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

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Presenter/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:45 am</td>
<td>Registration + Lunch</td>
<td></td>
</tr>
<tr>
<td>12:30 pm</td>
<td>Welcome/Agenda</td>
<td>Investor Relations</td>
</tr>
<tr>
<td>12:35 pm</td>
<td>Group Outlook Update</td>
<td>Werner Baumann</td>
</tr>
<tr>
<td>12:55 pm</td>
<td>Shaping Agriculture for Farmers, Consumers, Planet</td>
<td>Liam Condon</td>
</tr>
<tr>
<td></td>
<td>Deliberating World Class Innovation</td>
<td>Bob Reiter</td>
</tr>
<tr>
<td></td>
<td>Pioneering the Digital Transformation</td>
<td>Mike Stern</td>
</tr>
<tr>
<td>12:35 pm</td>
<td>Group Outlook Update</td>
<td>Werner Baumann</td>
</tr>
<tr>
<td>12:55 pm</td>
<td>Shaping Agriculture for Farmers, Consumers, Planet</td>
<td>Liam Condon</td>
</tr>
<tr>
<td></td>
<td>Delivering World Class Innovation</td>
<td>Bob Reiter</td>
</tr>
<tr>
<td></td>
<td>Pioneering the Digital Transformation</td>
<td>Mike Stern</td>
</tr>
<tr>
<td>01:30 pm</td>
<td>Executive Q&amp;A Panel</td>
<td>Werner Baumann, Liam Condon, Bob Reiter, Mike Stern</td>
</tr>
<tr>
<td>02:15 pm</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>02:45 pm</td>
<td>Crop Science Rotating Stations – Leading R&amp;D Platforms*</td>
<td></td>
</tr>
<tr>
<td>Seed &amp; Traits</td>
<td>Advanced Breeding Technology</td>
<td>Mike Graham, Amanda McLerren</td>
</tr>
<tr>
<td></td>
<td>Biotechnology</td>
<td>Shannon Hauf, Jeremy Williams</td>
</tr>
<tr>
<td>Crop Protection</td>
<td>Chemistry</td>
<td>Axel Trautwein, Marco Busch</td>
</tr>
<tr>
<td>Digital Ag</td>
<td>Biologicals</td>
<td>Benoit Hartmann, Denise Manker</td>
</tr>
<tr>
<td></td>
<td>Data Science</td>
<td>Mark Young, Sam Eathington</td>
</tr>
<tr>
<td></td>
<td>Rotating Sessions*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chesterfield Research Facility</td>
<td></td>
</tr>
<tr>
<td>Evening Events</td>
<td>Cocktail Reception</td>
<td></td>
</tr>
<tr>
<td>5:45 pm</td>
<td>Cocktail Reception</td>
<td></td>
</tr>
<tr>
<td>6:15 pm</td>
<td>Dinner</td>
<td></td>
</tr>
<tr>
<td>7:00 pm</td>
<td>Customer Panel - U.S. &amp; Brazil</td>
<td>Moderators: Brett Begemann, Leticia Goncalves</td>
</tr>
<tr>
<td>8:00 pm</td>
<td>End of Day</td>
<td></td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Group</th>
<th>Target delivery</th>
<th>Efficiency / Bayer 2022</th>
<th>Portfolio measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deliver on 2022 operational targets</td>
<td>Execute efficiency improvement program and realize synergies</td>
<td>Execution of announced portfolio measures for further sharpened business focus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Segments</th>
<th>Consumer Health</th>
<th>Pharmaceuticals</th>
<th>Crop Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drive performance improvement</td>
<td>Further strengthening of pipeline and intensify external sourcing</td>
<td>Integration of acquired business to shape the future of agriculture</td>
</tr>
</tbody>
</table>
Glyphosate Update: Dual Track Approach for Ongoing Litigation

Mediation Track Complements Continued Vigorous Defense in Legal Disputes

2019

April
Johnson Case
Appeal filed

May
Hardeman Case
Post-trial motions filed

June
Pilliod Case
Post-trial motions filed

July
Adams Case
Trial, St. Louis County

August
Lamb Case
Trial, St. Louis City

September
Winston Case
Trial, St. Louis City

October

Parallel mediation track launched

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

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

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

Mediation

Governance
On Track to Deliver on our Targets for 2019

Solid Financial Performance in H1 2019

Sales
In € billion
H1 2018 18.6
H1 2019 24.5
FY 2019e ~46

EBITDA
In € billion
Before special items
H1 2018 5.2
H1 2019 7.1
FY 2019e ~12.2

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

- 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

Outlook 2022

- ~€2.6bn Overall contributions
- ~12,000 Global FTE impact
- ~1.7x One-time cost

Q1 2019

- 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

Q2 2019

- Crop Science
- Outlook 2022

Indicative phasing of contributions

2020 | 2021 | 2022
---|---|---
30% | 70% | 100%

// Crop Science Summer Technology Showcase // August 1 – 2, 2019 // St. Louis, Missouri, U.S.A.
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

Other planned divestments

// 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
// 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

// Crop Science Summer Technology Showcase // August 1 – 2, 2019 // St. Louis, Missouri, U.S.A.
Pharma Snapshot: Executing on Portfolio and R&D Pipeline

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

**Sales**

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>8.3</td>
<td>8.8</td>
</tr>
</tbody>
</table>

**EBITDA**

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA</td>
<td>2.8</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>

EBITDA
In € million
Before special items

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>569</td>
<td>549</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>In € billion</td>
<td>5.9↑</td>
<td>11.2</td>
</tr>
</tbody>
</table>

**EBITDA**

<table>
<thead>
<tr>
<th></th>
<th>H1 2018</th>
<th>H1 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>In € billion Before special items</td>
<td>1.7↑</td>
<td>3.4</td>
</tr>
</tbody>
</table>

**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

---

1 Monsanto included since June 7, 2018
Crop Science: Charting the Path to Future Farming

Driving the Transition from Selling Inputs to Providing Outcomes

Providing inputs aided by digital

- Efficient resource allocation to highest-impact areas
- Enhance customer experience and optimize supply chain
- Continue innovating across our core portfolio
- Generate predictive R&D pipeline
- Pilot new business models – test small, learn, adapt, scale
- Explore new profit pools through digital ecosystems

Creating value: increased yields, improved farmer profitability and better risk management

Providing outcomes based on tailored solutions

- Common digital platform foundation

2019

Future
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
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 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.

