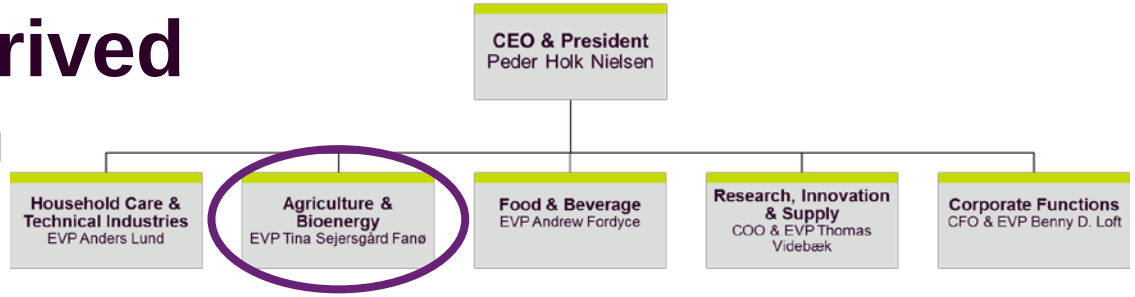
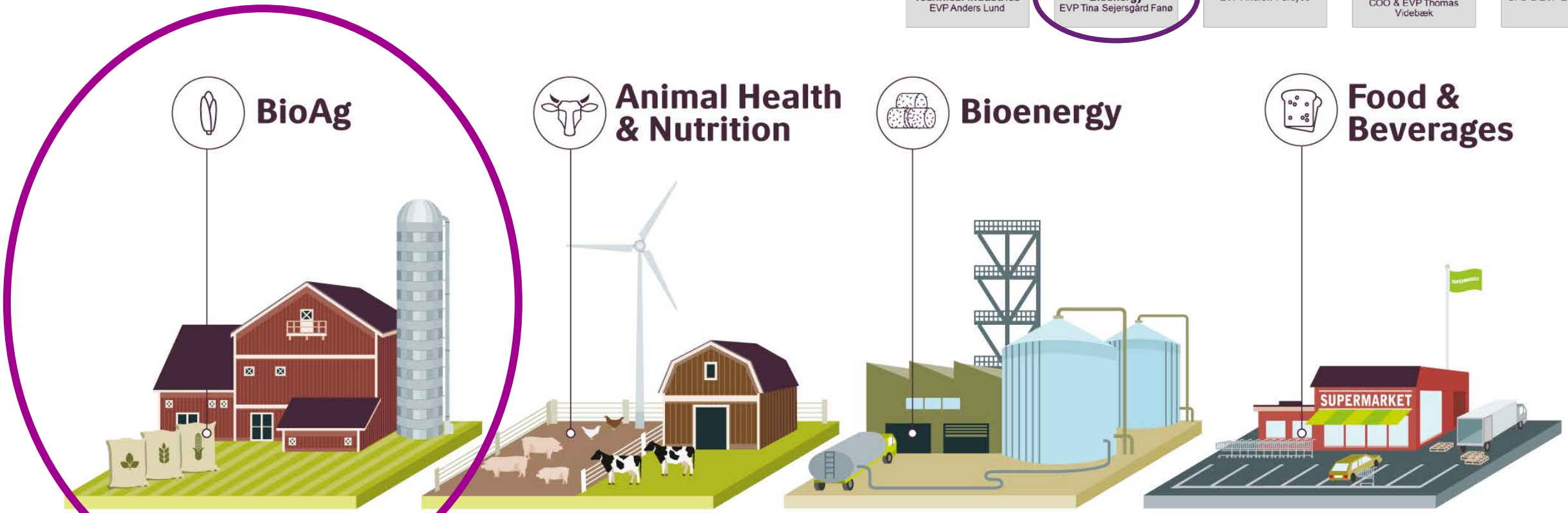
Biologiske frøbehandlinger

