

### Science for a Better Life

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### **Bayer Crop Science Innovation Summit**

New York City // June 20, 2023

/// Bayer Crop Science Innovation Summit /// June 20, 2023

### Cautionary Statements Regarding Forward-Looking Information



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

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



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### Event Agenda

Convene, One Liberty Plaza, NY, NY

### June 20, 2023

8:00 am	Welcome	Laura Meyer	
8:02 am	Vision for Sustainable & Regenerative Agriculture (Live Webcast)	Rodrigo Santos, Jeremy Williams, Frank Terhorst, Bob Reiter	
9:00 am	Break		
9:15 am	Innovation Engines to Power New Value Pools (Live Webcast)		
	// Designer Seeds: Next-Generation Breeding Technology	Mike Graham	
	// Transformative Trait Technologies	Kelly Gillespie	Convene – East Hub
	// Sustainable Small Molecules	Axel Trautwein	
	// Biological Breakthroughs	Jess Christiansen	
	// New Frontiers in Digital & Carbon Farming	Tom Eickhoff	
11:00 am	Break		
11:20 am	Live Q&A (Live Webcast)	Laura Meyer, Rodrigo Santos, Jeremy Williams, Frank Terhorst, Bob Reiter	
12:10 pm	End of Investor Portion of Event	Lunch Served	Convene – North Gallery



#### **Presentation Materials**

// Vision for Sustainable and Regenerative Agriculture

#### // Innovation Engines to Power New Value Pools



**Designer Seeds: Next-Generation Breeding Technology** 



Transformative Trait Technologies



Sustainable Small Molecules



**Biological Breakthroughs** 



New Frontiers in Digital & Carbon Farming



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# Vision for Sustainable & Regenerative Agriculture

**Crop Science Innovation Summit** 

June 20, 2023

Rodrigo Santos // President, Bayer Crop Science

### Crop Science Executive Leadership Perspectives



### Our Global Food Systems are Under Increasing Pressure

Demand for Sustainably Sourced Food and Renewable Fuels Never Greater



<sup>1</sup> UNDESA 2017 (United Nations Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision)

- <sup>2</sup>FAO 2017, (FAO Global Perspective Studies)
- <sup>3</sup>FAO, 2020 (Water Scarcity | UN-Water (unwater.org))
- <sup>4</sup>UN-Water, 2021 Water Scarcity | UN-Water (unwater.org))

<sup>6</sup> FAOSTAT (accessed Oct 30, 2018) for 1961-2016 data on land, FAO 2012 for 2030 and 2050 data on land, and UNDEDA 2017: World Population Prospects for world population data <sup>7</sup> Nelson et. al. (2014): FAO 2016 "Climate change and food security"

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<sup>&</sup>lt;sup>5</sup> FAO Saving our soils by all earthly ways possible | FAO Stories | Food and Agriculture Organization of the United Nations



#### **Future of Farming**

Broadening our sustainability approach with a regenerative focus



### Sustainability Focus

#### "Producing more with less"

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

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

#### Reducing and mitigating:

Increasing productivity while reducing the impact on nature

### Regenerative Focus

## "Producing more and restoring more"

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

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

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

#### Adapting and regenerating:

Increasing productivity and incomes while renewing nature



### Lead

with Regenerative Ag Solutions



### **Our Purpose**

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

#### **Benefits of Regenerative Ag:**



Yield increase and improved productivity, social and economic well-being of farmers and communities



Improved soil health



Mitigation of climate change



Preservation, restoration of biodiversity



Conservation of water

Deliver

Sustainably-sourced food, Renewable fuels

### The Established Leader in Crop Science

Industry leading profitability underpinned by ~€2.6bn in annual seed & trait licensing revenue



<sup>1</sup> Company information; exchange rate: FY 2022 ~1.05 USD/EUR. EBITDA before special items; Representing the legacy Syngenta AG results plus Adama

### Growers Worldwide Recognize the Value We Deliver

#1 in Seed & Traits with Leading Crop Protection Portfolio and >70% of Sales in the Americas



Note: Market Position determined annually, as of Q1-2023 <sup>1</sup> Company information; exchange rate: FY 2022: ~1.05 USD/EUR. <sup>2</sup> Environmental Science Divestiture - October 2022

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# Focused in High Value, Broad Acre Crops

### Bayer Crop Science 2022 Sales (€25.2bn)



<sup>1</sup>Source: Company estimates. Based on 2022 sales, excluding Environmental Science sales. Crop protection sales allocated to crops where they are applied. "Others" includes digital farming solutions, non-commercial crops, and non-identified crops.

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More than Doubling Our Accessible Market by Driving Productivity and Sustainability Together to Unlock Adjacent Spaces



<sup>1</sup> Company estimates

### Broadening our Reach To Shape Regenerative Ag on >400m Acres

- // Today our seed & trait technologies reach ~340m acres globally, anchoring our vision for regenerative system solutions
- II By the middle of the next decade, we envision broadening our reach to >400m acres
- // Hybrid wheat, direct seeded rice, corn traits in Africa & Asia and carbon farming enable potential in new crops and markets
- // Preceon Smart Corn System and next-gen herbicide tolerance in soybeans build out our base



### Delivering Regenerative Ag Benefits and Improved Profitability

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



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

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



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# Vision for Sustainable & Regenerative Agriculture

Crop Science Innovation Summit

June 20, 2023

Frank Terhorst // Head of Strategy & Sustainability, Bayer Crop Science Jeremy Williams, PhD // Head of Digital Farming Solutions



### Vision: North America Farm of the Future

Year-Round Cropping to Restore the Soil, Sequester Carbon and Improve Productivity & Profitability



John

Location: Illinois Size: 5,000 acres Crops: Corn, Soybeans, Covercress

#### **Current Needs**

- // Improved decision-making in crop planning and management
- # Effective management of rising input costs, volatility for fertilizers
- // New revenue opportunities
- // Maintaining healthy & productive soil for the long run
- // Contributing to sustainable farming without sacrificing returns

#### **Bayer's Unique** System of Solutions

- // Preceon Smart Corn System
- Next Gen Insect Control & Herbicide Tolerant Traits
- // Nitrogen-fixing seed treatment
- // Delaro fungicide

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- CoverCress (new crop opportunity)
- // HT4/HT5 Soybeans
- // Next Gen Broadacre Herbicide
- // Microsoft Azure
- // FieldView
  - // Seed Advisor
  - // Disease Management Advisor
  - // Multi-Season Crop Planner
  - // Outcome-based pricing
- // ForGround by Bayer

#### Features, Benefits, and Outcomes

- ✓ Industry-leading seeds & traits
- ✓ Most flexible, efficacious weed control
- Simplified, data-based decision making for crop management and precision application
- ✓ For short stature corn, crop management opportunity at later stage and less risk of losses from lodging/green snap
- ✓ Additional farm incomes from cover crops, opportunity from verifiable carbon offset credit
- ✓ Sustainable outcomes:
  - ${\ensuremath{/\!/}}$  Improved soil health
  - // Carbon sequestration
  - // Low-carbon oil for renewable diesel
  - // Reduced environmental impact from crop protection

Certain products and potential features, benefits, and outcomes on this slide are aspirational and may be subject to regulatory approvals and final verification











### Vision: LATAM Farm of the Future

**Bayer's Leading Innovation Drives Increased Farm ROI and Improved Sustainable Outcomes in Large-Scale Operations** 



Ana

Location: Brazil Size: 1,500 acres Crops: Soybeans

#### **Current Needs**

- // Sustaining productivity with the latest, most advanced input technologies to address challenging tropical farm environment
- Remaining competitive in export market with better cost efficiencies
- // Effective management of large-scale
  farming operations
- // Lower impact on the environment; reduced deforestation

#### **Bayer's Unique** System of Solutions



- // Monsoy Soybean Varieties
- Next Gen Intacta Insect Control & Herbicide Tolerant Traits
- // Broad insect control seed treatment
- Fox Family fungicide
- Plenexos insecticide
- Verango insecticide
- // Orbia
- PRO Carbono PRO Carbono Conecta PRO Carbono Commodities

