



Crop Science Summer Technology Showcase

Welcome



August 1–2, 2019
St. Louis, Missouri, U.S.A.





Event Agenda – Day 1

Crop Science Summer Technology Showcase – Day 1 // Chesterfield Research Facility, August 1, 2019

| | | | | | |
|----------|---|---|--|---|---|
| 11:45 am | Registration + Lunch | | | Presentation format in FF Atrium Chesterfield Research Facility | |
| 12:30 pm | Welcome/Agenda | | Investor Relations | | |
| 12:35 pm | Group Outlook Update | | Werner Baumann | | |
| 12:55 pm | Shaping Agriculture for Farmers, Consumers, Planet | | Liam Condon | | |
| | Delivering World Class Innovation | | Bob Reiter | | |
| | Pioneering the Digital Transformation) | | Mike Stern | Rotating Sessions* Chesterfield Research Facility | |
| 01:30 pm | Executive Q&A Panel | | Werner Baumann, Liam Condon, Bob Reiter, Mike Stern | | |
| 02:15 pm | Break | | | | |
| 02:45 pm | Crop Science Rotating Stations – Leading R&D Platforms* | | | | |
| | Seed & Traits | + | // | Advanced Breeding Technology | Rotating Sessions* Chesterfield Research Facility |
| | | | // | Biotechnology | |
| | Crop Protection | + | // | Chemistry | |
| | | | // | Biologicals | |
| | Digital Ag | + | // | Data Science | |
| | Tailored Solutions | = | | | Evening Events FF Atrium Chesterfield Research Facility |
| 5:45 pm | Cocktail Reception | | | | |
| 6:15 pm | Dinner | | | | |
| 7:00 pm | Customer Panel - U.S. & Brazil | | | | |
| 8:00 pm | End of Day | | | | |
| | | | | Moderators: Brett Begemann, Leticia Goncalves | |

*Rotating Sessions: Groups of ~15 Investors and Bayer Ambassadors. Each stop to include 25 minute presentation and Q&A and 10 minutes transition.



Forward-Looking Statements

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 at <http://www.bayer.com/>.

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



Crop Science Summer Technology Showcase

Bayer Group Update: Executing on our Focus Areas



Werner Baumann
CEO of Bayer AG





Recap: Our 4 Focus Areas to Deliver Value Creation



Growth ahead of competition
in health and nutrition



Strong free cash
flow generation



Consistent profitability
enhancement

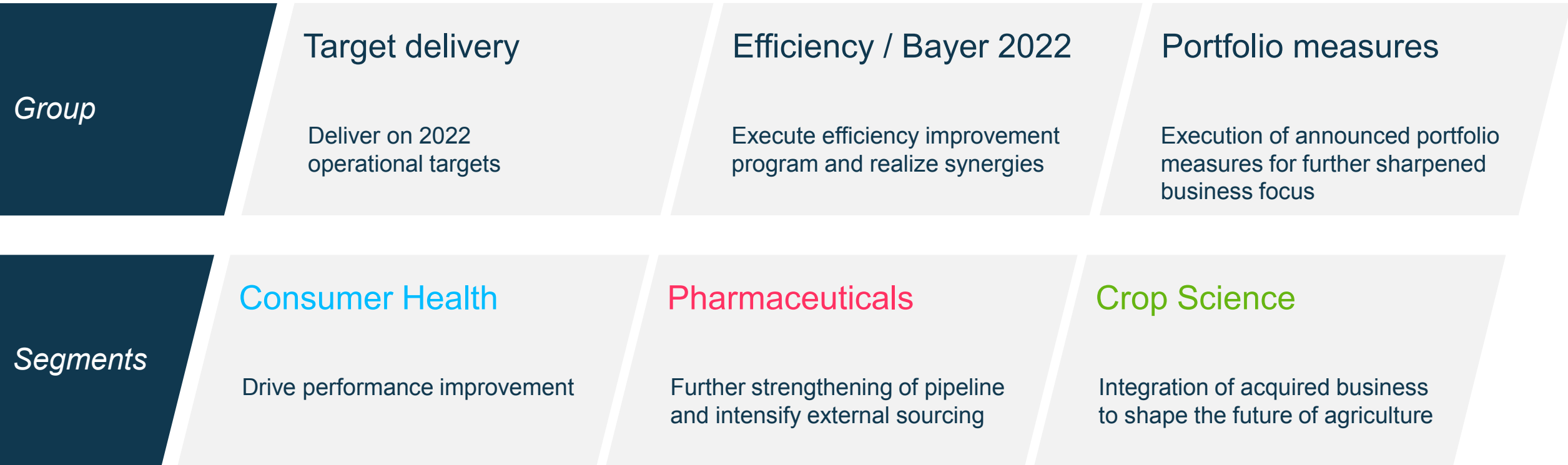


Disciplined
capital allocation



Executing on our Operational Focus Areas in 2019

Good Progress across all Areas

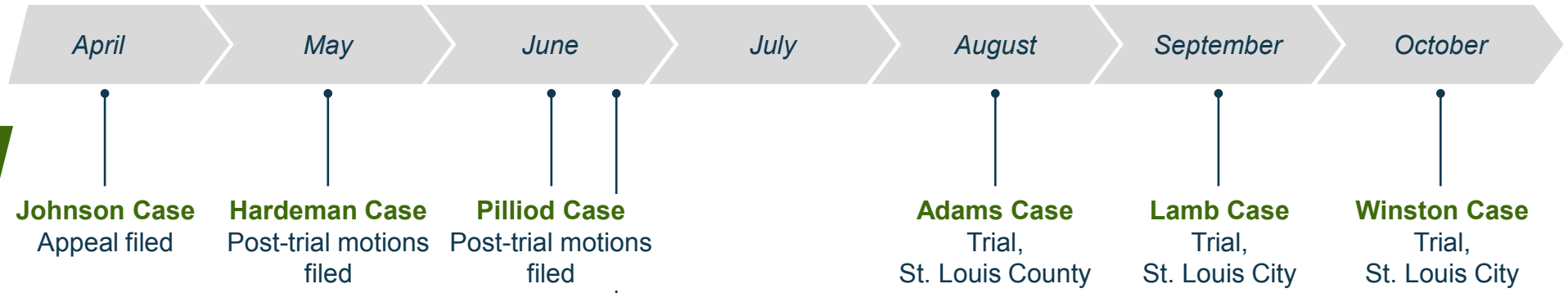




Glyphosate Update: Dual Track Approach for Ongoing Litigation

Mediation Track Complements Continued Vigorous Defense in Legal Disputes

2019



Court cases
*scheduled as of today but
dates are subject to change*

Mediation

Parallel mediation track launched

- // Court-ordered appointment of Ken Feinberg as mediator welcome
- // Constructive engagement in mediation process

Governance

New Supervisory Board Committee

- // Will intensively monitor these topics, consult with the Board of Management and make recommendations on the litigation strategy
- // John H. Beisner (Skadden) retained to advise the Supervisory Board

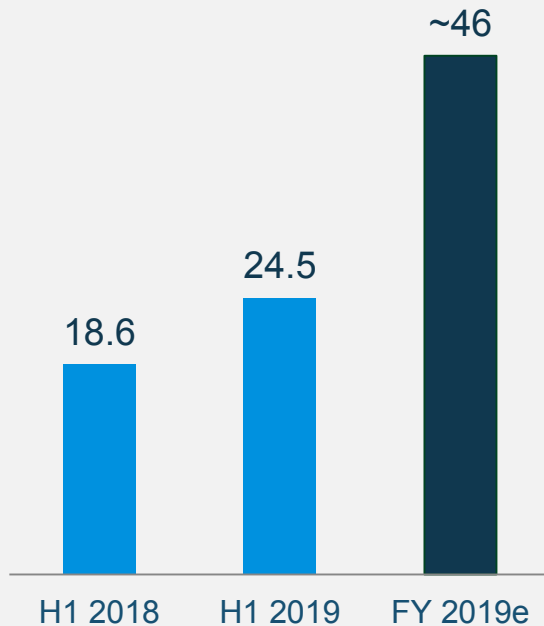


On Track to Deliver on our Targets for 2019

Solid Financial Performance in H1 2019

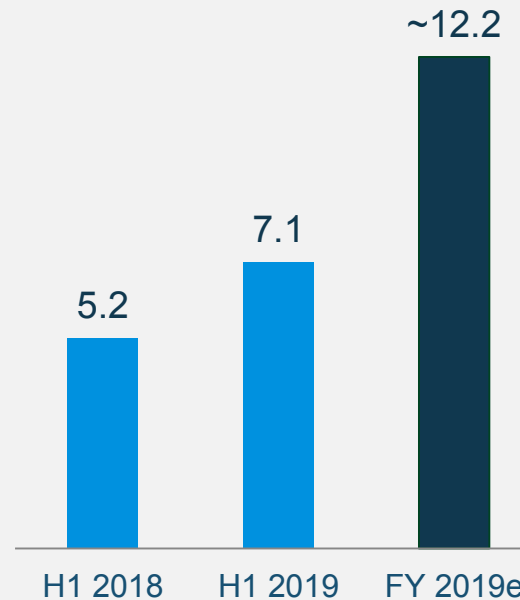
Sales

In € billion



EBITDA

In € billion
Before special items



Comments

- // Group sales increased by 32% to €24.5bn (Fx & portfolio adj. +2.4%)
- // EBITDA before special items improved 36% to €7.1bn
- // EBITDA margin up 80 bps to 29.0%
- // Guidance for 2019 confirmed; yet ambitious



Good Progress of Bayer 2022 Synergy and Efficiency Programs

Financial Targets Confirmed

Group

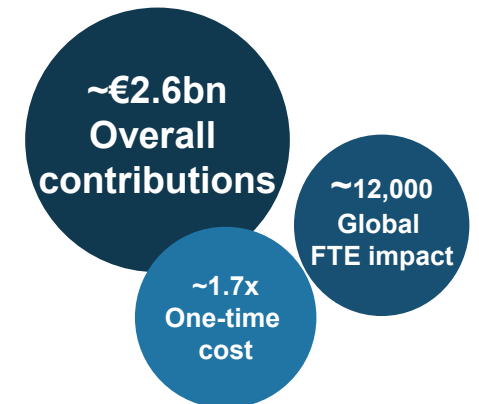
- ✓ Implementation of Bayer 2022 platform program well on track
 - // Annual cost savings of €1.4bn by 2022 confirmed
 - // Functional targets defined and translated into granular action plan
 - // Consultation with employee representatives started
 - // Good response to offered personnel instruments for FTE reduction in Germany

Segments

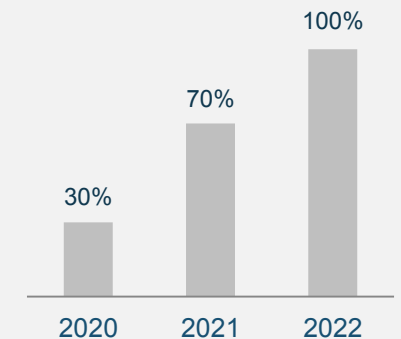
- ✓ Crop Science
 - // Strong progress with integration
 - // Synergy capture on track
- ✓ Pharmaceuticals
 - // Target operating model for realigned R&D defined
 - // Focus on disciplined cost management
- ✓ Consumer Health
 - // Executing on Phase 2 of turnaround plan
 - // Reset of cost base well advanced



Outlook 2022



Indicative phasing of contributions





Portfolio Measures: Sale of Suncare and Footcare Agreed

Objective to Sign all Transactions in 2019

Sale of Suncare & Footcare



- // Agreement with Beiersdorf AG signed in May
- // Attractive sales price of USD 550m
- // Excellent new owner with the potential to invest in and grow the brand
- // Transaction expected to close in Q3 2019



- // Agreement with Yellow Wood Partners signed in July
- // Good sales price of USD 585m
- // New owner sees great potential to grow the brand in its existing and other sales channels
- // Transaction expected to close in Q4 2019

Other planned divestments



Animal Health

- // Structured processes for both assets in advanced stage
- // Attractive businesses – high interest
- // Focus on maximizing value
- // Animal Health: primary focus on sale; carve-out proceedings in advanced stage
- // Objective to sign all transactions in 2019 and to achieve closing for Animal Health in 2020

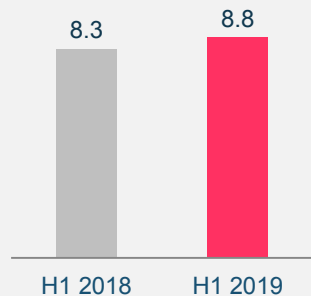


Pharma Snapshot: Executing on Portfolio and R&D Pipeline

Progress across various Therapeutic Areas with Strong Focus on Cardiovascular and Oncology

Sales

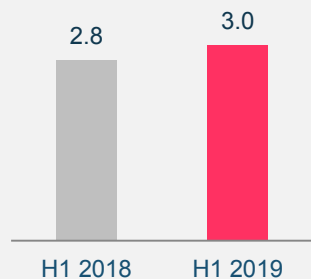
In € billion



2019e
+~4%

EBITDA

In € billion
Before special items



2019e
margin
~34%

Drive performance and deliver new growth opportunities



Maximize potential from existing portfolio

- // Continued attractive top-line growth mainly driven by Xarelto, Eylea and China
- // EBITDA margin expansion in H1 2019 by 80 basis points yoy



Execute on R&D pipeline

- // Expansion of oncology portfolio: Launch of Vitrakvi and FDA priority review of Darolutamide in the US
- // Upcoming milestones include clinical completion of first phase III trials for Finerenone and Vericiguat



Transform innovation model

- // Implementation of new R&D strategy under way: Focus R&D set-up and broaden external innovation sourcing
- // Expanded footprint of LEAPS investments with Century, Khloris. Further activities to strengthen mid/late stage pipeline as well as business development organization under way



Improve efficiency

- // Stringent focus on key brands and markets
- // Continued prudent cost management

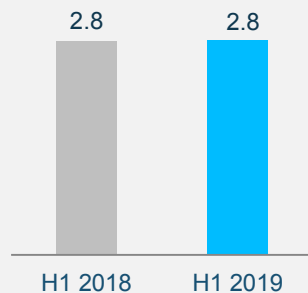


Consumer Health Snapshot: Executing on Turnaround

Phase 2 (“Rigorous Change”) of Turnaround Plan in Progress

Sales

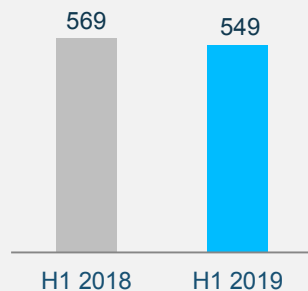
In € billion



2019e
+~1%

EBITDA

In € million
Before special items



2019e
margin
~21%

Reinvigorate our leading OTC position



Focus on winning portfolio

- // Divestment of RX Dermatology closed
- // Divestments of Suncare and Footcare signed



Returning to growth

- // Return to top-line growth in H1 (+0.4%)
- // Gradual recovery in the US under new management: 10 out of 14 top brands growing or holding share in H1 (~60% of US sales)



Modernize marketing and sales

- // Digital skills strengthened: share of digital in total media spend up to ~33% in H1
- // Acceleration in ecommerce: Established Chief Customer Officer Global Amazon



Optimize resources

- // Strengthening of key leadership positions completed in Q1
- // FTE reduction nearly completed (~15% globally 1,150 positions)
- // Optimization of SG&A ratio on track

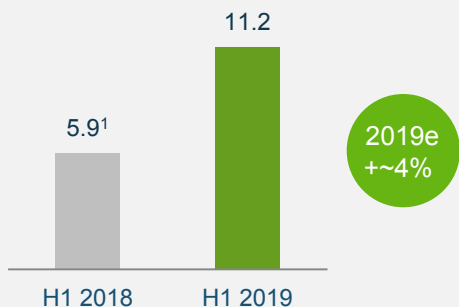


Crop Science Snapshot: Shaping the Future of Agriculture

Delivering on Integration and Leveraging #1 Platform

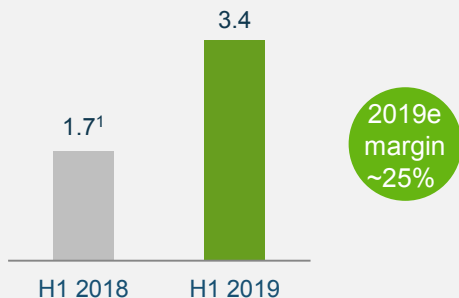
Sales

In € billion



EBITDA

In € billion
Before special items



Leverage #1 global platform to shape the future of agriculture



Drive integration and synergies

- // Integration fully on track
- // Synergy capture clearly in line with planning with expected cost synergies of >200 € million to be delivered in 2019



Capitalize on broadest portfolio of leading products

- // H1 performance ahead of market in challenging environment
- // Sales teams integrating and delivering early wins on cross-portfolio synergies



Leverage world-class R&D capabilities

- // Recent and near-term launches with peak sales potential of €17bn
- // Pursuing next growth opportunity at intersection of leading technology platforms



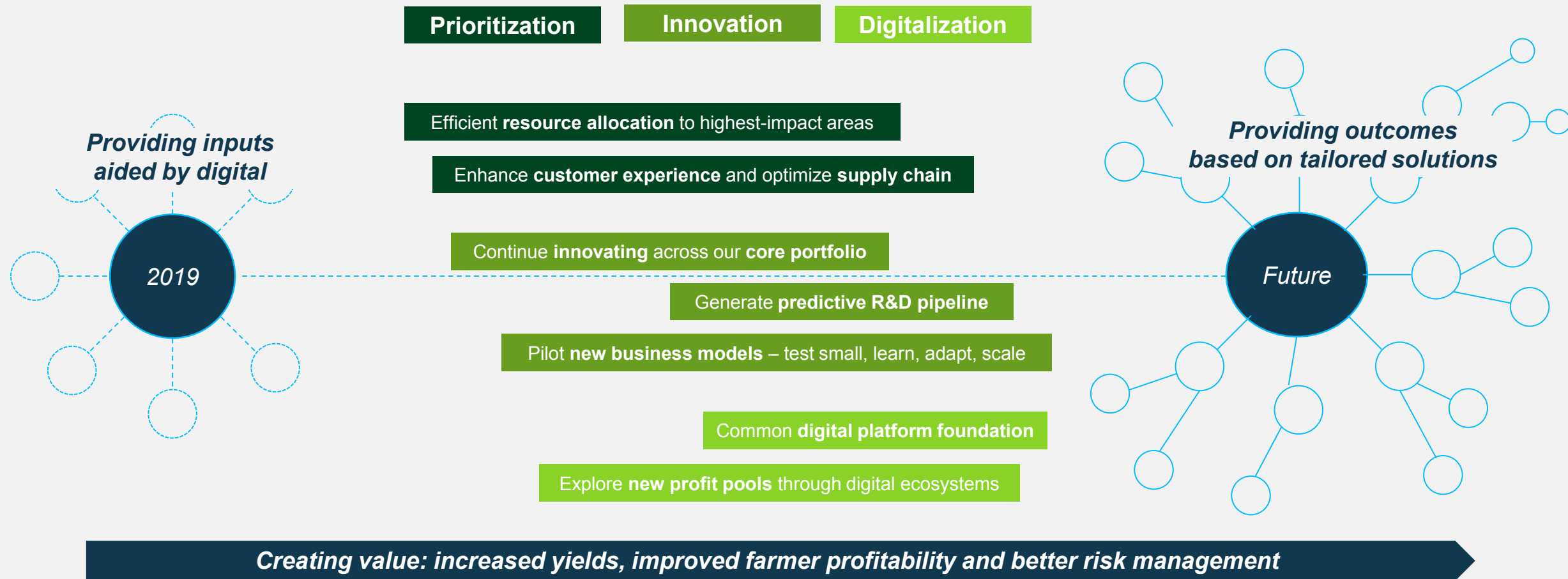
Grow digital farming business

- // On track to reach target of 90mn paid acres for Climate FieldView in 2019
- // Advancing new business models and tailored solutions



Crop Science: Charting the Path to Future Farming

Driving the Transition from Selling Inputs to Providing Outcomes





Crop Science Summer Technology Showcase

Shaping Agriculture for the Benefit of Farmers, Consumers and the Planet



Liam Condon

President of the Crop Science Division



Historic U.S. Weather Event

Spring 2019 flooding in the Midwest led to record-slow planting
pace for U.S. corn and soybeans





Shaping Agriculture to Benefit Farmers, Consumers and Our Planet

As the Industry Leader Uniquely Positioned to Create Value and Pioneer Tailored Solutions

Our Mission



Deliver
world-class
innovation



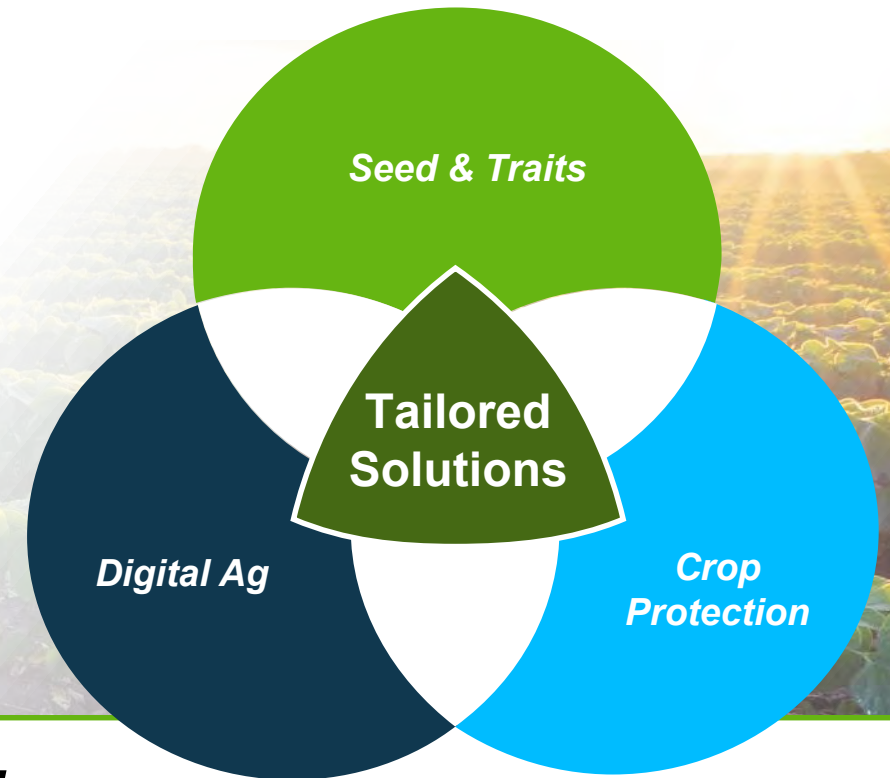
Pioneer
the digital
transformation



Set new
standards of
sustainability



Deliver on operational commitments



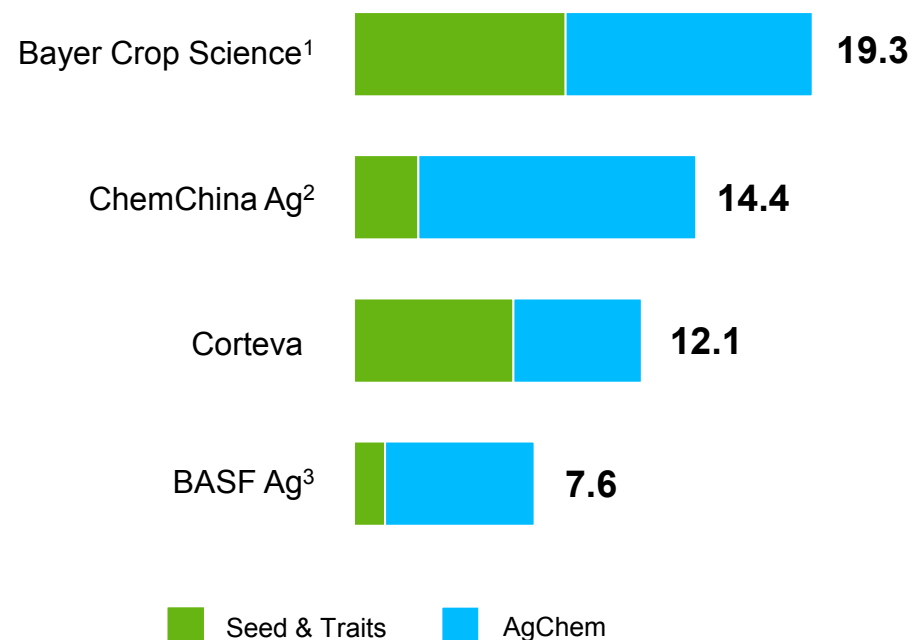
> Tailored solutions are key to sustainably managing resources and improving productivity to feed a growing global population



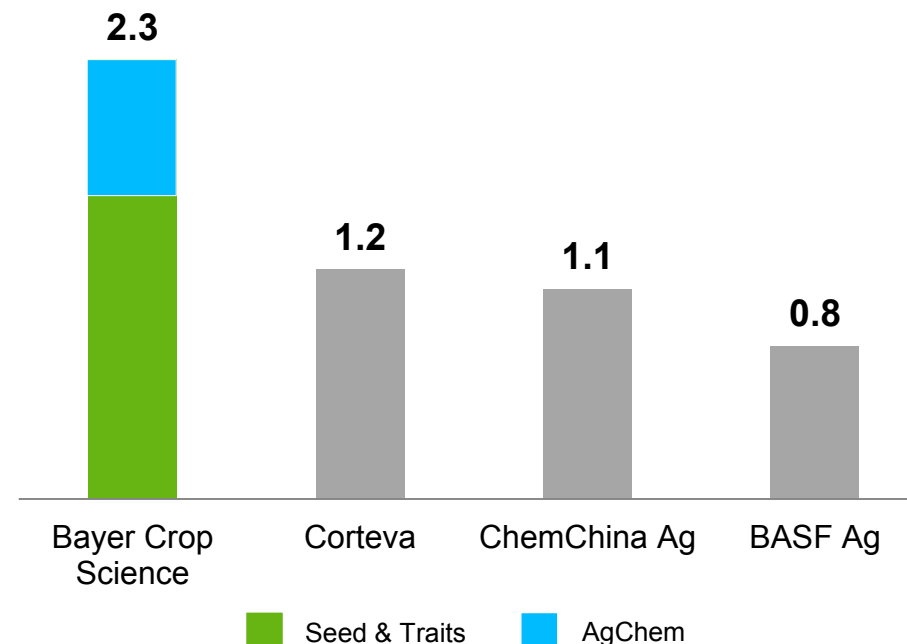
The Established Leader in Crop Science

Industry Leading Sales and Unmatched Investment in R&D

Sales 2018 (€bn)



2018 Ag R&D Investment (€bn)¹



¹ The unaudited Pro-forma data are presented as if both the acquisition of Monsanto and the associated divestments had taken place as of January 1, 2018. Sales of Monsanto are presented in periods as per the Bayer fiscal year. One-time effects of business operations, the accounting for discontinued operations and the recognition and measurement of sales from certain business transactions have been adjusted in line with our accounting.