Jeanne Kjær
DanSeed symposium 14 Marst 2017

+50% of Novozymes revenue is derived across the agricultural value chain

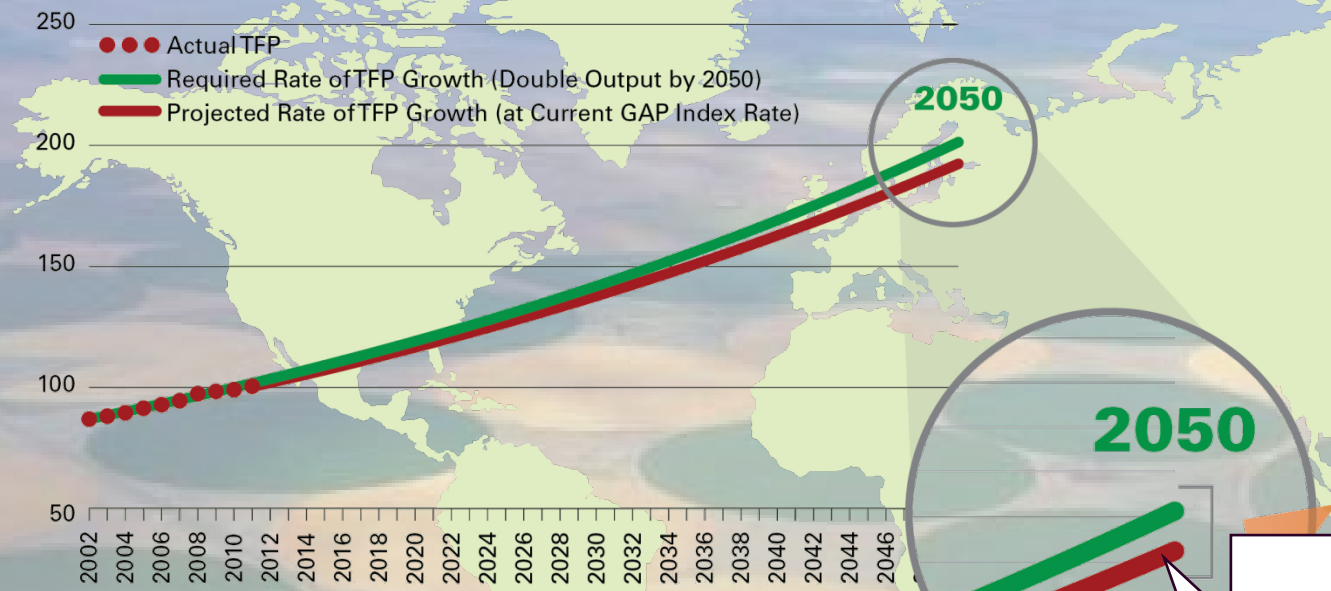


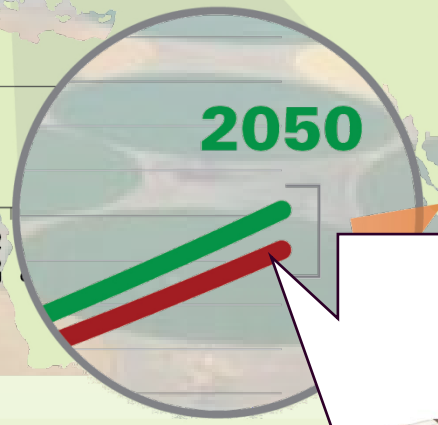


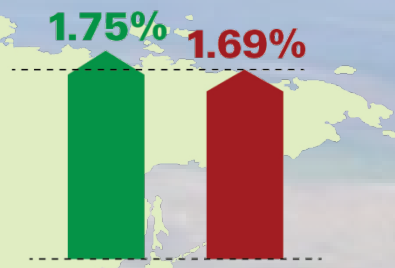
New kids on the block

novozymes

THE GLOBAL AGRICULTURAL PRODUCTIVITY (GAP) INDEX™







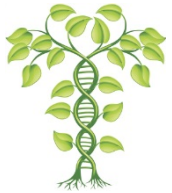
REQUIRED RATE OF TFP GROWTH

CURRENT RATE OF TFP GROWTH

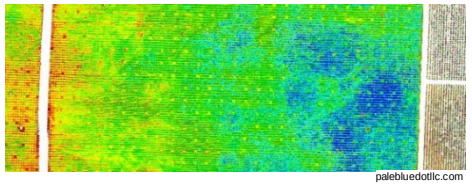
Source: Food Demand Index is from Global Harvest Initiative (GHI 2014); Agricultural Output from TFP Growth is from Economic Research Service (2014)