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

Includes BASF Ag Sales 2018 as reported plus €1.4bn (€2.027bn 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.

Exchange rate: FY 2018: ~1.18 USD/EUR

Competitor Pro forma R&D cost split not available
Leading Position in All Major Categories

Crop Science Market\(^1\) Currently Valued at ~€90bn

- **Corn** ~€20bn market\(^1\) #1 position
- **Soybean** ~€15bn market\(^1\) #1 position
- **Horticulture\(^2\)** ~€15bn market\(^1\) #1 position
- **Cereals** ~€10bn market\(^1\) #1 position
- **Digital Farming**

### Total Ag Market: By Input

- **Total Market Value ~€90bn\(^3\)**
  - Fungicides: 16%
  - Insecticides: 27%
  - Seeds and Traits: 44%
  - Herbicides: 13%

---

\(^1\) 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

$$\text{Yield} = f(g,e,p)$$

**g = Genetics**
- Inherent yield potential in the seed

**e = Environment**
- Climate and variability in soil types
- FieldView Yield Map
  - +75 bu/ac yield difference between red and green areas

**p = Farming Practices**
- 40 decisions made over a growing season

**Opportunity from optimized yield equation**
- 542 bu/ac vs. 175 bu/ac national average\(^1\)
- 138 bu/ac vs. 49 bu/ac national average\(^1\)

---

**Our evolution to capture the opportunity**
- Leading Products
- Product Combinations
- Digitally Informed Offerings
- Tailored Solutions

---

\(^1\) USDA crop production summary report. Results not typical.
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

- Leading germplasm libraries in corn, soybean, cotton and vegetables
  #1 field trial footprint

- Reach >350 m acres annually

- >20 new and next-generation traits in development

- Strong discovery platform for molecules with new mode-of-action and differentiated profiles
  30-60 molecules selected for field trials annually
  Leader in formulation technology

- 170,000 microbes in collection
  >10,000 microbes screened in vitro and in planta annually
  80 m acres of commercial products reached annually in row crops

- #1 database of grower and field trial seed performance data in the industry

- 90 m paid acres in U.S.A., Brazil and Europe represents industry’s leading platform reach

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

#1 Platform in the Digital Ag space

FY15 5m
FY16 15m
FY17 >35m
FY18 60m
FY19 Target 90m

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)

Future Tailored Solution with Short Stature Corn

Mature Corn (RT-2)

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\(^3,4\)

\(\text{Pro-Forma Sales} \, \text{€19.3bn}^1\)

<table>
<thead>
<tr>
<th>Key Sales Growth Drivers</th>
<th>Pro-Forma Sales Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliver annual germplasm refresh across the seeds portfolio to capture price and share gains</td>
<td>Vegetable Seeds 8%</td>
</tr>
<tr>
<td>Continue penetration of Roundup Ready Xtend crop system; transition to XtendFlex soybeans with expected U.S.A. launch in 2020(^2)</td>
<td>Environmental Science 3%</td>
</tr>
<tr>
<td>Increase crop protection sales on the &gt;400m acre seed &amp; trait footprint; FieldView platform an enabler</td>
<td>Insecticides 5%</td>
</tr>
<tr>
<td>Maximize sales synergies</td>
<td>Soybean Seed &amp; Traits 12%</td>
</tr>
<tr>
<td></td>
<td>Fungicides 14%</td>
</tr>
<tr>
<td></td>
<td>Corn Seed &amp; Traits 25%</td>
</tr>
<tr>
<td></td>
<td>Herbicides 26%</td>
</tr>
</tbody>
</table>

\(^1\) 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
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.

**Produce higher-yielding crops with fewer natural resources and inputs**

**Empower 100 million smallholder farmers**

**30%**
Reduction in field greenhouse gases emitted per kg of crops produced

**30%**
Reduction in impact on the environment

**100m**
Smallholders benefit e.g. from access to education, tailored solutions & partners

- Climate-smart practices:
  - No-tillage
  - Highly Productive Crops
  - Cover Crops
  - Precision Agriculture
  - Share knowledge and technologies

- Climate FieldView for precision application of pesticides /fertilizers
- Tolerant traits help to reduce pesticide use
- Develop crop protection products with lower environmental impact

- Enhancing social innovation (e.g. with Better Life Farming)
- Digital transformation with FarmRise

---

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

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
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

Bayer Crop Science 2.3
Corteva 1.2
ChemChina Ag 1.1
BASF Ag 0.9

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 Sales

- 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**

**Customer-sponsored Research**

**Universities & Research Institutes**

**Venture Capital**

Bayer Growth Ventures

**Crowdsourcing**

Grants4Targets™

Grants4Traits™
Growers Seek Tailored Season-Long Solutions

Combined Corn R&D Pipeline to Complete Grower Experience

Providing the science and tools to make season-long recommendations

Cropping Phases

Farmer Decision Points

Seed Selection

Choice of Seed + Treatment

Soil/Fertility Management

Water Management

Weed Management

Pest Management

Disease Management

Harvest Management

Post Harvest Management

Yield Establishment

Yield Protection

Secure Yield/Value

Cropping Phases

Farmer Decision Points

Seed Selection

Choice of Seed + Treatment

Soil/Fertility Management

Water Management

Weed Management

Pest Management

Disease Management

Harvest Management

Post Harvest Management

Providing the science and tools to make season-long recommendations
Comprehensive Corn R&D Pipeline to Deliver Tailored Solutions

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

R&D Pipeline Progressing Toward Tailored Solutions

Priority projects
// Short Stature Corn
// Market-Leading Genetic Gain
// Herbicide (IWM) and Insect Control Franchises (Fall Armyworm)

