SESSION TWO: The Evolving Business Environment - Innovation and Opportunity for Ag Inputs

Round Table Meeting January 2024

Please remember to follow Chatham House Rule.

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Accelerating people & ideas

Moderator
Bonnie Brayton

Venture Associate
Fulcrum Global Capital

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Brad Fruth
Director of Innovation
Beck's Hybrids

Shely Aranov
CEO & Co-Founder
InnerPlant

Hunter Swisher
CEO & Founder
Phospholutions, Inc.

Bruce Schnicker
Vice President and Head of Pipeline Delivery
Bayer Crop Sciences

Brad Fruth

Director of Innovation
Beck's Hybrids

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Beck's Innovation

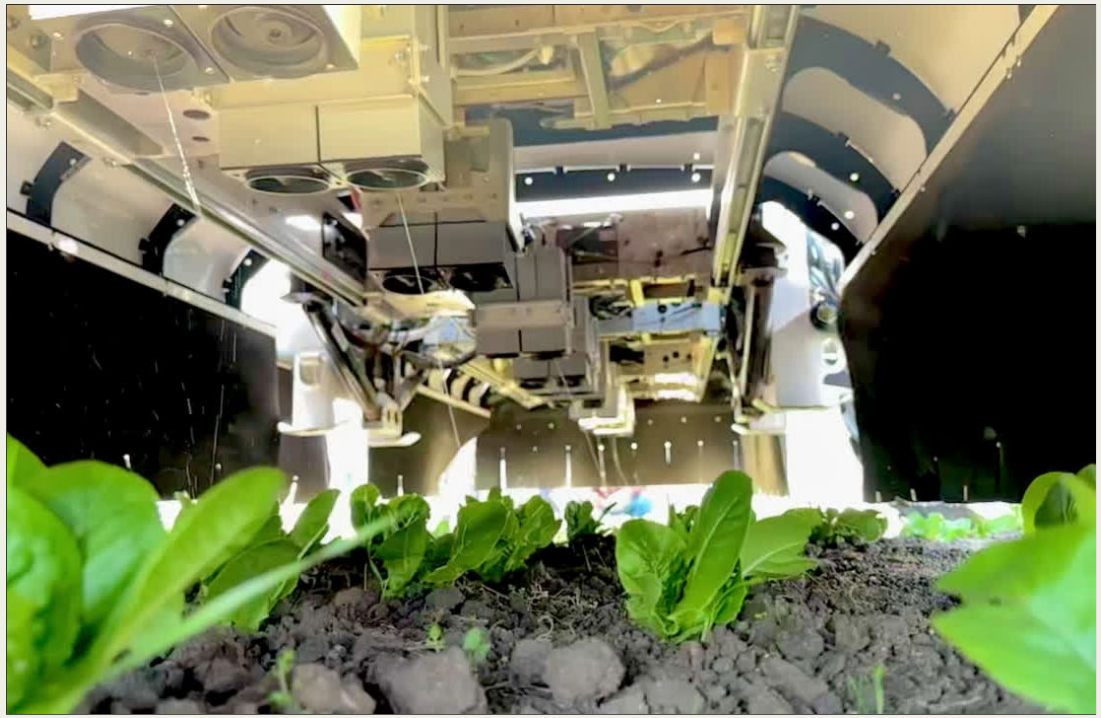
Farm Foundation Roundtable

Brad Fruth, Director of Innovation

BECK'S

VERDANT ROBOTICS

- Computer vision and machine learning to unlock targeted application of ag products
- Indexing every plant over space and time, and acting with precision, accuracy, frequency, and scale never before possible, and discovering new, transformative value through the power of computation.
- Verdant indexes the farm the way Google indexes the internet, uniquely tracking each plant over space and time to enable real-time decision making only possible with computation.
- Smart Sprayer can cover up to 3.75 acres per hour and is more effective than hand weeding. Verdant implements can apply crop protection and fertility chemicals, making the system substantially more effective than mechanical weeding alone.
- Smart Sprayer targets weeds with pinpoint accuracy, reducing chemical use by up to 96% for both organic and conventional growers.
- Currently used in California and other states growing specialty crops.
- Beck's is working with Verdant to adapt this technology for use in row crops, we started with soybeans this season.
- https://www.verdantrobotics.com/