ethioagrisol.com

ccafs.cgiar.org



www.nature.com



pablebluedotllc.com

plantcaretoday.com

Global Harvest INITIATIVE

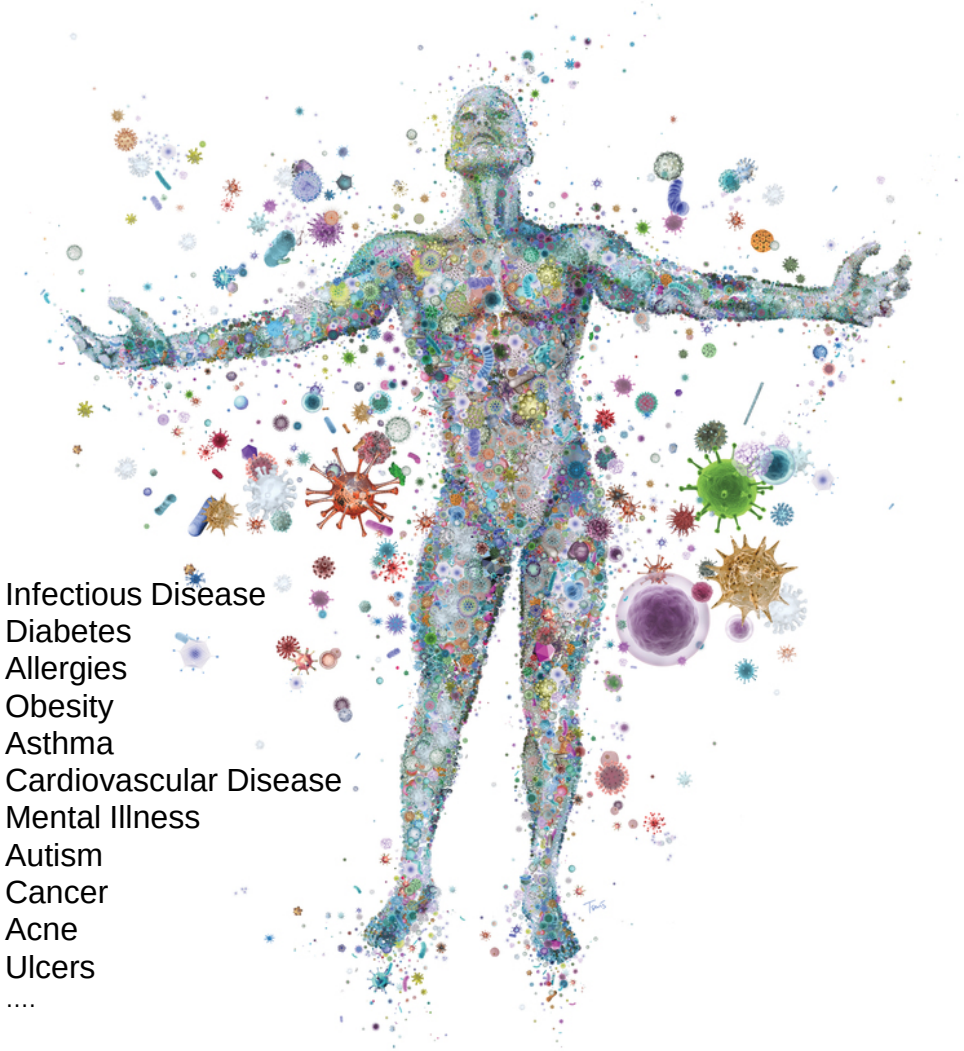
2014 GAP Report®

HVAD DRIVER VORES TEKNOLOGIUDVIKLING

- Udbytteforbedringer
- Restriktiv regulering
  - Politisk målsætning om at sænke miljø- og sundhedsbelastningen fra pesticider og sikre rent drikkevand
  - Miljøbeskyttelse/differentieret regulering ->Behov for miljøvenlige løsninger på sårbare jorde
  - Ny regulering af startgødning til Majs
- Resistentsproblematikken
- Forbrugerkrav om pesticidfrie fødevarer
- Stor modstand mod Genmodificerede afgrøder (GMO) i EU

VORES TEKNOLOGI

Role of microbes in health…



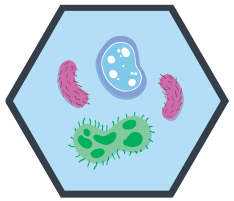
Infectious Disease
Diabetes
Allergies
Obesity
Asthma
Cardiovascular Disease
Mental Illness
Autism
Cancer
Acne
Ulcers
....

The Plant Microbiome…..

studying beneficial microbes that promote plant health

Microbes from soil Act as “Probiotics for Plants” to Improve Nutrient Uptake and Support Sustainable Practices

VORES LØSNINGER



Microbials, notably **bacteria and fungi**, are types of agricultural biologicals that **protect** crops from pests and diseases and **enhance** plant productivity and fertility.

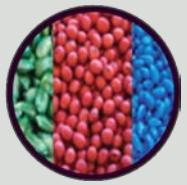
BioControl