Crop Efficiency
- Precision Breeding
- Next gen. Biologicals
- Short Stature corn

Weeds
- HT4, HT5
- Corvus next gen, plus two new MoA
- LCM
- Application Technology

Pests
- Lep4, Lep5, CRW
- Insecticide discovery

Disease
- Fungicide with new MoA
- Native traits
- SeedGrowth
- Digital Ag

Digital Ag
- Breeding
- Smol
- Traits
- Biologics

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

Field specific variety placement
- Plant density recommendations
- In season monitoring, issue identification, and mitigation
- Harvest 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

Research & Development
Bob Reiter

Small Molecules
Axel Trautwein

Biologics
Benoit Hartmann

Plant Biotechnology
Jeremy Williams

Breeding
Mike Graham

Field Solutions
Judy Speas

Vegetable Seeds R&D
John Purcell

Digital Farming
Sam Eathington

Corn Technology
Calvin Treat

Soybean Technology
Shannon Hauf

Horticulture Technology
Martina Preu

Cereals Technology
Bernard Leroux

Open Innovations & Strategic Partnerships
Bob McCarroll

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

<table>
<thead>
<tr>
<th>R&amp;D Target</th>
<th>Technology</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YIELD &amp; ABIOTIC STRESS – ~70% of Peak Sales Potential</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual germplasm upgrades</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Stature Corn</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PEST MANAGEMENT – ~15% of Peak Sales Potential</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above Ground (Lepidoptera)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th generation Lepidoptera protection</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th generation Lepidoptera protection</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetraniliprole</td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>Belt Smart</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Ground (Coleoptera)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SmartStax Pro</td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>4th generation Coleoptera protection</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sucking Pests</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stinkbug pipeline</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARVIS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nematodes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nemastrike 2</td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>Early Pipeline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>New Insecticide</strong></td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
</tbody>
</table>

**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

---

### DISEASE MANAGEMENT – ~5% of Peak Sales Potential

<table>
<thead>
<tr>
<th>R&amp;D Target</th>
<th>Technology</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Health Systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn Disease Shield - Annual upgrades</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceleron - Annual upgrades</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goss Wilt resistance</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Leaf Spots and Stem Diseases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Fungicide</td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
</tbody>
</table>

### WEED MANAGEMENT – ~10% of Peak Sales Potential

<table>
<thead>
<tr>
<th>R&amp;D Target</th>
<th>Technology</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Herbicide tolerance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd generation weed management system</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th generation weed management system w/ RHS2</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th generation weed management system</td>
<td>✓</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td><strong>Improved Di­camba formulations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved Di­camba &amp; Glyphosate Premix</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next Generation Glyphosate Formulations</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next Generation Dicamba Premix</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mesotrine-Acetochlor-Dicamba Premix</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Early Pipeline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novel PPO Herbicide</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RHS2 = Second Generation Roundup Hybridization System**

1 In collaboration with BASF
## Soybean R&D Pipeline – Peak Sales Potential: €6-7bn

### YIELD & ABIOTIC STRESS - ~25% of Peak Sales Potential
- **Annual germplasm upgrades**
- **High Yielding Soy**

### PEST MANAGEMENT - ~20% of Peak Sales Potential
- **INTACTA RR2 PRO**
  - 2nd generation insect protection
  - 3rd generation insect protection
- **Belt Smart**

### Sucking Pests
- **Aphid & Whitefly pipeline**
  - Novel Sucking Pest Solution
- **Stinkbug Pipeline**
  - ARVIS
- **Novel Mite Solution**

### Nematodes
- **Plant health systems**
  - 2nd generation Soy Cyst Nematode resistance
- **Nemastrike 2**

### Herbicide tolerance
- **Soy Disease Shield**
- **Acceleron Upgrades**
  - Asian Soybean Rust
- **Indiflin**
- **Fox XPro**
- **Leaf Spot Diseases**
  - **New Fungicide**
  - **NEW**

### Early Pipeline
- **New Fungicide**
  - **NEW**

### WEED MANAGEMENT - ~25% of Peak Sales Potential
- **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**

### Status achieved Phases 1 through 4
- **Breeding** – incl. native traits and molecular breeding
- **Plant Biotech** – biotechnology traits
- **Crop Protection** – chemical and biological solutions applied as seed treatment, folar or via soil

### Business Relationships
- In collaboration with BASF
- Status indication for Life Cycle Management Items
- Strategic collaborations
- Progress achieved Phases 1 through 4
- Pipeline status highlighting significant development, progress or advancement in R&D Pipeline (pink) and Key Life Cycle Management (blue) work.
Cereals, Oilseed Rape, Cotton, Rice R&D Pipelines – Peak Sales Potential: €4-5bn

<table>
<thead>
<tr>
<th>R&amp;D Target</th>
<th>Technology</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 Dev. Subm.</td>
<td></td>
</tr>
<tr>
<td><strong>YIELD &amp; ABIOTIC STRESS</strong></td>
<td>Annual germplasm upgrades</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selective Herbicides</td>
<td>✔ NEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Cereals Selective Herbicide</td>
<td>✔ NEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atlantis franchise extensions</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Autumn Herbicides</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td><strong>WEED MANAGEMENT</strong></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disease package annual upgrade</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Isoflupyr</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Fungicide</td>
<td>✔ NEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Bixafen extensions</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delaro forte</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redigo FS 25</td>
<td>✔ NEW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Fungicidal Seed Treatment</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td><strong>PEST MANAGEMENT</strong></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DEKALB LibertyLink Canola</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TruFlex Canola with Roundup Ready</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dicamba-Tolerant Canola</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Insecticide</td>
<td>✔ NEW</td>
<td></td>
</tr>
<tr>
<td><strong>DISEASE MANAGEMENT</strong></td>
<td>Annual germplasm upgrades including Podshatter</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