ROOT BOX PHOTOGRAMETRY

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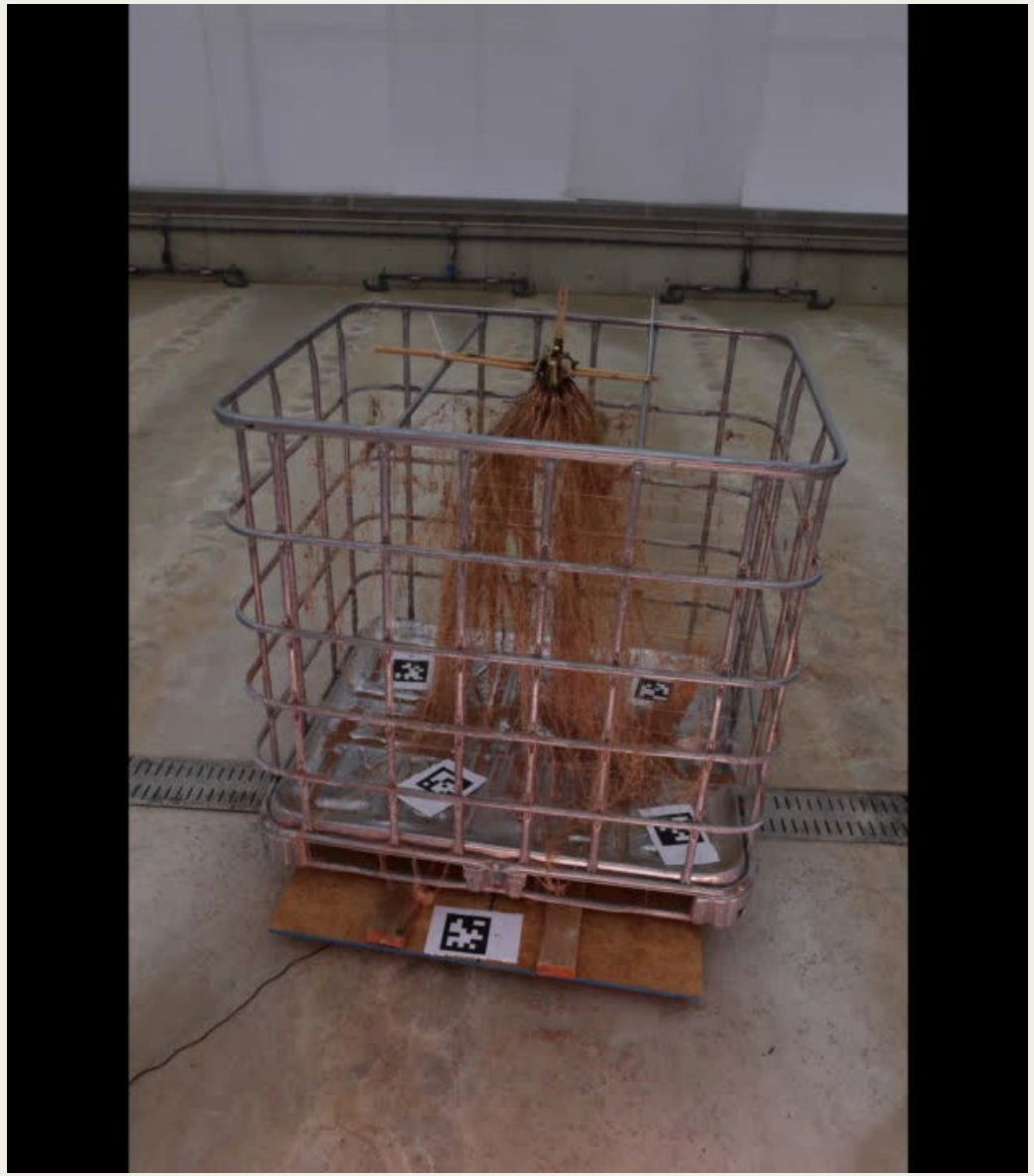
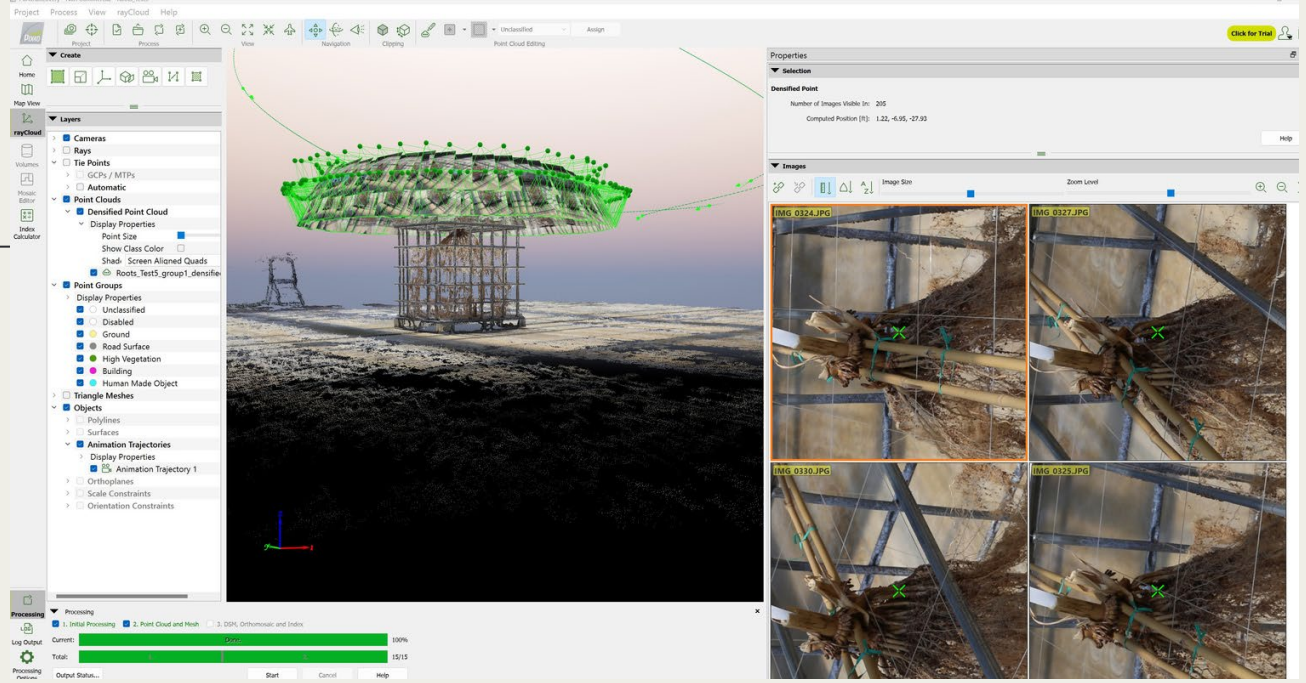


BECK'S

ROOT BOX PHOTOGRAMETRY

- How do you turn photos into data
- Photogrammetry and structure from motion creates a 3d point cloud of root boxes for product charactistication
- Point cloud and 3D model will be used to help charaticse root phenotype for our hybrids .
- Software: [Agrisoft Metashape]
- ~600+ image per root box.



CORN X SORGHUM

Project Objective:

- intergeneric hybridization between maize and sorghum.