// FieldView



#### Features, Benefits, and Outcomes

- ✓ Industry-leading seeds & traits
- ✓ Most flexible, efficacious weed control
- Simplified, data-based decision making for crop management and precision application
- ✓ For Orbia, convenient access to input solutions, agricultural & financial service providers, and commodities market
- ✓ Sustainable outcomes:
  - Improved soil health Carbon sequestration Low-carbon oil for renewable diesel Reduced environmental impact from crop protection

Certain products and potential features, benefits, and outcomes on this slide are aspirational and may be subject to regulatory approvals and final verification



### Vision: EMEA Farm of the Future

Creating a Tomato Growing Environment that Enhances Nutrition, **Conserves Water and Minimizes Crop Protection Use** 



**Pablo** 

Location: Spain Size: 50 acres **Crops: tomatoes** 

#### **Current Needs**

- # Adapting to shifting regulations on crop protection use & residue levels to serve both local & export markets
- Improving productivity while becoming more resource-efficient, especially in water use

**Bayer's Unique System of Solutions** 



- DeRuiter hybrid tomato seeds
- Serenade biological fungicide
- Ambition plant activator
- **BioAct biological**
- Vynyty Press
- Velum Prime
- Bayer NemaTool //
- // Bayer ResiYou



#### Features, Benefits, and Outcomes

- ✓ Varieties with better built-in disease resistance, higher yield potential
- ✓ Combination of chemical & biological crop protection solutions, with digital tools for verification, to be fully compliant with EU regulations
- ✓ Sustainable outcomes:
  - // Reduced environmental impact from crop protection

/// Bayer Crop Science Innovation Summit /// June 20, 2023

Certain products and potential features, benefits, and outcomes on this slide are aspirational and may be subject to regulatory approvals and final verification

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### Vision: APAC Farm of the Future

Providing Sustainability Benefits to Rice Production for Farmers and the Environment while Improving Farmer ROI



Ramesh

Location: India Size: 3 acres Crops: rice

#### **Current Needs**

- // Managing rice production with scarce and increasingly expensive labor
- // Gaining more know-how on new & better technologies and practices
- // Increasing productivity while keeping costs manageable
- # Adapting to climate change with expected water scarcity

#### **Bayer's Unique** System of Solutions



- # Arize non-GM herbicide tolerant hybrid rice seeds for direct seeding
- // Reatis & Evergol seed treatment
- // Herbicides:
  - // Oxadiazone pre-emergent Council early to mid-post Next gen post-emergent
- // Velum
- // Next Gen insecticides
- // Next Gen fungicide
- // FarmRise
- // Better Life Farming

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#### Features, Benefits, and Outcomes

- ✓ From direct seeding, higher yield output using less labor, inputs, and time vs transplanting
- ✓ For FarmRise and Better Life Farming access, know-how, & expertise on new technologies and practices, plus agricultural & financial service providers
- Additional incentives from verifiable carbon credits
- ✓ Sustainable outcomes:
  - // Lower carbon & methane emissions
  - // Reduced water use
  - // Reduced environmental impact from crop protection

Certain products and potential features, benefits, and outcomes on this slide are aspirational and may be subject to regulatory approvals and final verification



### Lead

with Regenerative Ag Solutions



Win by being more grower centric

### **Our Strategic Priorities**



Maintain Leadership positions in our core markets



Shape Regenerative Ag by investing to increase food production, farm incomes and resilience in a changing climate, while renewing nature



**Digitally Enable Our Sales** to offer full crop system solutions, creating an outstanding customer experience



Invest in innovation to Win in new markets



### Innovative, Sustainable Solutions to Address Global Challenges

#### **Global Challenges:**





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### **Our Innovation Investment**

Crop Science Innovation Summit

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Bob Reiter, PhD // Head of R&D, Bayer Crop Science

### Building the Farm of the Future with €2.6bn Annual R&D Investment



#### **Top Talent:**

>7,700 R&D employees<sup>3</sup> >100 Key Collaborations

**Providing Next Generation Solutions:** 

>500 Hybrids & Varieties

Hybrids & Varieties Deployed in `22

>250 New Crop Protection Registrations in `22 New Biotech Traits in Development

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**30-60** New Molecules in Field Trials Annually

2022 reported results, exchange rate: FY 2022: ~1.05 USD/EUR; <sup>1</sup> Bayer R&D expenses exclude special items; <sup>2</sup> Represents the legacy Syngenta results plus Adama for FY'22; <sup>3</sup> Per Bayer annual report

### Leaps by Bayer Technology Investments Expand R&D Reach

18 Distinct Investments in Sustainable Productivity and Improved Nutrition



Companies shown by primary Leap but may have potential in further Leaps For additional information on these and other Leaps by Bayer investments, please visit: https://leaps.bayer.com/

### R&D Investment Powers Pipeline with >€30bn Peak Sales Potential

#### ~50% of Peak Sales Incremental to Current Annual Sales



> ~€1.5bn Biologicals Sales Ambition

#### Phasing of €30bn PSP<sup>1</sup>: **30%** by 2032, **80%** by 2037

<sup>1</sup>Represents non-risk adjusted estimated peak sales for the combined breeding, biotech, crop protection and environmental science pipelines, as well as new business models and new value areas. Note that products are excluded from the pipeline PSP typically the year following launch. Projects listed are only a subset of the pipeline. SBE = Strategic Business Entity; LCM = Life Cycle Management; PSP = Peak sales potential

<sup>2</sup> "Other SBE" category includes seeds and traits, such as cotton, canola, wheat, OSR, rice, vegetable seeds and sugarbeets, plus digital platforms

### Successfully Advancing Regenerative Ag Solutions for Farmers

15 Projects Advance in 2022; Hundreds of Seed Deployments and New Crop Protection Registrations



# Convergence of Leading R&D Platforms to Unlock Next Layer of Value Creation in Agriculture



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Designer Seeds: Next-Generation Breeding Technology

Crop Science Innovation Summit

June 20, 2023

Mike Graham // Head of Plant Breeding, Bayer Crop Science

### Bayer Plant Breeding Unmatched Scale Maximizes Farm Productivity

Bayer Plant Breeding products reach ~160m acres globally

Six main row crops:



Elite germplasm with integrated biotech and native traits deliver €10.5bn annual seed & trait sales

### > Delivering World-Class Genetics and Product Offerings



Increasing Yield Potential Developing and deploying >500 unique products every year across large and small holder customers

Enabling increased yield potential across crops



Managing Biotech and Native Breeding Traits / / / / / / / Managing ~65 active biotech and native traits and 138 trait packages across crops within the breeding pipeline

Native traits like Short Corn (SD) and disease resistance provide additional value



Building Next Generation Innovations

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Each product advanced through the breeding pipeline goes through ~140 data science models until commercialized

New protected culture facilities in Marana, AZ and Petrolina, Brazil, expected to accelerate breeding generations by up to 6X

### Leading Positions in Global Seed & Traits Fueled by Innovation



<sup>1</sup> Source: As reported in FY 2022, exchange rate FY2022: ~1.05 USD/EUR; <sup>2</sup> Market Position determined annually, as of Q1-2022; <sup>3</sup> Internal estimate including sum of branded plus licensed seed (germplasm) share measured as of 2022 for U.S. and Europe and as of 21/22 season for Brazil, Argentina and South Africa

### Data Connected Plant Breeding Advantage

### Breeding Product Development Process (8-10 years)

#### Data & analytics driving decisions & Al connected pipeline - enabling a dynamic breeding pipeline

Fieldview Field Health Imagery Data Collection	Seed Chipping Technology for accelerated discovery	Marana, AZ Protected Culture Design Center	Cassette Planter delivers large scale field testing	Drone Sensors; globally connected data ecosystem	Seed Bulk-Up for Pre-Launch testing		
Customer Insights	Discovery	Phase One	Phase Two	Phase Three	Phase Four		
<b>Data &amp; Insights</b> Customer driven quantitative economic indices	<b>Population Selection</b> Population simulation and human supervised, model driven selection for desired characteristics	<b>Early Design</b> Advanced genomic selection including future environmental challenges	Intermediate Development Large-Scale Field Testing, Trait Integration and prescriptive data collection to inform models and feed pipeline	Advanced Product Understanding Traited Testing, Early Tailored Solutions data generation, and preparation of digital data package for Climate models	<b>Pre-Launch</b> Broad product testing by R&D and Market Development, Seed Bulk-Up, System Testing and Pre-Marketing		
Competitive Advantages							
<ul> <li>Extensive environmental and on-farm data driving targeted discovery</li> <li>Unique data-driven bio-economic models that allow precise fitting of product concepts</li> </ul>	<ul> <li>Industry-leading global germplasm libraries across crops and markets- 100X larger</li> <li>Decades of field and genomic data combined with industries leading data science platform</li> </ul>	<ul> <li>Ability to rapidly sample and genetically evaluate millions of seeds- 15X faster</li> <li>Advanced Product Design facilities that enable multiple cycles of planting per year</li> </ul>	<ul> <li>Industry leading Trait Integration programs stack traits into elite germplasm</li> <li>Largest global field-testing footprint &amp; digital field-testing twin capabilities diversifies geographic data insights</li> </ul>	<ul> <li>Fully automated seed distribution centers prescriptively sample diverse growing environment</li> <li>Traited-Testing evaluates products as they would be experienced by the growers</li> </ul>	<ul> <li>Most advanced and distributed network of field testing in the industry</li> <li>Evaluation of agronomic systems for product deployment &amp; customer recommendations</li> </ul>		

