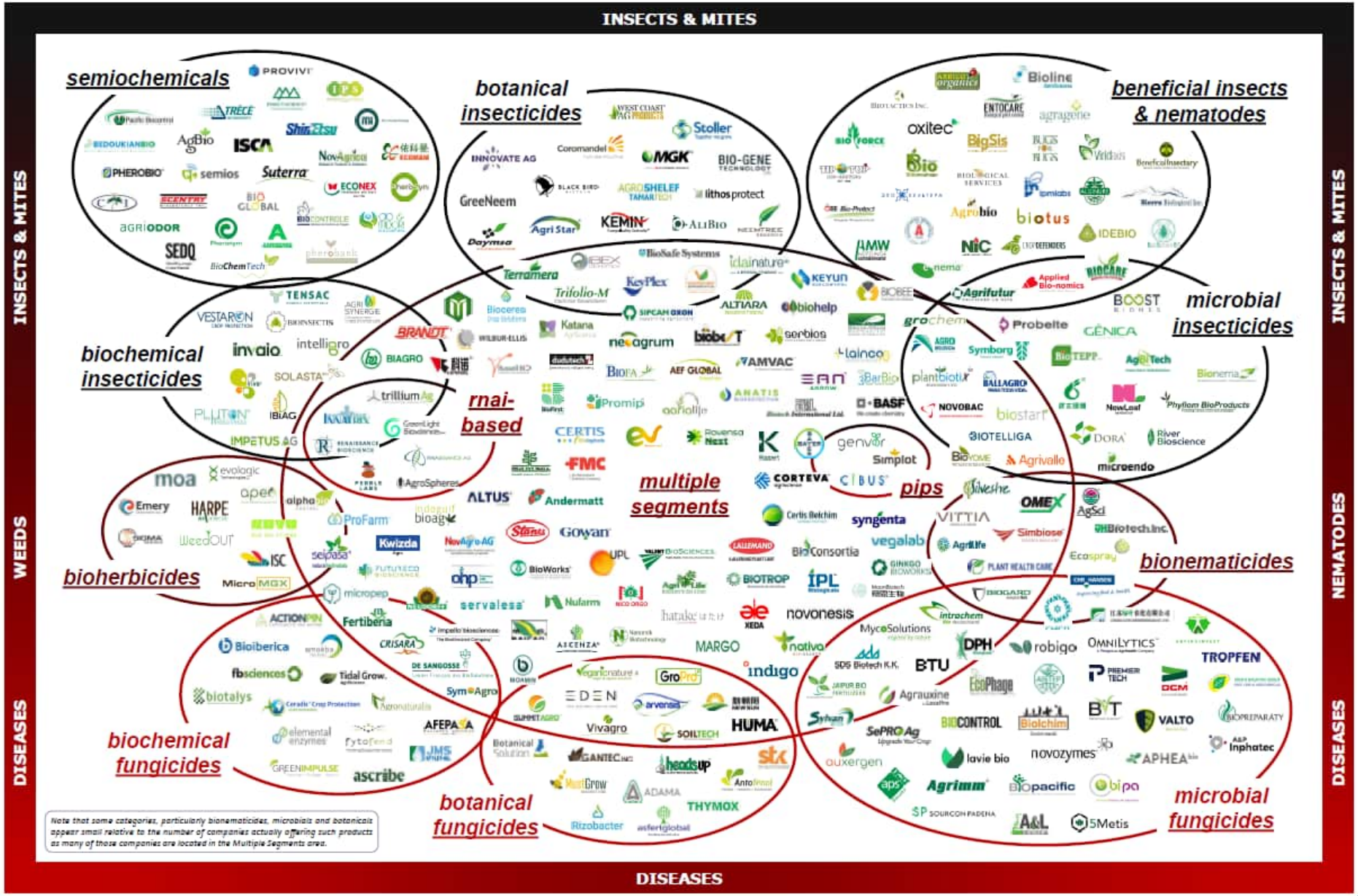
Ag Biologicals – Where are we headed



- **Shift from "product-by-product" to outcome-based systems biology + chemistry + data + placement**
- **Better validation**
  - Multi-site networks, standardized protocols, and digital capture will separate durable performers from hype
- **More precision delivery**
  - Seed treatment, in-furrow, targeted foliar at stress inflection points and decision rules tied to weather/soil
- **Portfolio consolidation + tighter claims**
  - Fewer "me-too" products, more defensible modes of action, and clearer positioning
- **The winners will be the biologicals that are;**
  - Consistent enough, operationally easy, chemistry-compatible, and ROI-explainable

2024 CROP BIOCONTROL LANDSCAPE

The Mixing Bowl
CONNECTING INNOVATORS IN FOOD, AG & IT



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Artificial Intelligence's Role in Agriculture

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Artificial Intelligence's Role in Agriculture

- **LLM (Large Language Model) – Top of Mind**
