



DROUGHT-TOLERANT CORN

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Maximizing Drought Tolerance Will be Achieved by Pairing Superior Biotech Genes with the Best-Yielding Germplasm

MONSANTO BREEDERS CHARACTERIZE GERmplasm FOR RESPONSE TO DROUGHT STRESS

- Drought tolerance is a complex characteristic to convey in plants
- Many mechanisms and genes are involved in complex traits
- Pairing specific combinations of germplasm and biotech trait may do more to address the many mechanisms impacting quantitative traits
- Our approach to helping farmers manage drought is a systems-based approach
 - Traditional plant breeding / native genes
 - Agronomic components
 - Biotechnology traits



GENETIC VARIATION FOR STRESS TOLERANCE EXISTS IN ELITE GERmplasm POOLS

First-Generation Drought Trait on Track for Launch in Western U.S. in 2012¹

DROUGHT TOLERANT CORN

HIT
PROJECT

FIRST
GENERATION

PHASE 4

SECOND
GENERATION

PHASE 2

FAMILY VALUE:

LAUNCH COUNTRY
ACRES²:

45M-55M

2020 VALUE²:

\$250-\$500M

SOURCES OF VALUE:

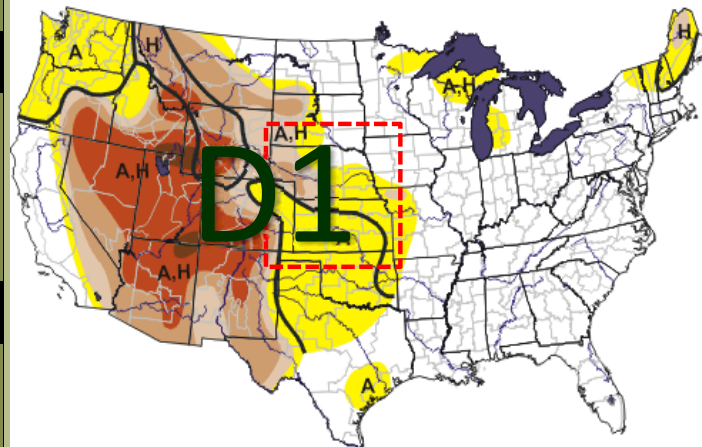
Improved Yield

- Reduces yield loss by up to 10 bushels per acre in water-stressed environments

DROUGHT I PROJECT STATUS:

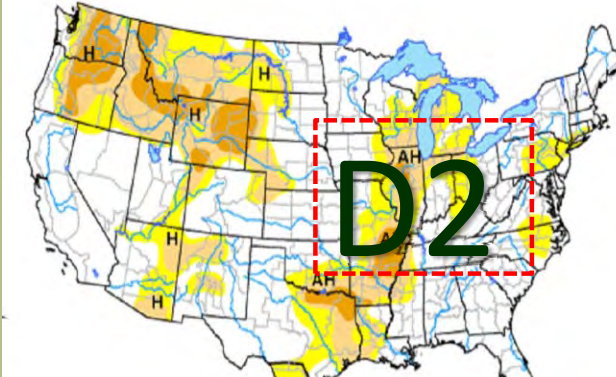
- Expanded testing in 2010
- Completed 12 global regulatory submissions
- Identifying best gene by germplasm combinations
- With Refuge-in-a-bag applicability, *Genuity SmartStax* and *Genuity VT Double PRO* are likely platforms for commercialization

WESTERN U.S. DRYLAND



KS, NE, TX, CO, SD, ND
10M-13M acres corn

DROUGHT "INSURANCE"



Central, E. and S. Corn Belt
30-50M acres

REDUCED IRRIGATION COST



KS, NE, TX, CO, ID
12M acres

¹ Commercialization depends on many factors, including successful conclusion of the regulatory process