#### BAYER E R

### Deploying >250 Corn Hybrids in 2022 to Expand Leading Position

Foundational to Expected Growth in Our >€6bn Global Annual Corn Seed & Trait Sales



<sup>1</sup> Annual yield advantage calculated each year by comparing 3 leading DEKALB products within each state having a minimum of 100 comparisons to national competitor products containing similar crop protection traits as of 2022. All comparisons are head-to-head using +- 2RMs and weighted average calculated using 15% moisture; <sup>2</sup> NCGA = National Corn Growers Association – National Corn Yield Contest. Soybeans, Cotton and Vegetable Seed Businesses Benefit from Annual Germplasm Refresh to Drive Sales Growth

![](_page_33_Picture_1.jpeg)

<sup>1</sup> Soy Trials: (184 locations with 20 in 2019 (Roundup Ready® 2 Xtend), 57 in 2020 (Roundup Ready® 2 Xtend), 67 in 2021 (XtendFlex® Soybeans) and 40 in 2022 (XtendFlex® Soybeans) reporting data located with 22-IA, 24-IL, 23-IN, 11-KS, 1-KY, 7-MI, 30-MN, 10-MO, 1-MS, 5-ND, 17-NE, 15-OH, 1-OK, 11-SD, 4-PA and 2-WI, ). Significant at P ≤ 0.10 LSD at 0.6 Bu/A as of 12/13/2022. Roundup Ready 2 Xtend or XtendFlex® soybeans planted with a farmer-selected (or in case of Bayer Trials, Bayer-selected) weed control program that may include dicamba, glyphosate, gluphosate, gluphosate, Enlist E3® soybeans planted with a farmer-selected) weed control program that may include dicamba, glyphosate, Enlist One® herbicide, Liberty® 280 SL herbicide and various residual herbicides; <sup>2</sup> Cotton 3-year average: 2600 trials comparing top DP varieties within a region vs. the top 3 planted competitors based on market survey data (Kynetec).

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### Breeding Pipeline to Deliver €11bn in Peak Sales Potential

Thousands of New Varieties and Hybrids in Development to Fuel Growth in €10.5bn S&T Sales

![](_page_34_Figure_2.jpeg)

<sup>1</sup> Represents non-risk adjusted estimated peak sales for the breeding pipeline. ~50% incremental sales value. Note: Projects listed per crop are subset of the pipeline; selected top contributors to peak sale potential

### Accelerating Genetic Gain with Precision Breeding

### ACCELERATING OUR ABILITY to bring innovative solutions to our customer around the world

Data & analytics driving decisions & AI connected pipeline - enabling a dynamic breeding pipeline

![](_page_35_Figure_3.jpeg)


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## Data Driven Solutions and Simulation Key to Acceleration

Starts with a Customer Driven Pipeline

> Accelerated Breeding Methods

accelerating from 5-6

vears to ~4 months

**Continuous Breeding Cycle** 

New protected culture facilities in

Marana, AZ and Petrolina, Brazil

Every plant designed is aligned with customer-preference quantification

Novel translation of **customer insights into a number** allowing for accurate data driven decisions through product development

Selection indices combine economic and agronomic data with customer survey preferences and insights to determine desired characteristics for next-gen. hybrids

Greene County, Iowa Customer Survey Preferences Economic, Yield and Disease Pressure Data







Leads to Digital Field-Testing Twin

- Simulations use our extensive data assets to predict performance across millions of scenarios and environments

Simulations assist with crop placement and product advancement

### Example: PRECEON Hybrid Ear Height Simulation

Short-Stature Hybrid1- Ear height too low in simulation

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



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

# Hybrid Wheat: New Production System for the World's Largest Crop

Potential to Shape Transformation of Wheat Production by End of the Decade

### **Resilient Hybrid Wheat System**

- Nybrid wheat expected to provide higher yield and yield stability, with potential fit on a significant portion of the ~555m acres of wheat grown globally and ~€700m PSP
- Envision a more sustainable and resilient system with better nitrogen use efficiency, disease, drought and heat tolerance
- Advancements in genomic tools and the cytoplasmic male sterility system are enabling the development of hybrid wheat at competitive cost
- Blue ocean' market potential to drive value of market for Wheat seed and technologies, which has already happened in crops like corn



Hybrid Wheat Row Configuration Testing Nampa, Idaho | June 2022



Hybrid Wheat Nursery Filer, Idaho | June 2022

### **Market Leaders in Hybrid Wheat**

**Different climatic zones** in key regions Europe and North America require **distinct approaches**:

### Europe

- In 2021, we launched a strategic R&D partnership with RAGT, the European market leader in varietal wheat, leveraging strong complementarity of partners:
  - RAGT: Best-in-class germplasm and rich portfolio of native traits
  - Bayer: Wide array of R&D assets, seed production know-how; leader in CP

### US

Hybrid wheat program based on our leading U.S. WestBred germplasm position



A digitally enabled sustainable hybrid wheat system offering



## Direct Seeded Rice: More Sustainable & Profitable Solution

Rice Production Systems Today Water & Labor Intensive

3<sup>RD</sup> LARGEST GLOBAL CROP WITH 165M HA<sup>1</sup>

USES UP TO 43% WORLD'S IRRIGATION<sup>2</sup>

~80% TRANSPLANTED PRODUCTION<sup>3</sup>

 <sup>1</sup> Our World in Data: Land area per crop type, World, 1961 to 2021 (ourworldindata.org)
 <sup>2</sup> International Rice Research Institutue: Water management - IRRI Rice Knowledge Bank
 <sup>3</sup> Scientific Reports: A global analysis of alternative tillage and crop establishment practices for economically and environmentally efficient rice production | Scientific Reports (nature.com)

## FARMER ECONOMICS SHOW 16% LOWER COSTS WITH DSR<sup>4</sup>

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- Reduces Water Usage by up to 40%<sup>5</sup>
- **D** Up to 45% reduction in CO2 emissions<sup>6</sup>
- Manual labor reduced by up to 50% or 150 labor hours per 1 Ha DSR<sup>7</sup>
- Methane reduction by up to 85%<sup>8</sup>

<sup>4</sup>Internal estimate via DirectAcre program in India | <sup>5</sup>TRP Water Use: Kyenetec Panel Survey Data 2020, IRRI (2009), Bouman et al. (2002) | Water Savings from TRP to DSR: Bayer Sustainable Rice Initiative Pilot, Singh et al: (2015) | <sup>6</sup> Carbon emission - IPCC (2006/2019) | <sup>7</sup> Labor: <u>Sidana</u> et al. (2020) | <sup>8</sup> CH4 Reduction: Science Direct <u>Direct-seeded</u> rice reduces methane emissions - ScienceDirect

### Today: Resource Intensive Transplanted Rice (TPR) practices

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Puddling & Leveling



Manual transplanting



**Nursery Beds** 



Manual reaping

### Future: Mechanized and Technology driven Direct Seeded Rice (DSR) cultivation



Laser land levelling



Precision Application



Direct seeding with machinery



Mechanical harvesting



Improve water use per kg of crop by 25% in 2030 by transforming rice cropping system

## Bayer Direct Acres: DSR Crop System Featuring Hybrid Rice

Elite Rice Germplasm, Effective Weed Mgmt. and Digital Tools to Drive Sustainable, Operational Efficiency