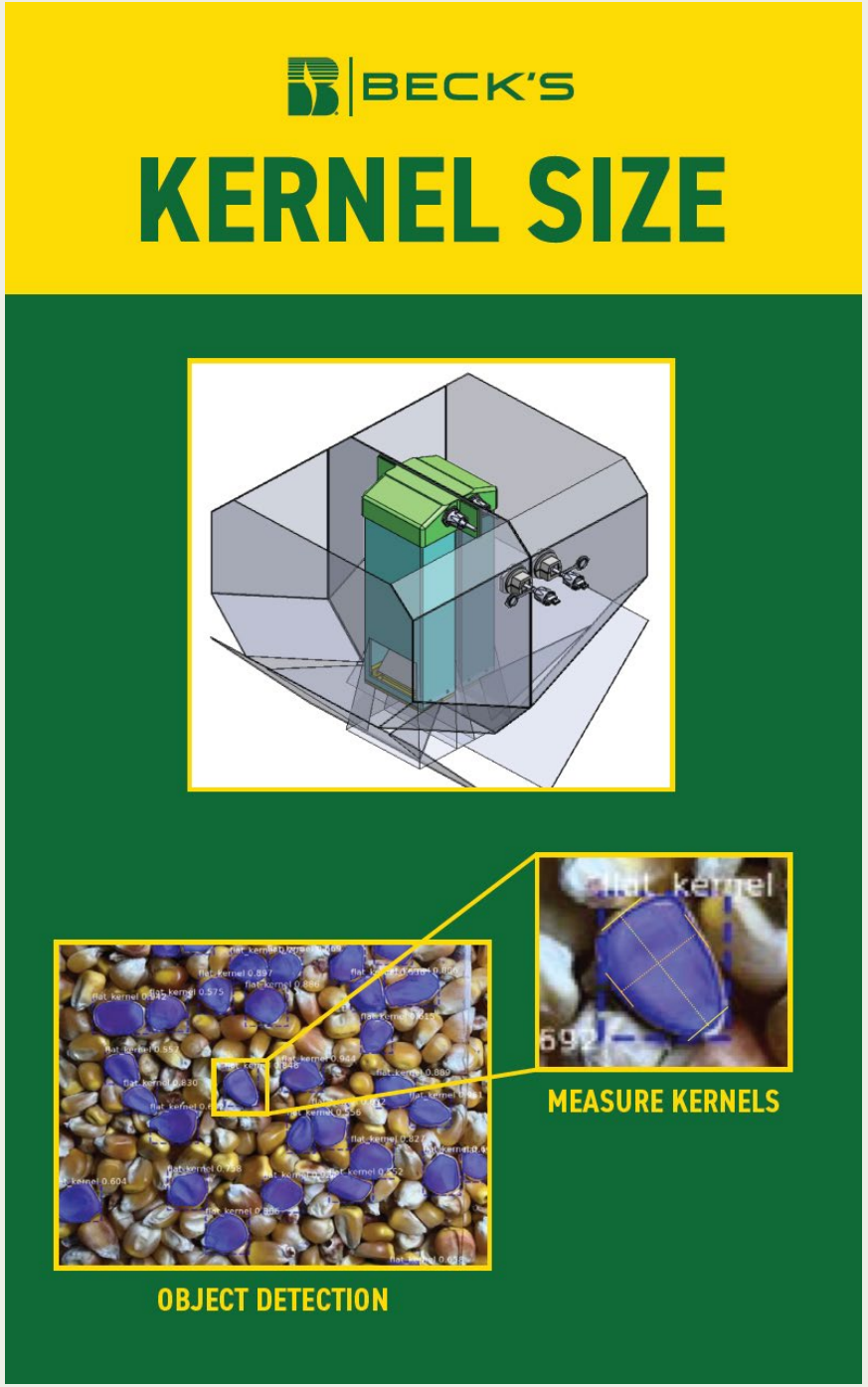
March 2023 – December 2023

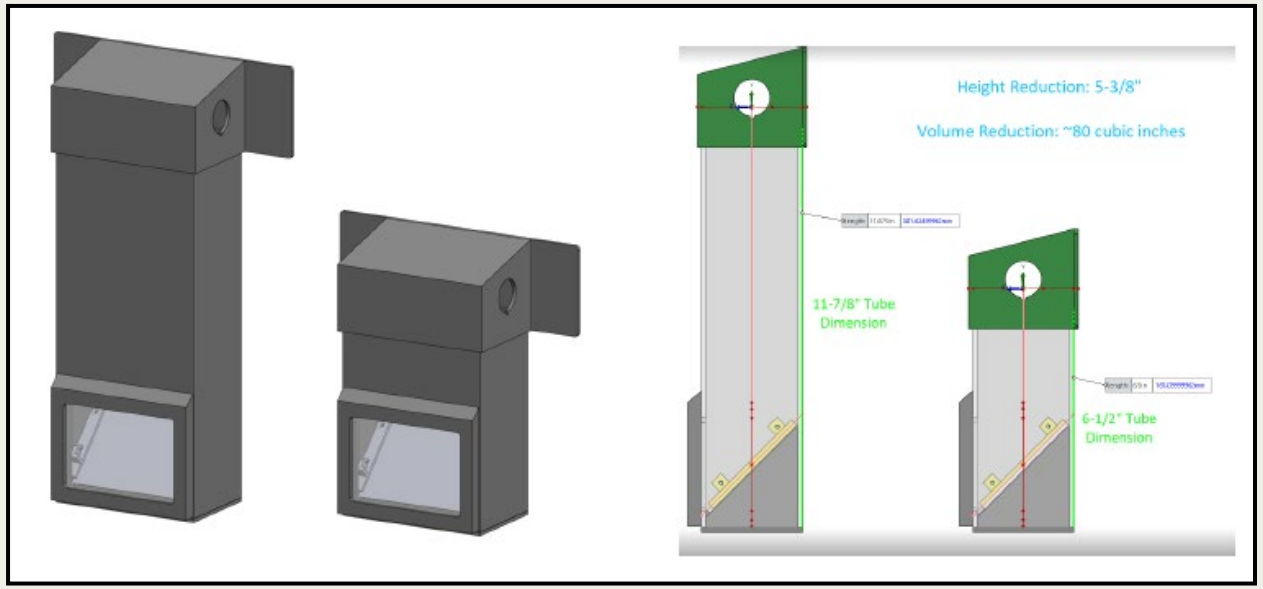
- Tetraploid corn planted in two row plots and surrounded by a bulk of eight sorghum inbred lines from our program that have been sequenced or are related to lines that have been sequenced. The corn was detasseled prior to pollen anthesis allowing mostly sorghum pollen on the silks.
- Approximately ten days post mid-silking/anthesis, approximately 100 ears were harvested and phenotypically evaluated for evidence of fertilization, embryo and endosperm development.