² Excludes non-agro business sales of ADAMA (nutritional supplements, aromatic products, industrial products)

³ Includes BASF Ag Sales 2018 as reported plus €1.4bn (€2.027m sales FY 2018 excluding €586m sales from Jan '18 until cut-off in Aug '18) reported sales in 2018 from Bayer businesses sold to BASF. Split between Seed and CP businesses based on internal estimates.

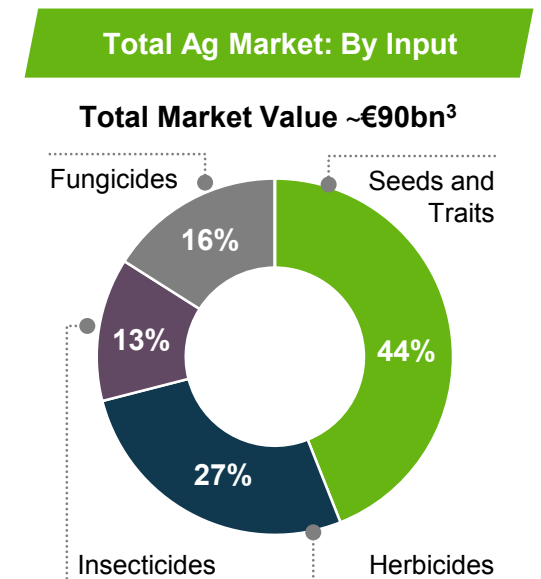
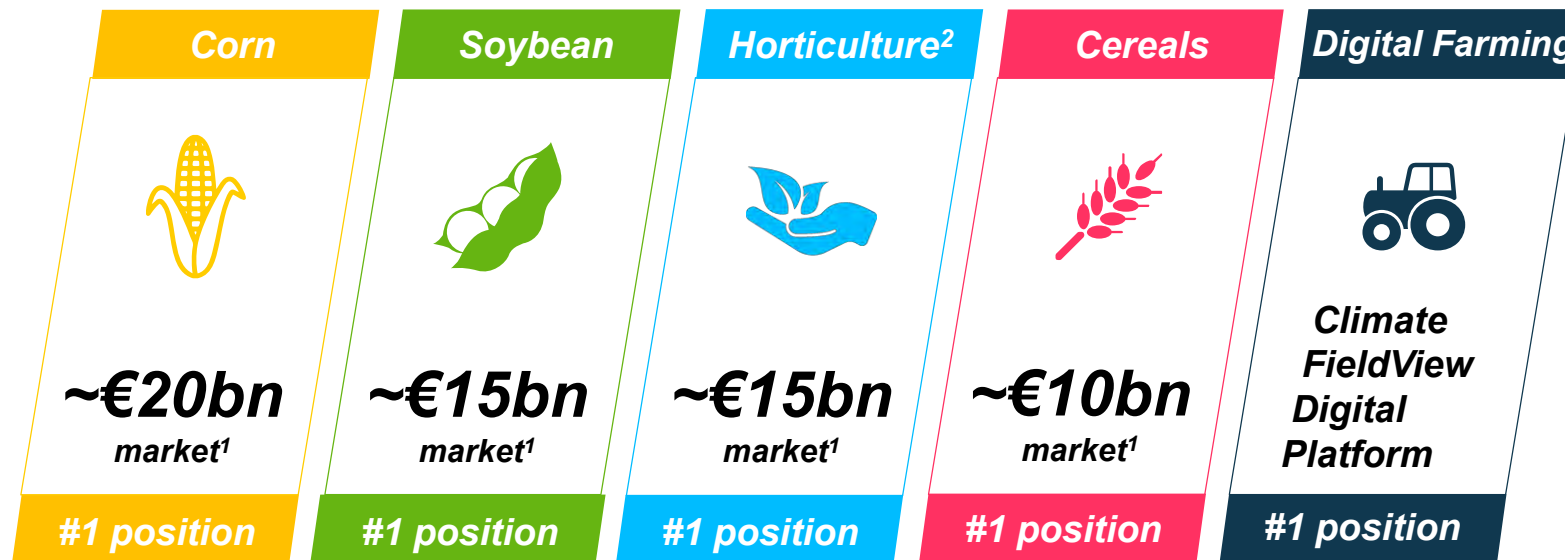
⁴ Exchange rate: FY 2018: ~1.18 USD/EUR

⁵ Competitor Pro forma R&D cost split not available



Leading Position in All Major Categories

Crop Science Market¹ Currently Valued at ~€90bn



¹ Includes seeds, traits, crop protection chemistries and environmental science; does not include fertilizer

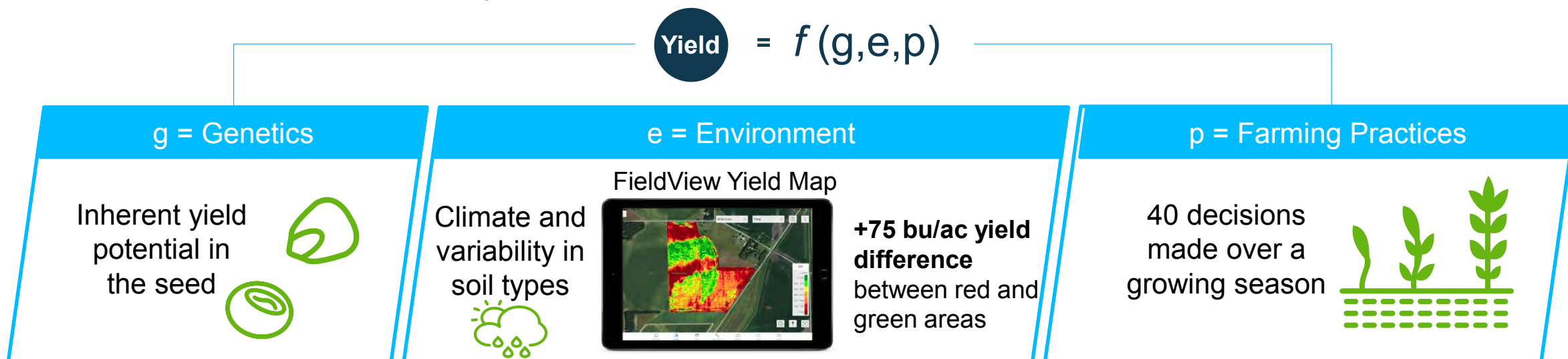
² Includes fruits, vegetables, flowers and nuts

³ Total market of ~€90bn includes €5bn of Environmental Science; actual pie charts exclude that amount, as not relevant in these views (Source: Bayer Crop Science market model)
Note: Reflecting Crop Science portfolio after divestments. Market sizes rounded to nearest €5bn. Source: Pro-forma calculations Bayer; Bayer Crop Science market model



Opportunity for Digital Transformation and Tailored Solutions

Precise Resource Use and Innovation Required to Address Demand Growth, Field Variability and Increased Pressure on Ecosystems to Generate Sustainable Yield Improvements



Opportunity from optimized yield equation

542 bu/ac vs. 175 bu/ac
national average¹



**2017 NCGA
Corn Yield
Contest winner**

138 bu/ac vs. 49 bu/ac
national average¹



**2017 Monsanto
Soybean Yield
Contest winner**

Our evolution to capture the opportunity



Leading
Products



Product
Combinations



Digitally Informed
Offerings



Tailored
Solutions

¹ USDA crop production summary report. Results not typical.

Each Plot
=10
Bushel Yield

 **Future**

 **2019**

 **2018**

 **2000**

 **1980**

 **1940**



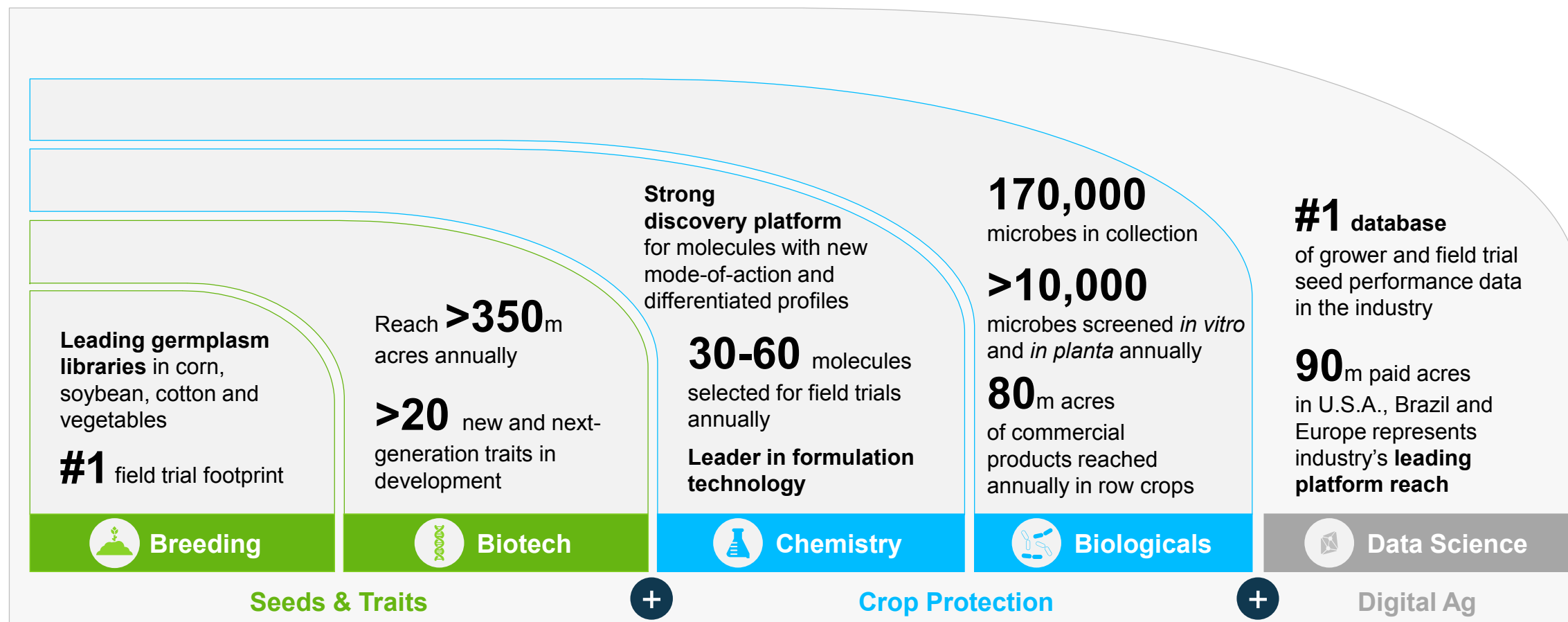
Producing Better

The history of corn production plot demonstrates the great strides we have made in producing more with less, and the opportunity we have to continue to “produce better” through tailored solutions that drive us toward our reduced environmental impact commitment while meeting the needs of a growing population on an increasingly hotter planet.



Next Growth Opportunity: Convergence of Leading R&D Platforms

Continued Investment in Data Science and New Technologies are Driving Future Opportunity



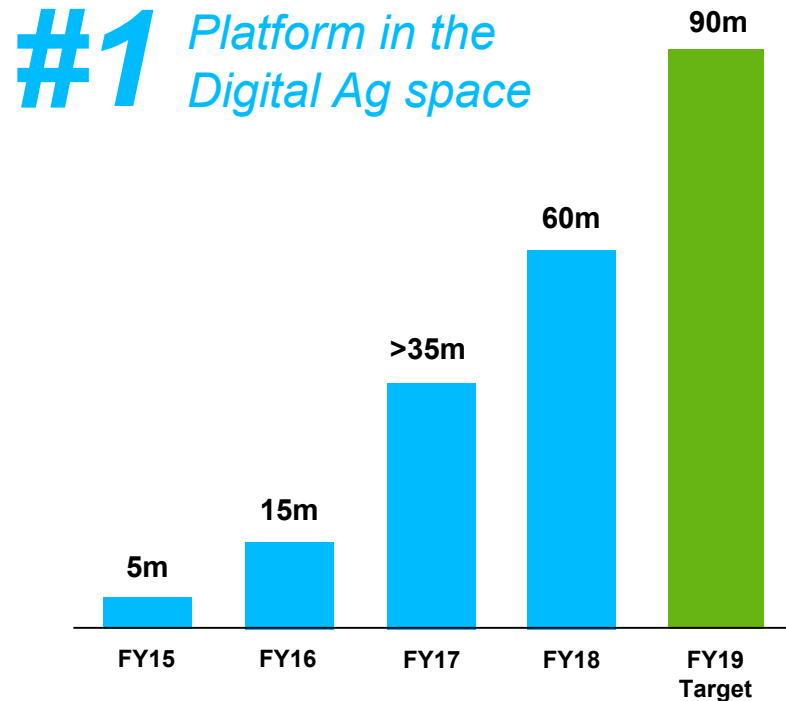
Best positioned to discover, combine and tailor solutions for growers



FieldView: The Leading Brand and Platform for Growers

Significant Opportunity to Expand Digital Ag Footprint

Global Paid Acres¹



Growth Fueled by Platform Advantages

Most Established, scalable

digital farming infrastructure

>60 Partners

on the FieldView Platform

#1 Brand

in digital Ag space²

New Business Models

enabling share of value and risk

Largest Database

of grower and field trial seed performance data in the industry

>35 Next-Gen Projects

in the pipeline

Global

distribution footprint established

~1bn Global Acre

Opportunity for Corn, Soybean, Wheat³

¹ Internal estimates

² 2018 Brand Health Monitor

³ Harvested acres – USDA FAS 2018-10-11, ex China

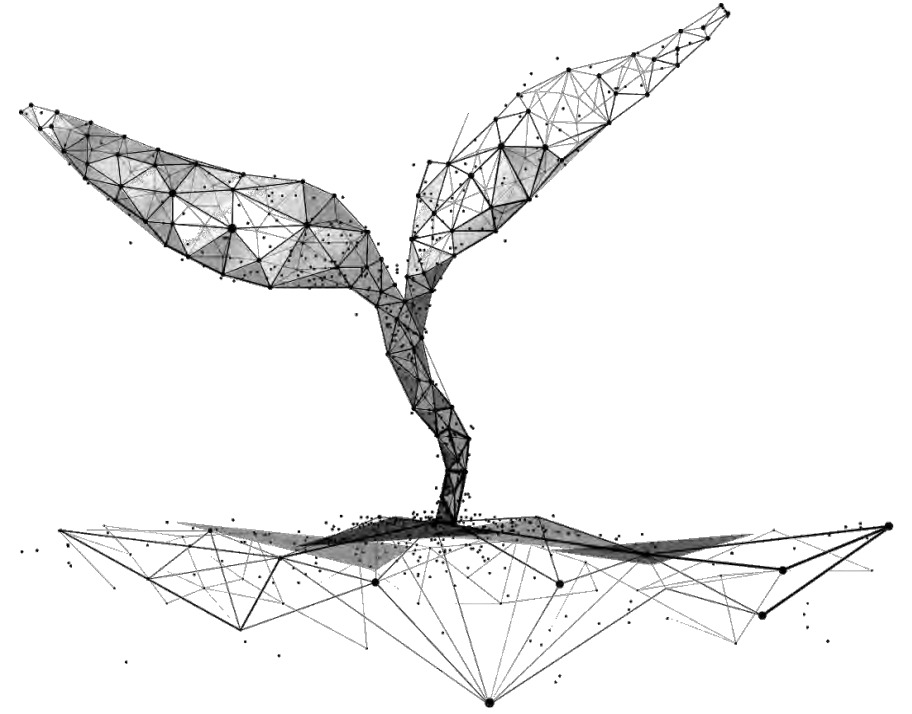


What will the Future look like?

A Solution and Outcome, Priced by the Acre



Opportunity: By combining world-class product R&D with digital data science product recommendations and tailored pricing, Bayer can create value by increasing yields, improving farmer profitability, and helping farmers manage risk.





Tailored Solutions and New Business Models

Non-optimized Corn Field: Representative of this region

Tailored Solution: Advanced Seed Scripting to optimize hybrid selection, placement and planting rate plus Elite Seed Treatment, Disease Mgmt. System, Delaro Fungicide, executed through new Outcome-Based Pricing business model

Future Tailored Solution: Same as tailored solution, plus short stature corn, next-generation fungicide. UAV to showcase imagery, stress detection and in-season application flexibility.



Late Planted Corn (V2-3)



Mature Corn (RT-2)

Future Tailored Solution with Short Stature Corn

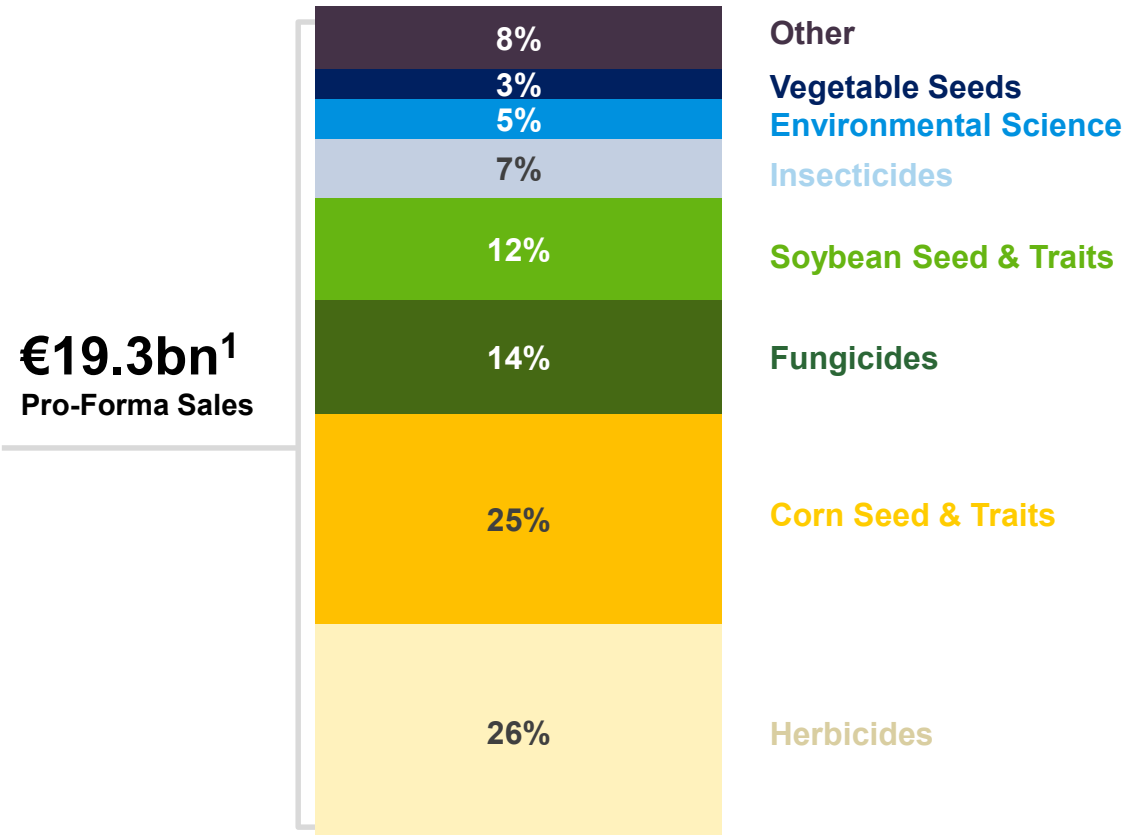
Tailored Solution

Non-optimized Corn Field



Leadership and Innovation Drive Above Market Sales Growth Target

Target Above Market Sales Growth from 2018 to 2022 and >30% EBITDA Margin by 2022^{3,4}



Key Sales Growth Drivers

- // Deliver annual germplasm refresh across the seeds portfolio to capture price and share gains
- // Continue penetration of Roundup Ready Xtend crop system; transition to XtendFlex soybeans with expected U.S.A. launch in 2020²
- // Continue penetration of Intacta RR2 PRO soybeans; transition to Intacta 2 Xtend with expected launch in South America in 2021²
- // Increase crop protection sales on the >400m acre seed & trait footprint; FieldView platform an enabler
- // Maximize sales synergies

¹ The unaudited Pro-forma data are presented as if both the acquisition of Monsanto and the associated divestments had taken place as of January 1, 2018. Sales of Monsanto are presented in periods as per the Bayer fiscal year. One-time effects of business operations, the accounting for discontinued operations and the recognition and measurement of sales from certain business transactions have been adjusted in line with our accounting. Due to this simplified procedure, they explicitly do not reflect sales according to IFRS or IDW RH HFA 1.004, meaning they have not been audited. Amounts as per the 2018 annual report.

² Pending regulatory approvals

³ EBITDA margin based on EBITDA before special items

⁴ 2022 targets at constant currencies, not including portfolio measures



Integration and Synergies On Track

Leadership in Place, Engagement High and Progressing Toward €1bn Synergy Target as of 2022

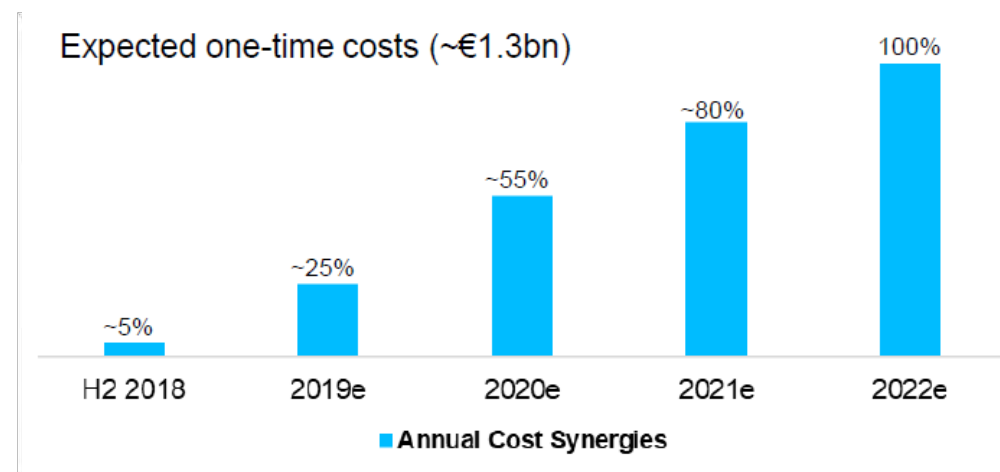
Integration Achievements



- // Crop Science functions advancing rapidly with **organizational integration**, expect completion by year end 2019 – Support functions to be completed in alignment with Bayer 2022 project
- // **Cultural Integration:** Q2 employee survey indicates continued high levels of employee engagement
- // **Cost Synergies:**
 - // Achieved 2018 target
 - // Q1 and Q2 well on track with anticipated ramp up of 25% in 2019
 - // Focused on headcount, IT and infrastructure savings



Cost Synergies ^{1,2}: ~€870m (~\$1bn) as of 2022



Sales Synergies¹: ~€170m (~\$200m) as of 2022

- // **Four countries** to generate >60% of the sales synergies
 - // U.S.A., Brazil, Argentina and Mexico
- // **Increase crop protection chemistry sales** in Americas on the >400m acre seed & trait footprint; Digital Ag to serve as an enabler

¹ Net EBITDA impact before special items, net of estimated dissynergies such as termination of selected distribution agreements as well as sales disruptions

² Majority of one time costs to achieve synergies expected to be recorded as special items
Applied FX rate of USD/EUR of 1.15



Enhancing Sustainability and Biodiversity in Agriculture

Bayer's Sustainability Commitments by 2030

Advancing a carbon-zero future for agriculture

through helping our customers reduce field greenhouse gases by crop production.

30%

Reduction in field greenhouse gases emitted per kg of crops produced

// Climate-smart practices:

- // No-tillage
- // Highly Productive Crops
- // Cover Crops
- // Precision Agriculture

// Share knowledge and technologies

CLIMATE
FIELD
VIEW

JOYN
BIO

Produce higher-yielding crops with fewer natural resources and inputs

30%

Reduction in impact on the environment¹

// Climate FieldView for precision application of pesticides /fertilizers

// Tolerant traits help to reduce pesticide use

// Develop crop protection products with lower environmental impact



INTACTA RR2 PRO

Empower 100 million smallholder farmers

100m

Smallholders benefit e.g. from access to education, tailored solutions & partners

// Enhancing social innovation (e.g. with Better Life Farming)

// Digital transformation with FarmRise

BETTER LIFE
FARMING



¹ Measured by EIQ (Environmental Impact Quotient) and other indicators



Key Priorities

Shaping Agriculture to Benefit Farmers, Consumers and Our Planet

1

Successfully integrate Monsanto and strengthen leadership position in Crop Science

2

Deliver world class innovation from industry's leading R&D pipeline

3

Pioneer the Digital Ag transformation with FieldView platform

4

Deliver financial targets through operational excellence, new technologies and synergy benefits

5

Set new standards of sustainability

6

Commit to responsibility, transparency and dialogue



Crop Science Summer Technology Showcase

Delivering World Class Innovation



Bob Reiter, Ph.D.