# Key Takeaways – Designer Seeds



Foundational germplasm platform delivers ~500 new products annually on >160m acres

Delivers ~€11bn in peak sales potential with expansion and upside potential



Widening our leadership position through **AI connected pipeline** and **key investments** to improve genetic gain and acceleration to market



Enabling opportunities in underserved market, like hybrid wheat and direct seeded rice



**Driving regenerative ag** with higher farm productivity, as well as resource and water utilization





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Transformative Trait Technologies

**Crop Science Innovation Summit** 

June 20, 2023

Kelly Gillespie // Head of Digital Ecosystem Services, Bayer Crop Science

## Bayer Industry Leader in the Development of Plant Biotech Traits

>65 Trait Products in 27 Years, Broadly Licensed and Widely Adopted

### Bayer Plant Biotech traits reach ~300m acres annually, focused in the Americas

Offered in four main row crops



Elite germplasm with integrated biotech and native traits deliver **€10.5bn** annual seed & trait sales; **€**2.6bn from licensing

### > Delivering Exceptional Insect & Weed Control Solutions



Herbicide

Tolerance

BAYER

glufosinate tolerance in soybeans, cotton, corn and canola; +dicamba tolerance in soybeans and cotton

Offering glyphosate,

Key enabler of conservation and no-tillage systems to improve carbon sequestration in Ag



| | | | | | |

Providing **resistance to insects** that feed on the roots, stalks, leaves and grain

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Has reduced insecticide use and allows for more targeted control through the expression of Bt proteins; plus RNAi technology in CRW3



Next Generation Innovations ThryvOn cotton firstever trait to target a piercing, sucking pest using engineered protein technology

Reducing height of corn plant using RNA biotechnology in **Phase 3 short-stature corn;** an industry-first with potential to transform corn production

## Leading Positions in Global Seed & Traits Fueled by Innovation



<sup>1</sup> Source: As reported in FY 2022, exchange rate FY2022: ~1.05 USD/EUR; <sup>2</sup> Market Position determined annually, as of Q1-2022; <sup>3</sup> Represents the percentage of acres planted in the country that contain at least one Bayer biotech trait

## Decades of Investment and Expertise Unlocks Biotech Advantage

### **Biotech Trait Development Process (12-15 years)**

Gene Library contains Millions of Unique Proteins	Gene to Phenotype Optimization	Commercial Candidate Selection	Field Trials for Trait Approval	Seed Bulk-Up for Pre-Launch testing
Phase 0	Phase 1	Phase 2	Phase 3	Phase 4
<b>Trait Discovery</b> High-Throughput Screening Identifies Desired Characteristics	Proof of Concept State-of-the-Art Gene and Protein optimization capabilities Drive Product Concept Demonstrations In-Crop	Early Development Large-Scale Transformation, Commercial Candidate Selection, Pre-Regulatory Data Generation	Advanced Development Trait Integration, Regulatory Data Generation	<b>Pre-Launch</b> Regulatory Submissions & Approvals, Seed Bulk-Up, System Testing and Pre-Marketing
Industry-leading <b>microbial</b> <u>gene</u> libraries enable new trait areas and novel MOAs Application of <b>cutting-edge</b> <u>RNA</u> technologies to develop targeted innovative products Industry leading <u>genome</u> editing toolkits drives novel trait discovery	Best-in-class <b>synthetic</b> <b>biology</b> <u>gene</u> expression toolkits drive precision in gene to phenotype optimization <b>High throughput, Al-driven</b> <u>protein</u> design drives rapid iteration to optimize new MOAs	Development of <u>multi-gene</u> stacks that enable a multitude of solutions for growers <u>CRISPR technology for</u> <u>targeted insertion</u> to enable product development flexibility Largest global field-testing footprint diversifies geographic data insights	<b>New traits are introgressed</b> into the most elite germplasm, and stacked with the industry's leading traits	Experience successfully launching traits globally Identification of optimal agronomic systems (trait, germplasm, chemistry) for product deployment & customer recommendations

## Widening Leadership in Plant Biotech with Key Technology Pillars

### Four Key Technology Pillars in Plant Biotechnology



Delivering sustainability, yield improvements, difficult to manage insect solutions, and flexibility in weed management

## Developing Novel Cash Cover Crop with Potential for Low-Carbon Renewable Feedstock in Growing Biodiesel Market

Bayer Acquires Majority Share (65%) in CoverCress Inc. (CCI)



Example: CoverCress seed fits in Bayer rotational corn/soy crop system



### CoverCress

BAYER

- Low carbon intensity rotational cash crop that can deliver many ecosystem benefits of a cover crop and attractive economics of an oilseed crop
- >> Carbon sequestration potential
- Developed through gene editing and advanced breeding tools; improved the oil profile, protein content and yield of field pennycress
- Niche market in U.S. Midwest initially; within draw area in proximity to crushing and refining facilities
- >>> Expect to launch crush-ready CoverCress product mid-2020's

### The Need

- Aviation and industrial transportation sector emissions reductions to come from sustainable low carbon intensity biofuels, due to lack of electrification options
- Expect demand for 6bn gallons of Renewable Diesel/Sustainable Aviation Fuel by 2030

### The Business Model

- Closed Loop Production Contract (i.e. Farmers will be paid a premium to produce CoverCress; Bunge delivers oil to Chevron to convert to Renewable Diesel/Sustainable Aviation Fuel; CoverCress receives value from crusher (i.e. Bunge))
- CoverCress ownership: Bayer 65%; Chevron and Bunge 35%

## Biotech Pipeline to Deliver €7bn in Peak Sales Potential

12 Biotech Traits in Development; Offering up to Six MOA's and Potential for 10 Traits in a Stack



<sup>1</sup> Represents non-risk adjusted estimated peak sales for the biotech pipeline. ~50% incremental sales value. Note: Projects listed per crop are subset of the pipeline; selected top contributors to peak sale potential

### BAYER E R

## Leading Sustainable Cotton Production Advancements

Genetic Improvements and Trait Technologies Key to Measurable Improvements in Sustainability of Cotton Production



## Next-Generation Traits Further Enhance Cotton Productivity

Driving Sustainability and Profitability in our >€600m Cotton S&T Business<sup>1</sup>



Scott, Mississippi, U.S. | Sep. 27, 2021

<sup>1</sup> 2022 cotton seed & trait sales for Bayer Crop Science ThryvOn™ Technology has received full approval for planting in the United States but, as of the date this material was published, is pending approval in certain export markets. Specific plans for commercialization depend upon regulatory approvals and other factors.

## Next-Gen Intacta Traits to Expand Leading Soybean Franchise

Intacta 2 Xtend Successfully Launched; IP3 and IP4 in Pipeline to Deliver >€800m peak sales potential



IP3 = 3rd generation insect protection trait in soybeans // IP4 = 4th generation insect protection trait in soybeans <sup>1</sup> Data based on number of traited acres per Bayer internal estimates

## Next Gen Soybean Herbicide Tolerance Traits to Provide Industry Leading Flexibility

Drives ~€1bn Peak Sales Potential by Addressing Farmers' Herbicide Resistance Challenges



BAYER

## Rollout of Most Advanced Corn Rootworm Control Trait Continues

CRW3: Industry's Only RNAi-Based Corn Rootworm Trait Launched in Brazil in VTPRO4 and in the U.S. in SmartStax PRO; Expected 2024 Launch in VT4PRO in U.S. as Additional Offering





<sup>1</sup> Head-to-head comparisons across 34 Bayer trials in medium to very high corn rootworm pressure environments;

<sup>2</sup> Tinsley, N.A., Estes, R.E. and Gray, M.E. 2012. Validation of a nested error component model to estimate damage caused by corn rootworm larvae. Journal of Applied Entomology. DOI:10.1111/j.1439-0418.2012.01776.x <sup>3</sup> Based on 2022 Bayer breeding data generated over 253 locations, 2838 comparisons of 2024 launch class of VT4PRO with RNAi technology vs. key commercial Qrome products within +/- 2 RM maturity range

## Next Gen of Corn Insect Control Drive >€1bn Peak Sales Potential

Delivering 4<sup>th</sup> Generation Corn Rootworm and 4<sup>th</sup>/5<sup>th</sup> Generation of Lepidoptera Protection