  - Rolodex of information- LLMs are a function of their data
    - Decision Tree/ Pattern Recognition
  - Generalist vs. Specialist => Mixture of Experts
  - **The power is in the prompt!**
  - Generates unique content based on probability and pattern learning from large databases of information
- **Machine Learning/Computer Vision**
  - e.g., image recognition, identifying crop stress, classifying weeds, livestock counting
  - Automation
  - Real time decision making

Artificial Intelligence's Role in Agriculture

- **Why now (LLM)?**
  - **Advancements in Computing**
    - ✓ On-site processing, Cloud server-based processing
    - ✓ Access to computing power

- **DATA is the Key to the Farm Gate**
  - To truly leverage to computational power of AI in the long run, it is critically important the data is as accurate as possible
  - Clean, quality data is the foundation for innovation

"Data is the new oil, its valuable, but if unrefined it cannot really be used"
– Clive Humby
"Garbage in Garbage out"

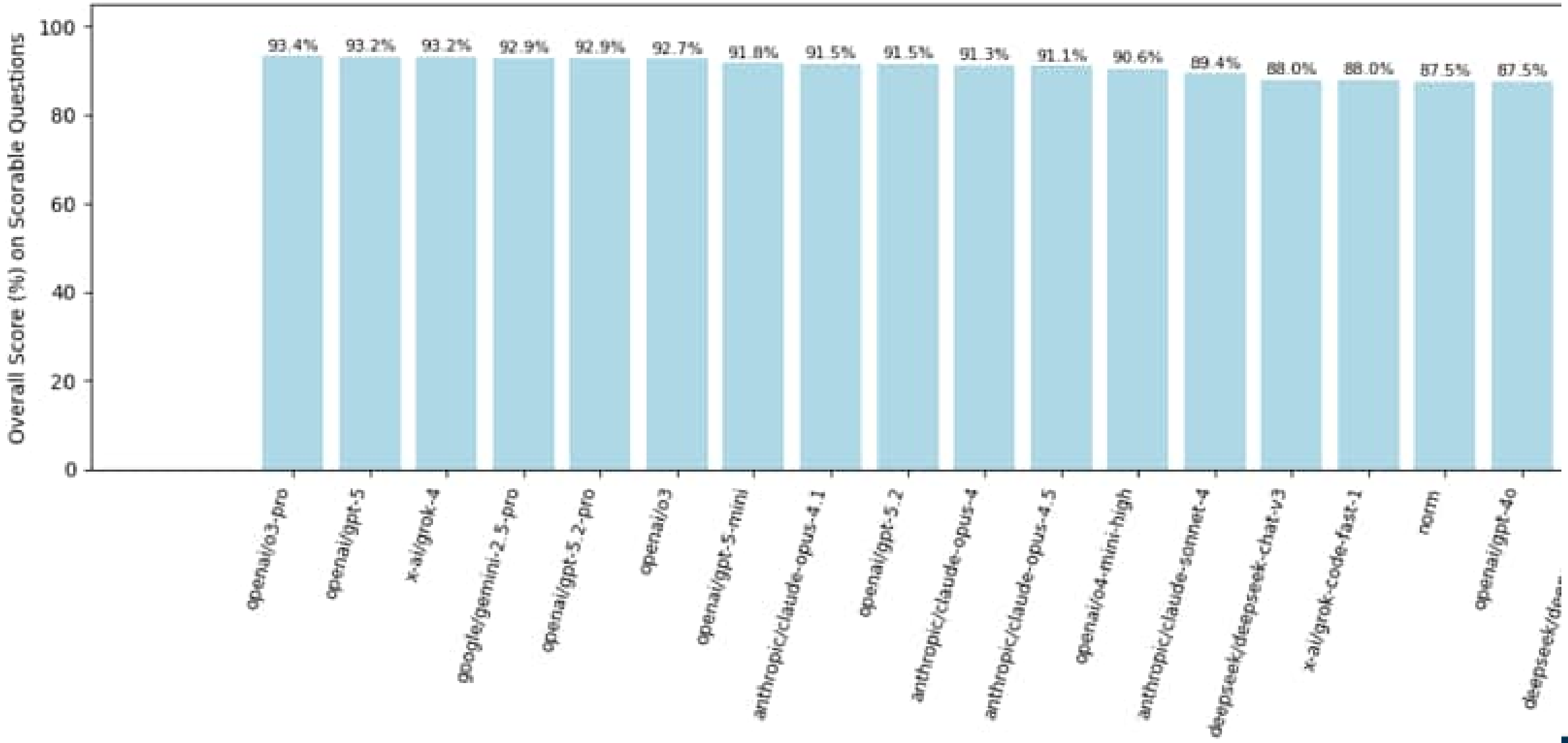
Artificial Intelligence's Role in Agriculture