- Complements or potentially replaces chemical pesticides
- Provides additional modes of action

BioYield

- Utilizes nutrients in the soil
- Creates stronger, healthier plants
- Provides new options for sustainable agriculture

How are microbials applied?



Seed treatment

Foliar

In-furrow

There are approximately

50 billion microbes

in 1 tablespoon of soil[1]

1. North Carolina State University Cooperative Extension

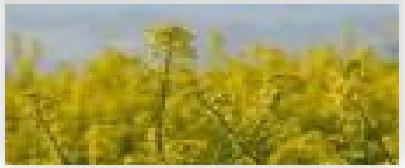
novozymes®

VORES LØSNINGER

Nuværende produkter

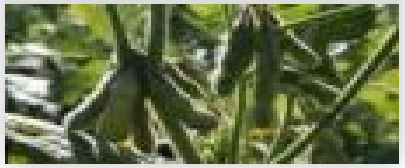
Inoculants

Nutrient efficiency



JumpStart® Torque®, QuickRoots® Ratchet®
Enhances nutrient efficiency of key nutrients and plant health incl. phosphate

Nitrogen fixation



TagTeam®, Cell-Tech®, Optimize®
Nitrogen-fixating inoculants

Biocontrol products

Biofungicides

Actinovate®
Provides disease control for fruits and vegetables

Bioinsecticides

MET52®
Provides insect control for fruits and vegetables as well as turf and ornamentals

CASE: JUMPSTART®

Microorganism applied to the seed before planting

The active ingredient, a soil fungus, grows on the roots and solubilizes the residual soil phosphate, unavailable for plant use

Yield increases due to superior nutrient uptake in plant's early life stage

novozymes®

How does The BioAg Alliance work?