- Expected mid decade
- Two new MOAs plus improved RNAi technology provides excellent efficacy against CRW populations under high pressure



## U.S. Ground Breaker Trials In 2023

Powered by Short Stature Corn Hybrids and FIELDVIEW

New era in corn production to help farmers manage risk and protect yields





# 9-12ft

Traditional corn hybrid plant height

Highest likelihood to plant a new trait in the history of our trait introductions<sup>1</sup>

<7ft

Short stature corn

hybrid plant height

<sup>1</sup> Source: Online farmer survey Feb./Mar. 2020 (n=900)



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## Offers Transformational Shift in Production

Powered by Short Stature Corn Hybrids and FIELDVIEW



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



## Planning Regional Tailored Approaches

Holistic Smart Corn System Powered by Short Stature Corn Developed via Three Technology Approaches



### Planned Technology Approach for Launch of Preceon Smart Corn System



## Key Takeaways – Transformative Trait Technologies





### Science for a Better Life

# generating growth



Sustainable Small Molecules

**Crop Science Innovation Summit** 

June 20, 2023

Axel Trautwein // Head of Regulatory Science, Bayer Crop Science

## Crop Protection Helps to Sustainably Feed the World



Based on 2019 study conducted by European Parliamentary Research Service (Farming without plant protection products (europa.eu)), EXCLUDING Corn and Soy numbers Note: Losses are calculated at the global scale and are caused by pathogens, pests, viruses and weeds. Crop protection without PPPs include crop rotation, biological control, soil management, resistant varieties...

### BAYER ER

## Leading Positions in Global Crop Protection

Driving >€13bn in Sales in 2022

> 2022 Herbicides Sales <sup>1</sup>	> 2022 Fungicides Sales <sup>1</sup>	> 2022 Insecticides Sales <sup>1</sup>
ln€bn	In €bn	In €bn
Bayer 8.3	Syngenta AG	FMC
Syngenta AG	Bayer 3.3	Syngenta AG
Corteva	BASF	Bayer <b>1.6</b>
BASF	Corteva	Corteva <sup>2</sup>
FMC	FMC	BASF
	DELARO Complete	
PowerMAX 3 HERRICIDE XTENDIMAX	Luna PROSARO FOX	vayego Curbix

Chart shows comparison to strategic peer group <sup>1</sup> Source: Company reporting, exchange rate FY2022: ~1.05 USD/EUR <sup>2</sup> Corteva Insecticides sales exclude non-crop business, internal estimates

### BAYER E R

## Bringing New Crop Protection Innovation to Market

Launched Two New Actives, 10 New Formulations and >250 Registrations in 2022



Fox products also sold under Cripton brand name in other markets; 1 In collaboration with Sumitomo; 2 Internal estimates; 3 for soybeans in LATAM; 4 BASF Orkestra Ultra; PSP = Peak Sales Potential

## Crop Protection Pipeline to Deliver ~€9bn in Peak Sales Potential

Advancing Nine Actives in 2022



<sup>1</sup> Represents non-risk adjusted estimated peak sales for crop protection, including biologicals. Note that products are excluded from the pipeline PSP typically the year following launch; PSP = Peak sales potential; ~50% incremental sales value. Estimated to reach ~30% of peak sales potential by 2032, ~80% by 2037 and 100% by 2038+; Projects included are only a subset of the pipeline

## Plenexos... Where Healthier Fields Meet Higher Yields

Our Next Generation Ketoenol Insecticide with ~€500m Peak Sales Potential

> Plenexos will be the first ketoenol insecticide expected to offer both foliar and soil uses

**Plenexos** will enhance ketoenol insecticides by offering:

High plant mobility, which will ensure **high efficacy** against key sucking pests (aphids, whiteflies, scales, mealybugs) at **low dose rates** for **foliar and soil uses** 

Featuring a **broad crop scope**, Plenexos will be suitable for application in **arable and horticulture** crops (soybeans, cotton, fruits and vegetables)

Favorable pollinator and beneficial toxicological profile which will ensure **broad flexibility** and **fit to Integrated Pest Management programs, as well as low residue levels** for several uses

Targeted markets: LATAM, NA, APAC and TAMECIS<sup>1</sup>

First regulatory submissions in key markets in 2022, first launches expected from 2025 onwards<sup>2</sup>



Always read and follow label instructions. Products not registered in all jurisdictions. Plenexos is the brand name of the ketoenol insecticide Spidoxamat

<sup>1</sup> TAMECIS stands for Turkey, Africa, Middle East, Commonwealth of Independent States; <sup>2</sup> Commercialization is dependent on multiple factors, including successful conclusion of the regulatory process. The information presented herein is provided for educational purposes only and is not and shall not be construed as an offer to sell, or a recommendation to use, any unregistered pesticide for any purpose whatsoever. It is a violation of federal law to promote or offer to sell an unregistered pesticide

BAYER

## New Broad Spectrum Fungicide<sup>1</sup> with a PSP of >€1bn

A New Fungicide with Broad Geographical, Crop and Disease Scope, Currently in Phase 3

> New broad-spectrum Fungicide with blockbuster potential



For global use confirmed in cereals, corn,fruits & vegetables with upside potential in numerous other crops

Proven Mode of Action in a highly competitive future market

Favorable regulatory profile

Providing farmers worldwide with a reliable
tool to ensure healthy crops and robust resistance management

Excellent fit with Bayer's fungicide portfolio, helping to strengthen our leading position

<sup>1</sup> in collaboration with 3rd party; PSP = Peak Sales Potential



# Agriculture

Unlocking a new benchmark in the industry

# CropKey

unlocking the future of sustainable crop protection

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Designing the Next Generation of Sustainable Crop Protection Solutions to Serve the Needs of Farmers & Society



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### BAYER E R

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## CropKey Approach to Open Uncharted MoA & Chemical Spaces

Pioneering Today to Unlock the Crop Protection Solutions of Tomorrow



## Enriching Our Pipeline with Novel & Sustainable Modes of Action

CropKey First representatives of CropKey approach are being brought from conception to reality in record time

### New Herbicide Molecule

- First new mode of action in post emergence weed control in 30 years, based on CropKey approach
- **///** Securing farmers production in situations with tough to control grasses
- /// Allows use in various new market segments, as well as potential for precision application

PSP of >€750m
Project is currently in Phase 3



**Glyphosate Only** 



Mix Partner + New Herbicide Product concept with new active

### New Fungicide Molecule

- **///** Broad-spectrum Horticulture fungicide with a new mode of action, based on CropKey approach
- /// Control of key leaf spot fungi (incl. Anthracnose) across key regions
- /// Opportunities to extend beyond horticulture to cereals (barley), oil seed rape and seed treatment<sup>1</sup>

### **PSP of >€200m<sup>1</sup>**

Project is currently in Phase 2



Standard Only

New Fungicide

### 

<sup>1</sup> Expansion into oil seed rape and seed treatment not yet included in PSP; PSP = Peak Sales Potential

## Key Research Partners and Academics Help Us Unlock the Future of Sustainable Crop Protection



BAYER

### Targenomix Joins Bayer Crop Science as part of the *CropKey* approach to R&D

- Acquired German biotech startup in November 2022
- Systems biology approaches to unlock new potential, fueling our discovery engine
- Innovative tools to identify and select safe and sustainable compounds



The *CropKey* approach creates new modalities with unparalleled safety for food and farm

- New collaboration with Oerth Bio announced in January 2023
- Unique protein degradation technololgy (PROTAC)
- Built to protect crops from disease and pests while leaving all other species and biome unaffected



## Using Genomics to Unlock the Future for Pest Control

- Project between Bayer, Rothamsted and Syngenta
- Sequence and assemble genomes of 20 of the world's most damaging crop pests

## Formulation Expertise Drives our Life Cycle Management

Expect to see ~90-100 new formulation launches in the next decade

Leader in product design for precision / drone application

- Require less water, reduce the overall volume of solution application and enhance operator safety
- Novel formulations extend good efficacy into verylow volume range through in-build adjuvants that enhance spreading, retention and uptake



### 

Key products validated in APAC for drone segment





- Relevant part of our crop protection portfolio validated for drone uses
- Pipeline strategy for very-low volume-ready products in place
- Partnering with drone manufacturers and application service providers such as Rantizo (LEAPS investment)