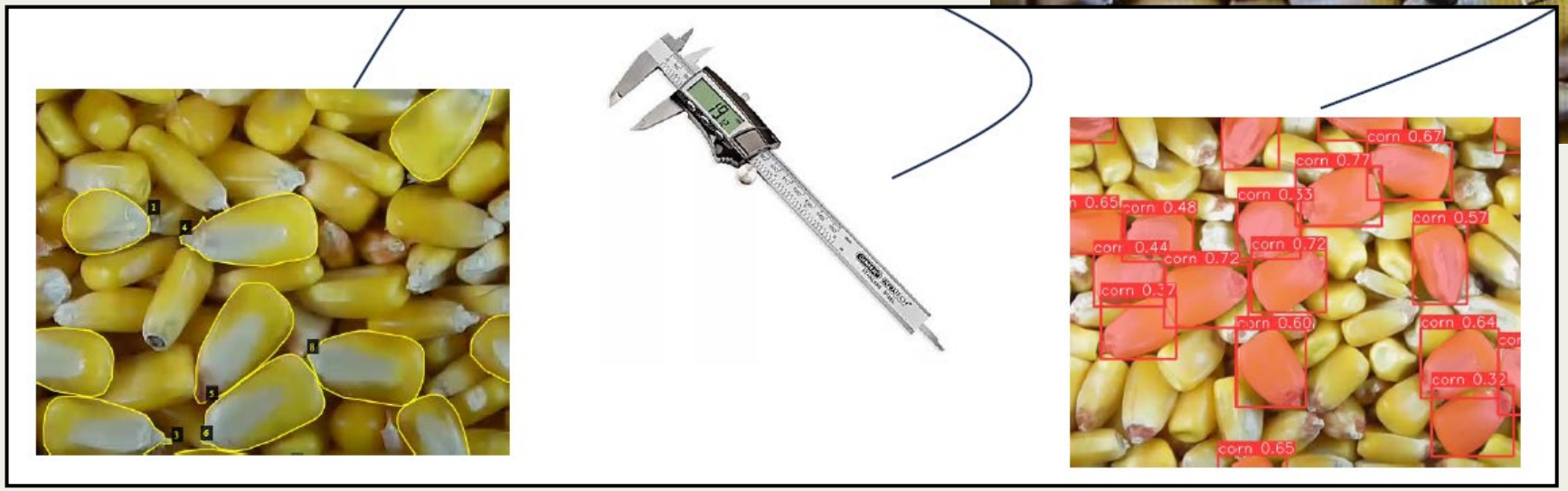
CORN X SORGHUM

KERNEL DEPTH PROJECT

- Use new methods of measurement to incorporate valable data in the breeding decision and new product development





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Shely Aranov

CEO & Co-Founder
InnerPlant

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INNERPLANT

Plants communicate, we give them a voice.

We can grow more while using less

40% crop loss

represents

$220B

in global production

30% wasted chemicals

represents

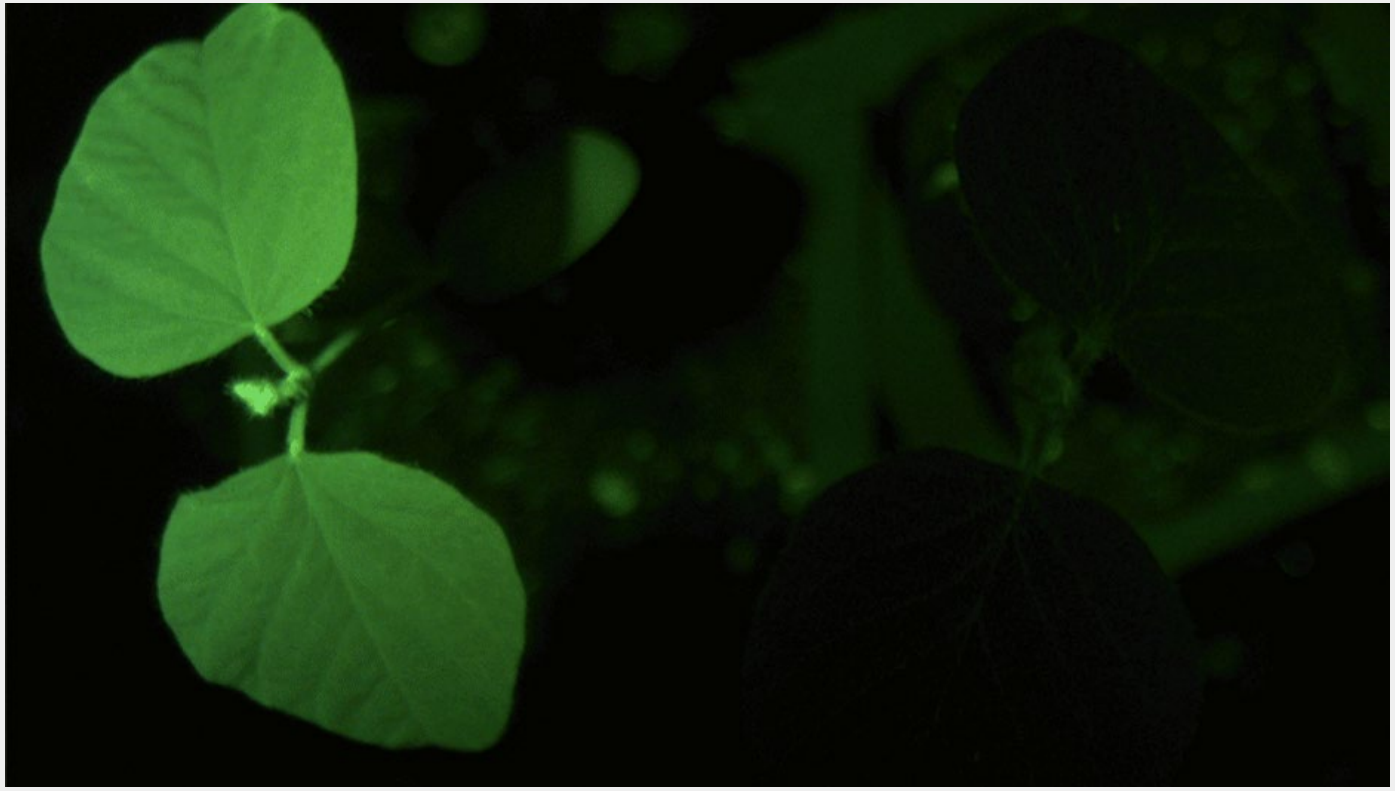
$100B

over applied

Plants communicate, we give them a voice

Plants communicate, we give them a voice

InnerPlant's USDA-approved, patented technology enables crops to communicate what they need



Seed Technology

Signaling capabilities embedded in plants, triggering fluorescence within **2 days** of stress onset, **2-3 weeks** before visible symptoms