novozymes — Established Microbial Leadership

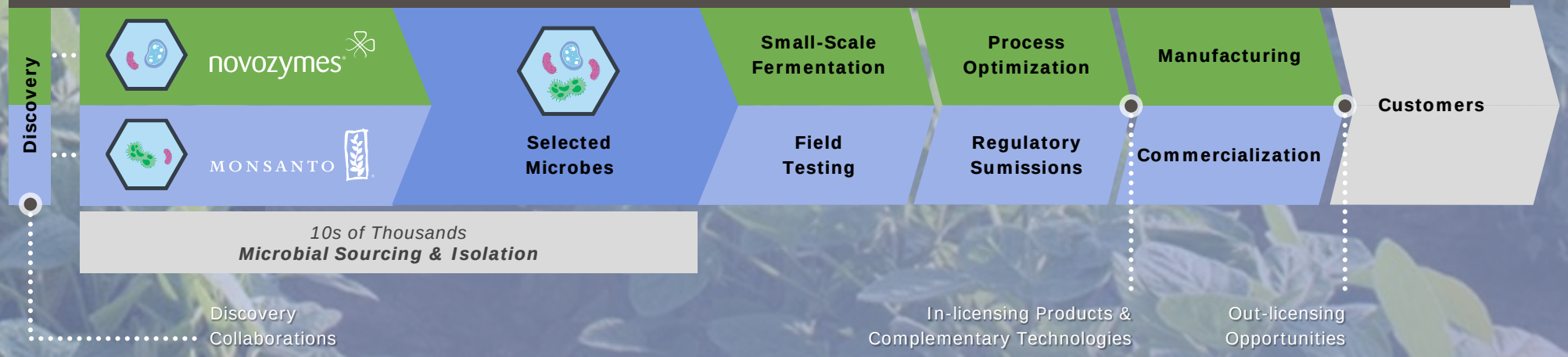
- Existing Microbial Products
- Microbial Discovery & Sourcing
- Strain Optimization & Formulations
- World Class Fermentation
- Intellectual Property

+

MONSANTO — Industry-Leading R&D Capability and Commercial Footprint

- Microbial Discovery & Sourcing
- World Class Field Testing
- Enabling Technologies & Formulations
- Regulatory
- Intellectual Property

HOW THE ALLIANCE WORKS



Leveraging Industry's Leading Field Testing Network

WHY FIELD FIRST?

Transformative Microbial Seed Treatment

PREMISE: Ignoring the environment during microbe selection has led to inconsistent performance, limiting crop benefits.

HYPOTHESIS: By screening in the field, we will select for microbes that provide a ***consistent crop benefit***

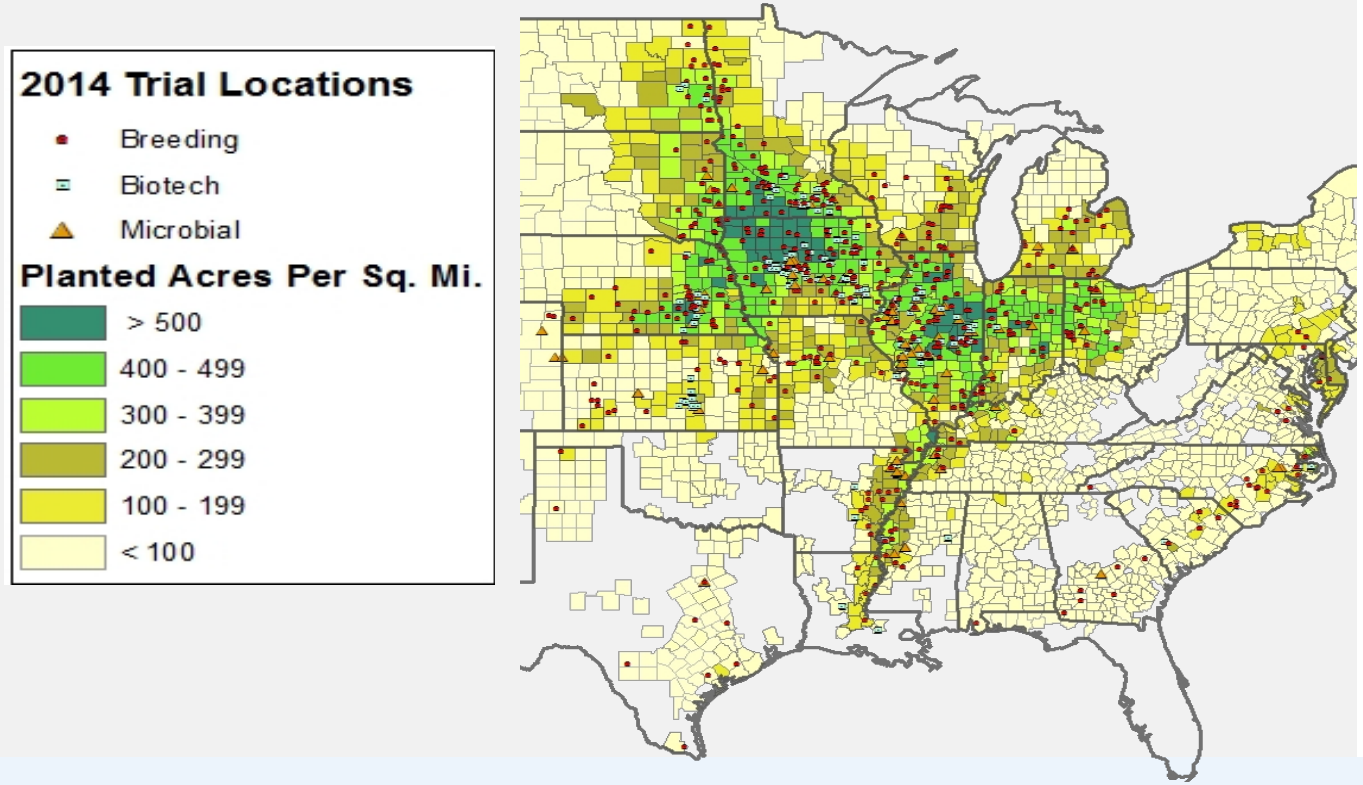
Ensure microbes provide benefit in our elite germplasm/trait/Acceleron® seed treatment product packages