### BAYER E R

## Reducing Crop Protection's Environmental Impact

Developing Crop Protection Products with Better Benefits and Less Impact on the Environment



<sup>1</sup> Comparison against a 2014 – 2018 baseline

Preliminary impact assessment has been conducted by Technical University of Denmark (DTU) based on the PestLCI/USEtox® models. PestLCI secondary distributions currently out of scope. Impact assessment limited to current scientific consensus of USEtox®: aquatic organisms and the substances which can be characterized in USEtox®. Terrestrial and pollinator impact assessment is currently not included in USEtox<sup>®</sup>. CP application data mostly from third parties such as Kynetec/Kleffmann in some countries based on Bayer estimates.
### Key Takeaways – Sustainable Small Molecules



We are a **global leader in Crop Protection** with >€13bn in sales in 2022 and #1 position in Herbicides, #2 position in Fungicides and #3 position in Insecticides

Promising catalysts drive **~€9bn peak sales potential** of our Crop Protection pipeline



We are **designing the next generation of sustainable Crop Protection solutions** to serve the needs of farmers & the society through our CropKey approach



Bring leading crop protection innovations to growers with a **new broad-spectrum fungicide** and **first new mode of action for post emergence weed control in 30 years** 



We are committed to reduce the environmental impact of our CP products by 30% by 2030

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#### Science for a Better Life

# generating growth



#### Biological Breakthroughs

**Crop Science Innovation Summit** 

June 20, 2023

**Jessica Christiansen** // Head of Sustainability and Business Stewardship, Bayer Crop Science

### Biological Solutions Key to Advancing Benefits of Regenerative Agriculture



Active ingredients derived or developed from naturally-occurring sources

Pathway for growers to **protect their crops and land**, increase their nitrogen use efficiency and **limit their environmental impact** 

### 01

#### BIOCONTROLS

Biocontrol products aim to protect plants from pests and diseases

02

#### BIOSTIMULANTS

**Biostimulant products** aim to improve nutrient use efficiency and tolerance to e.g. drought or heat regenerative agriculture

"producing more and restoring more"



Improved soil health



Conservation of water



Preservation, restoration of biodiversity

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Mitigation of climate change



Yield increase and improved productivity, social and economic well-being of farmers and communities



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

### Building on the Leading Portfolio of Biological Solutions to Meet Growing Market Needs



ACCELERON

products)

soybean and cotton)

- Bayer is the #1 Trusted Brand in Biologicals by Growers<sup>5</sup>
- Delivering **~€200m in annual sales** in 2022
- Offering >20 commercial products

<sup>1</sup> In-licensed from Total Energies; <sup>2</sup> Also sold under BioRise and Torque brand names; <sup>3</sup> 3rd party product from BASF, <sup>4</sup> In-licensed from Novozymes; <sup>5</sup> 75-100 growers polled in each of seven countries (Europe, Brazil, US) for potato, tomato and grapes, Bayer Market Research 2020



Acceleron portfolio offers advanced seed

Designed to complement, protect, and

treatment solution in the industry (for corn,

enhance seeds including Bayer's DEKALB corn commercial hybrids from

the outset (exclusive combinations of seed

treatments merging chemical and biological



#### **Biological Insecticide**

- Natural product containing fatty acids derived from a by-product of extra virgin olive oil
- Consistent broad-spectrum activity across multiple fruit and vegetable crops and pests
- In-licensed from AlphaBio Control

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### Serenade Soil Activ Tailored for Soil and Crop Health

Accelerate Growth in Emerging Global Soil Application Market Across Fruits & Vegetables



NEW Serenade Soil Activ propelling Serenade brands to >€170m peak net sales in next 10 years

Serenade brand family: the biological active bacillus amyloliquefaciens strain QST 713 delivers solutions in emerging soil treatment and expanding bacterial disease markets:

Serenade ASO offers QST 713's combination of several modes of action to help control foliar bacterial and fungal diseases while reducing residues

NEW Serenade Soil Activ with its higher concentration of QST 713 spores provides farmers handling efficiency with low use rates and less water consumption

- The concentrated QST 713 spores, applied in furrow or via drip, can speed up root formation and uptake of nutrients, raising marketable qualities (skin, shelf life, nutrient content)
- Launched in U.S., Canada & Australia, sales in all global regions expected with coming registrations

Always read and follow label instructions. Products not registered in all jurisdictions.

Higher proportion of big potatoes

 $\mathbf{\overline{\mathbf{v}}}$ 

Better skin finish, improved uniformity

Lower use of water/ac

~10% more

class potatoes

premium





Sustainably increases marketable yield with spores optimized for improved root colonization



#### BAYER Biologicals Market Expected to More than Double to €30bn by 2035

We aim to Outgrow the Market with a 17% CAGR



Source: Global Agricultural Biologicals Market, Forecast to 2030, Frost & Sullivan, 2022 and internal estimates

### Expanding a World Class Biological Platform with Open-Innovation

Partner of Choice with Industry Leading Capabilities in Development, Regulatory and Commercialization



Complementing efforts with academic partnerships and Leaps by Bayer investments, such as: andes Sound 👬 📣 PIVOT BIO

# BAYER

### Biologicals Most Effective in Integrated Crop Management System; Complementary to Other Technologies

Example: Integrated Citrus Pest Management



### Two Biological Seed Treatments Advanced in our Pipeline

Pipeline advancement focused on differentiated products

#### | | | | | | | | |

#### **Bird Repellent**

- > Bird repellent for corn seeds in Europe with Black Pepper Oleoresin (BPO) as active ingredient
- BPO is a food grade natural extract which is applied onto seeds to protect them from bird attacks in freshly sown fields, which cause 9-15% of corn acreage in Europe to be replanted<sup>1</sup>
- BPO is a unique biological alternative to substitute chemical bird repellents with poor toxicological and environmental profiles

#### **PROJECT IS CURRENTLY IN PHASE 3**



<sup>1</sup>according to internal survey in Germany, France and Italy <sup>2</sup>shows two week old corn plants grown in containers in greenhouse; Pipeline phases as of Feb'23

#### **Biological Seed Treatment**

- Expected to unlock yield potential in corn
- Significant and consistent yield increases demonstrated in trials over several years in the core regions
- Will associate with corn roots and increase nutrient availability by solubilizing insoluble nutrients
- Potential for improved and increased root systems can enable higher yields

#### **PROJECT IS CURRENTLY IN PHASE 3**



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### Comprehensive Open-Innovation Strategy for Nitrogen Fixation



#### BAYER Key Takeaways – Biological Breakthroughs



Pathway for growers to **protect their crops and land**, increase nitrogen use efficiency and limit their environmental impact





#### Science for a Better Life

# generating growth



New Frontiers in Digital and Carbon Farming

**Crop Science Innovation Summit** 

June 20, 2023

**Thomas Eickhoff** // Head of Science for Digital Farming, Bayer Crop Science

### Digital Platform Optimizing Through the Farm into the Value Chain

Enabling Sustainable Solutions from Farm to Fork





Digital Farming Brings Transformational Solutions While Driving Significant Franchise Value and Opportunities Downstream and in Value Chain





<sup>1</sup>According to Kynetec December 2021 FieldView Brand Tracker |<sup>2</sup> vs. non FV Plus users |<sup>3</sup> based on U.S. GPOS data 2018-2021 |<sup>4</sup> Internal estimate as of 2022 |<sup>5</sup> national average based on Kynetec/GFK Analysis

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### Digital Solutions Deliver Sustainable Profitability

Enabling Decisions that Matter with Industry Leading Data Collection



#### >8,000 digital field trials

BAYER

- >115bn data points of product performance under real-world farmer management practices
- > 62M hrs of equipment data
- Environmental and weather data
- Sensor or IoT data
- Platform Partner data





- Seed Placement
- Disease Management
- Weed Management
- Pest Management
- Horticulture







Providing Tools to Help Growers

- Increase yield and improve profitability
- Farm more efficiently and sustainably
- Manage risk and address variability



# Fieldview Digital Insights Maximizing Smart Corn System



Comprehensive Digital Agronomic Support

- > Hybrid Selection & Placement
- >> Planting Density
- Planting Date
- > Fertility Recommendations & Timing
- Crop Protection Recommendations & Timing

///////

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

FRANCHISE VALUE

CLIMATE FIED VIEW

///////

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





### Digitally-Proven: 2023 Bayer Corn Seed Showcase Pilot

Providing Confidence to Farmers in putting the Best Seed in the Ground



// Program jointly developed and tested with growers and dealers to minimize the risk of trying new brands and different hybrids of seed on their farm, reducing uncertainty and optimizing return on investment



Targeting 250k acres and 700-1000 farmers in targeted U.S. geography

Fieldview data-driven recommendation more accurately predicts winning products<sup>1</sup>

Seed Showcase farmers will **split plant** fields with competitor seed brand product and a **recommended BCS product**. If recommendation doesn't beat the competitor, BCS will pay a **\$6 bu/ac performance warranty** up to a **maximum of \$60/ac** 



Increased Engagement with Digital Tools and Outcome Based Offers

Value Created for Growers, Partners and Bayer

<sup>1</sup> Internal estimates generated from Digital Recommendation Model assessing last 5 years of agronomic results

The information on this document is to aid in understanding the 2023 Bayer New Business Models Master Agreement and the 2023 Channel or Dekalb Showcase Protocols, which govern all requirements associated with the two programs. This document does not change or modify the 2023 Bayer New Business Model Master.