*Head of R&D,
Crop Science Division*





Unmatched Investment in R&D

Shaping the Future of Agriculture with Most Productive Innovation Platform in the Industry

#1 R&D Platform in Crop Science

// ~7,300 R&D employees

// >35 R&D sites

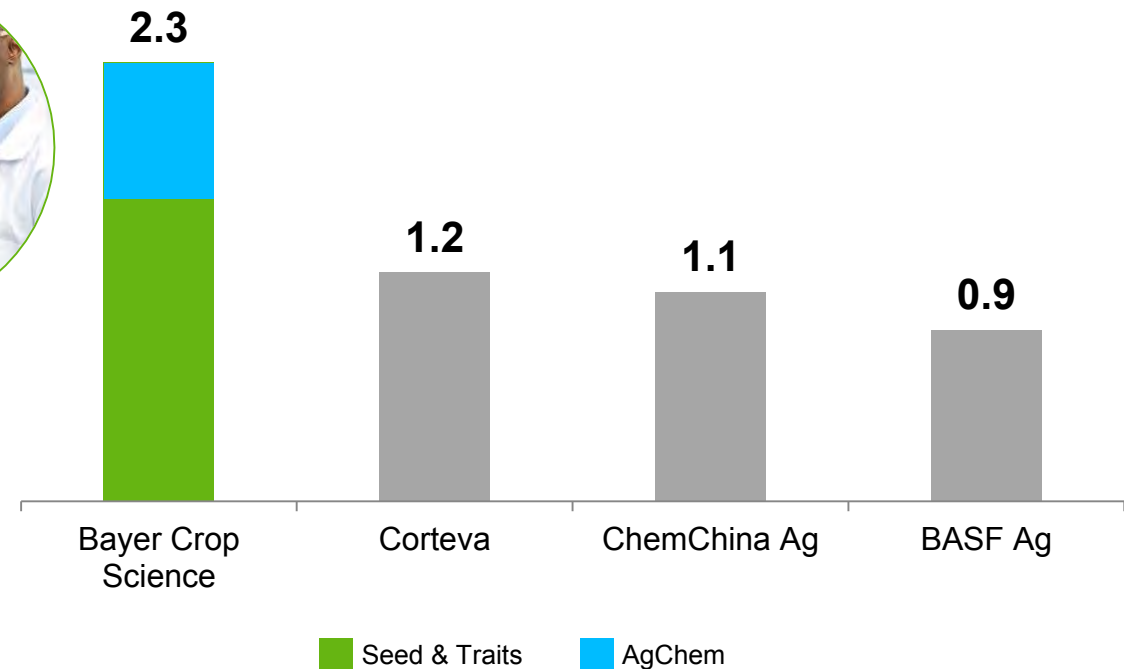
// >175 breeding locations delivering innovation

// Partner of choice

// Technology provider to the industry



2018 Ag R&D Investment (€bn)¹



¹ Pro-forma estimates based on company information and internal calculations | Bayer Pro-forma figures consider Monsanto acquisition and related divestments



Driving the Largest and Most Valuable R&D Pipeline in Ag

Highly Effective in Converting Investment into Meaningful Products for Farmers

Best positioned to discover, combine and tailor solutions for growers

Scale

Unmatched in the Industry

- // **>75** projects in seed & traits, crop protection and digital ag pipelines
- // **100's** of new hybrids and varieties commercialized annually

Advancements

Outpacing Competitors

- // **>70** advancements in 2016 and 2017
- // **>50** advancements in 2018

Value

Up to €30bn Peak Sales¹

- // Potential to accelerate with combined pipelines
- // Climate tools serve as an enabler to reach peak opportunity
- // Expect €17bn in peak sales from recent and near-term launches alone

Peak Sales Opportunity by Crop

Corn
~ €11-14bn



Soybean
~ €6-7bn



Cereals & Other
~ €4-5bn



Horticulture
~ €3-4bn



¹ Represents non-risk adjusted estimated peak sales for the combined breeding, biotech, crop protection and environmental science pipelines. Applied FX rate of USD/EUR of 1.15



Securing Future Growth by Two Pathways of Innovation

Continue being a Leading Innovator in Seeds, Traits and Crop Protection and Participate in Pioneering Break-Through Technologies

Incremental Innovation

- // Annual germplasm upgrades
- // New modes of action in weed, insect and disease control through biotech and crop protection
- // New formulations and uses in crop protection to expand spectrum and crops



Disruptive Innovation

- // Genome-editing
- // Next generation biological science
- // Precision breeding
- // Artificial intelligence
- // Drone application technology in crop protection
- // Digitalization and predictive analytics



Digitally enabled tailored solutions that allow growers to **produce better**....more sustainably and more profitably

Unmatched strength across scientific disciplines and technologies



Driving Data Science and Leveraging External Partnerships

Key Elements for Enabling Innovation and Effective Delivery on Industry-Leading Pipeline

Driving Transformation to Next Level Data Driven R&D Organization

R&D digital vision:

- // Build on a **broad technology portfolio** and **drive digital transformation across all functions** to provide novel value-adding solutions
- // Own the industry's **leading predictive pipeline informed by Artificial Intelligence**
- // Have **100% pipeline data connected**, stored, secured and accessible in unified platforms

'Open Innovation' Model in Place to Ensure Access to External Innovation

Technology Collaborations



Venture Capital



Customer-sponsored Research



Universities & Research Institutes



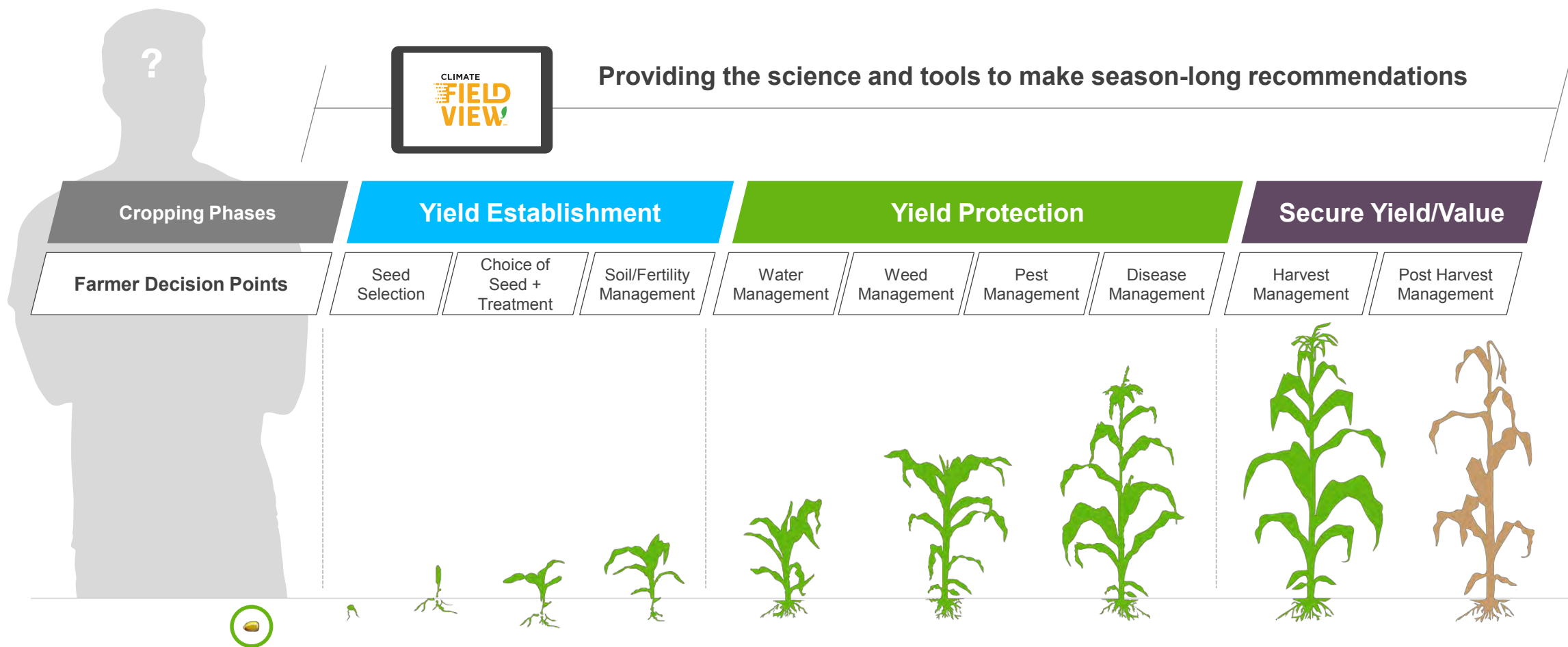
Crowdsourcing





Growers Seek Tailored Season-Long Solutions

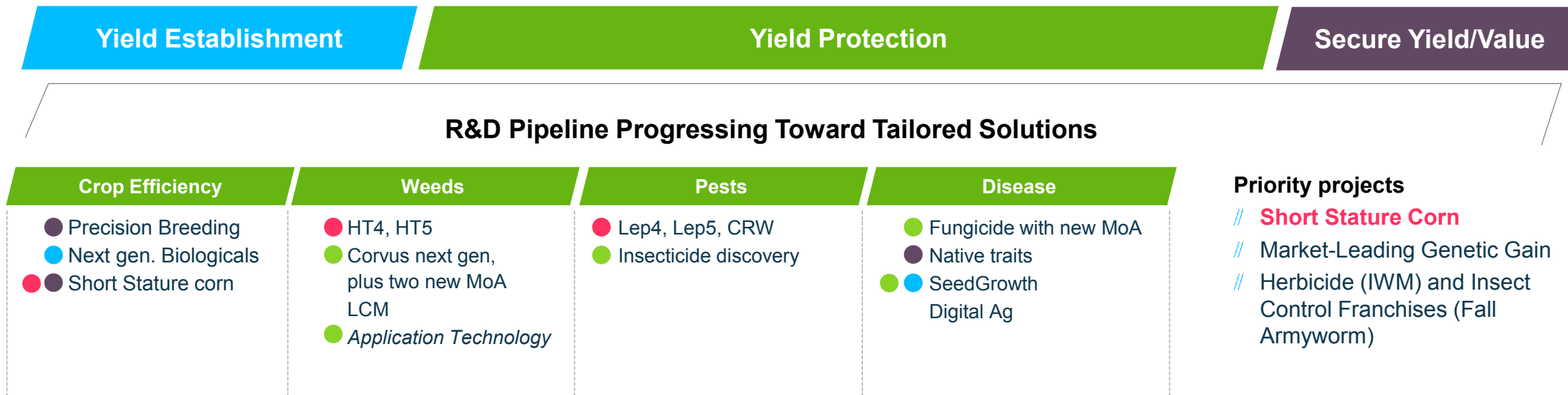
Combined Corn R&D Pipeline to Complete Grower Experience





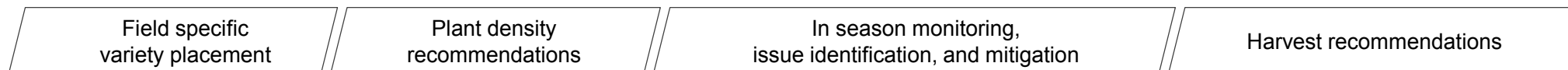
Comprehensive Corn R&D Pipeline to Deliver Tailored Solutions

Combined Corn R&D Pipeline to Complete Grower Experience; Augmented by Short-Stature Corn



● Breeding ● Smol ● Traits ● Biologics

Digitally Enabled Tailored Solutions Across Technology Platforms to Make Season-Long Recommendations



HT4 trait = tolerance to Glyphosate, 2,4-D, FOPs, dicamba, glufosinate + hybridization system
HT5 trait = building on HT4, additional tolerance to PPO chemistry from Sumitomo collaboration

CRW 4 trait = next generation corn rootworm control
Lep4 & Lep5 traits = next generation caterpillar control

MoA = Mode of Action
Smol = Small molecule



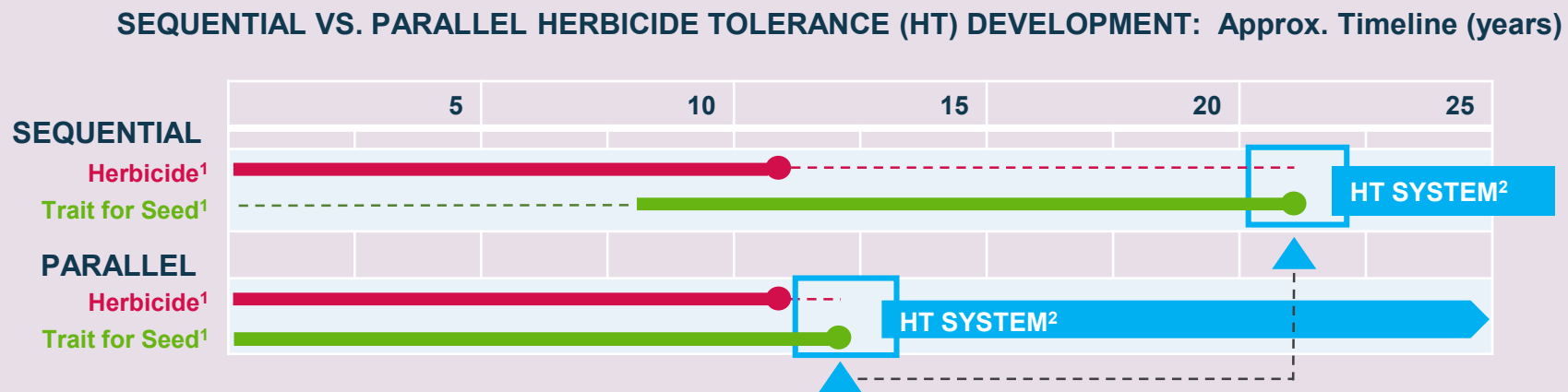
Combined Scientific Expertise Unlocks New Potential

Accelerates Rate of Innovation and Allocates R&D Investment More Efficiently

Our combined expertise in crop sciences will allow us to:

- // **Design complete solutions** that combine traits with chemistry for control of persistent insect pests
- // **Focus research investment** where control challenges currently exist to drive the development of **new product offerings**
- // **Minimize redundant R&D investment** to unlock new solutions that provide greater grower value
- // **Allow for parallel development of components of a tailored solution**, such as a herbicide tolerant trait and new active ingredient for a herbicide, to bring solutions to growers faster

EXAMPLE: Just a year into the integration process and we have already identified our first candidate for a herbicide tolerant trait to pair with a new herbicide molecule in development.



¹ Crop Life America estimates

² Bayer estimates



Key Takeaways

Delivering World Class Innovation

1

Leading R&D platforms and pipeline frontrunner in scale and value

2

R&D supplemented with open innovation model

3

Optimizing large and diverse germplasm library with advanced breeding technologies

4

Leader in next-generation biotech traits; technology provider to the industry

5

Advancing new approaches in new molecule discovery and biologicals

6

Unlocking new potential by combining R&D platforms, powered by data science



Crop Science R&D Leadership Team

Working Together to Deliver Better Solutions for Growers, Consumers and the Planet



Green denotes presenter at the 2019 Crop Science Technology Showcase



Crop Science Summer Technology Showcase

Appendix – Crop Science Pipeline



Bob Reiter, Ph.D.

*Head of R&D,
Crop Science Division*





Corn R&D Pipeline – Peak Sales Potential: €11-14bn

| R&D Target | Technology | | | Phase* | | | | Enhancement** | |
|---|------------|-----|----|--------|---|-----|---|---------------|-------|
| | Br | PBt | CP | 1 | 2 | 3 | 4 | Dev. | Subm. |
| YIELD & ABIOTIC STRESS – ~70% of Peak Sales Potential | | | | | | | | | |
| # Annual germplasm upgrades | ✓ | | | | | | | | |
| # Short Stature Corn | ✓ | | | | | | | | |
| # Short Stature Corn ¹ | | ✓ | | | | | | | |
| PEST MANAGEMENT – ~15% of Peak Sales Potential | | | | | | | | | |
| Chewing Pests | | | | | | | | | |
| # Above Ground (Lepidoptera) | | | | | | | | | |
| # 4 th generation Lepidoptera protection | | ✓ | | | | | | | |
| # 5 th generation Lepidoptera protection | | ✓ | | | | | | | |
| # Tetraniliprole | | | ✓ | | | | | | |
| # Belt Smart | | | ✓ | | | | | NEW | |
| # Below Ground (Coleoptera) | | | | | | | | | |
| # SmartStax Pro | | ✓ | | | | | | | |
| # 4 th generation Coleoptera protection | | ✓ | | | | NEW | | | |
| Sucking Pests | | | | | | | | | |
| # Stinkbug pipeline | | | | | | | | | |
| # ARVIS | | | ✓ | | | | | | |
| Nematodes | | | | | | | | | |
| # Nemastrike 2 | | | ✓ | | | | | NEW | |
| Early Pipeline | | | | | | | | | |
| # New Insecticide | | | ✓ | NEW | | | | | |

*R&D Phases:

1 – Research, 2 – Early Development, 3 – Late Development, 4 – Registrations Filed

**Product enhancement: (Life Cycle Management activities)

Dev. – Under development; Subm. – Submitted for Registration

| | |
|-----|---|
| Br | Breeding – incl. native traits and molecular breeding |
| PBt | Plant Biotech – biotechnology traits |
| CP | Crop Protection – chemical and biological solutions applied as seed treatment, foliar or via soil |

| R&D Target | Technology | | | Phase* | | | | Enhancement** | |
|---|------------|-----|----|--------|-----|---|---|---------------|-------|
| | Br | PBt | CP | 1 | 2 | 3 | 4 | Dev. | Subm. |
| DISEASE MANAGEMENT – ~5% of Peak Sales Potential | | | | | | | | | |
| Plant Health Systems | | | | | | | | | |
| /// Corn Disease Shield - Annual upgrades | ✓ | | | | | | | | |
| /// Acceleron - Annual upgrades | | | ✓ | | | | | | |
| /// Goss Wilt resistance | ✓ | | | | | | | | |
| Leaf Spots and Stem Diseases | | | | | | | | | |
| /// New Fungicide | | | ✓ | | NEW | | | | |
| WEED MANAGEMENT – ~10% of Peak Sales Potential | | | | | | | | | |
| Herbicide tolerance | | | | | | | | | |
| /// 3 rd generation weed management system | | ✓ | | | | | | | |
| /// 4 th generation weed management system with RHS2 | | ✓ | | | | | | | |
| /// 5 th generation weed management system | | ✓ | | | NEW | | | | |
| /// Improved Dicamba formulations | | | ✓ | | | | | | |
| /// Improved Dicamba & Glyphosate Premix | | | ✓ | | | | | | |
| /// Next Generation Glyphosate Formulations | | | ✓ | | | | | | |
| /// Next Generation Dicamba Premix | | | ✓ | | | | | | |
| /// Mesotrione-Aceto-chlor-Dicamba Premix | | | ✓ | | | | | | |
| Early Pipeline | | | | | | | | | |
| /// Novel PPO Herbicide | | | ✓ | | | | | | |

| | |
|--|---|
| | Progress achieved Phases 1 through 4 |
| | Status indication for Life Cycle Management Items |
| | Strategic collaborations |
| | Represents annual advancements and upgrades |
| | Pipeline status highlighting significant development, progress or advancement in R&D Pipeline (pink) and Key Life Cycle Management (blue) work. |

RHS2 = Second Generation Roundup Hybridization System

¹ In collaboration with BASF



Soybean R&D Pipeline – Peak Sales Potential: €6-7bn

| R&D Target | Technology | | | Phase* | | | | Enhancement** | |
|---|------------|-----|----|--------|-----|-----|---|---------------|-------|
| | Br | PBt | CP | 1 | 2 | 3 | 4 | Dev. | Subm. |
| YIELD & ABIOTIC STRESS - ~25% of Peak Sales Potential | | | | | | | | | |
| Annual germplasm upgrades | ✓ | | | | | | | | |
| High Yielding Soy ¹ | | ✓ | | NEW | | | | | |
| PEST MANAGEMENT - ~20% of Peak Sales Potential | | | | | | | | | |
| Chewing Pests | | | | | | | | | |
| INTACTA RR2 PRO | | ✓ | | | | | | | |
| 2 nd generation insect protection | | ✓ | | | | | | | |
| 3 rd generation insect protection | | ✓ | | | | NEW | | | |
| Belt Smart | | | ✓ | | | | | NEW | |
| Sucking Pests | | | | | | | | | |
| Aphid & Whitefly pipeline | | | ✓ | | | | | | |
| Novel Sucking Pest Solution | | | ✓ | | | | | | |
| Stinkbug Pipeline | | | ✓ | | | | | | |
| ARVIS | | | ✓ | | | | | | |
| Novel Mite Solution | | | ✓ | | NEW | | | | |
| Nematodes | | | | | | | | | |
| Plant health systems | | | | | | | | | |
| 2 nd generation Soy Cyst Nematode resistance | ✓ | | | | | | | | |
| NemaStrike 2 | | | ✓ | | | | | NEW | |

*R&D Phases:

1 – Research, 2 – Early Development, 3 – Late Development, 4 – Registrations Filed

**Product enhancement: (Life Cycle Management activities)

Dev. – Under development; Subm. – Submitted for Registration

| | |
|-----|---|
| Br | Breeding – incl. native traits and molecular breeding |
| PBt | Plant Biotech – biotechnology traits |
| CP | Crop Protection – chemical and biological solutions applied as seed treatment, foliar or via soil |

| R&D Target | Technology | | | Phase* | | | | Enhancement** | | |
|---|------------|-----|----|--------|-----|-----|-----|----------------|-------|--|
| | Br | PBT | CP | 1 | 2 | 3 | 4 | Dev. | Subm. | |
| DISEASE MANAGEMENT - ~30% of Peak Sales Potential | | | | | | | | | | |
| /// Soy Disease Shield | ✓ | | | | | NEW | | | | |
| /// Acceleron Upgrades | | ✓ | | | | | | | | |
| Asian Soybean Rust | | | | | | | | | | |
| /// Indiflin | | ✓ | | | | | NEW | | | |
| /// Fox XPro | | ✓ | | | | | | adv. to launch | | |
| Leaf Spot Diseases | | | | | | | | | | |
| /// New Fungicide | | ✓ | | | NEW | | | | | |
| Early Pipeline | | | | | | | | | | |
| /// New Fungicide | | ✓ | | NEW | | | | | | |
| WEED MANAGEMENT - ~25% of Peak Sales Potential | | | | | | | | | | |
| /// Herbicide tolerance | | ✓ | | | | | | | | |
| /// 3 rd generation weed management system | | ✓ | | | | | | | | |
| /// 4 th generation weed management system | | ✓ | | | | | | | | |
| /// 5 th generation weed management system | | ✓ | | | | | | | | |
| /// New Soybean selective herbicide | | ✓ | | | | | | NEW | | |
| /// Improved Dicamba & Glyphosate Premix | | ✓ | | | | | | | | |
| /// Improved Dicamba formulations | | ✓ | | | | | | | | |
| /// Next Generation Glyphosate Formulations | | ✓ | | | | | | | | |
| /// WARRANT® + Dicamba Premix | | ✓ | | | | | | | | |
| /// Next Generation Dicamba Premix | | ✓ | | | | | | | | |
| /// Podium Supra | | ✓ | | | | | | | | |
| Early Pipeline | | | | | | | | | | |
| /// Novel PPO Herbicide | | ✓ | | | | | | | | |
| /// New Herbicide | | ✓ | | NEW | | | | | | |

Progress achieved Phases 1 through 4

Status indication for Life Cycle Management Items

Strategic collaborations

Represents annual advancements and upgrades

Pipeline status highlighting significant development, progress or advancement in R&D Pipeline (pink) and Key Life Cycle Management (blue) work.

¹ In collaboration with BASF



Cereals, Oilseed Rape, Cotton, Rice R&D Pipelines – Peak Sales Potential: €4-5bn

Cereals

| R&D Target | Technology | Phase* | Enhancement** |
|-----------------------------------|------------|---------|----------------|
| | Br PBT CP | 1 2 3 4 | Dev. Subm. |
| YIELD & ABIOTIC STRESS | | | |
| # Annual germplasm upgrades | ✓ | | |
| WEED MANAGEMENT | | | |
| <i>Selective Herbicides</i> | | | |
| # New Cereals Selective Herbicide | ✓ | | NEW |
| # Atlantis franchise extensions | ✓ | | adv. to launch |
| # New Autumn Herbicides | ✓ | | |
| PEST MANAGEMENT | | | |
| # New Cereals Seed Treatment | ✓ | | |
| DISEASE MANAGEMENT | | | |
| # Disease package annual upgrade | ✓ | | |
| # Isoflucypram | ✓ | | NEW |
| # New Fungicide | ✓ | NEW | |
| # New Bixafen extensions | ✓ | | NEW |
| # Delaro forte | ✓ | | |
| # Redigo FS 25 | ✓ | | NEW |
| # New Fungicidal Seed Treatment | ✓ | | NEW |

Oilseed Rape

| | | | |
|--|---|-----|--|
| YIELD & ABIOTIC STRESS | | | |
| # Annual germplasm upgrades including Podshatter | ✓ | | |
| WEED MANAGEMENT | | | |
| # DEKALB LibertyLink Canola | ✓ | | |
| # TruFlex Canola with Roundup Ready | | | |
| # TruFlex Roundup Ready | ✓ | | |
| # TruFlex Roundup Ready + LibertyLink | ✓ | | |
| # Dicamba-Tolerant Canola | ✓ | | |
| PEST MANAGEMENT | | | |
| # New Insecticide | ✓ | NEW | |
| DISEASE MANAGEMENT | | | |
| # New Fungicide | ✓ | NEW | |

Cotton

| R&D Target | Technology | Phase* | Enhancement** |
|--|------------|---------|---------------|
| | Br PBT CP | 1 2 3 4 | Dev. Subm. |
| YIELD & ABIOTIC STRESS | | | |
| # Annual germplasm upgrades | ✓ | | |
| WEED MANAGEMENT | | | |
| # 4 th Generation Herbicide Tolerance | ✓ | | |
| # Improved Dicamba formulations | ✓ | | |
| # Improved Dicamba & Glyphosate Premix | ✓ | | |
| # Next Generation Glyphosate Formulations | ✓ | | |
| # WARRANT® + Dicamba Premix | ✓ | | |
| # Next Generation Dicamba Premix | ✓ | | |
| <i>Early Pipeline</i> | | | |
| # Novel PPO Herbicide | ✓ | | |
| PEST MANAGEMENT | | | |
| <i>Chewing Pests</i> | | | |
| # 4 th Generation Bollgard | ✓ | | |
| <i>Sucking Pests</i> | | | |
| # Lygus & Thrips Control | ✓ | | |
| # Novel sucking pest solution | ✓ | | |
| # Novel Mite solution | ✓ | NEW | |
| <i>Nematodes</i> | | | |
| # NemaStrike 2 | ✓ | | NEW |
| <i>Early Pipeline</i> | | | |
| # New Insecticide | ✓ | NEW | |
| DISEASE MANAGEMENT | | | |
| # New Fungicide | ✓ | NEW | |

Rice

| | | | |
|-----------------------------------|---|-----|----------------|
| YIELD & ABIOTIC STRESS | | | |
| # Annual germplasm upgrades | ✓ | | |
| # Annual hybrid production | ✓ | | |
| WEED MANAGEMENT | | | |
| # Council Activ | ✓ | | adv. to launch |
| PEST MANAGEMENT | | | |
| # Sucking Pest Tolerance | ✓ | | |
| # Tetraniliprole | ✓ | | |
| <i>Early Pipeline</i> | | | |
| # New Insecticide | ✓ | NEW | |
| DISEASE MANAGEMENT | | | |
| # New Fungicide | ✓ | NEW | |
| # Super Nativo | ✓ | | NEW |

¹ Peak Sales Potential Split: Yield & Abiotic stress = ~10%, Pest Management = ~20%, Disease Management = ~35% and Weed Management = ~35%



Horticulture R&D Pipeline – Peak Sales Potential: €3-4bn

| R&D Target | Technology | | | Phase* | | | | Enhancement** | |
|--|------------|-----|----|--------|-----|---|---|---------------|-------|
| | Br | PBt | CP | 1 | 2 | 3 | 4 | Dev. | Subm. |
| YIELD AND ABIOTIC STRESS - ~40% Peak Sales Potential | | | | | | | | | |
| # >146 advancements to launch | ✓ | | | | | | | | |
| # Torelino tomato | ✓ | | | | | | | | |
| # Pfiefer bell pepper | ✓ | | | | | | | | |
| # Whitex cauliflower | ✓ | | | | | | | | |
| PEST MANAGEMENT - ~25% of Peak Sales Potential | | | | | | | | | |
| Chewing Pests | | | | | | | | | |
| # Tetraniliprole | | | ✓ | | | | | | |
| Sucking Pests | | | | | | | | | |
| # Aphid & Whitefly pipeline | | | | | | | | | |
| # Novel Sucking Pest Solution | | | ✓ | | | | | | |
| # SIVANTO brand family extension | | | ✓ | | | | | | |
| # Novel Mite Solution | | | ✓ | | NEW | | | | |
| Nematodes | | | | | | | | | |
| # NemaStrike | | | ✓ | | | | | | |
| # Velum | | | ✓ | | | | | | |
| # Next gen nematode resistant tomato | ✓ | | | | | | | | |
| Early Pipeline | | | | | | | | | |
| # New Insecticide | | | ✓ | NEW | | | | | |

| R&D Target | Technology | | | Phase* | | | | Enhancement** | |
|---|------------|-----|----|--------|-----|---|----------------|---------------|-------|
| | Br | PBt | CP | 1 | 2 | 3 | 4 | Dev. | Subm. |
| DISEASE MANAGEMENT - ~30% of Peak Sales Potential | | | | | | | | | |
| Plant Health Systems | | | | | | | | | |
| ## Geminivirus resistant tomato | ✓ | | | | | | | | |
| ## Downy Mildew resistant lettuce | ✓ | | | | | | | | |
| Dicot Leaf & Fruit Diseases | | | | | | | | | |
| ## New Fungicide | | | ✓ | | NEW | | | | |
| ## Isoflucypram | | | ✓ | | | | NEW | | |
| ## LUNA brand family extension | | | ✓ | | | | | | |
| ## Serenade ASO | | | ✓ | | | | | | |
| Oomycetes | | | | | | | | | |
| ## Fluoxapiprolin | | | ✓ | | | | | | |
| Seed- & Soilborne Diseases | | | | | | | | | |
| ## Isoflucypram | | | ✓ | | | | NEW | | |
| ## High concentrated biological | | | ✓ | | | | | | |
| Bacteria | | | | | | | | | |
| ## Isotianil | | | ✓ | | | | adv. to launch | | |
| ## Serenade ASO | | | ✓ | | | | | | |
| Early Pipeline | | | | | | | | | |
| ## New Fungicide | | | ✓ | NEW | | | | | |
| WEED MANAGEMENT - ~5% of Peak Sales Potential | | | | | | | | | |
| Early Pipeline | | | | | | | | | |
| ## New Herbicide | | | ✓ | NEW | | | | | |

*R&D Phases:

1 – Research, 2 – Early Development, 3 – Late Development, 4 – Registrations Filed

**Product enhancement: (Life Cycle Management activities)

Dev. – Under development; Subm. – Submitted for Registration

Br Breeding – incl. native traits and molecular breeding

PBt Plant Biotech – biotechnology traits

CP Crop Protection – chemical and biological solutions applied as seed treatment, foliar or via soil

Progress achieved Phases 1 through 4

Status indication for Life Cycle Management Items

Strategic collaborations

Represents annual advancements and upgrades

Pipeline status highlighting significant development, progress or advancement in R&D Pipeline (pink) and Key Life Cycle Management (blue) work.



