

The Promise of AI for Agriculture

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The world needs more innovation in agriculture

Need to produce significantly more while protecting

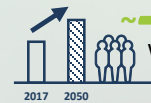
natural resources

Demand



50 %

More food, feed & biofuel* needed



~10 Bn

World population*

70 %

More meat in developing nations* needed



Supply

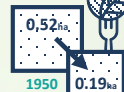
17 %

Harvest losses*



12 Mio

Ha of agricultural land loss annually



0.16 ha

Land for food per capita**

Source: FAO 2017, The Future of Food and Agriculture

* By 2050; ** 2050 land for food per capita estimate: 2000: 0.24ha; 1950: 0.52ha



Shaping agriculture to benefit farmers, consumers, and our planet

Our Mission



Deliver world-class innovation



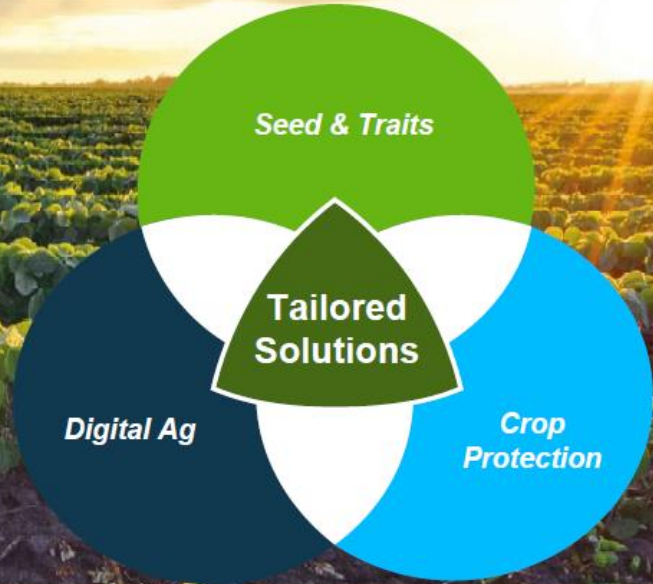
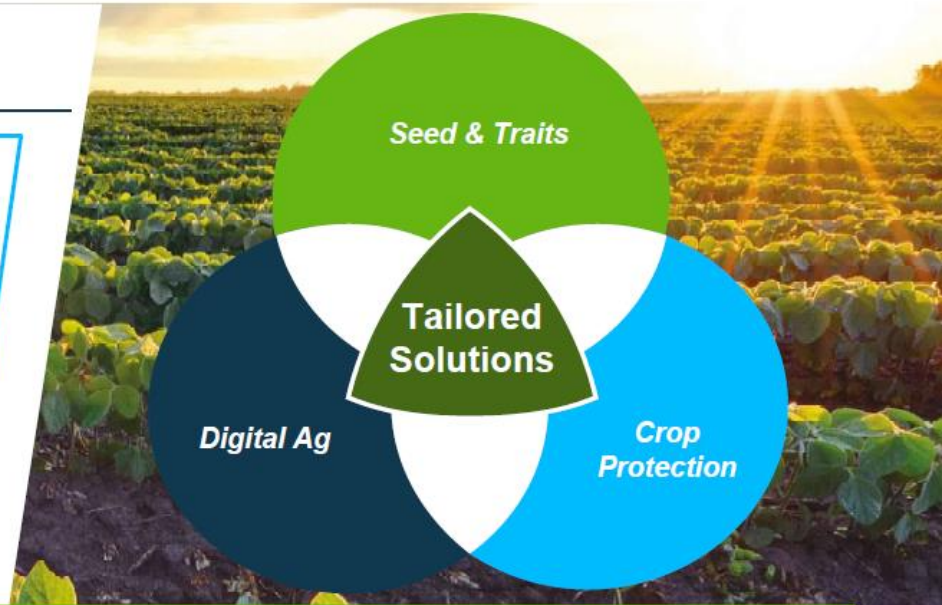
Pioneer the digital transformation