Advancing Climate Smart Practices on Farm To Achieve Carbon Goals for Growers and Businesses; Creating New Revenue Stream

>

ForGround by Bayer

Digital platform that helps farmers transition to climate-smart practices and connects growers, acres, and buyers to more meaningful opportunities.

**Growers** have access to tools, resources, discounts and financial benefits *(through Bayer Carbon Program)*  **Companies** have access to carbon assets and services powered by **FIEDVIEW** platform to support their sustainability goals

DOWNSTREAM

VALUE

Our Commitment: 30% Reduction of Field Greenhouse Gas Emissions by 2030

#### Builds on Success with our Existing Bayer Carbon Program

~2,600 participating farmers

10 countries covered

~1.5m acres globally

// Long-term program providing **annual incentives** to **FIEDVIEW** users, enrolled in the program, for verified and validated **climate-smart practices** like no-till and cover cropping

// Enables 3 Expected Downstream Revenue Opportunities in >\$200bn/year market<sup>1</sup>

Carbon Services Product Sales Carbon Assets first removals in NA in 2023

#### Creates new opportunities for growers and businesses alike

&



- First food value chain B2B collaboration on ForGround platform spanning across Perdue's entire grain network
- Perdue grain farmers may be compensated for adopting regenerative practices, allowing Perdue to decarbonize their supply chain



- > Supports Nori in advancement of the carbon marketplace
- > Pave the way for price discovery of carbon removal credits on the open market
- > Bayer Carbon Program grower payments will be reassessed in accordance with **carbon credit market price** fluctuations





Seeking to Create Carbon Neutral Soybean Industry by

Combining Bayer PRO Carbono Practices with our Leading Seeds & Traits



<sup>&</sup>lt;sup>1</sup> Source: As reported in FY 2022, exchange rate FY2022: ~1.05 USD/EUR

<sup>2</sup> Assumptions and challenges of carbon footprint accounting in agriculture - Marcelo Morandi and Marília Folegatti - Embrapa Meio Ambiente; SOC = Soil Organic Carbon

BAYER E



### Orbia JV is the Largest Digital Ag-Marketplace in LATAM

In combination with **FIEDVIEW**, provides an integrated digital grower experience

# Orbia



- Connects growers, input providers and grain traders to a network to expand their reach, secure financing, redeem rewards from Bayer's Impulso loyalty program, purchase and sell inputs
- Established in 2019 in Brazil, later expanded to Argentina, Colombia and Mexico<sup>2</sup>
- ~300 distributors with inputs such as pesticides, seeds and fertilizers
- ~€460m in commissioned online transactions (GMV<sup>3</sup>) in 2022
- >270,000 registered growers across LATAM
- Covers ~75% of Brazil planted area
- Recently launched **Orbia Pag**, the first digital pre-approved credit mechanism for farmers

<sup>1</sup> Brazil-based marketing agency who managed Bayer's loyalty program in Brazil, prior to the formation of Orbia. <sup>2</sup> Orbia is named "Nucle" in Mexico // <sup>3</sup> GMV means Gross Merchandise Value, the most common metric for marketplace development

Orbia Pag

### Industry First Collaboration Offering B2B Digital Solutions that Connect the Farm to the Value Chain



PLATFORM VALUE

Enabling Transparency and Sustainability for Companies and Consumers; Advancing New Opportunities for Farmers

Azure Data Manager for Agriculture is the **largest connection** point of agricultural data and services **driving interoperability** across the value chain – including food, feed, fiber and fuel

COLLABORATION

Combines **Bayer's ag expertise** and leading digital farming platform with **Microsoft's cloud technology** for unrivaled B2B solutions

Bayer AgPowered Services, based on proprietary capabilities, now available to the industry on Azure Data Manager's robust infrastructure

Imagery Insights

Microsoft

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- Smart Boundary Detection<sup>1</sup>
- Crop Water Use Maps
  - S OC Crop Growth Models<sup>1</sup>
- Growing Degree Days

Provides cloud-based digital tools and data science solutions for ag and agri-food businesses to license and use for internal platforms or customer-facing digital solutions

Will provide solutions to address farming operations, sustainable sourcing, manufacturing and supply chain improvement, and ESG monitoring and measurement

<sup>1</sup> Additional offerings in development

### Key Takeaways – New Frontiers in Digital & Carbon Farming





#### Science for a Better Life

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## generating growth

#### **Bayer Crop Science Innovation Summit**

New York City // June 20, 2023

/// Bayer Crop Science Innovation Summit /// June 20, 2023

#### Crop Science: Seed & Traits and Digital R&D Pipeline (Annual Update Feb 2023)

	Phase I		Phase II		Phase III		Phase IV		PSP	
	Corn Disease Shield - NA 2nd Generation Seed Density Digital Tool - NA Annual Germplasm Upgrades		5th Generation Lepidoptera Protection 5th Generation Herbicide Tolerance w/ (RHS2 Digital Disease Mgmt. – NA Seed Placement Digital Tool - NA Annual Germplasm Upgrades		Short Stature Corn – Biotech Trait <sup>2</sup> 4th Generation Coleoptera Protection Annual Germplasm Upgrades	)AS MOR MOR	Short Stature Corn – Breeding Approach 4th Generation Lepidoptera Protection Seed Density Digital Tool – EMEA Seed Density Digital Tool – LATAM Annual Germplasm Upgrades		~€11bn	
SOTBEAN SEED & INALL	Digital Disease Mgmt NA Annual Germplasm Upgrades Soybean Native Resistance	<u></u> ∠ >≤	Seed Placement Digital Tool – NA 4th Generation Insect Protection Annual Germplasm Upgrades Soybean Native Resistance	}≪ }≪ □	<ul> <li>3rd Generation Insect Protection</li> <li>2nd Generation Soy Cyst Nematode resistance</li> <li>4th Generation Herbicide Tolerance (HT4)</li> <li>(5 Tolerances – Adds 2, 4-D and HPPD)</li> <li>5th Generation Herbicide Tolerance</li> <li>(6 Tolerances – Adds PPO)</li> <li>Annual Germplasm Upgrades</li> <li>Soybean Native Resistance</li> </ul>	Jee Jee not de voi	Vistive Gold Xtend Annual Germplasm Upgrades Soybean Native Resistance	)48 ()48 <b></b>	~€4bn	
Including Carbon Model	Canola/OSR Digital Disease Mgmt NA Wheat Annual Germplasm Upgrades Wheat Disease Package Upgrades Cotton Annual Germplasm Upgrades Canola/OSR Annual Germplasm Upgrades Veg- Annual Germplasm Upgrades Rice Annual Germplasm Upgrades	he he he he he he	Wheat Digital Disease Mgmt EMEA Wheat Annual Germplasm Upgrades Wheat Disease Package Upgrades Cotton Annual Germplasm Upgrades Canola/OSR Annual Germplasm Upgrades Veg- Annual Germplasm Upgrades Rice Annual Germplasm Upgrades	Des Des Des Des Des	Canola Dicamba Tolerance Sugarbeets 2nd Generation Herbicide Tolerance <sup>1</sup> Cotton 4th Generation Herbicide Tolerance (HT4) (5 tolerances – Adds 2, HPPD and PPO) Cotton 4th Generation Insect Protection Wheat Annual Germplasm Upgrades Wheat Disease Package Upgrades Cotton Annual Germplasm Upgrades Canola/OSR Annual Germplasm Upgrades Rice Annual Germplasm Upgrades	he he he he he he war not not	Lygus and Thrips Control (ThryvOn Technology) - <i>Stewarded Commercial Launch</i> Wheat Annual Germplasm Upgrades Wheat Disease Package Upgrades Cotton Annual Germplasm Upgrades Canola/OSR Annual Germplasm Upgrades Veg- Annual Germplasm Upgrades Rice Annual Germplasm Upgrades	Des Des Des Des Des	∼€6bn	<ul> <li>Breeding</li> <li>Trait</li> <li>Digital Model</li> <li>advanced to next phase</li> </ul>