Biologicals R&D Pipeline

| Research Target | Crop | | | Phase* | | | | Enhancement** | |
|--------------------------------|------|------|-----|----------------|---|---|---|---------------|-------|
| | F&V | Corn | Soy | 1 | 2 | 3 | 4 | Dev. | Subm. |
| YIELD & ABIOTIC STRESS | | | | | | | | | |
| Yield & Quality | | | | | | | | | |
| # BioRise 2 | | ✓ | | adv. to launch | | | | | |
| # High concentrated Biological | ✓ | | | | | | | | |
| # Corn BioYield 3 | | ✓ | | | | | | | |
| Early Pipeline | | | | | | | | | |
| # New Biological | | ✓ | ✓ | NEW | | | | | |
| DISEASE MANAGEMENT | | | | | | | | | |
| Dicot Leaf Spots | | | | | | | | | |
| # Serenade ASO | ✓ | | | | | | | | |
| Powdery Mildew | | | | | | | | | |
| # Sonata ASO | ✓ | | | | | | | | |
| Bacteria | | | | | | | | | |
| # Serenade ASO | ✓ | | | | | | | | |
| Seed- & Soil-borne Diseases | | | | | | | | | |
| # High concentrated Biological | ✓ | | | | | | | | |
| Early Pipeline | | | | | | | | | |
| # New Fungicide | ✓ | | | NEW | | | | | |
| PEST MANAGEMENT | | | | | | | | | |
| Nematodes | | | | | | | | | |
| # BioAct DC | ✓ | | | | | | | | |
| Early Pipeline | | | | | | | | | |
| # New Insecticide | ✓ | | | NEW | | | | | |

***R&D Phases:**

1 – Research, 2 – Early Development, 3 – Late Development, 4 – Registrations Submitted

****Product enhancement:** (Life Cycle Management activities)

Dev. – Under development; Subm. – Submitted for Registration

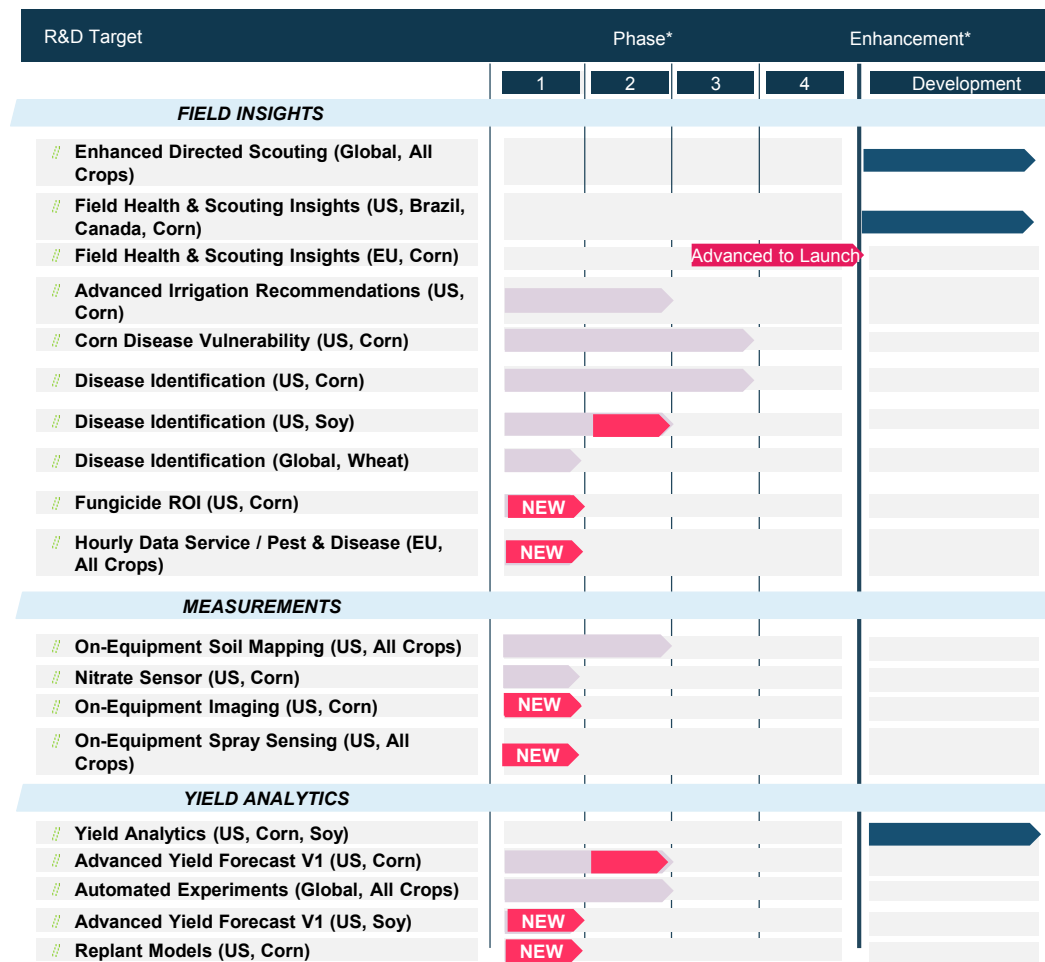
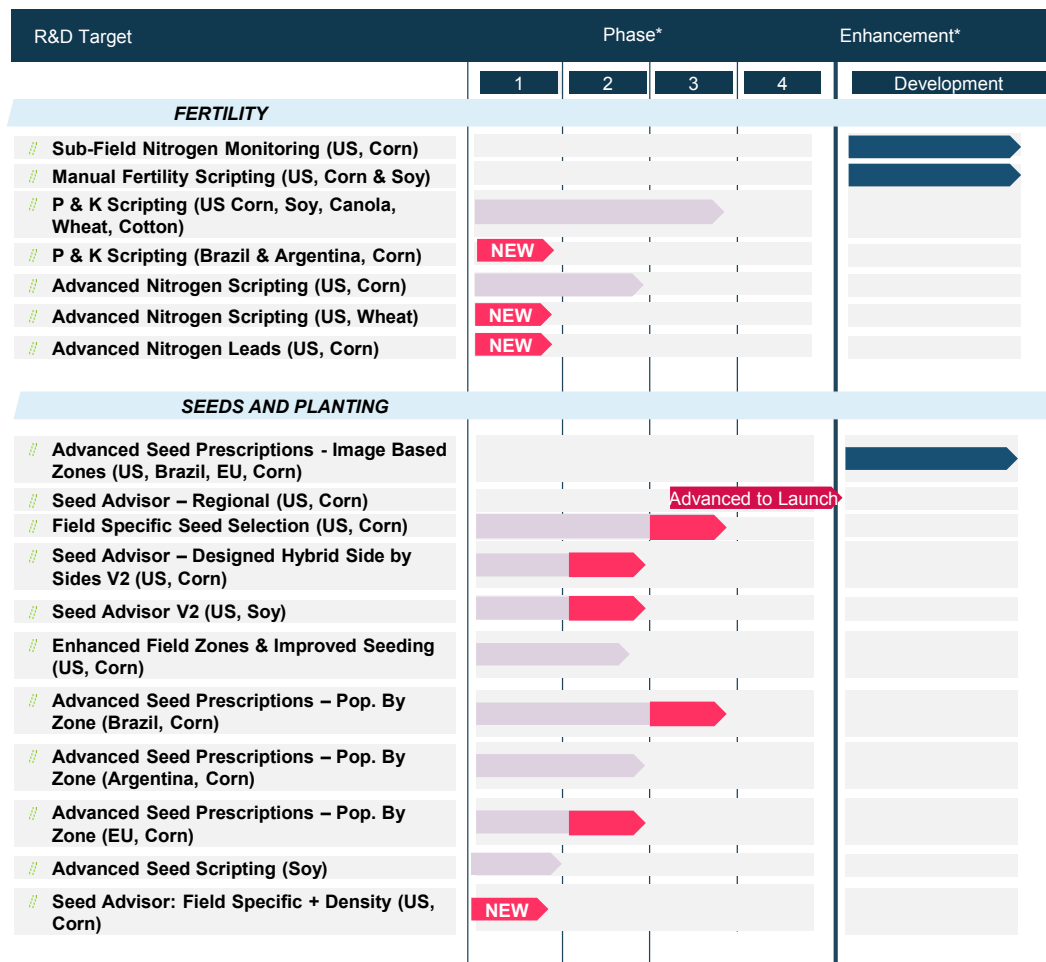
Progress achieved Phases 1 through 4

Status indication for Life Cycle Management Items

Pipeline status highlighting significant development, progress or advancement in R&D Pipeline



Digital R&D Pipeline



*R&D Phases:

1 – Proof of Concept, 2 – Development, 3 – Pre-Commercial, 4 – Commercial / Launch, 5 – Post-Commercial / Enhancement

P = Phosphorus

K = Potassium

Progress achieved Phases 1 through 4
Status indication for Enhancements to Commercial Products

Pipeline status with color highlighting significant development, progress or advancement in R&D and commercial work



Crop Science Summer Technology Showcase

Pioneering the Digital Transformation



Mike Stern, Ph.D.

*Head of the Climate Corporation
and Digital Farming*

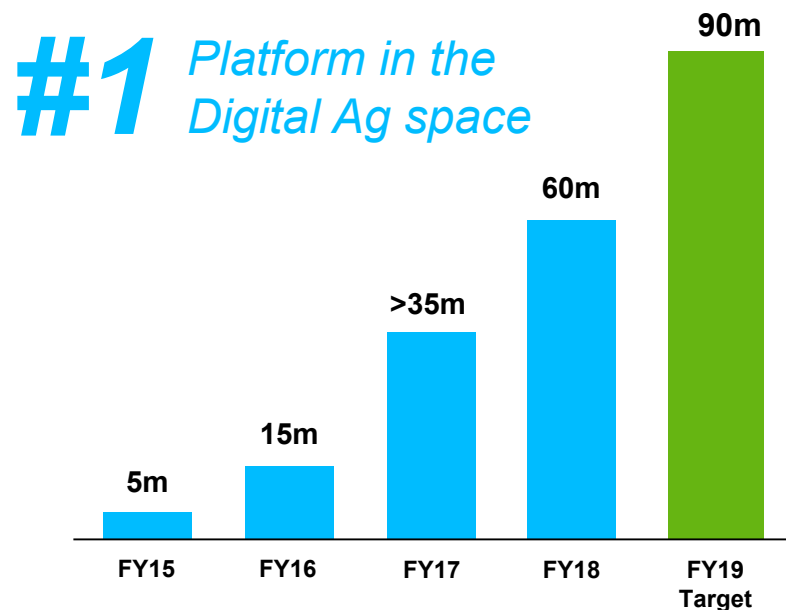




FieldView: The Leading Brand and Platform for Growers

Our Value Creation is Supported by our Performance Trends

Global Paid Acres¹

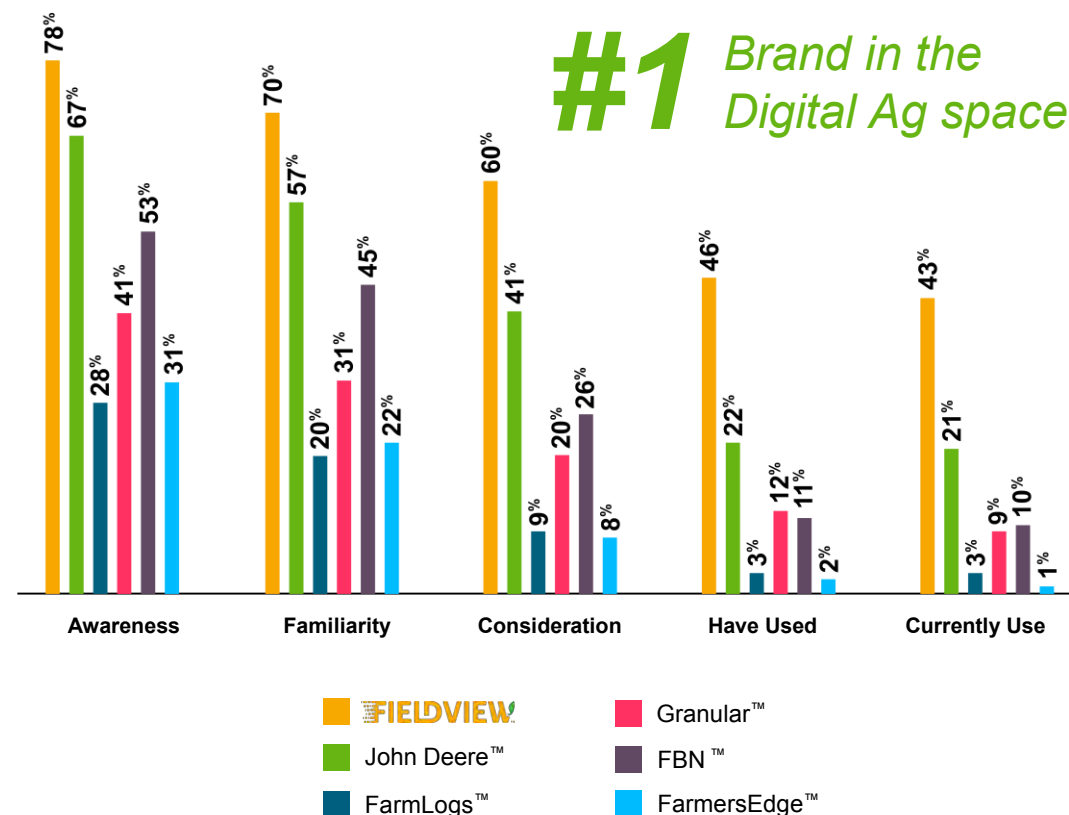


- Launched in the U.S., Canada, Brazil, Argentina, 15 countries in Europe including Germany, France, Spain, Romania, Italy & Ukraine; preparing for launch in South Africa and Australia
- 100K monthly active users of FarmRise in India

¹ Internal estimates

² 2019 Brand Health Monitor

Brand Health² (U.S.)



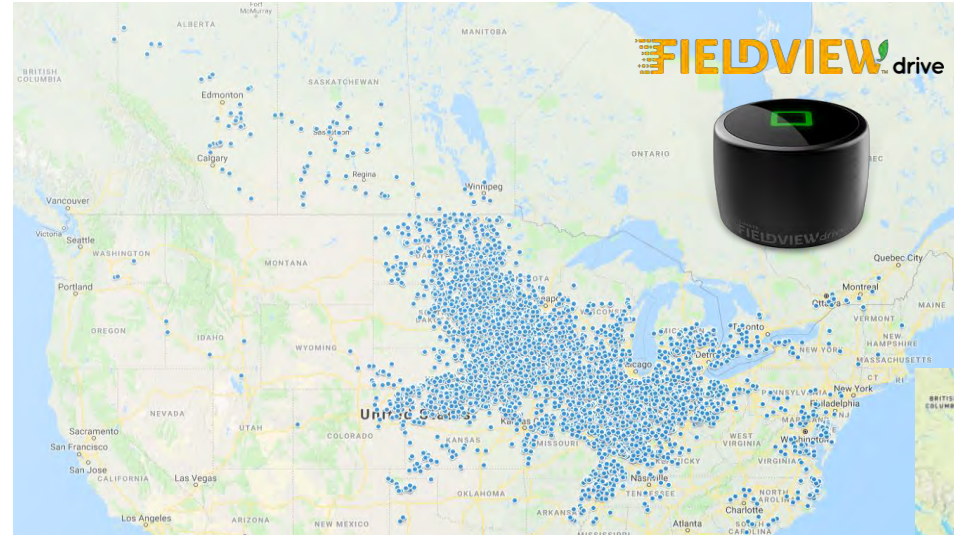


Extensive and Unique Data Collection Capability

FieldView Drive Device Collects, Connects and Digitizes Farmer Activity Informing and Improving our Models and the Digital Tools Farmers are Deploying in their Fields

Connected Combines

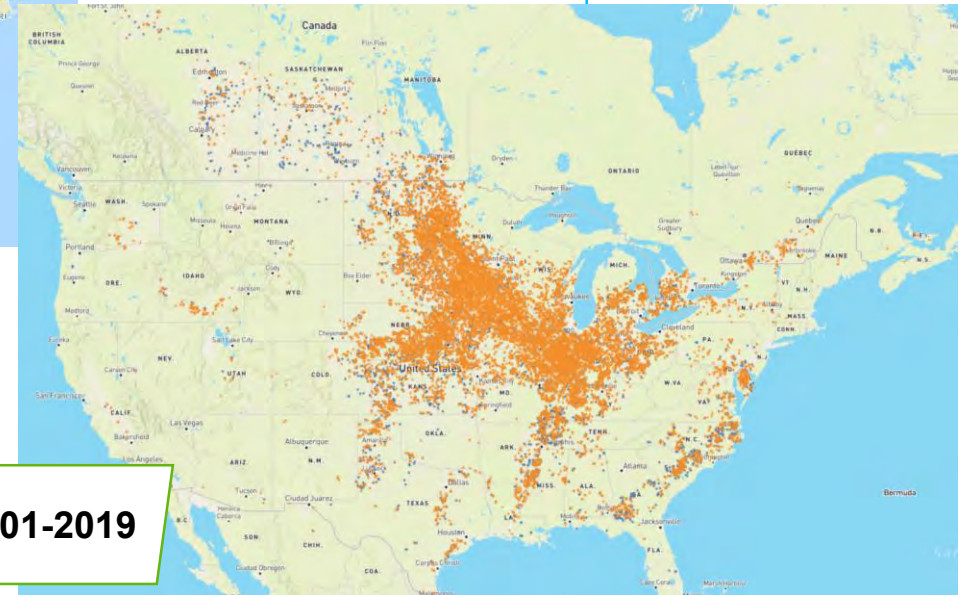
Seamless Data Aggregation



➤ ~10,000 connected combines uploading data on 10-18-2018

Connected Planters & Sprayers

Seamless Data Aggregation

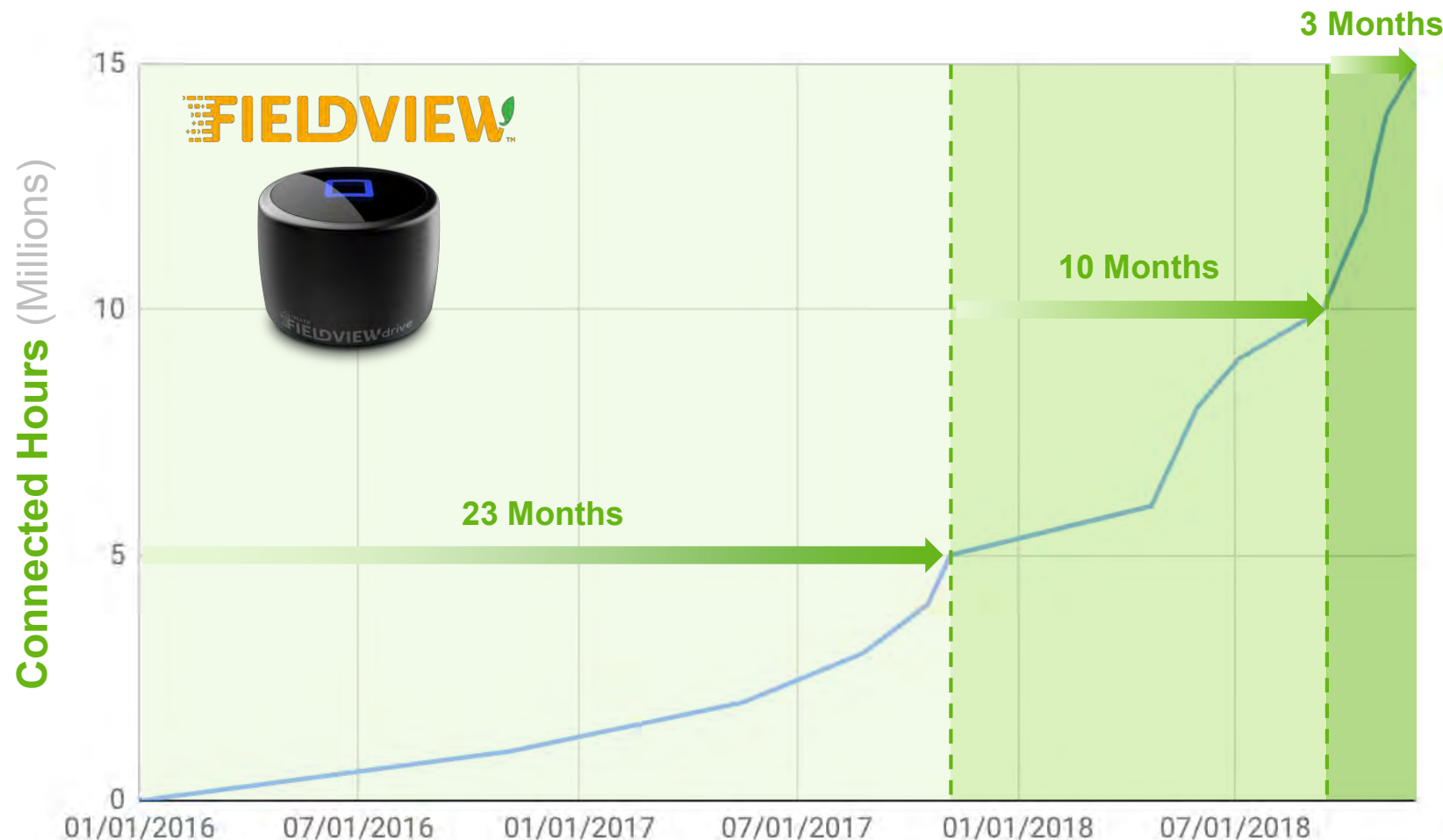


➤ ~16,000 planters and ~4,500 sprayers uploading data since 01-01-2019



Data Collection as Core Competitive Advantage

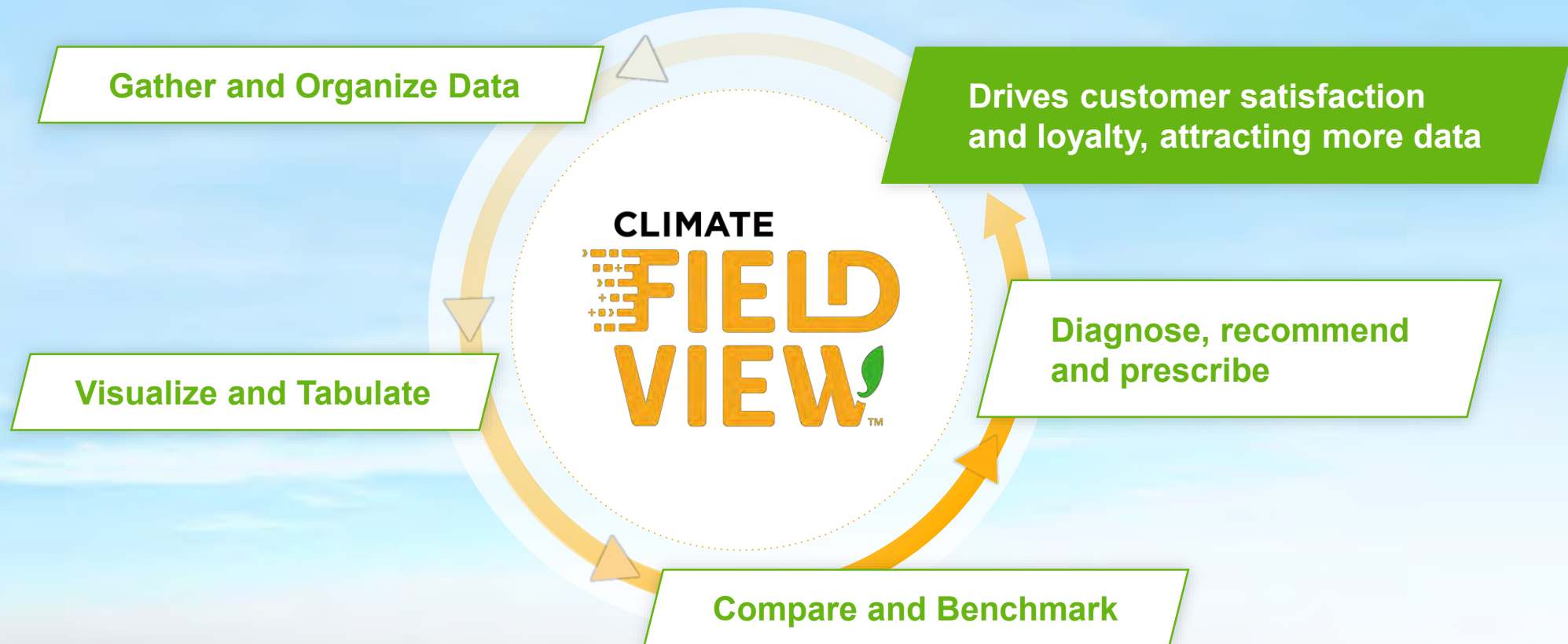
Able to Collect 5 Million Connected Hours of Data in a Fraction of the Time it Took a Year Ago