Find crop beneficial microbes quickly and be confident in performance

Performance: Find those that perform consistently or understand the drivers for inconsistencies

Leverages existing infrastructure and expertise

TESTING MICROBIALS ON A SCALE THAT'S NEVER BEEN SEEN BEFORE

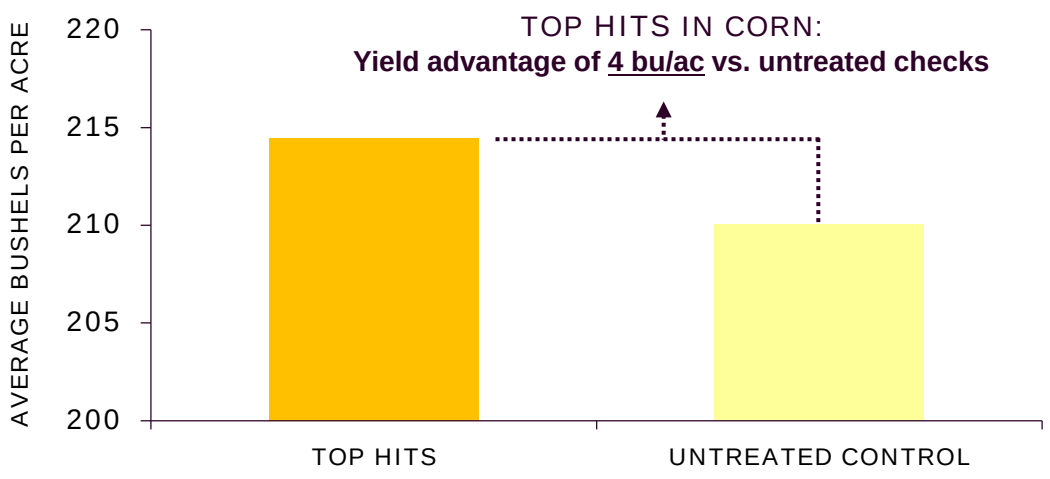


- **In 2014, 170K yield plots testing hundreds of strains in corn and soybean trials across 70 U.S. locations**
- **Significant step up in field testing planned for 2015, with more than double field plots testing thousands of strains**
- **Proprietary imaging technology used to collect quantitative early season data**