- **Advanced Decision-Making**
  - AI algorithms analyze data (weather, soil, crop health) to provide predictive insights for optimizing operations
- **Automated Machinery**
  - Computer vision, complex decision-making, autonomous navigation
- **Precision Farming**
  - From farm level to field level, ultimately plant level leveraging digital twins
- **Livestock Management**
  - Animal health and behavior analysis
- **Supply Chain / Market Optimization**
  - Advanced trend analysis
- **Research Tool**
  - Time compression in research and development

Large Language Model Use Cases

- **Bayer, Syngenta, Becks, Winfield, Penn State.. The list continues to grow**
  - Internal development of private LLM sandbox for historic information for query, future development
- **CNH**
  - Internal Model built around Assist Service tool
- **Corteva**
  - Protein Model- Predict novel protein structures
    - Pharma-> Ag
    - LLM+ protein detection+ proprietary datasets
    - Use in discovery of novel proteins – modes of action
- **Farmer**
  - Research assistant, private data (enterprise models) expensive
  - Fleet management tools

LLM Performance in ag



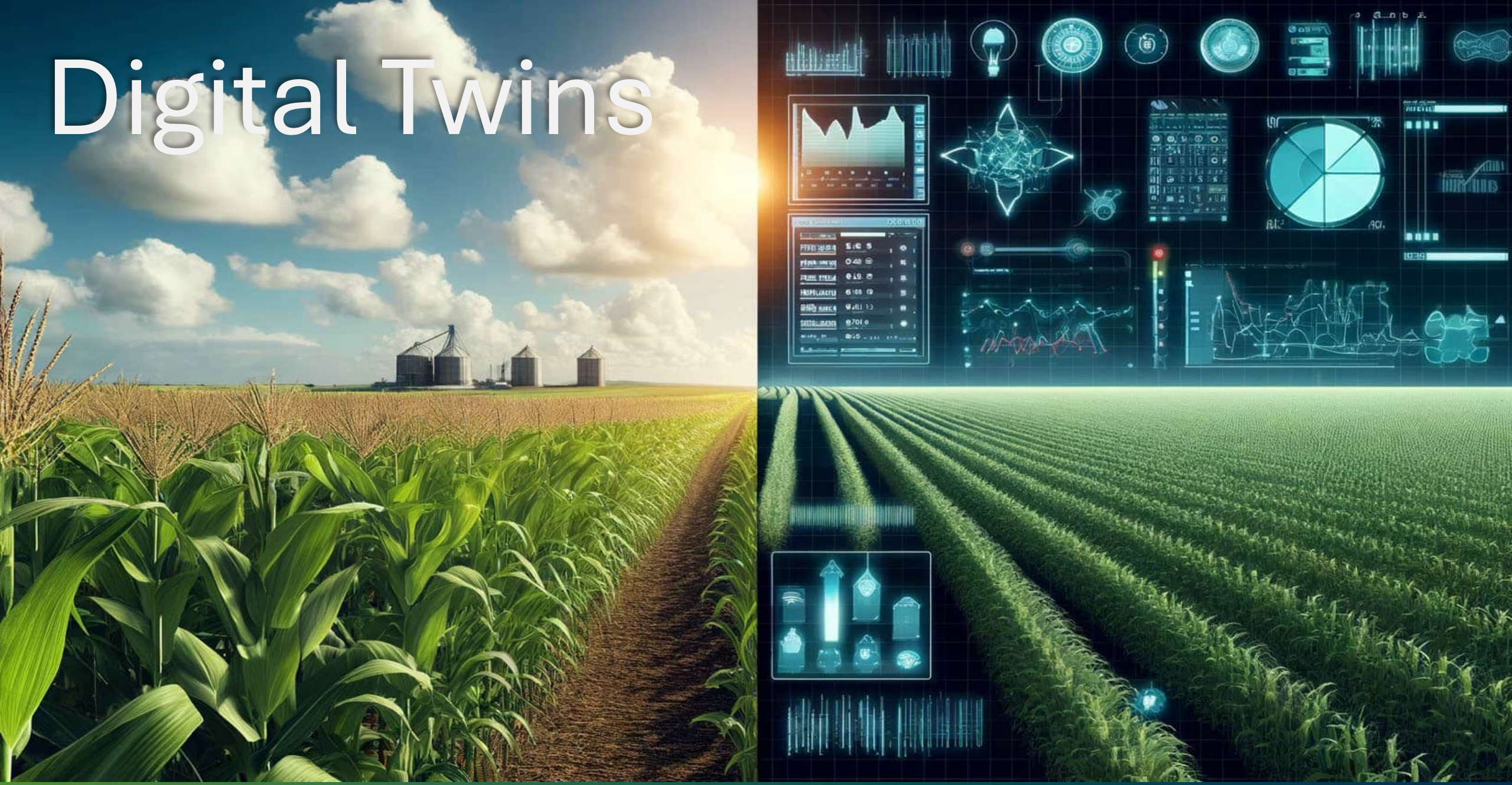
Artificial Intelligence / Machine Learning Use Case

- **Computer Vision / Edge Compute - See and Spray Systems**
  - 50-70% reduction in chemical use
  - Disrupts traditional chemical supply chains
  - Change of practice
  - **EXPENSIVE SOLUTION**
  - SaaS model charging per acre
  - Success depends on implementing complete agronomic program
- **Data Mining**
  - Opportunity to gather high-res plant data
  - Building block towards plant-level agronomics
- **Alternative Approach**
  - Prescriptive spraying, Drone applications

Artificial Intelligence / Machine Learning Use Case

- **Computer Vision / Edge Compute**
  - Real-time loss counts
  - Field analytics
  - Disease detection
  - Farmwave, Bloomfield, Vivid machines, Moss a few examples
- **Operator Agnostic**
  - Allows novice operators to level up
- **Enhance Aged Equipment's IQ**
  - Allows farmers to upgrade legacy equipment

Digital Twins



Questions ?

“Agriculture has always been about adapting to change. Those who plant the seeds of understanding today will harvest the benefits of tomorrow.”

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