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

### YIELD AND ABIOTIC STRESS - ~40% Peak Sales Potential

<table>
<thead>
<tr>
<th>Technology</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding</td>
<td>Br</td>
<td></td>
</tr>
<tr>
<td>Plant Biotech</td>
<td>PBt</td>
<td></td>
</tr>
<tr>
<td>Crop Protection</td>
<td>CP</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dev.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Advancements to Launch
- >146 advancements to launch
- Torelini tomato
- Pfeifer 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

#### Nematodes
- Nemastrike
- Velum
- Next gen nematode resistant tomato

### Early Pipeline
- New Insecticide
- New Herbicide

### **Product enhancement:** (Life Cycle Management activities)
Dev. – Under development; Subm. – Submitted for Registration

### R&D Phases:
1 – Research, 2 – Early Development, 3 – Late Development, 4 – Registrations Filed

### DISEASE MANAGEMENT - ~30% of Peak Sales Potential

#### Plant Health Systems
- Geminivirus resistant tomato
- Downy Mildew resistant lettuce

#### Dicot Leaf & Fruit Diseases
- New Fungicide
- Isolucytrap
- LUNA brand family extension
- Serenade ASO

#### Oomycetes
- Fluosapiprintin
- Seed & Soilborne Diseases
- Isolucytrap
- High concentrated biological

#### Bacteria
- Isotianil
- Serenade ASO

#### Early Pipeline
- New Fungicide

### WEED MANAGEMENT - ~5% of Peak Sales Potential

#### Early Pipeline
- New Herbicide

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

### Progress achieved Phases 1 through 4

### Status indication for Life Cycle Management Items

### Strategic collaborations

### Represents annual advancements and upgrades

---

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
### Biologicals R&D Pipeline

<table>
<thead>
<tr>
<th>Research Target</th>
<th>Crop</th>
<th>Phase*</th>
<th>Enhancement**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YIELD &amp; ABIOTIC STRESS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield &amp; Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BioRise 2</td>
<td>✓</td>
<td>2</td>
<td>adv. to launch</td>
</tr>
<tr>
<td>High concentrated Biological</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Corn BioYield 3</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Early Pipeline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Biological</td>
<td>✓ ✓</td>
<td>4</td>
<td>NEW</td>
</tr>
<tr>
<td><strong>DISEASE MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dicot Leaf Spots</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serenade ASO</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sonata ASO</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serenade ASO</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Seed &amp; Soil-borne Diseases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High concentrated Biological</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Early Pipeline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Fungicide</td>
<td>✓</td>
<td>4</td>
<td>NEW</td>
</tr>
<tr>
<td><strong>PEST MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nematodes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BioAct DC</td>
<td>✓</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Early Pipeline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Insecticide</td>
<td>✓</td>
<td>4</td>
<td>NEW</td>
</tr>
</tbody>
</table>

*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

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
## Digital R&D Pipeline

### FERTILITY
- Sub-Field Nitrogen Monitoring (US, Corn)
- Manual Fertility Scripting (US, Corn & Soy)
- P & K Scripting (US Corn, Soy, Canola, Wheat, Cotton)
- P & K Scripting (Brazil & Argentina, Corn)
- Advanced Nitrogen Scripting (US, Corn)
- Advanced Nitrogen Scripting (US, Wheat)
- Advanced Nitrogen Leads (US, Corn)

### SEEDS AND PLANTING
- Field Specific Seed Selection (US, Corn)
- Seed Advisor – Regional (US, Corn)
- Seed Advisor – Designed Hybrid Side by Side V2 (US, Corn)
- Seed Advisor V2 (US, Soy)
- Enhanced Field Zones & Improved Seeding (US, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (Brazil, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (Argentina, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (EU, Corn)
- Seed Advisor: Field Specific + Density (US, Corn)

### FIELD INSIGHTS
- Enhanced Directed Scouting (Global, All Crops)
- Field Health & Scouting Insights (US, Brazil, Canada, Corn)
- Field Health & Scouting Insights (EU, Corn)
- Advanced Irrigation Recommendations (US, Corn)
- Corn Disease Vulnerability (US, Corn)
- Disease Identification (US, Corn)
- Disease Identification (US, Soy)
- Disease Identification (Global, Wheat)
- Fungicide ROI (US, Corn)
- Hourly Data Service / Pest & Disease (EU, All Crops)

### MEASUREMENTS
- On-Equipment Soil Mapping (US, All Crops)
- Nitrate Sensor (US, Corn)
- On-Equipment Imaging (US, Corn)
- On-Equipment Spray Sensing (US, All Crops)

### YIELD ANALYTICS
- Yield Analytics (US, Corn, Soy)
- Advanced Yield Forecast V1 (US, Corn)
- Automated Experiments (Global, All Crops)
- Advanced Yield Forecast V1 (US, Soy)
- Replant Models (US, Corn)

### P & K Scripting
- P & K Scripting (Brazil & Argentina, Corn)
- P & K Scripting (US Corn, Soy, Canola, Wheat, Cotton)

### YIELD ANALYTICS
- Advanced Nitrogen Scripting (US, Corn)
- Advanced Nitrogen Leads (US, Corn)

### SEEDS AND PLANTING
- Advanced Seed Prescriptions - Image Based Zones (US, Brazil, EU, Corn)
- Seed Advisor – Regional (US, Corn)
- Field Specific Seed Selection (US, Corn)
- Seed Advisor – Designed Hybrid Side by Side V2 (US, Corn)
- Seed Advisor V2 (US, Soy)
- Enhanced Field Zones & Improved Seeding (US, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (Brazil, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (Argentina, Corn)
- Advanced Seed Prescriptions – Pop. By Zone (EU, Corn)
- Seed Advisor: Field Specific + Density (US, Corn)

*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 Acres**

<table>
<thead>
<tr>
<th>Year</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>FY19 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>5m</td>
<td>15m</td>
<td>&gt;35m</td>
<td>60m</td>
<td>90m</td>
</tr>
</tbody>
</table>