Set new standards of sustainability



Drive operational excellence



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



Developing Solutions for Farmers

Better Lives

1 NO POVERTY

2 ZERO HUNGER

8 DECENT WORK AND ECONOMIC GROWTH

High Yield, Data-Driven Ag, Insect, Weed and Disease Control, Ag Biologicals

Better Planet

6 CLEAN WATER AND SANITATION

13 CLIMATE ACTION

15 LIFE ON LAND

Insect Control, Stress Tolerance, Seed Treatments, Digital Ag

Better Partner

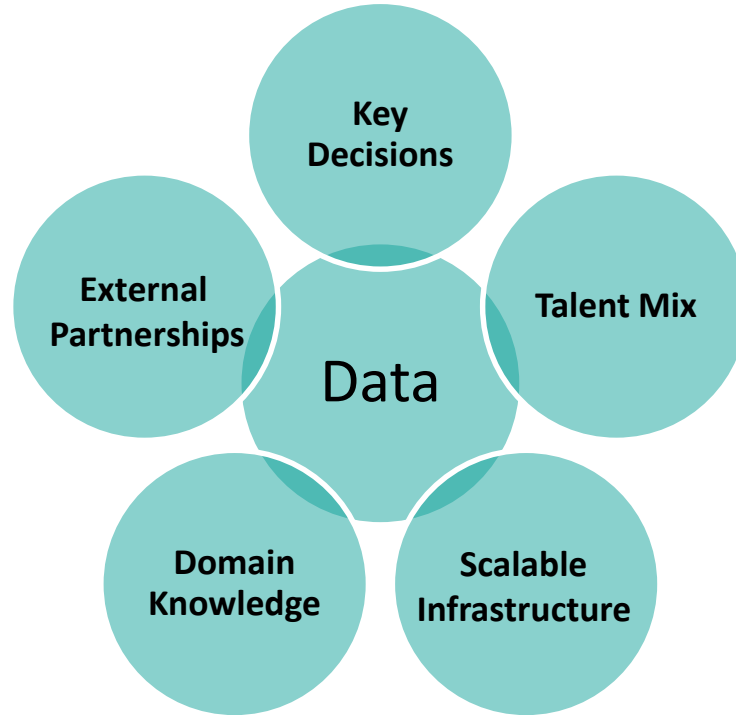
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

17 PARTNERSHIPS FOR THE GOALS

Insect, Weed and Disease Control, Stress Tolerance, Digital Ag

Multiple key elements needed to come together for AI Success



AI in action: machine learning increases scale and speed of plant breeding innovation



DNA SEQUENCE CHIPS

Testing in the Lab

One DNA sequence chip holds the equivalent of 14 acres of information.

Two months of lab work generates the same data as one year of field testing did in the past, helping us reduce land needs, inputs and equipment use.



Breeders Make Selections

Advanced analytics convert DNA sequence data into data identifying agronomic traits.

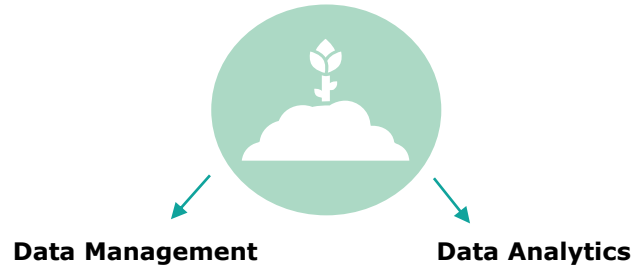
Today's corn and soybean pipelines are 4X and 6X larger than 2012.

AI in action: improving supply chain sustainability through advanced analytics modeling

Complex Logistics Environment

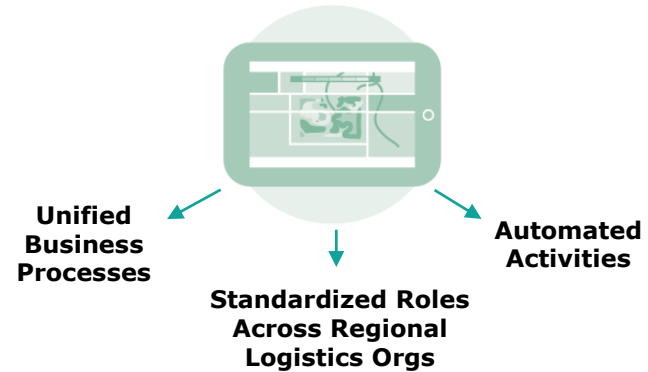
32K+ Customer destinations – 300K+ Shipments a year – Product movement in 70+ countries

Advanced Seed Production Initiative



In 2017, results from grower score cards, seed scripts, planting, pollination and harvest optimization models led to a 9.4K acre reduction in our seed production footprint.

Transportation Management Systems (TMS)



In the U.S., TMS has reduced transportation CO₂ emissions 8% per unit for row crops since FY15.

AI in action: predictive modeling enables us to test only the best products in the field

Predicting Flavor

Bayer breeders deliver more than 125 new variety introductions across 20 produce crops each year. AI lab analysis identifies products with an enhanced taste profile in early generation testing.



AI in action: enabling better farmer decisions to deliver higher yield from same land

Algorithm Development¹

- // 5 years of Bayer R&D Data
- // 6m Data Points
- // +53K Fields, ~7,600 Hybrids
- // Validated Using 4.4m Acres of FieldView Customer Data



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

Field Tests¹

2017 Results

77% win rate
+6 bu/ac

> Additional data points increase algorithm efficacy and **predicted win rate of >90%**

2018 Results

89% win rate
+10 bu/ac

(30 trials to date)

2019 Beta (Launch)

- // \$4/acre per season
- // 50 dealers, 3 states
- // 200 farmers

> Developing algorithm for soy: beta testing in 2020

2016

2017

2018

2019

¹ Internal estimates and field trials

/// Bayer Capital Markets Day /// London, December 5, 2018

Some takeaways...

- What are your key decisions?
- Free your data...
- Let data experts guide you
- Business partnering is essential
- Leaders need to lead!