The only tech providing farmers insights **early enough to act**

Our technology listens to plants.
From single plant, all the way to space

Rapid Remote Sensing

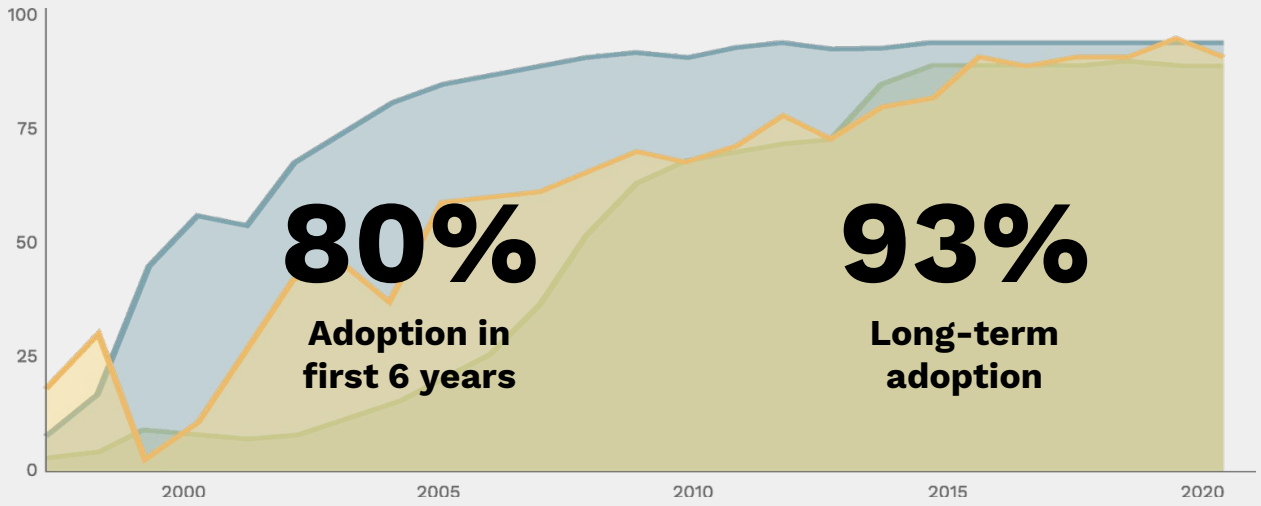
Technology built from the ground up to be easy for farmers to adopt and low-cost for us to scale

Scalable, affordable, and **seamless**

Farmers want technology that simplifies operations, reduces risk, and protects yields

Roundup Ready = System to manage *weeds*

HT Trait ⟷ **Weeds**



InnerPlant = System for *all other controllable stress*

Data Trait ⟷

- **Fungus**
- **Insects**
- **Nitrogen**
- **Phosphorus**
- **Potash**
- **Etc**

$70B of value for farmers from optimized treatments

Soybean

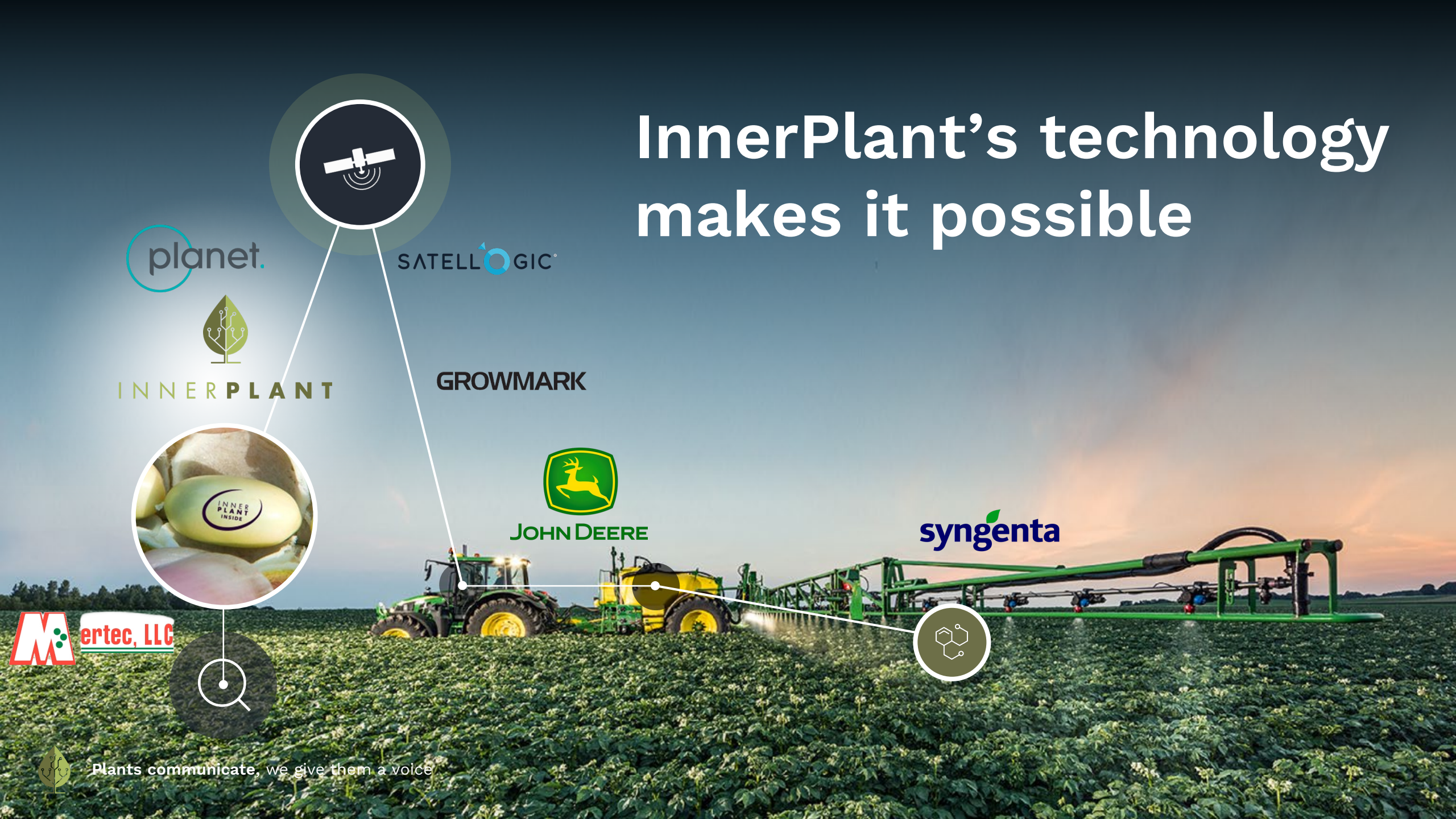
200M
acres

Corn

150M
acres

	Value to Farmer	
Signal	Per Acre	Total
Fungi	$40	**$8B**
Insects	$40	**$8B**
Fungi	$145	**$22B**
Insects	$65	**$10B**
Nitrogen	$150	**$22B**
Improved yields, reduced inputs	=	**$70B**