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

**Brand Health** (U.S.)

- **Awareness**
  - FieldView: 70%
  - John Deere™: 28%
  - FarmersEdge™: 22%
  - FarmLogs™: 9%
  - Granular™: 3%
  - FBN™: 3%

- **Familiarity**
  - FieldView: 67%
  - John Deere™: 41%
  - FarmersEdge™: 41%
  - FarmLogs™: 31%
  - Granular™: 26%
  - FBN™: 21%

- **Consideration**
  - FieldView: 57%
  - John Deere™: 31%
  - FarmersEdge™: 46%
  - FarmLogs™: 22%
  - Granular™: 22%
  - FBN™: 12%

- **Have Used**
  - FieldView: 60%
  - John Deere™: 20%
  - FarmersEdge™: 22%
  - FarmLogs™: 8%
  - Granular™: 46%
  - FBN™: 3%

- **Currently Use**
  - FieldView: 46%
  - John Deere™: 26%
  - FarmersEdge™: 43%
  - FarmLogs™: 8%
  - Granular™: 1%
  - FBN™: 1%

1 Internal estimates
2 2019 Brand Health Monitor
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

~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

Gather and Organize Data

Drives customer satisfaction and loyalty, attracting more data

Visualize and Tabulate

Diagnose, recommend and prescribe

Compare and Benchmark
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

**Per-acre Services**
- Advanced Seed Scripting
- Seed Placement Advisor

**FieldView Platform**
- 60+ partnerships to bring Digital Ag innovation to farmers

**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

CLAIRE FIELDVIEW 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

- 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

FY19 Target

90m

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

Bob Reiter
Head of R&D, Crop Science Division

Liam Condon
President of the 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

8–10 Year Product Development Timeline

Vast Library of Germplasm
Includes hundreds of thousands of unique sets of genetic information. Represents breeding in 120+ locations/25+ countries

Every seed genotyped
Proprietary chipping technology for DNA genotyping preserves seed for subsequent protected culture and field testing

Grow Selections in Protected Culture
7 acre, automated greenhouse in AZ will allow 3 planting cycles a year, speeding time to market

Prescribed Field Experiments
Time savings in the lab enables 2 years of germplasm/trait combination testing in the field

Imaging at scale
Collected >20 million data points through our field imaging capabilities

Globally connected harvest
Advanced analytics applied to every decision. Partnership with Climate Corp. to enable next-gen product development

Competitive Advantage
Allows us to create 1 million new genetic lines annually from a proprietary library

Competitive Advantage
Pipelines for corn & soybean are 4X & 6X larger than 2012 due to genotyping in the lab saving 1 year of testing

Competitive Advantage
Enabling faster development of new products in a protected greenhouse environment

Competitive Advantage
Improving customer recommendations, better match products to specific environments

Competitive Advantage
Data accuracy and analytics throughout the pipeline to enhance decision making at every stage

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

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.
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

- Weed Control
- Insect Control
- Disease Control
- Yield (Germplasm)

Crop Protection ⬇️ Seed & Traits

Leading Treated 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)

**Discovery**
- Gene / Trait Identification
  - High-Throughput Screening for desired characteristic and Early Crop Testing
  - Competitive Advantage: Industry-leading genome & germplasm libraries in house and through collaborations
  - Best-in-class screening capabilities

**Phase One**
- Proof of Concept
  - Gene Optimization and Demonstration of Product Concept In-Crop
  - Competitive Advantage: Technical expertise to optimize gene expression and performance in-crop
  - Ability to rapidly test many gene combinations to evaluate stacks

**Phase Two**
- Early Development
  - Large-Scale Transformation, Commercial Candidate Selection, Pre- Regulatory Data Generation
  - Competitive Advantage: Knowledge of optimal genome locations
  - Largest global field-testing footprint diversifies geographic data insights

**Phase Three**
- Advanced Development
  - Trait Integration, Regulatory Data Generation
  - Competitive Advantage: New traits are introgressed into the most elite germplasm, and stacked with the industry’s leading traits

**Phase Four**
- Pre-Launch
  - Regulatory Submissions & Approvals, Seed Bulk-Up, System Testing and Pre-Marketing
  - Competitive Advantage: Global regulatory experience is unrivaled
  - Evaluation of agronomic systems (trait, germplasm, chemistry) for product deployment & customer recommendations
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

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
- Base-pair editing technology
- Disease Resistance Research & Technology
- 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

<table>
<thead>
<tr>
<th># of Genes for Control Targeted</th>
<th>Key Pests Controlled with Expected Insect traits by 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cotton Bollworm</td>
</tr>
<tr>
<td></td>
<td>Fall and Beet Armyworms</td>
</tr>
<tr>
<td></td>
<td>Lygus</td>
</tr>
<tr>
<td></td>
<td>Pink Bollworm</td>
</tr>
<tr>
<td></td>
<td>Thrips</td>
</tr>
<tr>
<td>3</td>
<td>Black Cutworm</td>
</tr>
<tr>
<td>7</td>
<td>Corn Borners</td>
</tr>
<tr>
<td></td>
<td>Corn Earworm</td>
</tr>
<tr>
<td>1</td>
<td>Bean Shoot Moth</td>
</tr>
<tr>
<td>4</td>
<td>Black armyworm</td>
</tr>
<tr>
<td>7</td>
<td>Podworm Complex</td>
</tr>
<tr>
<td>3</td>
<td>Southern armyworm</td>
</tr>
<tr>
<td>3</td>
<td>Soybean Looper</td>
</tr>
<tr>
<td>3</td>
<td>Velvetbean Caterpillar</td>
</tr>
</tbody>
</table>

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

# of Tolerances Targeted

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2026</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPO</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>HPPD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dicamba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glufosinate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glyphosate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Herbicide Classes with Seed Tolerance by 2030

Example: Soybean Herbicide Tolerance

Next Generation Biotech Weed Control Solutions

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

HPPD = 4-hydroxyphenylpyruvate dioxygenase
PPO = Protoporphyrinogen oxidase

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
Short Stature Corn Offers Transformational Shift in Production