Data is Digital Currency to Build a Global Integrated Platform

Continuous Circle of Value Creation from Richer Data Sets, Leading to Smarter Digital Tools





FieldView Platform Leads the Digital Transformation in Agriculture

Provides Multiple Ways to Create Value for **Farmers**, the **Industry** and the **Enterprise**

Agronomic Services

Visualize, analyze and recommend — driven by data

FIELDVIEW plus

FIELDVIEW drive



Per-acre Services

Advanced Seed Scripting

Seed Placement Advisor²

FieldView Platform¹

60+ partnerships to bring Digital Ag innovation to farmers

AGRIAN

Agvance

ceresimaging

HELENA

CHS

AGCO
Your Agriculture Company

Veris
technologies

FIELDALYTICS
empowering decisions

TerraVion

DEXERON
LUX

FS
GROWMARK

CNH
INDUSTRIAL

SST Summit[®]

Nutrien

WINFIELD
UNITED

Enterprise Benefit

Driving value across our operations

Commercial Sales

Technology

Supply Chain

Business Analytics

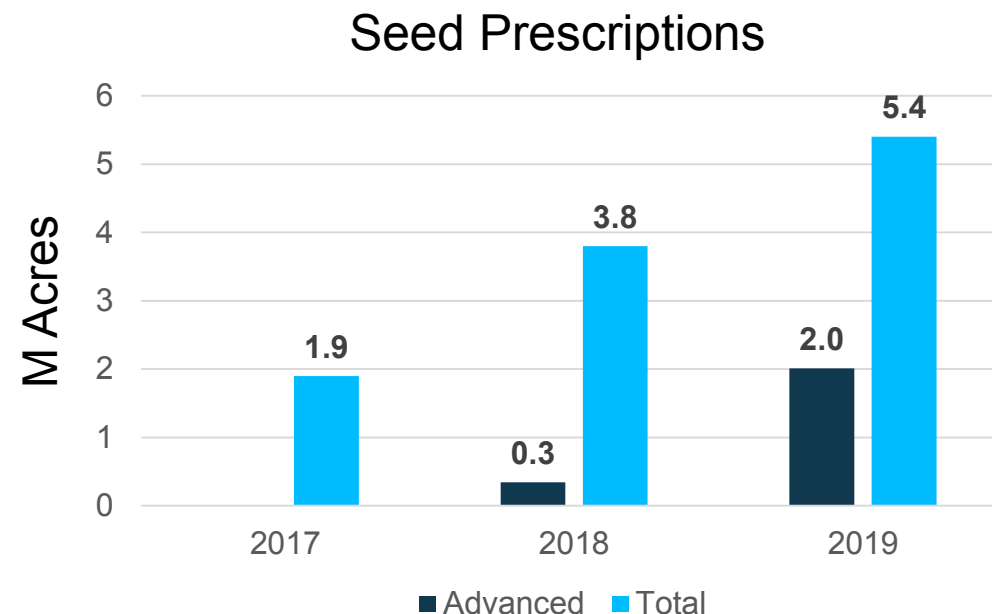
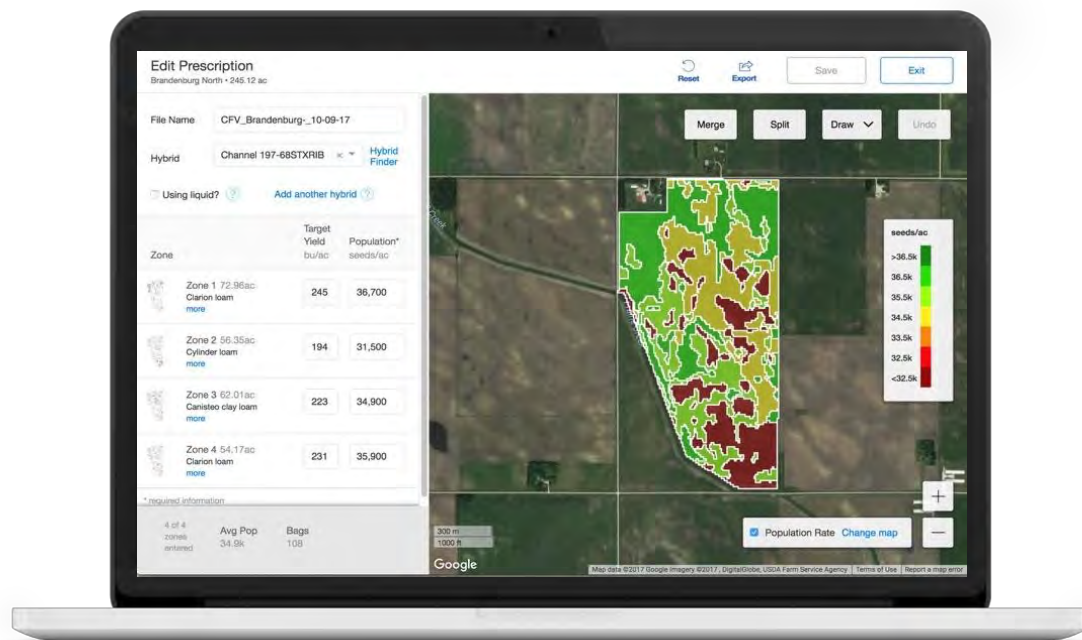
¹ All trademarks are the property of their respective owners

² Beta Launch in 2019 in 3 states with ~50 dealers and ~150 farmers



Elevating Agronomic Services and Enabling Tailored Solutions

Advanced Seed Prescriptions Grew 6x in One Year; Reflects Grower Demand for Informed Decisions



provides a global, scalable seed scripting platform for Bayer Crop Science



Significant Opportunity to Expand Digital Ag Footprint

Growth Fueled by Leading Infrastructure, Data, Distribution and Partnerships

FieldView Paid Acres

Global Acres

Platform Advantages

#1 *Platform in the Digital Ag space*

~1bn *Global Acre Opportunity*

90m

FY19 Target

Wheat

Soybeans

Corn

- // Most established, scalable digital farming infrastructure
- // Largest database of grower and field trial seed performance data in the industry
- // Established global distribution footprint
- // Strategy to drive innovation through FieldView platform from partners around the world

¹ Harvested acres – USDA FAS 2018-10-11, ex China



Key Takeaways

Shaping Agriculture to Benefit Farmers, Consumers and our Planet

1

FieldView platform is leading digital ag platform and U.S. brand in the industry

2

Significant opportunity to minimize variability and optimize yields with digital tools

3

Widening the gap with our leading proprietary data, warehouses and algorithms

4

**Creating enterprise value from increased seed customer retention and share of farm;
first-ever outcome-based pricing models, enabled by FieldView**

5

Pursuing next opportunity to advance the agricultural landscape with tailored solutions



Crop Science Summer Technology Showcase

Executive Q & A Panel



August 1–2, 2019
St. Louis, Missouri, U.S.A.





Executive Q&A Panel

Crop Science Summer Technology Showcase



Werner Baumann
CEO of Bayer AG



Liam Condon
President of the
Crop Science Division



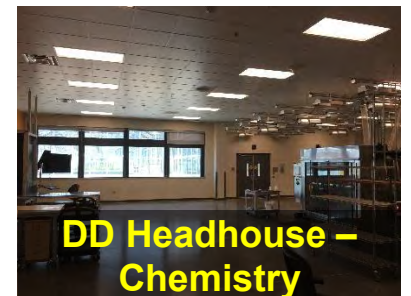
Bob Reiter
Head of R&D,
Crop Science Division



Mike Stern
Head of Digital Farming,
Crop Science Division



Chesterfield Research Facility





Crop Science Summer Technology Showcase

Advanced Breeding Technology



Mike Graham, Ph.D.

*Head of Crop Science R&D,
Breeding*

Amanda McClerren, Ph.D.

*Head of Trait and Pipeline Delivery,
Breeding*





Annual Germplasm Upgrade Drives Growth and Attracts Partners

Global Germplasm Libraries and Advanced Breeding Tools Deliver High-Performing Seeds

Corn



- // Deployed >170 new hybrids in 2018; offer >1,350 hybrids globally
- // Average >7 bu/acre U.S.A. yield advantage with leading hybrids

Soybeans



- // Deployed >180 new varieties in 2018; offer >850 varieties in the Americas
- // Average ~2 bu/acre U.S.A. yield advantage with leading varieties

Cotton



- // Deployed >15 varieties in 2018; offer >25 varieties in the U.S.
- // U.S.A. lint/acre yield advantage with leading varieties; 2018 was 81lbs of lint per acre advantage

Vegetables



- // Deploy ~150 varieties annually; focus in tomatoes and peppers; sell over 2,100 vegetable hybrids and varieties in 22 crops annually
- // Focus on disease resistance and yield with new launches

Protect performance with seed-applied solutions

Provides for annual price mix gains as growers trade up to higher-performing seeds

Digital Ag becomes proof point for performance advantage



Scale and Leading Technology Drives New Seed Development

Optimizing Extensive Germplasm Library to Develop New Capabilities for Better Customer Solutions





Precision Breeding: Moving from Selecting the Best with Breeding 3.0 to Designing the Best Seeds for Farmers

Uses Seed Chipping, Markers, Genetic Mapping and Predictive Analytics

// Proprietary Seed Chipping Technology enables breeder to **know every seed**



// Latest marker-assisted breeding, genetic mapping and predictive analytics to **increase the number of products screened early in the breeding process**



// Driving faster decisions to pinpoint which products are best **for testing in local fields**



// Powered by data analytics, breeders can make more informed **selections earlier in the pipeline** to enable **longer field testing before commercialization**



Seed Chipper



Sample of DNA from seed chip is sequenced and analyzed

Sequencing Machine



Millions of data records are analyzed every night, all year round from our breeding database, accelerating our research pipeline. Use of molecular markers identifies key genes in combating diseases.



A 2X2 inch gene sequencing chip holds the equivalent of 14 acres of information



Corn Product Design Center

Marana, AZ





Key Takeaways

Breeding Technology

1

Leading breeding genetics and technology platform is a pipeline frontrunner in scale and value

2

Investment in data science and machine learning leverage data for thousands of pipeline decisions

3

AI driven, globally connected pipeline is unlocking new potential fueled by globally connected data and insights

4

Protected culture and advanced breeding methods drive increases in cycle-time and throughput for breeding improvements, biotech trait delivery and gene edits

5

***Precision Breeding* enables a new generation of products and data insights**



Crop Science Summer Technology Showcase

Biotechnology



Shannon Hauf, Ph.D.

*Head of Crop Science R&D,
Crop Technology, Soybean*

Jeremy Williams, Ph.D.

Head of Plant Biotechnology



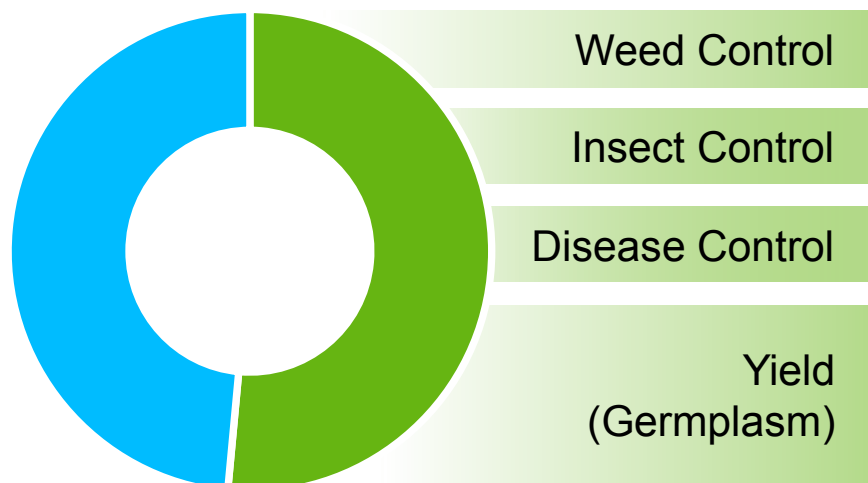


Robust Biotech Trait Franchise Drives ~40% of Seed & Trait Sales

Our Broadly Licensed Traits Reach >350m acres Annually Across Corn, Soybeans and Other Crops

2018 Crop Science Pro Forma Sales €19.3bn

*Value Components
in the Seed Bag*



Crop Protection Seed & Traits

Leading Traited Seed Offerings Today



U.S.A

- // SmartStax RIB Complete
- // VT Double PRO RIB Complete
- // VT Triple PRO RIB Complete
- // DroughtGard VT Double PRO RIB Complete
- // Trecepta (offered with VT Double PRO)
- // Roundup Ready Corn 2

BRAZIL

- // VT Triple PRO
- // VT Double PRO



U.S.A.

- // Roundup Ready 2 Xtend
- // Roundup Ready 2 Yield

BRAZIL & ARGENTINA

- // Intacta RR2PRO



U.S.A.

- // Bollgard 3 XtendFlex Cotton
- // Roundup Ready XtendFlex Cotton

INDIA

- // Bollgard II Cotton

AUSTRALIA

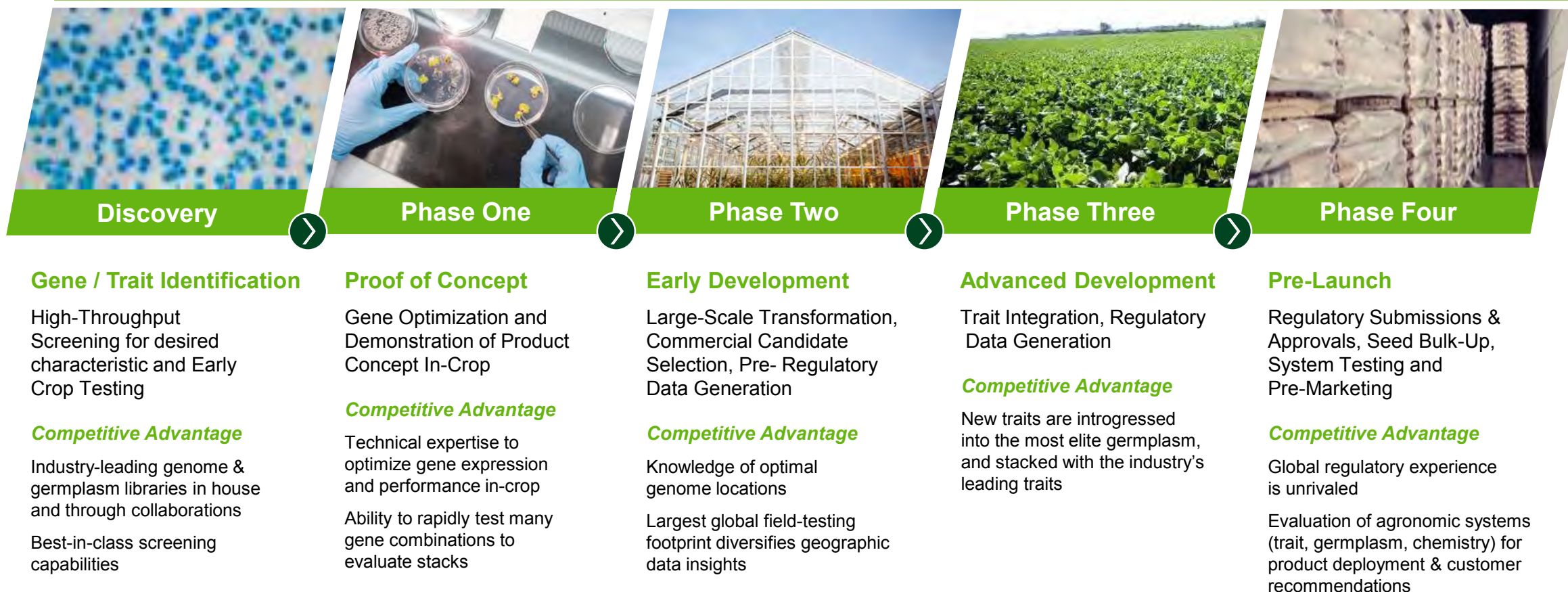
- // Bollgard 3 Roundup Ready Flex Cotton
- // Roundup Ready Flex Cotton



Scale and Expertise in Biotech Crop Development Lead the Industry

Developing World-Class Biotech Traits and Crops

Trait Development Process (12-15 years)





Relentless Optimization of Biotech Trait Development Capabilities

Drives Delivery of >20 New or Next-Generation Products in the Pipeline

Key Differentiating Biotech Trait Development Capabilities

1. Gene discovery: Leverage extensive internal microbial and plant genome collection and best of external innovation to drive new gene discovery for industry-leading trait pipeline

2. Protein optimization & expression expertise: Key to turning discovered genes into commercial traits, enabled delivery of first-ever trait to control a piercing/sucking insect pest

**EX: Protein Optimization;
Lygus and Thrips Control
Cotton**

Protein design and optimization expertise resulted in a protein that controls targeted piercing/sucking insect pests of cotton expressed in the plant tissues that the insects attack



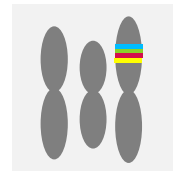
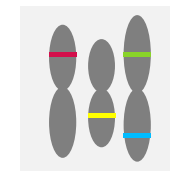
3. Experts in building multi-gene vector stacks and site directed integration via gene editing:

Crucial to putting more genes at single chromosomal location to speed trait deployment

EX: Site-Directed Integration

HISTORICAL

TODAY



4. Robust regulatory data and submission strategies to secure early cultivation country regulatory approvals; proactive preparation and immediate responses to technical questions

Collaborations



RNA-guided nucleases:
CRISPR-Cas9 & CRISPR-Cpf1



PAIRWISE

Base-pair editing
technology



Disease Resistance
Research & Technology



SECOND
GENOME

Metagenomics &
Gene Discovery

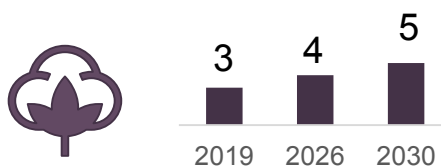


Biotech: A Global Leader in Insect-Control Solutions

Next-Generation Solutions in Corn, Soybeans and Cotton all in Pre-Commercial Phase 4

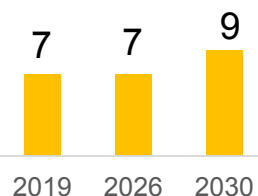
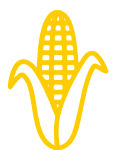
Leading Insect Control Biotech Trait Pipeline

of Genes for Control Targeted

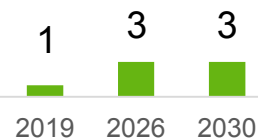


Key Pests Controlled with Expected Insect traits by 2030

Cotton Bollworm
Fall and Beet Armyworms
Lygus
Pink Bollworm
Thrips



Black Cutworm
Corn Borers
Corn Earworm
Corn Rootworm
Fall Armyworm
Western Bean Cutworm



Bean Shoot Moth
Black armyworm
Podworm Complex
Southern armyworm
Soybean Looper
Velvetbean Caterpillar

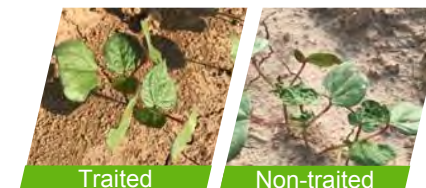
MoA = Mode of Action

Key Next Generation Insect Control Traits

Near-Term Projects Refresh Solutions in Corn, Soy and Cotton

Lygus and Thrips in Cotton
Phase 4

- // First biotech trait for piercing and sucking insects
- // >10m acre opportunity



Third-Gen Below-Ground in Corn
Phase 4

- // 3 modes-of-action for rootworm control
- // Novel RNAi MoA
- // >100m acre opportunity



Intacta 2 Xtend
Phase 4

- // Improved durability and expanded spectrum
- // Additional herbicide tolerance MoA (dicamba)
- // >100m acre opportunity

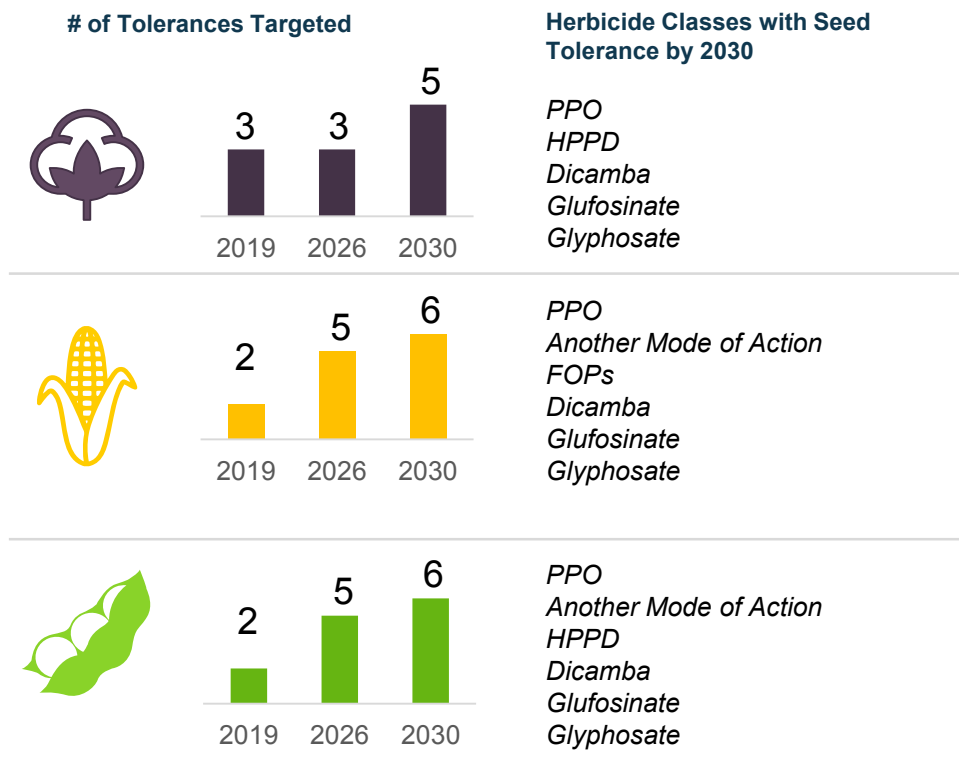




Biotech: A Global Leader in Weed-Control Solutions

Expect Tolerances to Five-to-Six Herbicide Classes Across Corn, Soybeans and Cotton by 2030

Herbicide Tolerance Biotech Trait Pipeline Replenishes Value for Weed Control Benefit in Seed



HPPD = 4-hydroxyphenylpyruvate dioxygenase
PPO = Protoporphyrinogen oxidase

Next Generation Biotech Weed Control Solutions

Example: Soybean Herbicide Tolerance

Third-Gen Phase 4

- // Glyphosate
- // Dicamba
- // Glufosinate



Fourth-Gen Phase 2

- // Glyphosate
- // Dicamba
- // Glufosinate
- // HPPD & another mode of action



Fifth-Gen Phase 1

- // PPO tolerance added to earlier generation tolerance stacks





Short Stature Corn Offers Transformational Shift in Production

Inspired by 'Green Revolution' Agronomic Science Pioneered by Dr. Norman Borlaug



Jerseyville, Illinois, U.S. August 2018



Key Takeaways

Biotechnology

1

Clear leaders in biotechnology with broadly licensed traits that reach >350M acres annually

2

Leveraging extensive internal microbial and plant genome collection and external innovation to drive new gene discovery

3

Protein optimization and expression expertise is key to turning discovered genes into commercial traits

4

Experts in building multi-gene vector stacks and site directed integration via gene editing

5

Robust regulatory and submission strategies drive successful commercialization of traits

6

Robust pipeline of >20 next-generation traits to manage resistance and expand into new areas, critical to meeting commitment to reduce environmental impact by 30 percent by 2030



Crop Science Summer Technology Showcase

Chemistry



Axel Trautwein, Ph.D.
*Head of Crop Science R&D
Small Molecules*

Marco Busch, Ph.D.
Head of Weed Control Research











Leading Crop Protection Portfolio Delivers ~€9 bn Sales Today

Provides Season-Long Solutions for Control of Weeds, Disease and Pests in Relevant Crops








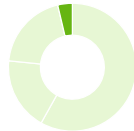
Global Herbicide Market^{1,2}

Crop % of Mkt. Bayer Position⁴

| | | |
|--|---|----|
|  Corn |  | #1 |
|  Soybean |  | #1 |
|  Cereals |  | #1 |






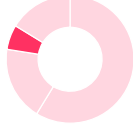
Global Fungicide Market^{1,2}

Crop % of Mkt. Bayer Position

| | | |
|---|---|----|
|  Horticulture |  | #2 |
|  Soybean |  | #1 |
|  Cereals |  | #1 |
|  Corn |  | #3 |

Global Insecticide Market^{1,2}

Crop % of Mkt. Bayer Position

| | | |
|---|---|----|
|  Horticulture |  | #1 |
|  Soybean |  | #3 |
|  Corn |  | #3 |

¹ Global Market: Represents the defined crop's portion of the global herbicide market. Optimas forecast for Market 2018, Status October 2018

² Bayer Indication Position: Agrowin 2017 + estimations for DowDupont and Bayer divestments split and allocation, Status October 2018;

³ Bayer S&T Footprint: Internal estimations of percent of planted acres in the region containing at least one seed or trait technology from Bayer

⁴ Corn herbicide position is head-to-head with ChemChina



Crop Protection Small Molecules Innovation Approach Constantly Redefined and Adapted to Meet Changing Needs of Farmers

Drivers

Weed, Insect and Fungal Resistance

Regulatory Pressure on Old Products

Increasing Regulatory Hurdles for New Products

Strong Reliance on a Few Modes of Action

Redefining Our Approach

**CROP
PROTECTION
SMALL
MOLECULES
INNOVATION**

Dedicated activities to understand resistance

Establishing early safety testing tools

New technologies like phenotyping to find new products

Target Strategy to find new Modes of Action



Innovative Small Molecules for Farmers

Customized Agronomic Solutions Along the Plant's Life Cycle



Seeds & Traits:
High yielding seeds



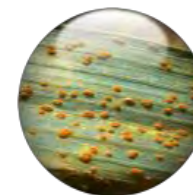
Seed Treatment:
Effective protection from soil pests and nematodes