InnerPlant's technology makes it possible



Plants communicate, we give them a voice

INNERPLANT

Seeding the future of farming

shely@innerplant.com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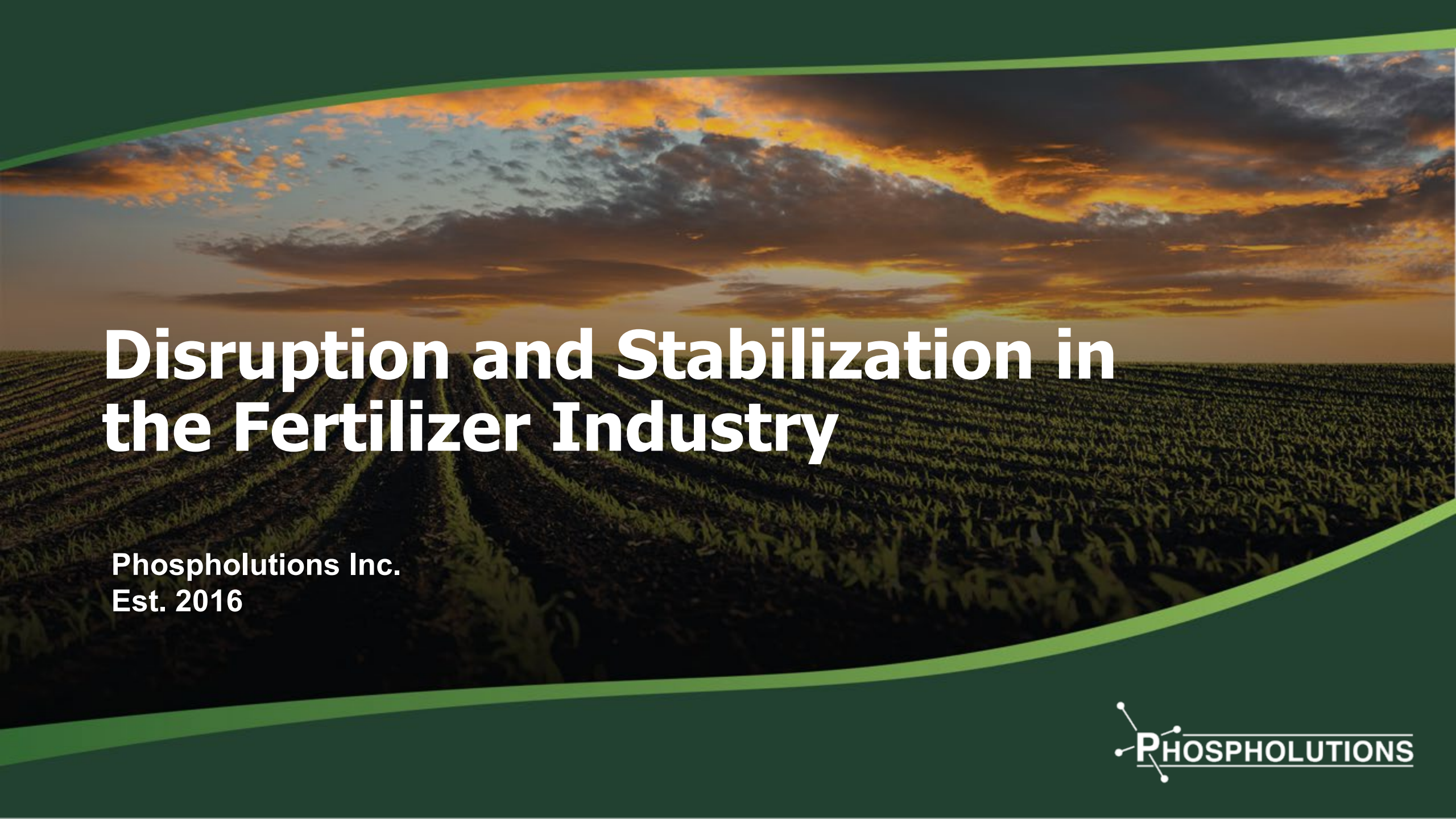


Disruption and Stabilization in the Fertilizer Industry

Phospholutions Inc.
Est. 2016

PHOSPHOLUTIONS

Global P Use is Inefficient & Unsustainable

Inefficient Use

As much as 90% of conventional P fertilizer is wasted, lowering profitability for growers and contributing to runoff

Global Impact

Inefficient use degrades our waterways and is a large contributor of GHG emissions at ~1.7MT CO2 eq./ MT P_2O_5

Limited Resource

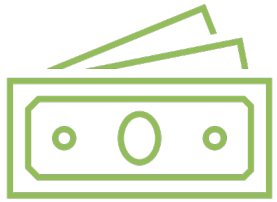
P rock is mined in only a few select regions globally, limiting availability and contributing to food insecurity

No revolutionary innovation in phosphorus fertilizer manufacturing in 60 years.

Global P Market Opportunity & Growth

Today

Conventional sources are highly inefficient



Short Term

Phosphorus fertilizer prices are volatile

Long Term

Resources are finite

Global P Market Expected to Reach **$100B+** by 2030

Global resources located in only a few select regions

- 70%+ of the world's supply is in Morocco; US has less than 40 years left
- Phosphorus is a critical nutrient needed in high quantities to grow crops
- Unequal access of affordable fertilizer exaggerated by geopolitical factors
- Inefficient use and lack of availability of fertilizer is destabilizing fragile food systems

RHIZOSORB®

The Next Generation of Phosphorus Fertilizers

Benefiting Manufacturers, Growers, & Environment

Preserved Yields

Growers use 50% less phosphorus per acre cutting fertilizer costs with an ROI of up to $20/A

Sustainable

Reduces GHG emissions for P fertilizer use by 45% per acre and reduces runoff potential by 78%

Higher Profitability

RhizoSorb® both lowers cost of production and increases value per unit of phosphorus mined

Scalable & Easy to Use

Only patented fertilizer additive embedded directly into fertilizer granules during upstream production

Fertilizer Supply-Chain Disruption

Fertilizer Availability & Pricing Dependency

- Energy prices
- Trade flows
- Regulatory pressure
- Raw material availability & cost

Geopolitical Factors

Events over the past four years have challenged resiliency impacting some of the most fragile food systems globally

- COVID-19
- War in Ukraine
- China export limitations

Outcome

Estimated 75 million more people experienced severe famine due to lack of availability of phosphorus in 2021

Examples

- Disruption of trade flows due to COVID increased fertilizer prices by 300%
- Shut down of nitrogen production facilities in Europe due to high energy costs
- Tariffs imposed by US on Russian, Moroccan, and Saudi phosphates
- China cut off all exports of phosphates for >18mo

Ensuring Stability of Fertilizer Inputs

- Better resource utilization and allocation across food systems
- More efficient use through new technologies
- Sustainable production and distribution
- Reduce environmental impact
- Collaboration between producers and technology providers
- Increased research and development

Providing the Next Generation of Phosphate Fertilizers

Hunter Swisher
CEO & Founder
hswisher@phospholutions.com

PHOSPHOLUTIONS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Vice President and Head of Pipeline Delivery
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Science for a Better Life

Regenerative Ag Solutions

regenerating growth

Session 2: The Evolving Business Environment – Innovation and Opportunity for Ag Inputs