Inspired by ‘Green Revolution’ Agronomic Science Pioneered by Dr. Norman Borlaug
### 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

<table>
<thead>
<tr>
<th></th>
<th>Crop % of Mkt.</th>
<th>Bayer Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Herbicide Market(^1,2)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>#1</td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td>#1</td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td>#1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Crop % of Mkt.</th>
<th>Bayer Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Fungicide Market(^1,2)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horticulture</td>
<td>#2</td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td>#1</td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td>#1</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>#3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Crop % of Mkt.</th>
<th>Bayer Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Insecticide Market(^1,2)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horticulture</td>
<td>#1</td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td>#3</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>#3</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Global Market: Represents the defined crop’s portion of the global herbicide market. Optima 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 Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
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

**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

---

**Analyze Data**
- Analytics
- Biochemistry & Biology
- Agrokinetics & 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
Complementary Screening Approaches and Early Safety Testing to Find Differentiating Small Molecules

**A Biological Screening with Phenotyping:**

- **Idea**
- **Synthesis**
- **Phenotypic Screening**
- **Greenhouse**
- **Field Development**

**Phenotyping** finds new starting points missed with conventional screening.

**B Early Safety Testing**

**Safety Testing**

**Early Safety Testing** drives chemical optimization toward registerable compounds.

**C Target-based Screening**

- **Idea**
- **Molecular Target**
- **Optimization**
- **Target Screening**
- **Greenhouse**
- **Field Development**

**Target-based Screening** directs focus on new modes-of-action.

= Target
Enhancements to Identify and Optimize Small Molecule Candidates

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

Differentiated Starting Points

Biological Screening

Target-based Screening

Phenotyping

Early Safety Testing

Increased P (Success)

New Small Molecules Candidates in Discovery since 2015

= 2x
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, Biologics

Denise Manker, Ph.D.
R&D Fellow, Biologics
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
"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."

From broad testing of conventional microbes...

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

Well characterized collection of >170,000 diverse, microbial strains to leverage genetic diversity

Biomarker and Mode-of-Action identification

Targeted Strain and Process Improvement

Greenhouse and Worldwide Field Testing

Excellence in Manufacturing and Quality

……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 Biologics**

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

- novozymes
- Grants4Biologicals
- JÜLICH
- CRDF
- elemental enzymes
- PIVOT BIO
- NewLeaf
- alphasic control
- trendlines
- JOYN BIO
- BIMAkers

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
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

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

<table>
<thead>
<tr>
<th>Discovery &amp; Research</th>
<th>Early Development</th>
<th>Advanced Development</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop Protection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Microbial</td>
<td>High concentrated</td>
<td>Serenade QST713</td>
</tr>
<tr>
<td></td>
<td>Candidate 076</td>
<td>Biological</td>
<td>Contans 91-08</td>
</tr>
<tr>
<td></td>
<td>New Microbial</td>
<td></td>
<td>Sonata QST2808</td>
</tr>
<tr>
<td></td>
<td>Candidate 844</td>
<td></td>
<td>BioAct WG/DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Requiem QRD460</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flipper</td>
</tr>
<tr>
<td><strong>Crop Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Microbial</td>
<td></td>
<td>BioRise 2</td>
</tr>
<tr>
<td></td>
<td>Candidate 284</td>
<td></td>
<td>Blagro NG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>JumpStart</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>QuickRoots</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TagTeam</td>
</tr>
</tbody>
</table>

Product Highlights in Demonstration

- **New Microbial Candidate 284**
- **New Microbial Candidate 844**
- **New Microbial Candidate 076**
- **New Microbial Candidate 284**

- **Disease Control**
- **Pest Control**
- **Crop Efficiency**

Promotion in 2018
Promotion in 2019

Promotion in 2019

- Powdery mildew in grapes (USA/EUR)
- Downy mildew in tomatoes (Spain)
Key Takeaways

Biologics

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

**Gather and Organize Data**
- Widespread compatibility across machinery types and brands
- Access to years of internal breeding trial data and extensive customer data
- Unique platform approach leverages insights from 3rd party innovators

**Visualize and Tabulate**
- Proprietary data science warehouse with layers of field data

**Compare and Benchmark**
- Able to analyze in specific *field zones* vs. yield averages across fields.

**Diagnose, Recommend and Prescribe**
- More predictive tools derived from rich internal R&D data, customer data streams and machine learning algorithm development
- Global market reach through Bayer’s distribution channels

**Drives Customer Satisfaction and Loyalty, Attracting More Data**
- Collaborative approach with retailers to illuminate grower value

Significant Differentiators in Bayer Digital Farming Tools

---

// Crop Science Summer Technology Showcase // August 1-2, 2019 // St. Louis, Missouri, U.S.A.

89
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
- Developed seed placement models
- Validated seed placement models

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

Climate Corporation internal algorithm development tracking
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

<table>
<thead>
<tr>
<th>Algorithm Development</th>
<th>Field Tests</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 years of Bayer R&amp;D Data</td>
<td>2017 Results</td>
<td>77% win rate</td>
<td>80% win rate</td>
<td>2019 Beta (Launch)</td>
<td></td>
</tr>
<tr>
<td>6m Data Points</td>
<td>+6 bu/ac</td>
<td>+9.1 bu/ac</td>
<td>$4/acre per season</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+53K Fields, ~7,600 Hybrids</td>
<td>2017 Results</td>
<td>77% win rate</td>
<td>80% win rate</td>
<td>2019 Beta (Launch)</td>
<td></td>
</tr>
<tr>
<td>Validated Using 4.4m Acres of FieldView Customer Data</td>
<td>Additional data points confirm algorithm predictability and continual improvement</td>
<td>2019 Beta (Launch)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algorithm selection of corn hybrids predicted win rate of 80% and 3-4 bu/ac advantage</td>
<td>Developing algorithm for soy: beta testing in 2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Internal estimates and field trials