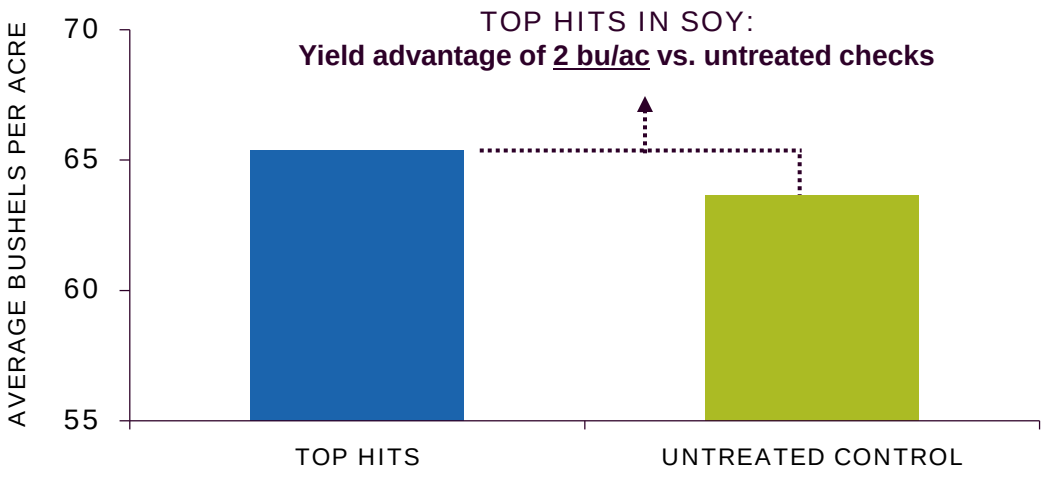
Initial Microbial Screening Advances Multiple Strains Based on Promising Yield Performance

2014 MICROBIAL U.S. FIELD TRIALS (PHASE 1 SCREENING)[1]

CORN TRIALS:
NEW MICROBIAL STRAINS VS. UNTREATED CONTROL

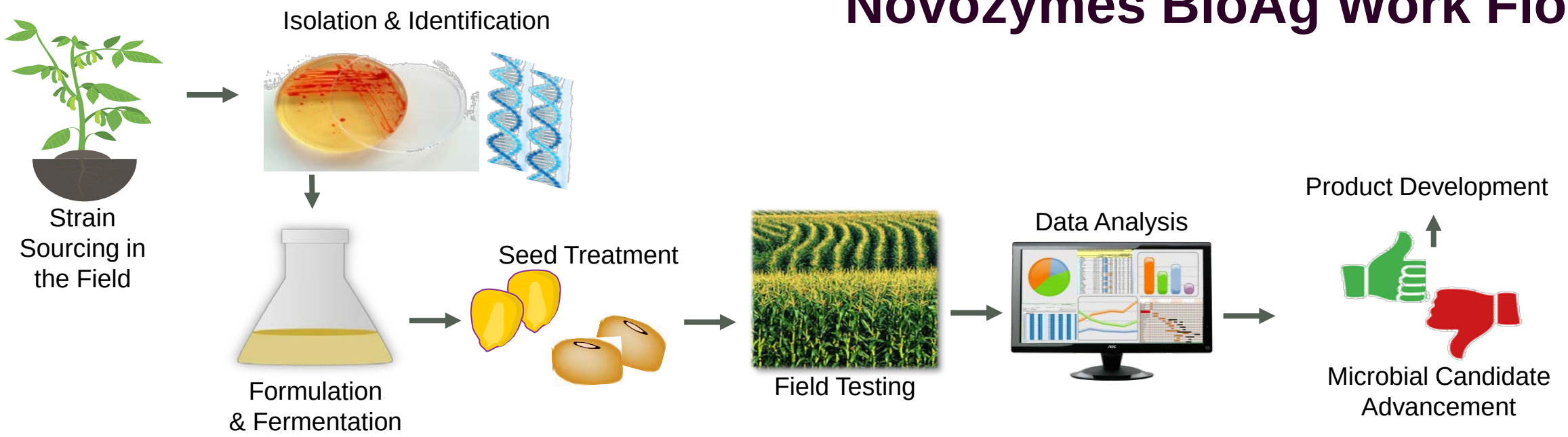


SOYBEAN TRIALS:
NEW MICROBIAL STRAINS VS. UNTREATED CONTROL



1. 2014 Monsanto U.S. field trial data from early microbial screening in corn and soybeans across more than 50 locations