Weed Management:
Incl. new tools to address resistances



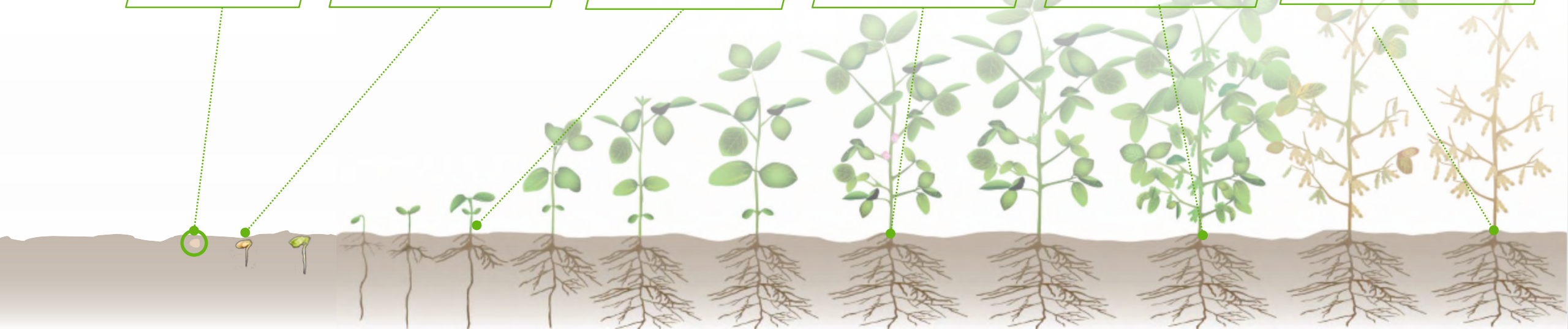
Pest Management:
To avoid loss due to yield-robbing pests



Disease Management:
To prevent losses from diseases



TARGET: Healthy Plants:
With high yield and high quality



Pre-seeding
Burndown Herbicide

Germination

Leaf Development

Flowering

Pod Development

Ripening

Senescence

Image source: University of Illinois, 1999



Agrochemistry Focused on Innovative Small Molecules for Farmers

Data Analysis, Structure Design and Synthesis Drive New Candidates

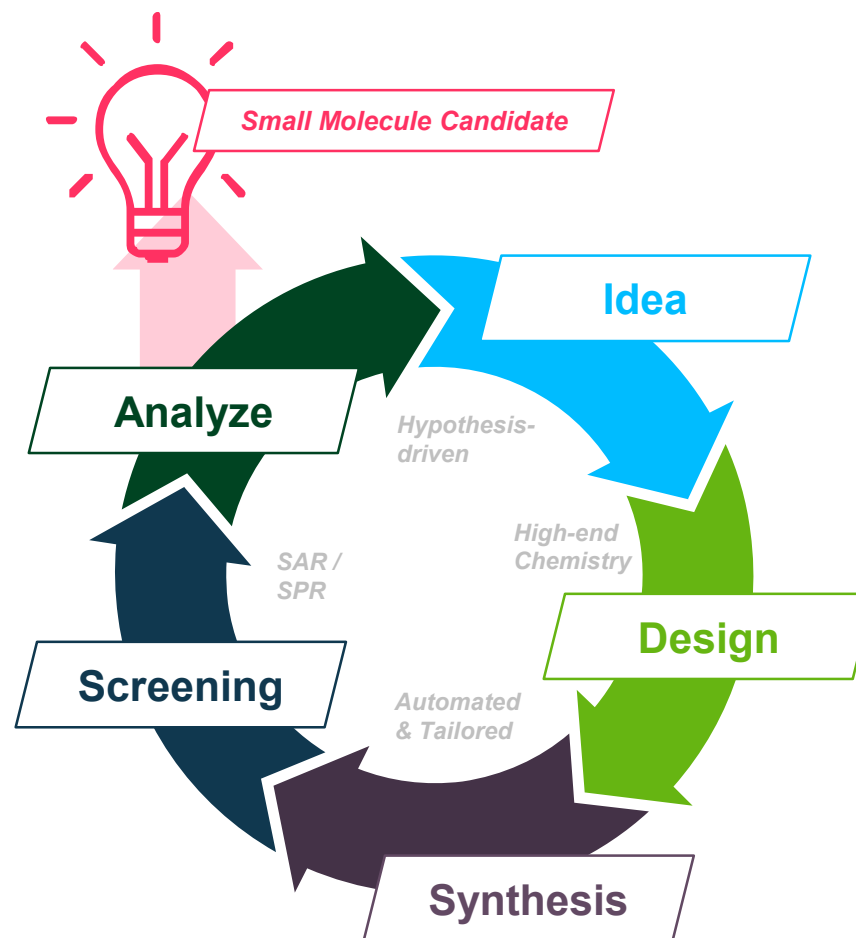
Analyze Data

- // Analytics
- // Biochemistry & Biology
- // Agrokinesics & Toxicokinetics
- // Human & Environmental Safety
- // All supported by Data Science

Screening

- // Automated High throughput testing
- // Greenhouse testing
- // Advanced sensor enabled profiling platform
- // Special test for local conditions (e.g. soil types)
- // High throughput safety testing

SAR: structure activity relationship
SPR: structure property relationship



Generate Idea

- // Screening Approaches
- // Bayer Life-Science Switch
- // Collaborations & Technology Scouting
- // Digital & Data Science

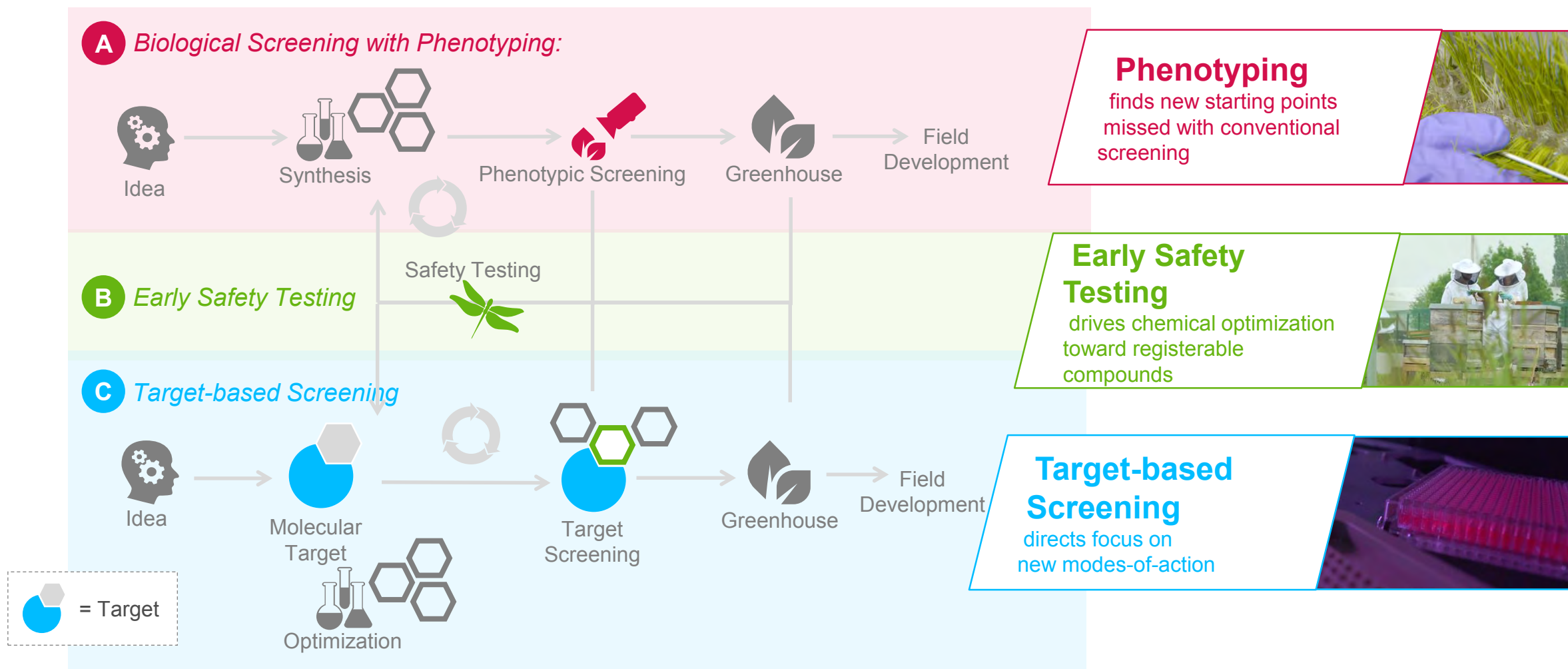
Design Structures

- // Creativity & Expertise
- // Digital Tools
- // Hypotheses-driven
- // Intellectual property

Synthesize Molecules

- // Active Ingredient Labs
- // Automation & Purification Labs
- // Scale-Up Network
- // Internally & Externally

Complementary Screening Approaches and Early Safety Testing to Find Differentiating Small Molecules

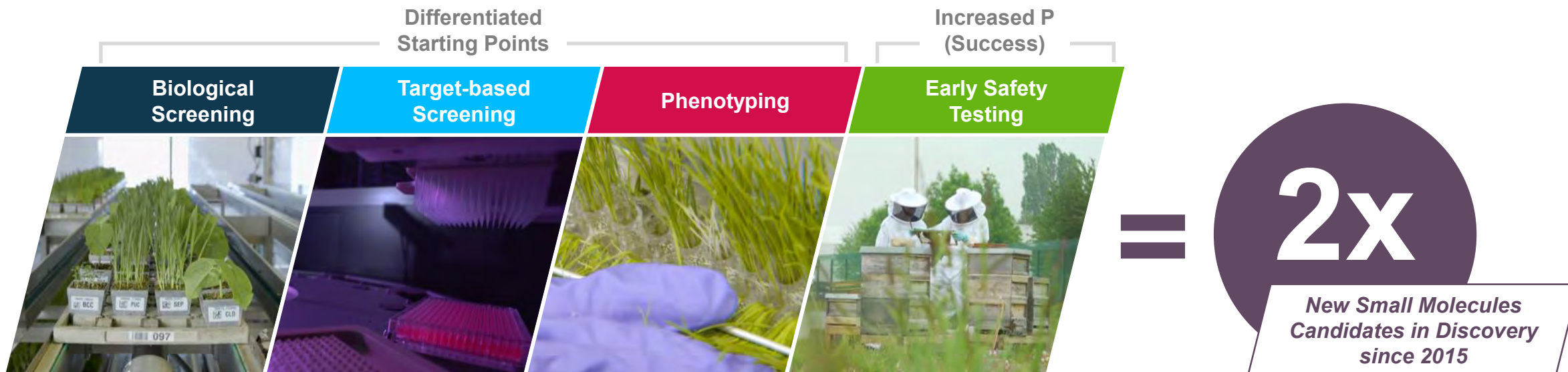




Enhancements to Identify and Optimize Small Molecule Candidates

Early Safety Testing and tailored Screening Approaches, Combined with New Data Tools, Collectively Contribute

To identify diverse development candidates with a higher probability of regulatory success with new modes-of-action, we constantly improve and tailor our approaches:





Key Takeaways

Small Molecules

1

Leading crop protection portfolio delivers €9bn sales annually

2

Integral part of tailored solutions

3

Target based screening and phenotyping creates differentiated starting points

4

High throughput and project specific safety testing increases the selection of most likely candidates and optimizes towards registerable compounds

5

Enhancements have delivered 2x new small molecules candidates since 2015



Crop Science Summer Technology Showcase

Biologicals



Benoit Hartmann, Ph.D.

Head of Crop Science R&D, Biologicals

Denise Manker, Ph.D.

R&D Fellow, Biologicals





Biologicals Expand Solution Set for Growers Globally

Biological Treatments and Sprays Serve Multiple Crops with Sustainable, Broadly Accepted Technology

////// ***Biologicals** consist of*

Microorganisms

(e.g. bacteria, fungi and viruses)

Beneficial Macroorganisms

(e.g. predatory mites)

Semiochemicals

(e.g. pheromones)

Natural Compounds

(e.g. plant extracts)



Seed treatment
(Corn and Soy)

Nutrient availability
Root architecture



Soil
(Potato, vegetables)

Trigger host defense
Promote plant health



Foliar spray
(Fruit and vegetables)

Pest & Disease Control
Protect yield

// We enable growers to achieve **best results** by offering **tailored solutions**

// We help growers to meet **societal demands** in a **sustainable** way,
contributing to our commitment to reduce our environmental impact by 30%

// We develop biologicals that are based on **modern** and **responsible science**



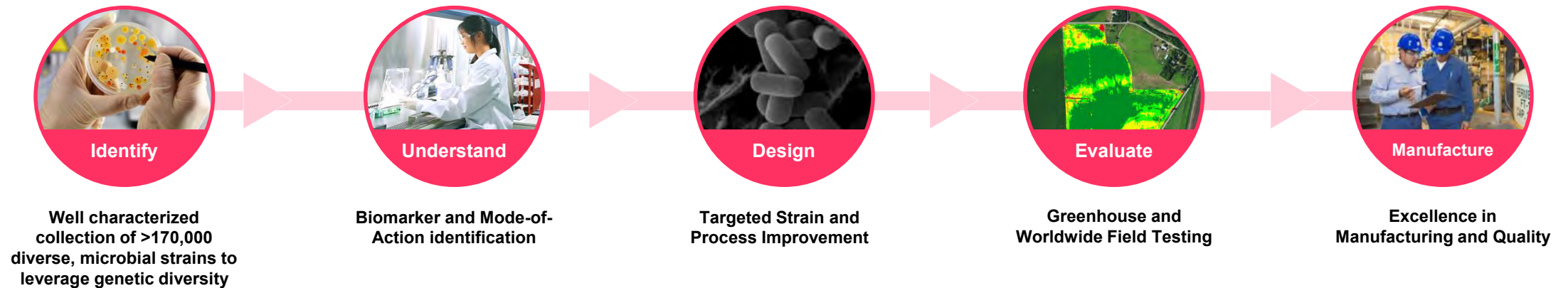
Biologicals: Expanding Pipeline of Differentiated Products

Accelerating Transformation in the Development and Delivery of New Biological Products

From broad testing of conventional microbes...

“Bayer is perfecting a process that selects the strains we want to bring to market, improves them to meet commercial standards and then predicts and optimizes how well they will perform.”

...to hypothesis & data-driven design of differentiating microbes with combined talent of both organizations



.....through investment in next generation microbial technologies and digital tools



Leading Biologicals Capabilities, from Strain Optimization to Manufacturing Excellence

Partner of Choice to Bring Solutions to the Growers

Core Competencies

Unsurpassed capabilities through access to internal resources throughout Bayer



**Discovery
Platforms**



**System
Biology**



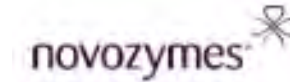
**Fermentation &
Formulation**



**Global
Infrastructure**

Preferred Partner in Ag Biologicals

Portfolio of collaboration and strategic partnership to access new technologies & complementary products



Grants4Biologicals





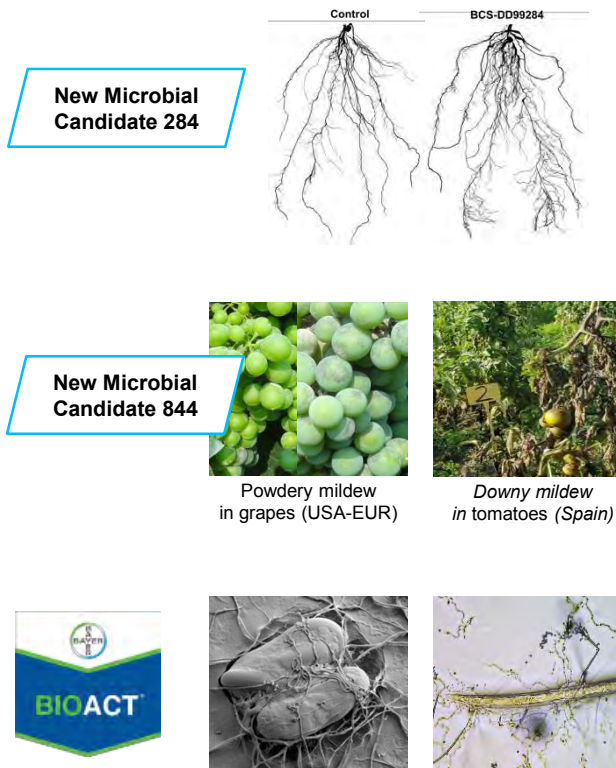
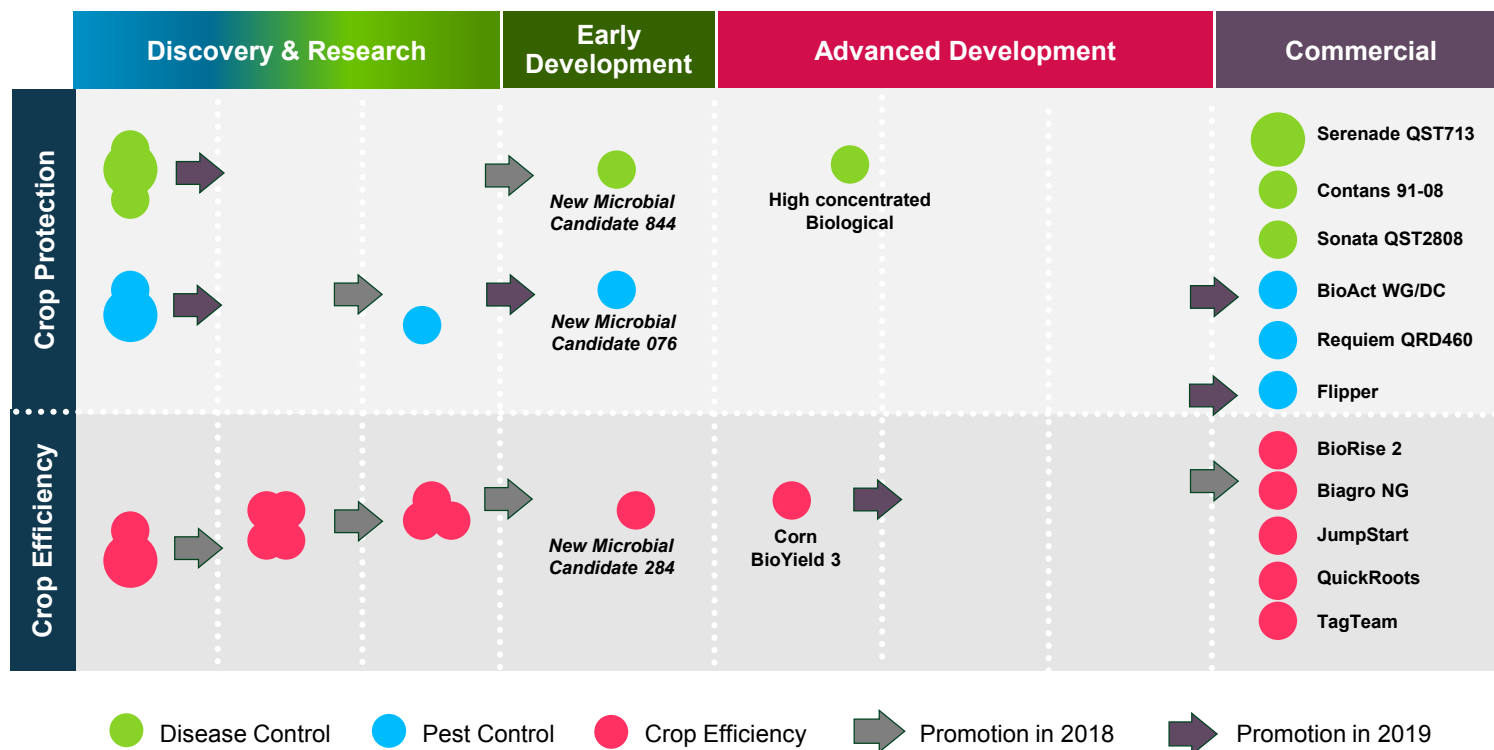
Combination Results in Leading Biologics Portfolio and Pipeline

Leading Portfolio in Corn Seed Treatments and New Generation Products in Horticulture

Leading Portfolio and Pipeline in the Industry

Product Highlights in Demonstration

Successful commercial assets with leading portfolio and pipeline in Corn Seed Treatment and strong portfolio in horticulture with new generation products





Key Takeaways

Biologics

1

Biologics will be a part of the future of agriculture and we are uniquely positioned to lead the way in row crops and horticulture

2

Expanding pipeline of differentiated biological products from broad testing of conventional microbes and data-driven design of differentiating microbes

3

Leading biological capabilities in discovery, systems biology and fermentation and formulation

4

World's leading germplasm base allows for study of the interaction between plant genetics and broad integrated testing networks allows testing within the small molecule platform

4

Preferred partner for collaboration and partnership to access new technologies and complementary products



Crop Science Summer Technology Showcase

Data Science



Mark Young

Climate Chief Technology Officer

Sam Eathington, Ph.D.

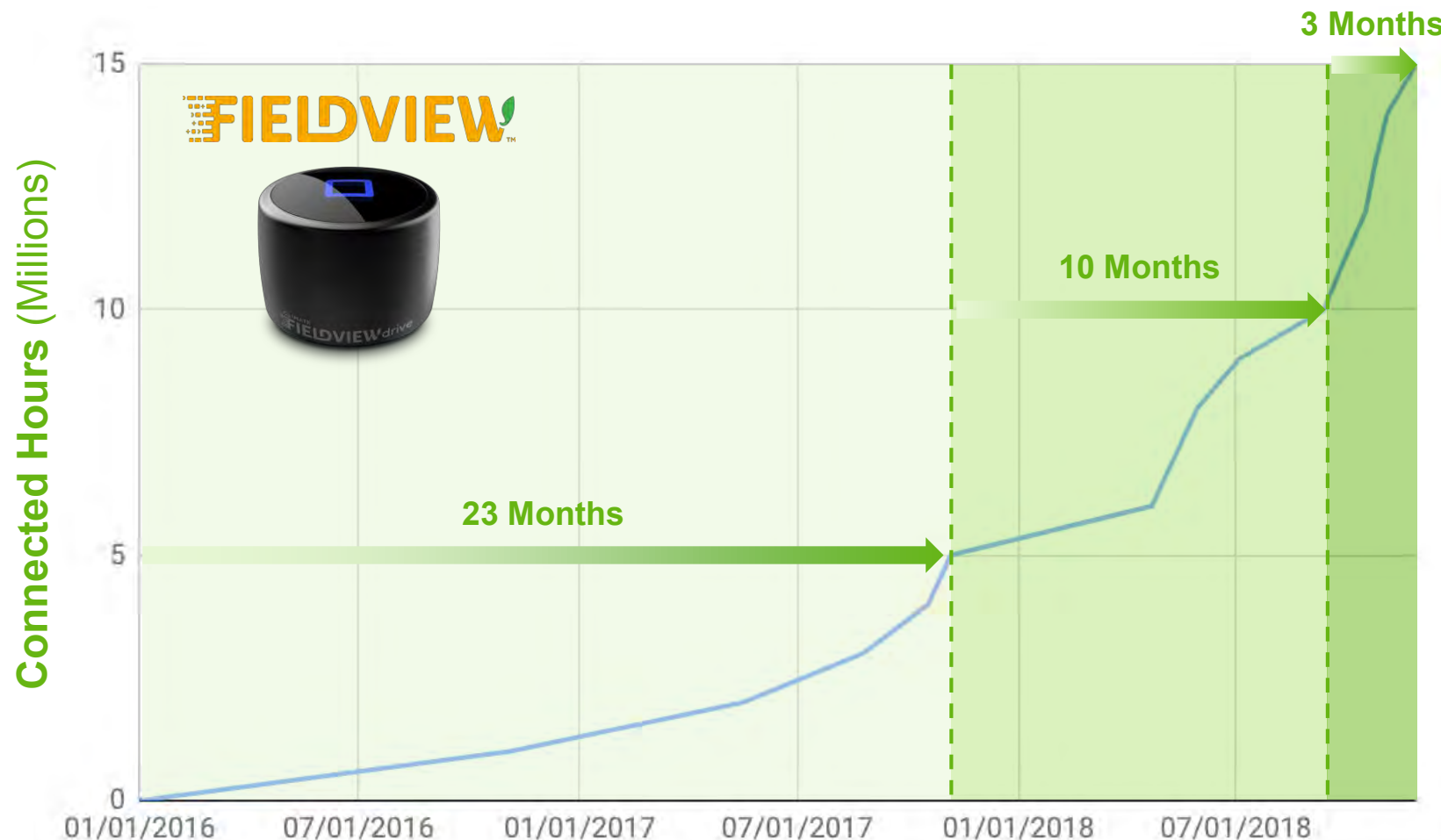
Climate Chief Science Officer





Data Collection as Core Competitive Advantage

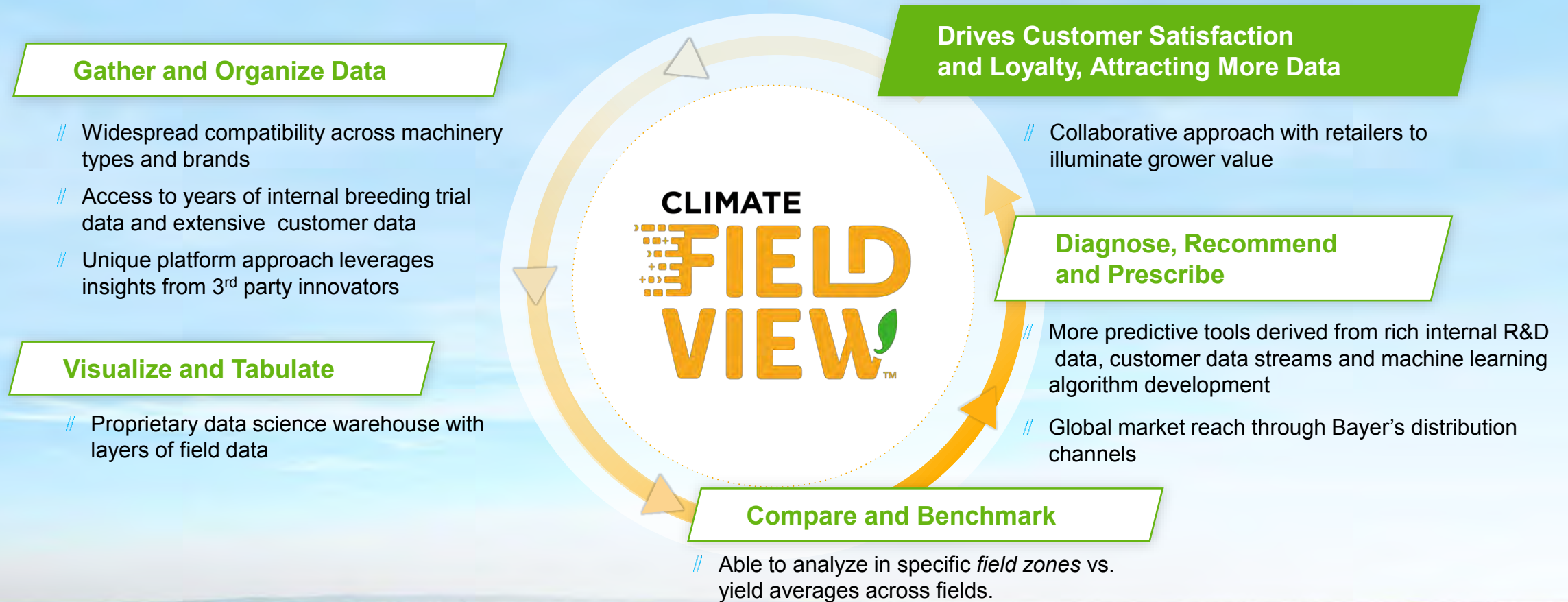
Able to Collect 5 Million Connected Hours of Data in a Fraction of the Time it Took a Year Ago