**€21**bn

**PSP** 

Projects listed here and included in the peak sales potential by segment do not include projects funded by our LEAPS investments; includes all advancements made in FY'22, updated Feb'23

PSP = Peak Sales Potential, 50% incremental; Expected to reach 30% of PSP by 2032, 80% of PSP by 2037 and remainder in 2038+; Note that products are excluded from the pipeline PSP typically the year following launch <sup>1</sup> In collaboration with KWS; <sup>2</sup> In collaboration with BASF; <sup>3</sup> "Other" category includes seeds and traits, such as cotton, canola, wheat, OSR, rice, vegetable seeds and sugarbeets, plus carbon and digital Models



### Crop Science: Crop Protection R&D Pipeline

(Annual Update Feb 2023)

	Phase I Phase II		Phase III	Phase IV	Life Cycle Management <sup>1</sup>				
HERBICIDES	New Al Development New Herbicide ✓ , , , New Herbicide ✓ ✓ , , , New Herbicide ✓ , , , ,		New Herbicide 🗸 🗸 🦨 New Herbicide <sup>3</sup> 🖌 🖧		Non-Selective         Glyphosate LCM       ✓         Selective       ✓         Merlin Flexx / Adengo LCM       ✓         Balance Flexx LCM       ✓         Convintro       ✓         New over-the-top herbicide       ✓	~€4bn			
FUNGIC.	New Fungicide 🗸 🍾	New Fungicide 🗸 🔥	New Fungicide³ ✔✔ ♣		Luna Flexx ✓ Super Nativo ✓ ✓ Delaro Forte ✓	~€3bn			
INSECT.	New Insecticide ✓ ✓ _ ♣		Novel Mite Solution 🗸 🗸 🗸 🍌	Plenexos ✓ ✓ ✓ ೄÅ₀	Vayego Duo     ✓       Velum LCM     ✓       Rice Plant Hopper     ✓	~€2bn			
SEED GROWTH <sup>2</sup>			New Seed Treatment ✓ $43$ , New Seed Treatment ✓ $43$ ,		INS FUN ready mixture Redigo FS 25 ✓				

€9bn **PSP** 

Corn 🗸 Soybeans 🖌 Fruits and vegetables 🗸 Cereals, oilseed rape, sugarbeets, cotton and rice 🍫 Biological

🦾 Small Molecule

<sup>1</sup> Shown here is a subset of Bayer's total life cycle management activities; focused on new formulation developments which have the potential to bring significant innovation to customers compared to currently marketed product; Products shown may not yet be fully registered in all jurisdictions; includes all advancements made in FY'22, updated Feb'23; <sup>2</sup> SeedGrowth is currently reported within other SBEs; <sup>3</sup> 3rd party collaboration

PSP = Peak Sales Potential, 50% incremental; Expected to reach 30% of PSP by 2032, 80% of PSP by 2037 and remainder in 2038+; Note that products are excluded from the pipeline PSP typically the year following launch.

advanced to next phase Selection of projects listed here and included in the peak sales potential by segment do not include projects in early research or discovery

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### Data Connected Plant Breeding Advantage

#### Breeding Product Development Process (8-10 years)

#### Data & analytics driving decisions & AI connected pipeline - enabling a dynamic breeding pipeline

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Fieldview Field Health Imagery Data Collection	Seed Chipping Technology for accelerated discovery	Marana, AZ Protected Culture Design Center	Cassette Planter delivers large scale field testing	Drone Sensors; globally connected data ecosystem	Seed Bulk-Up for Pre-Launch testing				
Customer Insights	Discovery	Phase One	Phase Two	Phase Three	Phase Four				
<b>Data &amp; Insights</b> Customer driven quantitative economic indices	<b>Population Selection</b> Population simulation and human supervised, model driven selection for desired characteristics	<b>Early Design</b> Advanced genomic selection including future environmental challenges	Intermediate Development Large-Scale Field Testing, Trait Integration and prescriptive data collection to inform models and feed pipeline	Advanced Product Understanding Traited Testing, Early Tailored Solutions data generation, and preparation of digital data package for Climate models	<b>Pre-Launch</b> Broad product testing by R&D and Market Development, Seed Bulk-Up, System Testing and Pre-Marketing				
Competitive Advantages									
<ul> <li>Extensive environmental and on-farm data driving targeted discovery</li> <li>Unique data-driven bio-economic models that allow precise fitting of product concepts</li> </ul>	<ul> <li>Industry-leading global germplasm libraries across crops and markets- 100X larger</li> <li>Decades of field and genomic data combined with industries leading data science platform</li> </ul>	<ul> <li>Ability to rapidly sample and genetically evaluate millions of seeds- 15X faster</li> <li>Advanced Product Design facilities that enable multiple cycles of planting per year</li> </ul>	<ul> <li>Industry leading Trait Integration programs stack traits into elite germplasm</li> <li>Largest global field-testing footprint &amp; digital field-testing twin capabilities diversifies geographic data insights</li> </ul>	<ul> <li>Fully automated seed distribution centers prescriptively sample diverse growing environment</li> <li>Traited-Testing evaluates products as they would be experienced by the growers</li> </ul>	<ul> <li>Most advanced and distributed network of field testing in the industry</li> <li>Evaluation of agronomic systems for product deployment &amp; customer recommendations</li> </ul>				

### Decades of Investment and Expertise Unlocks Biotech Advantage

#### **Biotech Trait Development Process (12-15 years)**

Gene Library contains Millions of Unique Proteins	Gene to Phenotype Optimization	Commercial Candidate Selection	Field Trials for Trait Approval	Seed Bulk-Up for Pre-Launch testing
Phase 0	Phase 1	Phase 2	Phase 3	Phase 4
<b>Trait Discovery</b> High-Throughput Screening Identifies Desired Characteristics	Proof of Concept State-of-the-Art Gene and Protein optimization capabilities Drive Product Concept Demonstrations In-Crop	Early Development Large-Scale Transformation, Commercial Candidate Selection, Pre-Regulatory Data Generation	Advanced Development Trait Integration, Regulatory Data Generation	<b>Pre-Launch</b> Regulatory Submissions & Approvals, Seed Bulk-Up, System Testing and Pre-Marketing
Industry-leading <b>microbial</b> <u>gene</u> libraries enable new trait areas and novel MOAs Application of <b>cutting-edge</b> <u>RNA</u> technologies to develop targeted innovative products Industry leading <u>genome</u> editing toolkits drives novel trait discovery	Best-in-class <b>synthetic</b> <b>biology</b> <u>gene</u> expression toolkits drive precision in gene to phenotype optimization <b>High throughput, Al-driven</b> <u>protein</u> design drives rapid iteration to optimize new MOAs	Development of <u>multi-gene</u> stacks that enable a multitude of solutions for growers <u>CRISPR technology for</u> <u>targeted insertion</u> to enable product development flexibility Largest global field-testing footprint diversifies geographic data insights	<b>New traits are introgressed</b> into the most elite germplasm, and stacked with the industry's leading traits	Experience successfully launching traits globally Identification of optimal agronomic systems (trait, germplasm, chemistry) for product deployment & customer recommendations

### Industry-Leading Expertise in Chemical Crop Protection R&D

Designing Molecules to Safely & Sustainably Address Needs of Farmers and Society



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### Industry-Leading Technology for the Next Generation of Biologicals





#### Science for a Better Life

# **generating** growth

#### **Bayer Crop Science Innovation Summit**

New York City // June 20, 2023