Novozymes BioAg Work Flow



Microbial Discovery

- Isolate, ID, characterize, DNA sequence thousands of strains/yr
- Pre-screen and nominate strain for field testing

Microbial Physiology

- Ferment and stabilize thousands of strains per year and deliver to Monsanto for field testing
- Re-ferment winning strains to allow for repeat field testing

Applications Development

- Decipher mode of action and optimize dosing rate, formulation, etc of winning microbes to prepare for regulatory approval and commercialization

Assay Development

Invent new methods to perform studies and tasks listed above

Novozymes®

New product launched for maize in the USA – Dec 2016

How Acceleron® B-300 SAT works

The fungus *Penicillium bilaiae* releases phosphate in soil and fertilizer so it's more readily available for the plant to use. This can boost corn production by more than 3 bushels per acre while helping farmers use fertilizer more efficiently and producing less CO_2.

Novelty

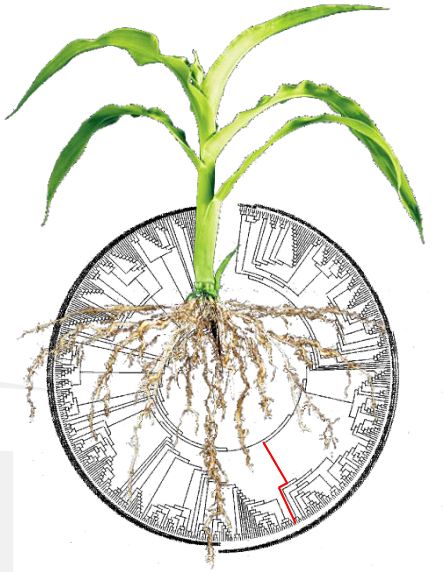
Improved seed stability allow the seeds to be coated with the microbial product before the seeds are shipped to retailers and farmers (up-stream application).

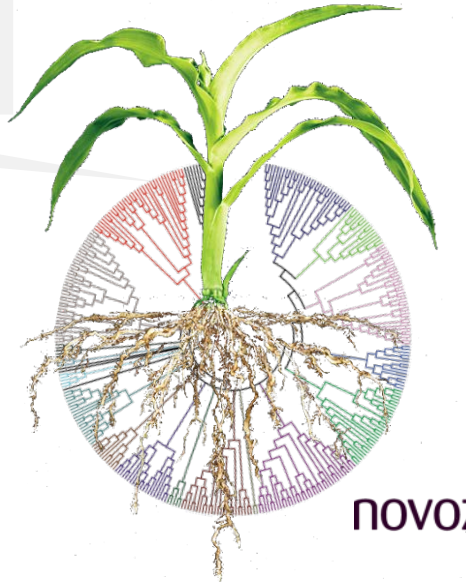
Acceleron® is a trademark owned by Monsanto Technology LLC.

Environmental fate and impact on the soil microbiome

Can a bacterial or fungal inoculant strain compete in a complex ecosystem long enough to provide benefit the plant?

Does addition of a foreign bacterial or fungal strain alter the native microbial community? If so, how long does this change last?





novozymes

MIKROBIELLE LØSNINGER

- En miljøvenlig teknologi, der kan løse nogle af landbruget udfordringer (udbytteforbedringer, resistens, miljøvenlige løsninger på sårbare jorde, forbrugerkrav om pesticidfrie fødevarer)
- Vi ser frem til fortsat samarbejde og dialog med myndigheder/landbrug for at få implementeret disse løsninger i dansk landbrug