Significant Differentiators in Bayer Digital Farming Tools

Advantages at Every Turn of the Cycle, from Data Collection to Collaboration with Retailers





Key Features in Climate FieldView

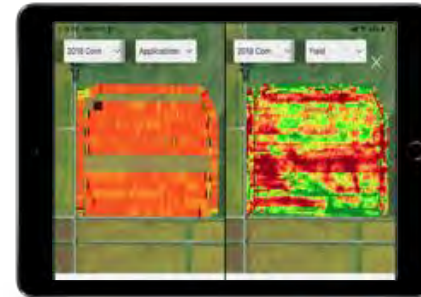
Climate FieldView Tools Provide Unmatched Visualization, Analysis and Insights



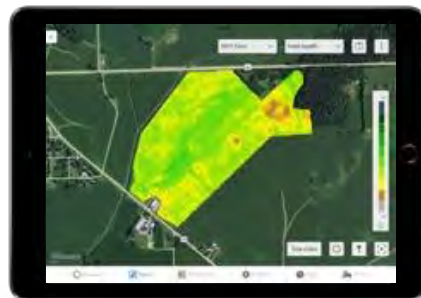
In-cab visualization



Yield analysis



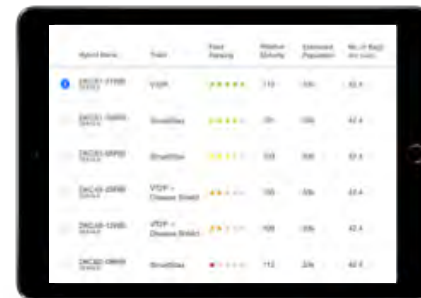
Performance Visualization



Field health images



Advanced seed prescriptions



Seed Placement Advisor*

* 2019 Limited Launch





Climate FarmRise Creates a Daily Conversation with Smallholders

Serves ~100K Monthly Active Users in India; Focuses on Local Agronomics, Credit and Crop Marketing

Objective

To have a daily conversation with our smallholders and be the **digital companion for all of their needs.**

Early Success in India

- // Focus on unique smallholder challenges (local agronomics, credit, crop marketing)
- // Available in **10 states, 6 languages**
- // Agronomic info for **10 key crops**
- // Marketing info for **64 crops**
- // Built to scale across multiple **geographies, crops, and partners**





Vast, Diverse Data and Technical Infrastructure Drive Machine Learning Capabilities and Competitive Advantage

Smarter Digital Tools Enable Significantly Improved Decision-Making and Productivity for Growers

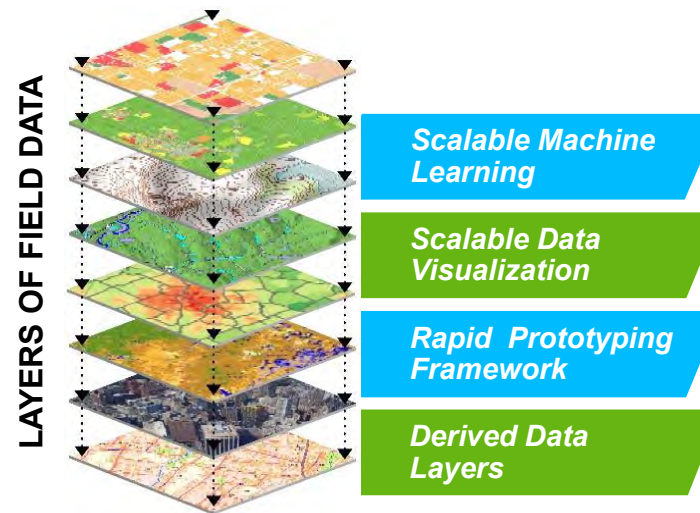
Data Sources

- // Bayer Research Trials
- // Climate Research Farms
- // Climate Research Partners
- // FieldView Data
- // Environmental Data
- // Platform Partner Data

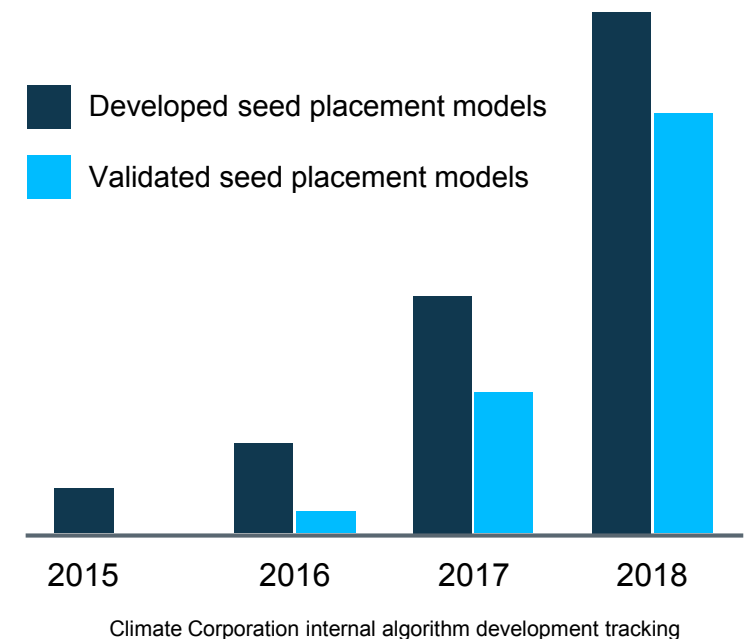


Proprietary Data Science Warehouse

- // Ingest
- // Clean
- // Standardize
- // Grid
- // Integrate



Machine Learning Algorithm Development



Our data science warehouse and machine learning platform dramatically improves predictive models



Introducing Seed Placement Advisor for Corn

Using Multiple Algorithms and FieldView Data to Support Seed Selection and Field Placement has Significantly Improved Productivity in Field Tests

2016

2017

2018

2019

Algorithm Development ¹

- // 10 years of Bayer R&D Data
- // 6m Data Points
- // +53K Fields, ~7,600 Hybrids
- // Validated Using 4.4m Acres of FieldView Customer Data

Field Tests ¹

2017 Results

77% win rate
+6 bu/ac

2018 Results

80% win rate
+9.1 bu/ac

2019 Beta (Launch)

- // \$4/acre per season
- // 50 dealers, 3 states
- // 250 farmers; 250K acres

➤ Algorithm selection of corn hybrids
predicted win rate of 80% and
3-4 bu/ac advantage

➤ Additional data points confirm
algorithm predictability and
continual improvement

➤ Developing algorithm for soy:
beta testing in 2020

¹ Internal estimates and field trials



In-Season Disease Risk Prediction to Identify Susceptible Fields

Faster Scouting and More Timely Deployment of Crop Protection

Field Level Risk Model

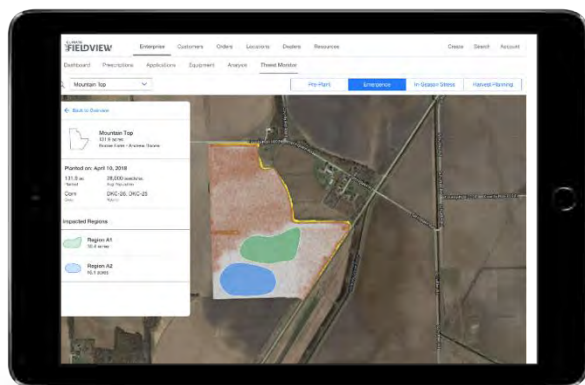
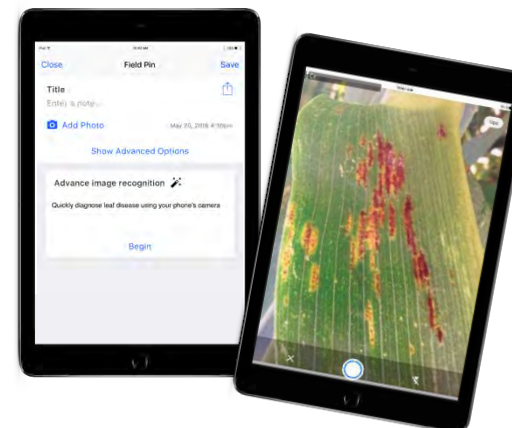


Image Collection / Scouting Tools



Disease identification tools



- // In-season predictions of disease impact for each field
- // *Enabling business models that help farmers address risk by identifying fields with highest likelihood of positive return for fungicide application*

- // Faster, simplified scouting with automatic disease identification
- // Incorporate history into next season management and product selection
- // *Expanding to weed, insects, soil and residue cover models across multiple crops and geographies*



Key Takeaways

Data Science

1

Unparalleled data access with widespread machinery compatibility, access to years of internal breeding data and extensive customer data

2

Widening the gap with our leading proprietary data, warehouses and algorithms and the velocity of new data accumulation

3

Creating new value through predictive features like Seed Placement advisor

4

Enabling business models to help address risk with in-season field risk reports and disease risk prediction modeling

5

Addressing both large and smallholder farmers' unique challenges



Crop Science Summer Technology Showcase

Welcome



August 1–2, 2019
St. Louis, Missouri, U.S.A.





Event Agenda – Day 2

Crop Science Summer Technology Showcase – Day 2 // Jerseyville Agronomy Center, August 2, 2019

| | | | |
|-----------------|---|---|---|
| 6:30 am | <i>Breakfast</i> | | <i>Drury Plaza Hotel - Main Ballroom</i> |
| 7:15 am | Technology Q&A Panel | Bob Reiter, Mike Graham, Axel Trautwein, Jeremy Williams, Sam Eathington, Benoit Hartmann, Shannon Hauf, Calvin Treat | <i>Drury Plaza Hotel – Main Ballroom</i> |
| 8:00 am | Site & Safety Overview | Laura Meyer | <i>Drury Plaza Hotel - Main Ballroom</i> |
| 8:15 am | <i>Travel to Jerseyville</i> | | <i>Buses waiting outside main lobby</i> |
| 9:20 am | Rotating Field Stops – Differentiated Tailored Solutions* // Producing Better; Progression of Corn Production // Transforming Corn Production with Short Stature Corn // Next Generations of Weed Control // Next Generations of Insect Control // Tailored Solutions and New Business Models | Bob Reiter, Mike Stern Calvin Treat, JD Rossouw Arnd Nenstiel, John Chambers Renata Bolognesi, Rodrigo Santos Aaron Robinson, John Jansen | |
| 11:50 am | Closing Remarks | Liam Condon | |
| 12:00 PM | <i>End of Day</i> | <i>Box lunches will be provided</i> | <i>Buses depart for ST. Louis Airport and Drury Plaza Hotel</i> |

*Rotating Sessions: Groups of ~20 Investors and Bayer Ambassadors. Each stop to include 25 minute presentation and Q&A and 5 minutes transition.



Forward-Looking Statements

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 at <http://www.bayer.com/>.

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



Crop Science Summer Technology Showcase

Technology Q & A Panel



August 1–2, 2019

St. Louis, Missouri, U.S.A.





Crop Science Technology Leadership Q&A Panel

Crop Science Summer Technology Showcase

- // Bob Reiter, *Head of R&D Crop Science*
- // Mike Graham, *Head of R&D Crop Science, Breeding*
- // Axel Trautwein, *Head of R&D Crop Science, Small Molecules*
- // Jeremy Williams, *Head of Plant Biotechnology*
- // Sam Eathington, *Climate Chief Science Officer*
- // Benoit Hartman, *Head of R&D Crop Science, Biologics*
- // Shannon Hauf, *Head of Soybean Technology R&D*
- // Calvin Treat, *Head of Corn Technology R&D*



Jerseyville Agronomy Center Field Demonstrations

***Producing
Better***

***Tailored Solutions and
New Business Models***

***Next-Generations
of Weed Control***

Transforming Corn Production

***Next-Generations
of Insect Control***



Crop Science Summer Technology Showcase

Producing Better



Bob Reiter, Ph.D.

Head of R&D Crop Science Division

Mike Stern, Ph.D.

*Head of the Climate Corporation and
Digital Farming*



Each Plot
=10
Bushel Yield

 **Future**

 **2019**

 **2018**

 **2000**

 **1980**

 **1940**



Producing Better

The history of corn production plot demonstrates the great strides we have made in producing more with less, and the opportunity we have to continue to “produce better” through tailored solutions that drive us toward our reduced environmental impact commitment while meeting the needs of a growing population on an increasingly hotter planet.



Crop Science Summer Technology Showcase

Transforming Corn Production



Calvin Treat, Ph.D.

*Head of Crop Science R&D Crop
Technology, Corn*

JD Rossouw, Ph.D.

Head of North America Breeding





Proprietary Global, Diverse Germplasm Library Foundational to Successful Breeding Program

Our germplasm library includes *hundreds of thousands of unique sets of genetic information.*

Our diversity of germplasm, based on seed companies and global assets acquired over more than 20 years, helps us generate *more than 1 million new genetic combinations every year.*

This is the *foundation for continued seed product development* that can perform in the various field environments in which our customers farm.





Evolving from Selecting the Best to Designing the Best

Precision Breeding Tools Lead to Best Recommendations for Growers

Breeding Evolution: From Selecting the Best to **Designing the Best**

- // 15 years of marker to phenotype association enables **“yield testing”** in the lab, in addition to our field testing footprint
- // Sequencing and seed chipping platform **enables high density information** and **higher throughput**
- // Systematically connect artificial intelligence (AI), genetic engine and product testing in a protected environment to design the desired performance
- // Building on tools and capabilities to usher in Genome Editing benefits in the next decade



Expected Improvements in the Breeding Pipeline by 2022

- // Achieve 30% increase in genetic gain
- // 100% of pipeline decisions are AI driven
- // Sustainability and Social Responsibility expanded in our business practices at every site

Precision Breeding capitalizes on investments in data science, automation & advanced marker technology



AI Driven Pipeline



**Every Seed
Genotyped**



**Protected
Culture**



**Automated Seed
Processing**



**Prescribed Field
Experiments**



Imaging at Scale



**Globally connected
Harvest**



Short Stature Corn Offers Transformational Shift in Production

Benefits Include Plant Stability, Late Season Applications of Crop Inputs and Efficient Use of Key Nutrients



Reduced Crop Loss

- // Enabled by improved plant stability and lodging tolerance
- // Reduces crop loss from challenging environmental conditions
- // Annual yield losses due to stalk lodging in the U.S. range from 5% to 25%¹



Precision of Crop Input Applications

- // Extended in-season crop access due to shorter height
- // Supports tailored solutions with precise in-season crop protection



Increased Environmental Sustainability

- // Potential to optimize use of key nutrients like nitrogen, as well as reducing land and water requirements

¹ Purdue University (<https://www.extension.purdue.edu/extmedia/ay/ay-262.html>)

Acre Fit



Potential fit across
140
Million
Corn Acres
in the Americas

Multiple Generations in the Pipeline

- // Lead project through conventional breeding, in **Phase 2**
- // Biotechnology approach in collaboration with BASF, also in development, in **Phase 2**





Short Stature Corn Offers Transformational Shift in Production

Inspired by 'Green Revolution' Agronomic Science Pioneered by Dr. Norman Borlaug



Jerseyville, Illinois, U.S. August 2018



Key Takeaways

1

Plant Breeding: Industry leading global germplasm library drives yield improvements, genetic diversity and customer solutions

2

Market leader in advancing new approaches in environmental characterization, field insight and data analytics for better customer solutions

3

***Breeding evolution* has positioned us for step-change yield performance; *Precision breeding* drives next step change**

4

Significant opportunities to deliver tailored solutions for crop diseases and other stresses

5

Bayer short stature corn product concept creates a step-change in corn growing practices enabling greater opportunities for tailored solutions and more sustainable products

Transforming Corn Production

Bayer Crop Science is transforming corn production through the optimization of a global diverse germplasm pool with advanced breeding tools that results in the launch of hundreds of new higher-performing hybrids every year.

From this foundation, we are developing short-stature corn, currently in phase 2. This will allow farmers to grow corn more sustainably, enabling precise season-long application of inputs, allowing the crop to better withstand lodging and green snap and to potentially use less water, land and other resources while achieving desired yields.



Global Germplasm Collection



Short Stature Corn Biotech Approach



Short Stature Corn Breeding Approach



Precision Breeding



Crop Science Summer Technology Showcase

Next Generations of Weed Control



Arnd Nenstiel-Koehling, Ph.D.

Head of Asset Mgmt. Herbicides

John Chambers

Head of Market Development, North America





Every Farmer Has to Perform Weed Control

Without Controlling Weeds, One Third of Yields Would be Lost

Grower needs in weed control:



Typical infestation of Palmer Amaranth in Southeast U.S.A.

WITHOUT
WEED CONTROL MEASURES



Typical infestation of Black Grass in cereal field in the UK

Weed-free field ...

WEED DESTRUCTION TOOLS

(in the order of cost & convenience to the grower)

- 1 Herbicides
- 2 Mechanical / Manual
- 3 New emerging weed control solutions

... without damaging the crop

SELECTIVITY MECHANISM that protects the crop from herbicides and, in the case of herbicide tolerant traits, enables conservation and no-till systems that conserve topsoil and improve carbon sequestration.

- 1 Intrinsic selectivity (selective herbicides)
- 2 Positioning selectivity; timing and targeted applications
- 3 Safeners
- 4 Herbicide Tolerance (HT) Traits

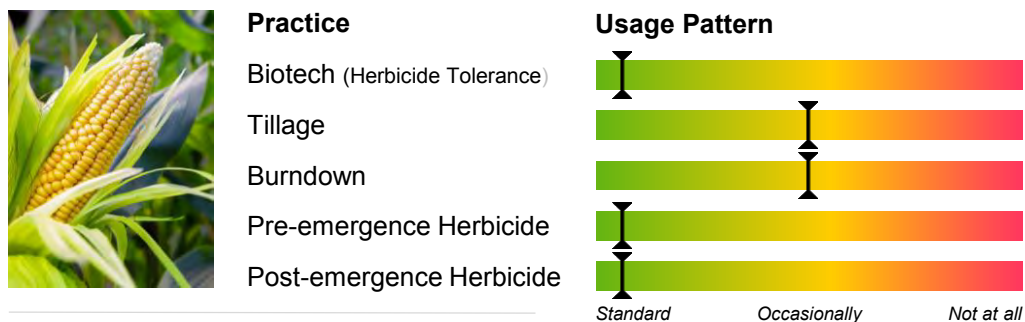


Availability of Tools and Growing Resistance is Prompting Farmers to Diversify Weed Management Practices Around the World

Typical Weed Management Practices in Different Crops and Regions

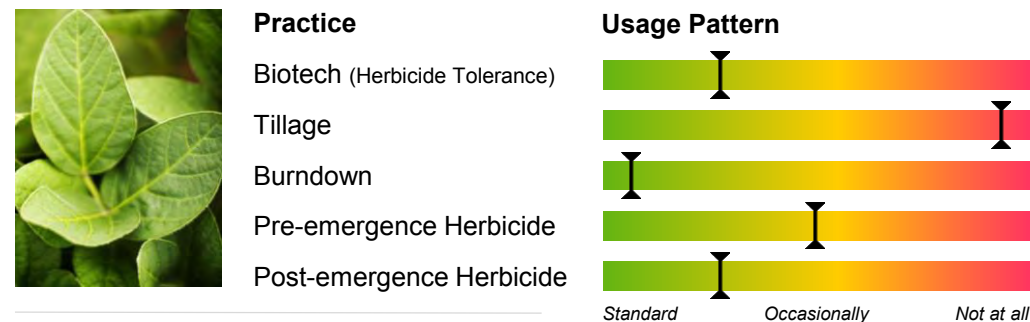
Corn – North America (Large scale professional farmers)

Primary challenge: Palmer Amaranth, Waterhemp, Giant Ragweed (Dicots)



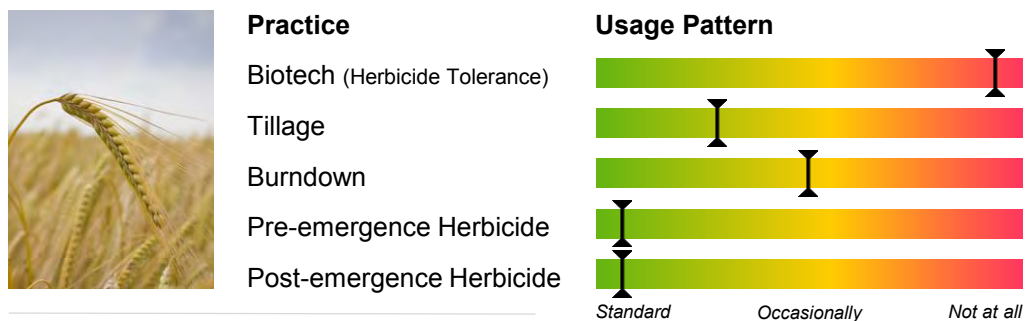
Soybean – South America (Large scale professional farmers)

Primary challenge: Resistant grasses (e.g. digitaria insularis, eleusine indica) and broadleaf weeds (e.g. conyza, palmer amaranth)



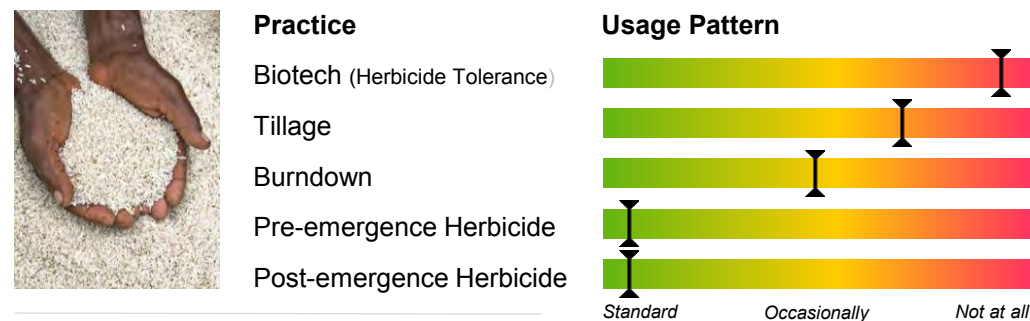
Cereals – EMEA (Large and medium sized farms)

Primary challenge: Grass weeds (blackgrass, ryegrass)



Rice – APAC (Small farms)

Primary challenge: Grass weeds (sedges), e.g. echinocloa, red rice

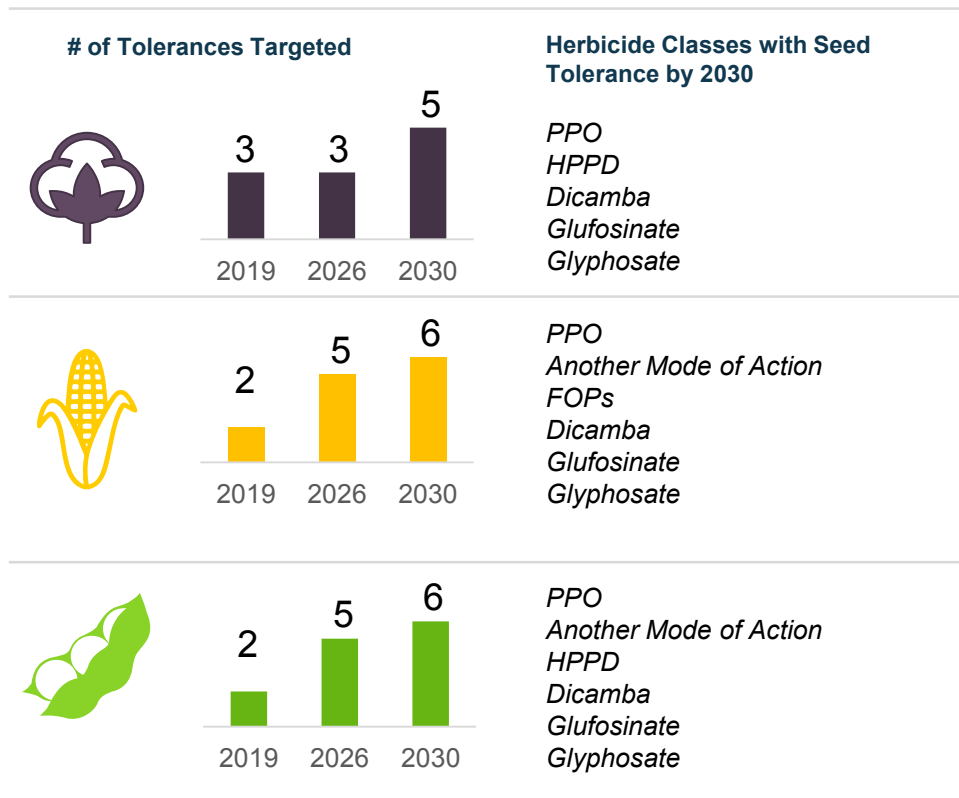




Biotech: A Global Leader in Weed-Control Solutions

Expect Tolerances to Five-to-Six Herbicide Classes Across Corn, Soybeans and Cotton by 2030

Herbicide Tolerance Biotech Trait Pipeline Replenishes Value for Weed Control Benefit in Seed



HPPD = 4-hydroxyphenylpyruvate dioxygenase
PPO = Protoporphyrinogen oxidase

Next Generation Biotech Weed Control Solutions

Example: Soybean Herbicide Tolerance

Third-Gen Phase 4

- // Glyphosate
- // Dicamba
- // Glufosinate



Fourth-Gen Phase 2

- // Glyphosate
- // Dicamba
- // Glufosinate
- // HPPD & another mode of action



Fifth-Gen Phase 1







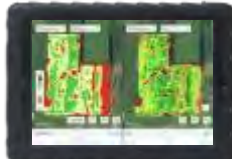



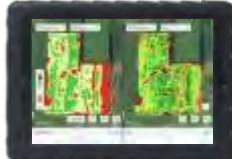


- // PPO tolerance added to earlier generation tolerance stacks





Herbicides: Capitalize on Opportunities with Leading Portfolio

New Value Capture Concepts Around Integrated Weed Management in a Changing Weed Control Market Environment

| | Global Herbicide Market ^{1,2} | | Seed & Trait Footprint ³ | | Key Growth Factors | Digital Tools |
|--|--|-----------------------------|--|---|---|---|
| |  Crop % of Mkt. | Bayer Position ⁴ |  Bayer % of Planted Acres | | | |
|  Corn |  | #1 | NA  | LATAM  | Corn in NA and LATAM: Expand share of combined portfolio by including selective herbicides in existing grower offers |  In-season Field Health |
|  Soybean |  | #1 | LATAM  | | Soybean in LATAM: Launch new selective herbicides to complement glyphosate business and contribute to holistic crop solutions |  In-season Field Health |
|  Cereals |  | #1 | Not relevant | | Cereals in EMEA: Defend/expand industry-leading position in cereals through differentiated lifecycle management | |

¹ Global Market: Represents the defined crop's portion of the global herbicide market. Optimas forecast for Market 2018, Status October 2018

² Bayer Indication Position: Agrowin 2017 + estimations for DowDupont and Bayer divestments split and allocation, Status October 2018

³ Bayer S&T Footprint: Internal estimations of percent of planted acres in the region containing at least one seed or trait technology from Bayer

⁴ Corn herbicide position is head-to-head with ChemChina



Next Generations of Weed Control

Next Gen Herbicide
Tolerant Traits in Soybeans

Next Gen Herbicide
Tolerant Traits in Corn



Roundup Ready
Xtend Soybeans

Herbicide Solutions
in Soybeans

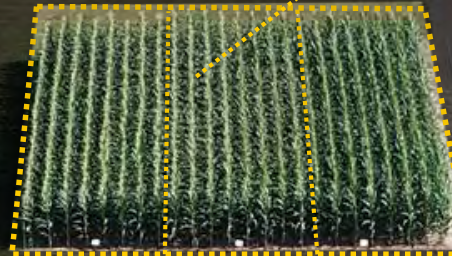
XtendFlex



Soy
HT4



Soy
HT5



Corn
HT3



Corn
HT4



Corn
HT5



DKC64-34RIB
SmartStax Corn

Herbicide Solutions
in Corn



Commercial Sprayer



BAYER PLUS Soy Pre-
Emergent Herbicides



BAYER PLUS Soy Pre and Post
Emergent Herbicides



BAYER PLUS Corn Pre-
Emergent Herbicides



BAYER PLUS Corn Pre and Post
Emergent Herbicides



Key Takeaways

Advancing Weed Control With Six Herbicide Tolerance Classes by 2030

1

Clear leaders in weed control with broad portfolio of herbicide tolerance traits today

2

Supplement herbicide tolerance with vast array of selectives through Roundup Ready PLUS

3

Third-generation herbicide tolerance in soybeans and corn is expected near-term

4

Beyond that, subsequent generations of technology designed to offer growers flexibility

5

Deep expertise in formulation technology keeps actives viable and premixes refreshed



Crop Science Summer Technology Showcase

Next Generations of Insect Control



Rodrigo Santos

*Head of Country – Crop Science,
Latin America*

Renata Bolognesi, Ph.D.