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

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:30 am</td>
<td>Breakfast</td>
<td>Drury Plaza Hotel - Main Ballroom</td>
</tr>
<tr>
<td>7:15 am</td>
<td>Technology Q&amp;A Panel</td>
<td>Drury Plaza Hotel – Main Ballroom</td>
</tr>
<tr>
<td>8:00 am</td>
<td>Site &amp; Safety Overview</td>
<td>Drury Plaza Hotel - Main Ballroom</td>
</tr>
<tr>
<td>8:15 am</td>
<td>Travel to Jerseyville</td>
<td>Buses waiting outside main lobby</td>
</tr>
<tr>
<td>9:20 am</td>
<td>Rotating Field Stops – Differentiated Tailored Solutions*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Producing Better; Progression of Corn Production</td>
<td>Bob Reiter, Mike Stern</td>
</tr>
<tr>
<td></td>
<td>Transforming Corn Production with Short Stature Corn</td>
<td>Calvin Treat, JD Rossouw</td>
</tr>
<tr>
<td></td>
<td>Next Generations of Weed Control</td>
<td>Arnd Nenstiel, John Chambers</td>
</tr>
<tr>
<td></td>
<td>Next Generations of Insect Control</td>
<td>Renata Bolognesi, Rodrigo Santos</td>
</tr>
<tr>
<td></td>
<td>Tailored Solutions and New Business Models</td>
<td>Aaron Robinson, John Jansen</td>
</tr>
<tr>
<td>11:50 am</td>
<td>Closing Remarks</td>
<td>Liam Condon</td>
</tr>
<tr>
<td>12:00 PM</td>
<td>End of Day</td>
<td>Box lunches will be provided</td>
</tr>
</tbody>
</table>

*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

Tailored Solutions and New Business Models
Producing Better
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
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
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

1. AI Driven Pipeline
2. Every Seed Genotyped
3. Protected Culture
4. Automated Seed Processing
5. Prescribed Field Experiments
6. Imaging at Scale
7. 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/ay262.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

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
Short Stature Corn Offers Transformational Shift in Production

Inspired by ‘Green Revolution’ Agronomic Science Pioneered by Dr. Norman Borlaug
# 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.
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:

WEED DESTRUCTION TOOLS (in the order of cost & convenience to the grower)

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

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

Typical infestation of Black Grass in cereal field in the UK

... 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

1/3 of yields would be lost
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)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Herbicide Tolerance)</td>
<td></td>
</tr>
<tr>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>Burndown</td>
<td></td>
</tr>
<tr>
<td>Pre-emergence Herbicide</td>
<td></td>
</tr>
<tr>
<td>Post-emergence Herbicide</td>
<td></td>
</tr>
</tbody>
</table>

**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*)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Herbicide Tolerance)</td>
<td></td>
</tr>
<tr>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>Burndown</td>
<td></td>
</tr>
<tr>
<td>Pre-emergence Herbicide</td>
<td></td>
</tr>
<tr>
<td>Post-emergence Herbicide</td>
<td></td>
</tr>
</tbody>
</table>

**Cereals – EMEA** (Large and medium sized farms)

*Primary challenge:* Grass weeds (blackgrass, ryegrass)

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Herbicide Tolerance)</td>
<td></td>
</tr>
<tr>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>Burndown</td>
<td></td>
</tr>
<tr>
<td>Pre-emergence Herbicide</td>
<td></td>
</tr>
<tr>
<td>Post-emergence Herbicide</td>
<td></td>
</tr>
</tbody>
</table>

**Rice – APAC** (Small farms)

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

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Herbicide Tolerance)</td>
<td></td>
</tr>
<tr>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>Burndown</td>
<td></td>
</tr>
<tr>
<td>Pre-emergence Herbicide</td>
<td></td>
</tr>
<tr>
<td>Post-emergence Herbicide</td>
<td></td>
</tr>
</tbody>
</table>
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

### 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

<table>
<thead>
<tr>
<th>Herbicide Classes with Seed Tolerance by 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPO</td>
</tr>
<tr>
<td>HPPD</td>
</tr>
<tr>
<td>Dicamba</td>
</tr>
<tr>
<td>Glufosinate</td>
</tr>
<tr>
<td>Glyphosate</td>
</tr>
</tbody>
</table>

Non-trailed               Trailing

HPPD = 4-hydroxyphenylpyruvate dioxygenase
PPO = Protoporphyrinogen oxidase

// Crop Science Summer Technology Showcase // August 1 - 2, 2019 // St. Louis, Missouri, U.S.A.
Herbicides: Capitalize on Opportunities with Leading Portfolio

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

<table>
<thead>
<tr>
<th>Global Herbicide Market&lt;sup&gt;1,2&lt;/sup&gt;</th>
<th>Seed &amp; Trait Footprint&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Key Growth Factors</th>
<th>Digital Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop % of Mkt.</td>
<td>Bayer Position&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Bayer % of Planted Acres</td>
<td></td>
</tr>
<tr>
<td><strong>Corn</strong></td>
<td>#1</td>
<td>NA</td>
<td>LATAM</td>
</tr>
<tr>
<td><strong>Soybean</strong></td>
<td>#1</td>
<td>LATAM</td>
<td><strong>Soybean in LATAM:</strong> Launch new selective herbicides to complement glyphosate business and contribute to holistic crop solutions</td>
</tr>
<tr>
<td><strong>Cereals</strong></td>
<td>#1</td>
<td>Not relevant</td>
<td><strong>Cereals in EMEA:</strong> Defend/expand industry-leading position in cereals through differentiated lifecycle management</td>
</tr>
</tbody>
</table>

<sup>1</sup> Global Market: Represents the defined crop’s portion of the global herbicide market. Optima forecast for Market 2018, Status October 2018
<sup>2</sup> Bayer Indication Position: Agrowin 2017 + estimations for DowDupont and Bayer divestments split and allocation, Status October 2018
<sup>3</sup> Bayer S&T Footprint: Internal estimations of percent of planted acres in the region containing at least one seed or trait technology from Bayer
<sup>4</sup> Corn herbicide position is head-to-head with ChemChina
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
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

What would today's crop production potential be without insect protection?\(^1\)

Successful pest management using all available tools for intervention...