Farm Foundation® Round Table

January 18, 2024

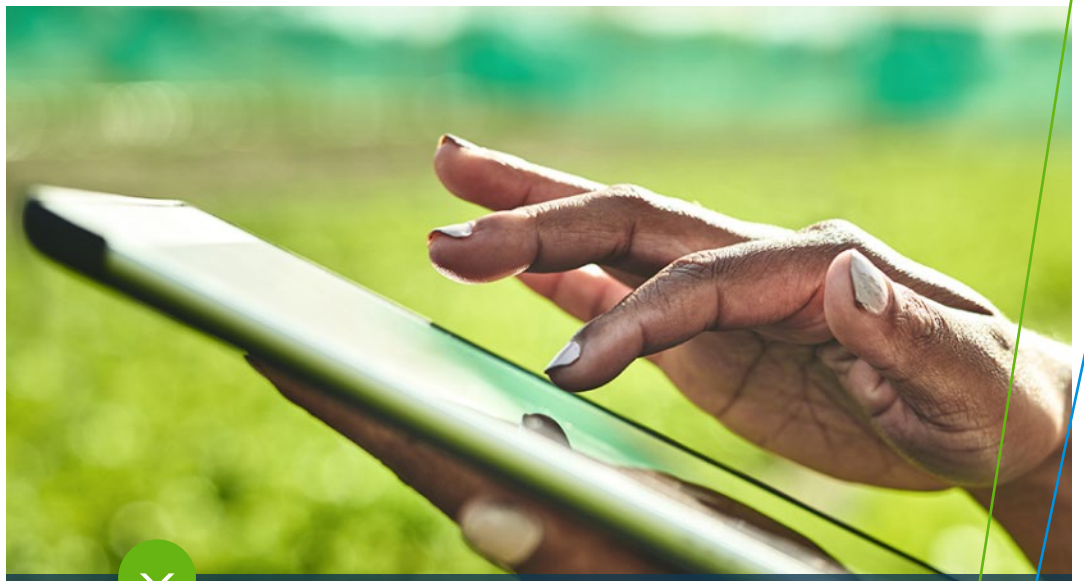
Bruce Schnicker, Ph.D. // Vice President & Head of Pipeline Delivery
Hawaii/Marana, Bayer Crop Science

Cautionary Statements Regarding Forward-Looking Information

This presentation may contain forward-looking statements based on current assumptions and forecasts made by Bayer management

Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in Bayer's public reports which are available on the Bayer website

▶ ***WWW.BAYER.COM***



The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments

Future of Farming

Broadening our sustainability approach with a regenerative focus

re generating growth

Sustainability
Focus

“Producing more with less”

We’re supporting food security while reducing agriculture’s impact on nature

- We’re committed to: (1) minimizing the climate footprint of farming, (2) reducing the environmental impact of crop protection, (3) enabling smallholder farmers and (4) improving water use

Reducing and mitigating:

Increasing productivity while reducing the impact on nature

Regenerative
Focus

“Producing more and restoring more”

We’re supporting food security and securing farm incomes while delivering net benefits to nature

- We’re committed to: **(1)** minimizing the climate footprint of farming, **(2)** reducing the environmental impact of crop protection, **(3)** enabling smallholder farmers and **(4)** improving water use

+

- We’re delivering nature-positive outcomes by improving soil health, restoring biodiversity and protecting habitats, conserving water and sequestering carbon
- We’re helping farmers increase productivity and incomes with climate adaptation solutions and new sources of revenue

Adapting and regenerating:

Increasing productivity and incomes while renewing nature

Lead

with Regenerative Ag Solutions

Win

by being more grower centric

Our Purpose

Shaping agriculture for the benefit of farmers, consumers and the planet

Benefits of Regenerative Ag:

- Yield increase and improved productivity, social and economic well-being of farmers and communities
- Improved soil health
- Mitigation of climate change
- Preservation, restoration of biodiversity
- Conservation of water

Deliver / **Sustainably-sourced food, Renewable fuels**

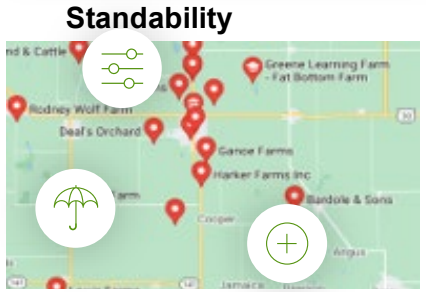
Data Driven Solutions and Simulation Key to Acceleration

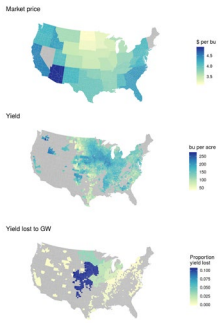
Starts with a Customer Driven Pipeline

- Every plant designed is aligned with **customer-preference quantification**
- Novel translation of **customer insights into a number** allowing for accurate data driven decisions through product development
- Selection indices combine **economic and agronomic** data with customer survey preferences and insights to determine desired characteristics for next-gen. hybrids

Greene County, Iowa Customer Survey Preferences

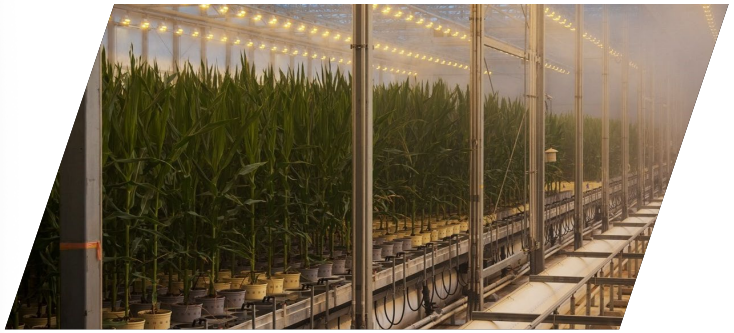
Economic, Yield and Disease Pressure Data





Accelerated Breeding Methods

- Continuous Breeding Cycle **accelerating from 5-6 years to ~4 months**
- New **protected culture** facilities in Marana, AZ and Petrolina, Brazil,

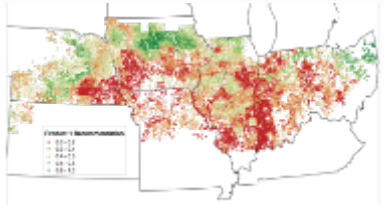


Leads to Digital Field-Testing Twin

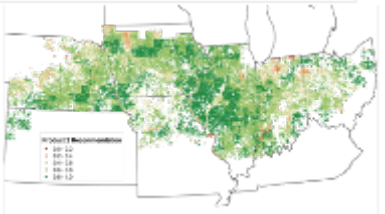
- Simulations use our **extensive data assets** to predict performance across millions of scenarios and environments
- Simulations assist with **crop placement** and **product advancement**