*North America Corn & Soybean
Technology Lead*





Integrated Pest Management is Critical for Successful Agriculture

Insect Populations are Continuously Evolving, Requiring Ever More Innovative Solutions to Manage



Soybeans damaged by soybean looper on the right; no Intacta trait in the control

What would today's crop production potential be without insect protection?¹



Seeking selective solutions that preserve beneficial insects

Successful pest management

using all available tools for intervention...

- 1 Traits
- 2 Biological control
- 3 Chemical Insecticides
- 4 Other technologies



50%
of current yields



75%
of current yields



20%
of current yields

... with *minimum impact*

to minimize risks for human health and the environment

- 1 Pollinator safety
- 2 Selectivity to beneficial insects
- 3 Monitoring, prediction and precise positioning
- 4 Alternation for resistance management

¹ Adapted from Oerke (2006)



Availability of Tools and Growing Resistance is Prompting Farmers to Diversify Pest Management Practices Around the World

Typical Pest Management Practices in Different Crops and Regions

Corn – North America (Large scale professional farmers)

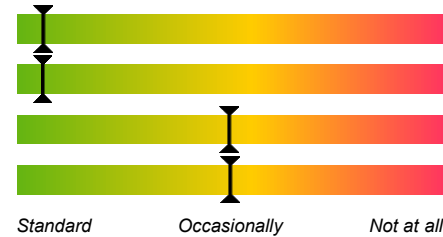
Primary challenge: Above and especially below ground attack by biting insects, damaging roots, leaves and cob



Practice

Biotech (Insect Resistance)
Seed Applied
Foliar
Biologicals

Usage Pattern



Soybean – South America (Large scale professional farmers)

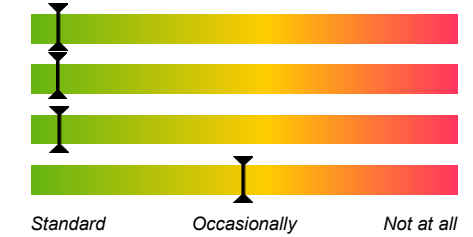
Primary challenge: Several generations of biting and sucking pest in one crop season due to subtropical conditions



Practice

Biotech (Insect Resistance)
Seed Applied
Foliar
Biologicals

Usage Pattern



Horticulture – EMEA (Medium sized farms, protected culture)

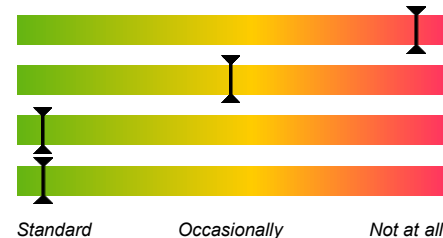
Primary challenge: Several generations of biting and sucking pest



Practice

Biotech (Insect Resistance)
Seed Applied
Foliar
Biologicals

Usage Pattern



Rice – APAC (Small farms)

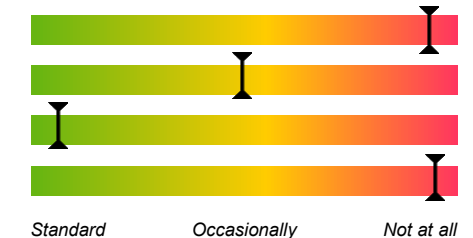
Primary challenge: Several generations of biting and sucking pest



Practice

Biotech (Insect Resistance)
Seed Applied
Foliar
Biologicals

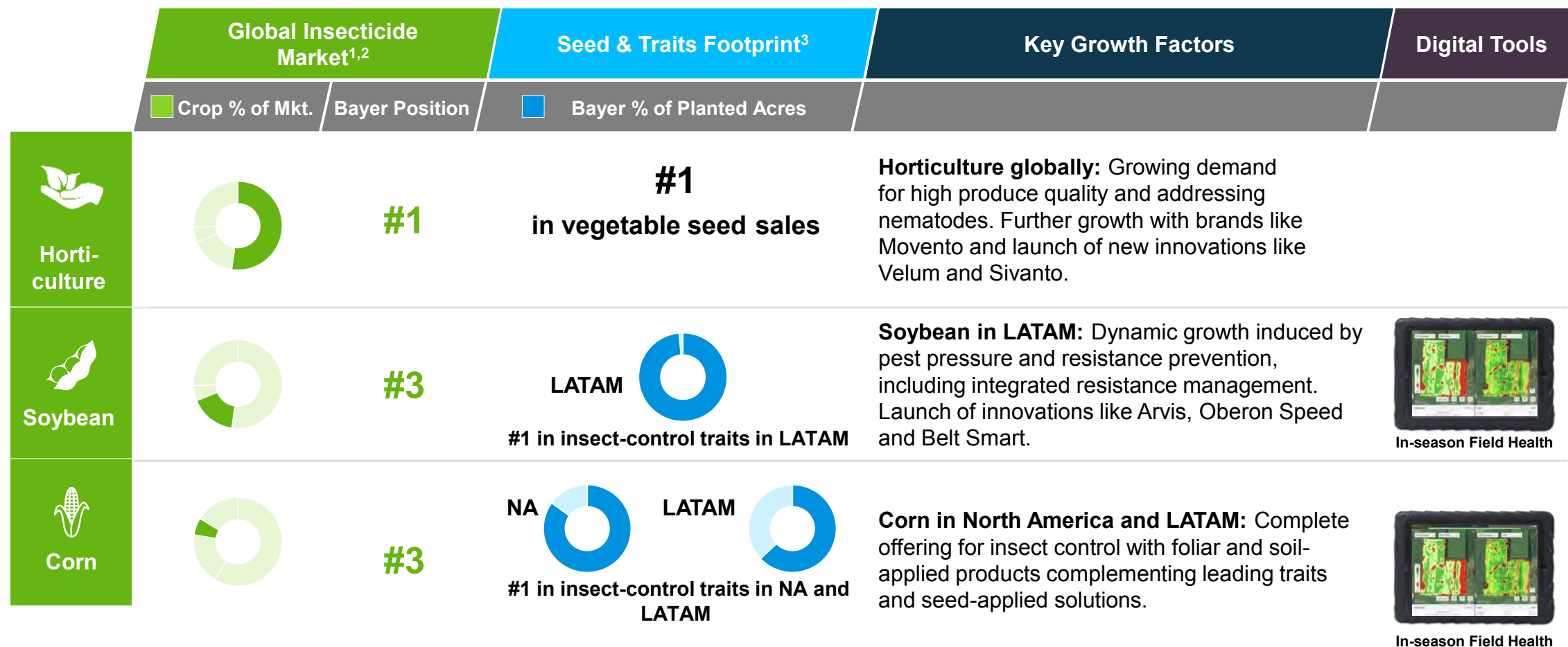
Usage Pattern





Insecticides: Innovation and Portfolio Enable Growth Above Market

Growing Food and Feed Demand, Pest Epidemics and Resistance Challenges Drive Demand



¹ Global Market: Represents the defined crop's portion of the global herbicide market. Optimas forecast for Market 2018, Status October 2018

² Bayer Indication Position: Agrowin 2017 + estimations for DowDupont and Bayer divestments split and allocation, Status October 2018;

³ Bayer S&T Footprint: Internal estimations of percent of planted acres in the region containing at least one seed or trait technology from Bayer

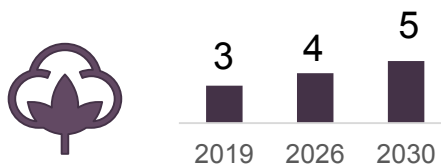


Biotech: A Global Leader in Insect-Control Solutions

Next-Generation Solutions in Corn, Soybeans and Cotton all in Pre-Commercial Phase 4

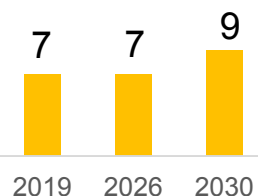
Leading Insect Control Biotech Trait Pipeline

of Genes for Control Targeted

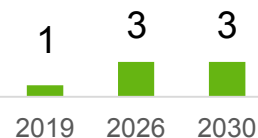


Key Pests Controlled with Expected Insect traits by 2030

Cotton Bollworm
Fall and Beet Armyworms
Lygus
Pink Bollworm
Thrips



Black Cutworm
Corn Borers
Corn Earworm
Corn Rootworm
Fall Armyworm
Western Bean Cutworm



Bean Shoot Moth
Black armyworm
Podworm Complex
Southern armyworm
Soybean Looper
Velvetbean Caterpillar

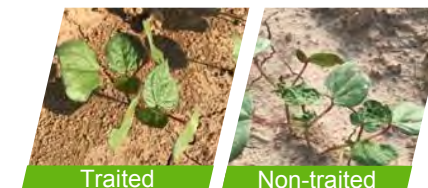
MoA = Mode of Action

Key Next Generation Insect Control Traits

Near-Term Projects Refresh Solutions in Corn, Soy and Cotton

Lygus and Thrips in Cotton
Phase 4

- // First biotech trait for piercing and sucking insects
- // >10m acre opportunity



Third-Gen Below-Ground in Corn
Phase 4

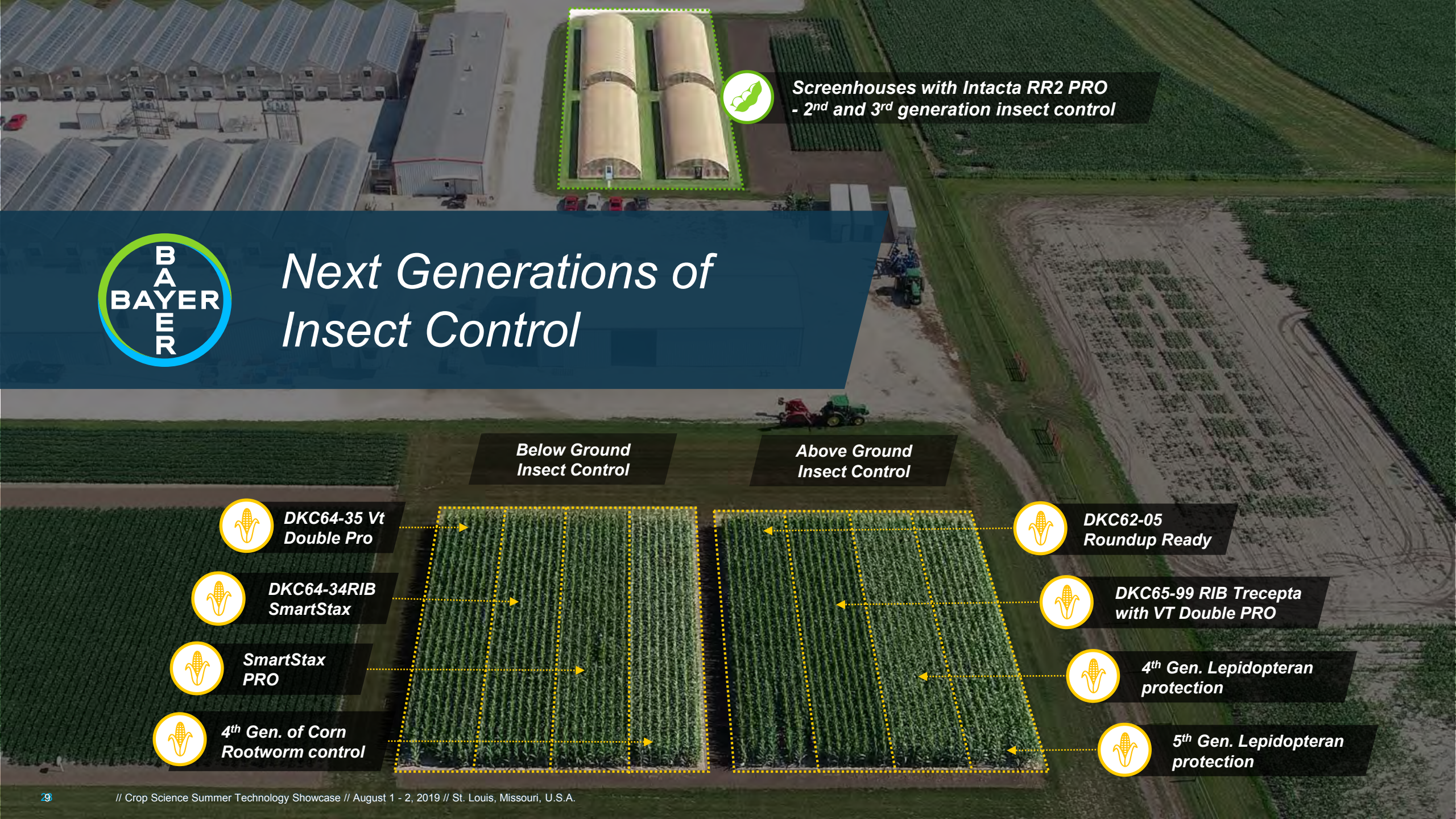
- // 3 modes-of-action for rootworm control
- // Novel RNAi MoA
- // >100m acre opportunity



Intacta 2 Xtend
Phase 4

- // Improved durability and expanded spectrum
- // Additional herbicide tolerance MoA (dicamba)
- // >100m acre opportunity





Screenhouses with Intacta RR2 PRO
- 2nd and 3rd generation insect control



Next Generations of Insect Control

Below Ground Insect Control

Above Ground Insect Control



DKC64-35 Vt Double Pro



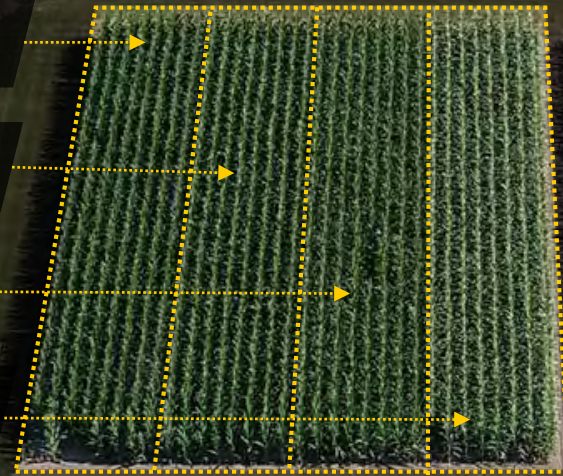
DKC64-34RIB SmartStax



SmartStax PRO



4th Gen. of Corn Rootworm control



DKC62-05 Roundup Ready



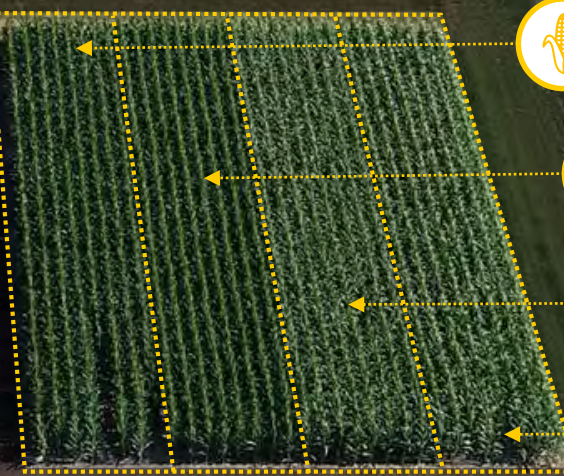
DKC65-99 RIB Trecepta with VT Double PRO



4th Gen. Lepidopteran protection



5th Gen. Lepidopteran protection





Key Takeaways

1

Integrated pest management is critical for success in agriculture

2

Availability of tools and growing resistance is prompting farmers to diversify pest management practices around the world

3

Bayer is a uniquely positioned leader in pest management across technologies and crops to tailor solutions that meet growers needs

4

Innovation in insecticides and our portfolio are key enabler of above market growth

5

Bayer traits are leading insect control in the Americas in row crops like corn, soybeans and cotton



Crop Science Summer Technology Showcase

Tailored Solutions and New Business Models



Aaron Robinson

N.A. Business Model Strategy Lead

John Jansen

*Climate Advisory
Services Lead*



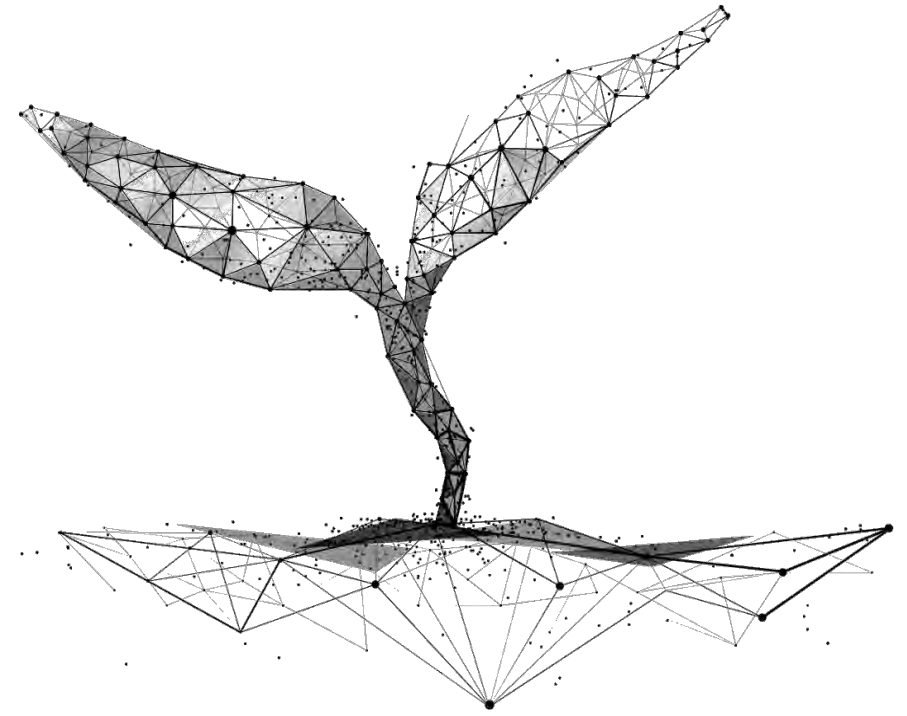


What will the Future look like?

A Solution and Outcome, Priced by the Acre



Opportunity: By combining world-class product R&D with digital data science product recommendations and tailored pricing, Bayer can create value by increasing yields, improving farmer profitability, and helping farmers manage risk.





The sale of the future is not
the sale of today...

The sale of bags and jugs
will change

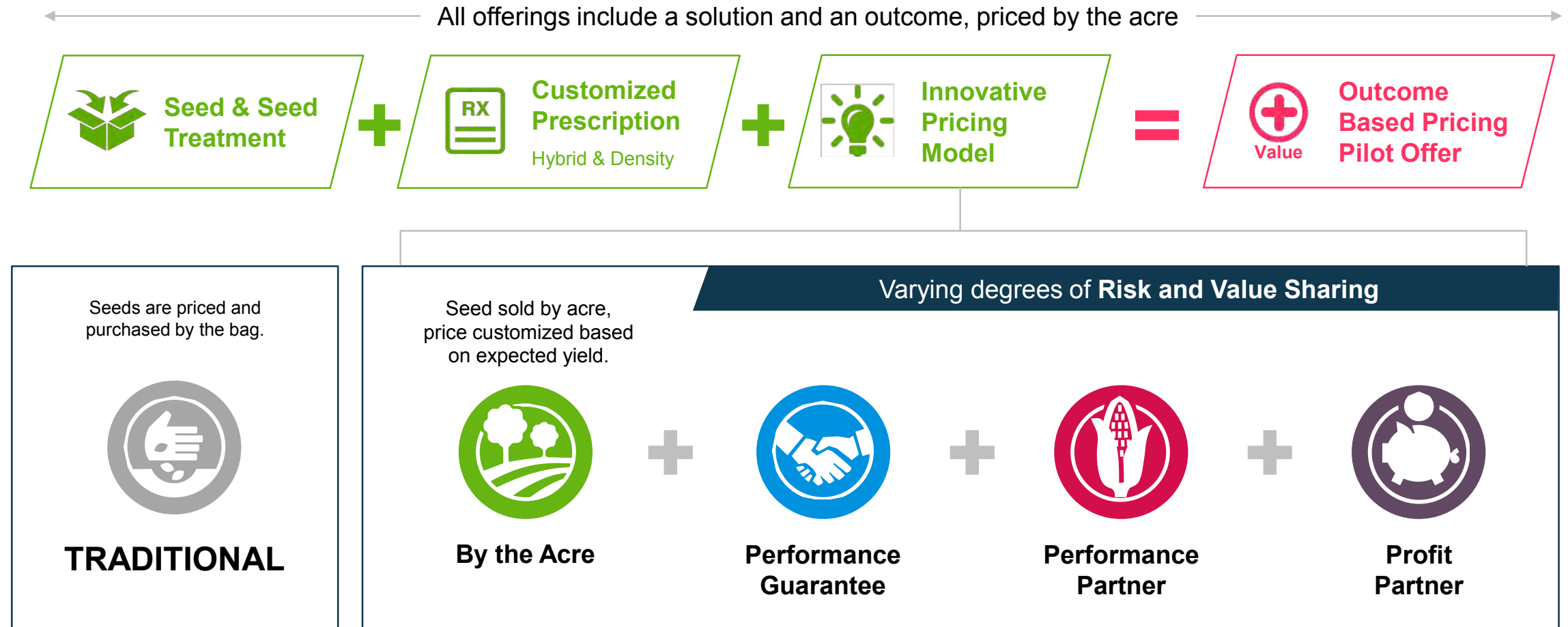
***We will sell
productivity,
via tailored
solutions and
new business
models***





Trials of Four Outcome-Based Offerings Underway in the U.S.

Bringing the Best of Bayer Crop Science; Personalized for the Grower Profile and His Fields



* Subject to terms and conditions to be agreed between grower and Bayer



FieldView Platform and Tools Deliver Season-Long Connectivity

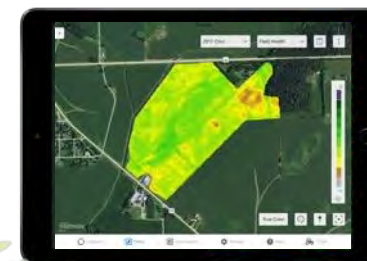
Informs Decisions, Recommends Products and Solutions and Reconciles the Outcome

Pre-Planting:
Seed Scripting
& Seed Advisor

During Planting:
Data capture & real-
time data visualization

In-Season:
Capture as-applied data for crop inputs to measure
performance later;
Monitor Field Health throughout the growing season









Harvest/Post-Harvest:
Capture yield data in real-time;
Analyze yield data to optimize
decisions in following seasons






Seed Selection, Density and Field Placement with Seed Advisor


Optimized Portfolio

| | | | | |
|---|---|----------|----------|-------|
|  | Jerseyville Farm Default Farm • Default Client | 98.7 ac | DKC64-35 | ★★★★★ |
|  | 210 Default Farm • Default Client | 130 ac | DKC65-95 | ★★★★★ |
|  | Birkestrand Default Farm • Default Client | 117.3 ac | DKC62-53 | ★★★★★ |
|  | Dale's E Default Farm • Default Client | 46.6 ac | DKC64-88 | ★★★★★ |
|  | Dale's S Default Farm • Default Client | 69.6 ac | DKC65-95 | ★★★★★ |
|  | Dale's W Default Farm • Default Client | 77.4 ac | DKC64-88 | ★★★★★ |
|  | Elliot's Default Farm • Default Client | 229.7 ac | DKC65-95 | ★★★★★ |
|  | Hoksbergen Default Farm • Default Client | 110.2 ac | DKC64-35 | ★★★★★ |

Field Level Assignment

| | | |
|---|--|-------|
|  | Jerseyville Farm NAFTO • Jerseyville • 3.9 ac | |
| DKC64-35 | VT2 | ★★★★★ |
| DKC65-95 | VT2 | ★★★★★ |
| DKC63-57 | VT2 | ★★★☆☆ |
| DKC62-53 | VT2 | ★★☆☆* |
| DKC64-88 | VT2 | ★★☆☆* |
| DKC67-44 | VT2 | ★☆☆☆☆ |

Product Specific Density

| | |
|---|---|
|  | Jerseyville Farm DKC64-35RIB VT2 Advanced Prescription |
|---|---|





Tailored Solutions and New Business Models

Non-optimized Corn Field: Representative of this region

Tailored Solution: Advanced Seed Scripting to optimize hybrid selection, placement and planting rate plus Elite Seed Treatment, Disease Mgmt. System, Delaro Fungicide, executed through new Outcome-Based Pricing business model

Future Tailored Solution: Same as tailored solution, plus short stature corn, next-generation fungicide. UAV to showcase imagery, stress detection and in-season application flexibility.



Late Planted Corn (V2-3)



Mature Corn (RT-2)

Future Tailored Solution with Short Stature Corn

Tailored Solution

Non-optimized Corn Field



Key Takeaways

Tailored Solutions and New Business Models

1

Ag industry is ripe for new business models as farmers adopt digital tools at rapid pace

2

Sale of the future is not jugs of crop protection and bags of seeds; it's productivity through tailored solutions captured through new business models

3

FieldView and tools like Seed Advisor, enable tailored solutions and new business models

4

Optimal tailored solution requires leading seed, crop protection and digital components

5

Trials of new business models with varying risk and value sharing underway in the U.S.