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

... with minimum impact to minimize risks for human health and the environment

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

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Insect Resistance)</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Seed Applied</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Foliar</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Biologicals</td>
<td><img src="image" alt="Standard" /></td>
</tr>
</tbody>
</table>

**Soybean – South America** (Large scale professional farmers)

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

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Insect Resistance)</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Seed Applied</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Foliar</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Biologicals</td>
<td><img src="image" alt="Standard" /></td>
</tr>
</tbody>
</table>

**Horticulture – EMEA** (Medium sized farms, protected culture)

- **Primary challenge:** Several generations of biting and sucking pest

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Insect Resistance)</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Seed Applied</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Foliar</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Biologicals</td>
<td><img src="image" alt="Standard" /></td>
</tr>
</tbody>
</table>

**Rice – APAC** (Small farms)

- **Primary challenge:** Several generations of biting and sucking pest

<table>
<thead>
<tr>
<th>Practice</th>
<th>Usage Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotech (Insect Resistance)</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Seed Applied</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Foliar</td>
<td><img src="image" alt="Standard" /></td>
</tr>
<tr>
<td>Biologicals</td>
<td><img src="image" alt="Standard" /></td>
</tr>
</tbody>
</table>
### Insecticides: Innovation and Portfolio Enable Growth Above Market

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

<table>
<thead>
<tr>
<th>Global Insecticide Market¹²</th>
<th>Seed &amp; Traits Footprint³</th>
<th>Key Growth Factors</th>
<th>Digital Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Horticulture globally:</strong> Growing demand for high produce quality and addressing nematodes. Further growth with brands like Movento and launch of new innovations like Velum and Sivanto.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Soybean in LATAM:</strong> Dynamic growth induced by pest pressure and resistance prevention, including integrated resistance management. Launch of innovations like Arvis, Oberon Speed and Belt Smart.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Corn in North America and LATAM:</strong> Complete offering for insect control with foliar and soil-applied products complementing leading traits and seed-applied solutions.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Global Market: Represents the defined crop’s portion of the global herbicide market. Optimus forecast for Market 2018. Status October 2018
2 Bayer Indication Position: Agrwin 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
Leading Insect Control Biotech Trait Pipeline

<table>
<thead>
<tr>
<th># of Genes for Control Targeted</th>
<th>Key Pests Controlled with Expected Insect traits by 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cotton Bollworm</td>
</tr>
<tr>
<td></td>
<td>Fall and Beet Armyworms</td>
</tr>
<tr>
<td></td>
<td>Lygus</td>
</tr>
<tr>
<td></td>
<td>Pink Bollworm</td>
</tr>
<tr>
<td></td>
<td>Thrips</td>
</tr>
<tr>
<td></td>
<td>Black Cutworm</td>
</tr>
<tr>
<td></td>
<td>Corn Borer</td>
</tr>
<tr>
<td></td>
<td>Corn Earworm</td>
</tr>
<tr>
<td></td>
<td>Corn Rootworm</td>
</tr>
<tr>
<td></td>
<td>Fall Armyworm</td>
</tr>
<tr>
<td></td>
<td>Western Bean Cutworm</td>
</tr>
<tr>
<td></td>
<td>Bean Shoot Moth</td>
</tr>
<tr>
<td></td>
<td>Black armyworm</td>
</tr>
<tr>
<td></td>
<td>Podworm Complex</td>
</tr>
<tr>
<td></td>
<td>Southern armyworm</td>
</tr>
<tr>
<td></td>
<td>Soybean Looper</td>
</tr>
<tr>
<td></td>
<td>Velvetbean Caterpillar</td>
</tr>
</tbody>
</table>

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
Next Generations of Insect Control

Below Ground Insect Control
- DKC64-35 Vt Double Pro
- DKC64-34RIB SmartStax
- SmartStax PRO
- 4th Gen. of Corn Rootworm control

Above Ground Insect Control
- DKC62-05 Roundup Ready
- DKC65-99 RIB Trecepta with VT Double PRO
- 4th Gen. Lepidopteran protection
- 5th Gen. Lepidopteran protection

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

All offerings include a solution and an outcome, priced by the acre

Seed & Seed Treatment + Customized Prescription Hybrid & Density + Innovative Pricing Model = Outcome Based Pricing Pilot Offer

Seeds are priced and purchased by the bag.

TRADITIONAL

Seed sold by acre, price customized based on expected yield.

By the Acre + Performance Guarantee + Performance Partner + Profit Partner

Varying degrees of Risk and Value Sharing

* Subject to terms and conditions to be agreed between grower and Bayer
FieldView Platform and Tools Deliver Season-Long Connectivity

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

Informs Decisions, Recommends Products and Solutions and Reconciles the Outcome
Seed Selection, Density and Field Placement with Seed Advisor

Optimized Portfolio

<table>
<thead>
<tr>
<th>Field Level Assignment</th>
<th>Product Specific Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jerseyville Farm</td>
<td>Jerseyville Farm</td>
</tr>
<tr>
<td>DKC64-35</td>
<td>DKC64-35RIB VT2</td>
</tr>
<tr>
<td>DKC65-95</td>
<td></td>
</tr>
<tr>
<td>DKC63-57</td>
<td></td>
</tr>
<tr>
<td>DKC62-53</td>
<td></td>
</tr>
<tr>
<td>DKC64-88</td>
<td></td>
</tr>
<tr>
<td>DKC67-44</td>
<td></td>
</tr>
</tbody>
</table>

Field Level Assignment

| Jerseyville Farm       | NAFTO • Jerseyville • 3.9 ac |
| DKC64-35 VT2           | 37.8                        |
| DKC65-95 VT2           | 43.3                        |
| DKC63-57 VT2           | 63.3                        |
| DKC62-53 VT2           | 37.8                        |
| DKC64-88 VT2           | 43.3                        |
| DKC67-44 VT2           | 63.3                        |

Product Specific Density

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