Example: PRECEON Hybrid Ear Height Simulation

Short-Stature Hybrid1- Ear height too low in simulation



Short-Stature Hybrid 2 - shows favorable ear height in simulation



Simulated ear height for >130k farmer fields across 10 environmental years

Offers Transformational Shift in Production

Powered by Short Stature Corn Hybrids and FIELDVIEW

PRECEON™ SMART CORN SYSTEM

Key Features and Benefits Enhance Profitability and Environmental Sustainability of Corn Production

Protection

- Production stability with improved standability in high winds and challenging weather conditions
- Annual yield losses due to stalk lodging in the U.S. range from 5% to 25%[1]

Iowa 2020 Trials Following Derecho Windstorm

Access

- Improved in-season crop access due to reduced height
- Supports tailored solutions with precise in-season crop protection

Spray Rig in Short-Stature Corn Plot
Jerseyville, IL August 2019

Yield potential

- Shows promise in unlocking yield potential through increased opportunity to optimize crop inputs, planting densities, and field placement
- Potential to optimize use of key nutrients like nitrogen, as well as reducing land and water requirements

Poseyville, Indiana July 2021
Nitrogen Y-Drops for Precise In-Season Application

[1] Purdue University (http://www.extension.purdue.edu/ay/ay-262.html)

Comprehensive Open-Innovation Strategy for Nitrogen Fixation

The Need

- Synthetic nitrogen fertilizer has helped feed >3.5bn people[1]
- But accounts for ~3% of global greenhouse gas emissions
- Regulatory requirements are increasing around the globe

// *"Pulling fertilizer out of thin air"* //

Our Approach

- In-licensing or distribution
- Pipeline advancements
- Strategic research partnerships

Transformational Partnership with GINKGO BIOWORKS

- Enhance nitrogen fixing bacteria through synthetic biology
- Leverage Ginkgo's expertise in microbial discovery, our expertise in agronomics, product development and commercialization
- Exclusive commercialization rights to programs already started at Bayer and/or Joyn Bio
- Aiming to reduce use of added synthetic fertilizers while maintaining the yield potential of the crops

[1] Source: Our World in Data

Delivering Regenerative Ag Benefits and Improved Profitability

Example: 130 HA Bayer Forward Farm Agricola Testa, located in Pergamino, Argentina 2019-2022

Increased farmer roi[1]

+13%
grain productivity

+22%
gross margin/HA

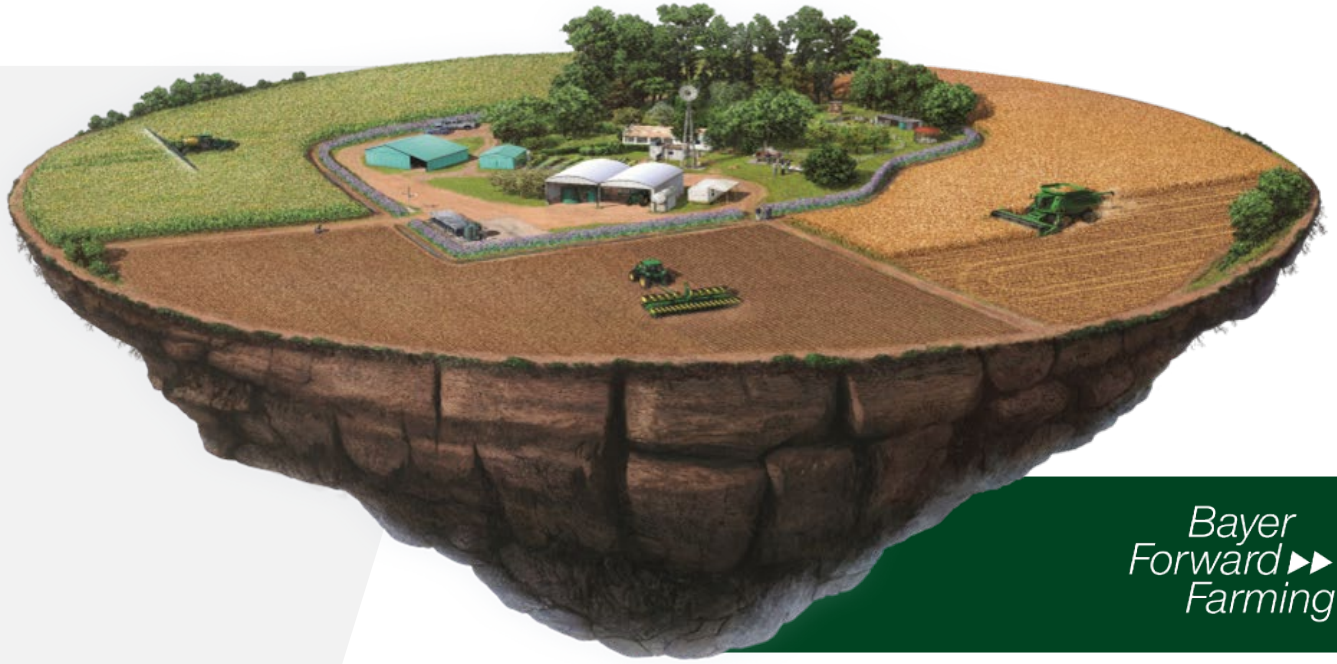
.....And more sustainable agriculture[1]

65%
Improvement in carbon balance (CO_2 eq kg/ha)

+1,512
carbon sequestration (Kg CO_2/HA)

+40%
system biomass production

-15%
less sprays



Graphical depiction of Bayer Forward Farm in Pergamino, Argentina

Farmer expanded regenerative farming practices to 1,000 HA rented land after seeing these results

[1]Since 2015, Agricola Testa has been certified in Good Agricultural Practices in sowing, spraying and harvesting. Results shown here depict the improvements achieved from adoption of no-till agriculture, crop rotation, inclusion of winter & cover crops, implementation of digital agriculture, selection of top performing germplasm, biotechnology traits, a balanced fertilization strategy and monitoring pests for defined control timing practices, from 2019 to 2022 at Bayer's Forward Farm, Agricola Testa, located in Pergamino, Argentina.

Science for a Better Life

Thank You!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QUESTION AND ANSWER

Please submit your questions on the meeting app or use one of the microphones.

- **Go to app** 
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