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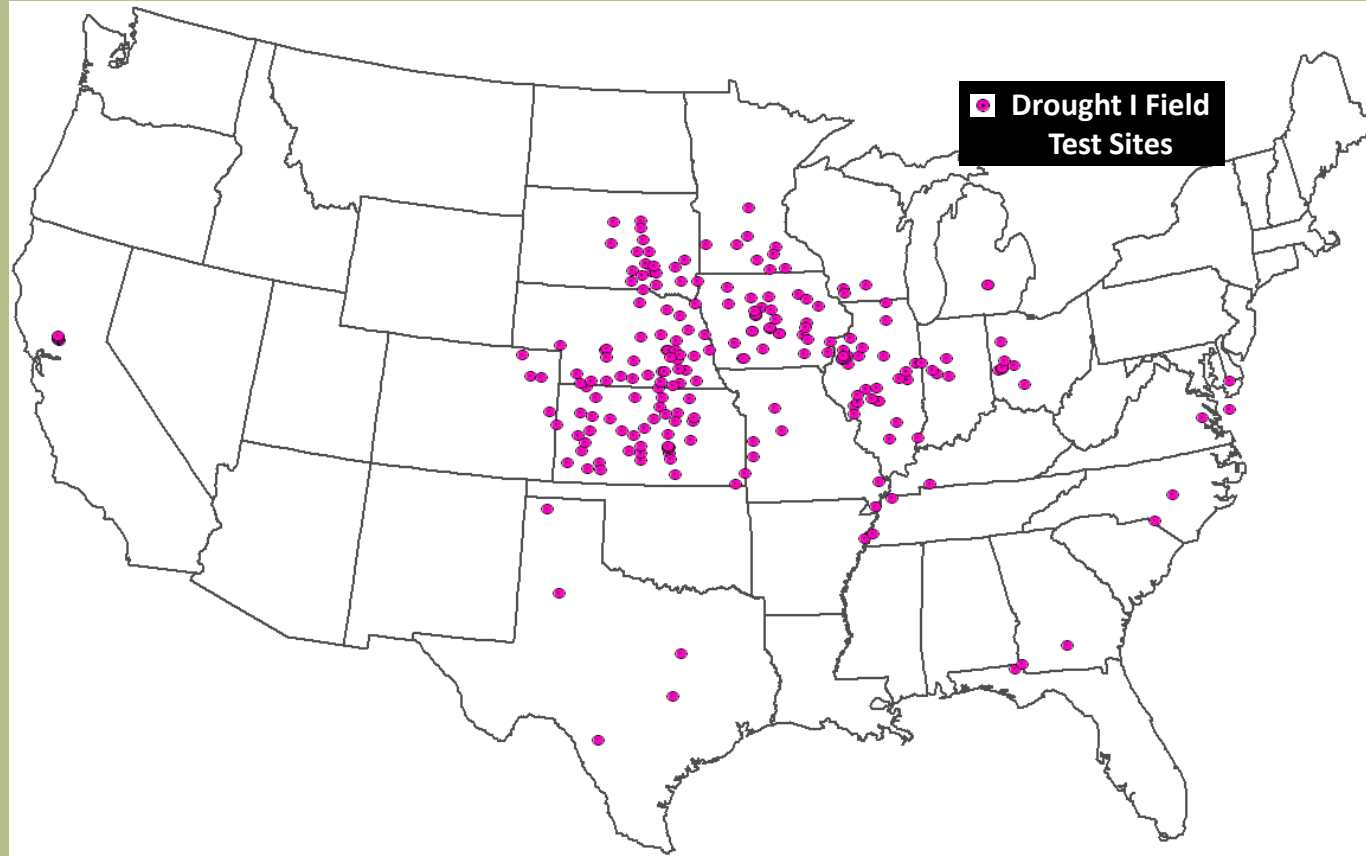
² Launch country represents the U.S. where Monsanto technology fits on its share base; 2020 value reflects gross sales opportunity in the country of launch

First-Generation Drought Trait in Pre-Launch Phase: Expanded Testing in 2010 To Isolate Best Gene by Germplasm Combinations

HIT
PROJECT

DROUGHT I: 2010 FIELD TESTS

- Over 200 testing locations across the U.S.
- Over 100 locations in target market of Colorado, South Dakota, Kansas and Nebraska
- Plans include simulated drought conditions in the event of excessive moisture
- Hot weather and adequate rainfall across much of the Corn Belt with isolated pockets of very dry conditions



Discovery

Phase 1
Proof of Concept

Phase 2
Early Development

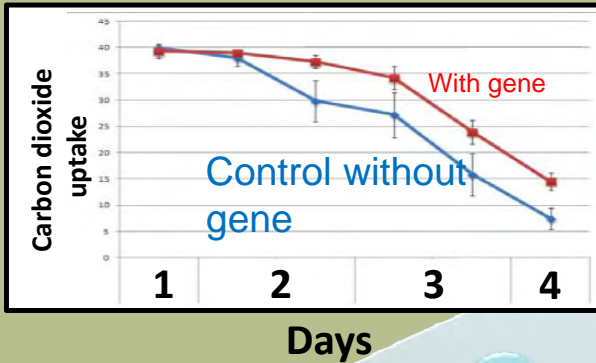
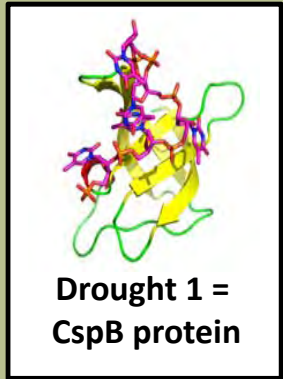
Phase 3
Adv. Development

Phase 4
Pre-Launch

Launch

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How Does the First-Generation Drought Gene Work?



CspB enhances the way the plant uses its genetics

↑ CspB plants adapt more effectively to deal with drought

↑ Under drought CspB plants are less stressed leading to enhanced photosynthesis and development

↑ Better growth leads to increased kernel number

Increased Yield Under Water-Deficit Stress



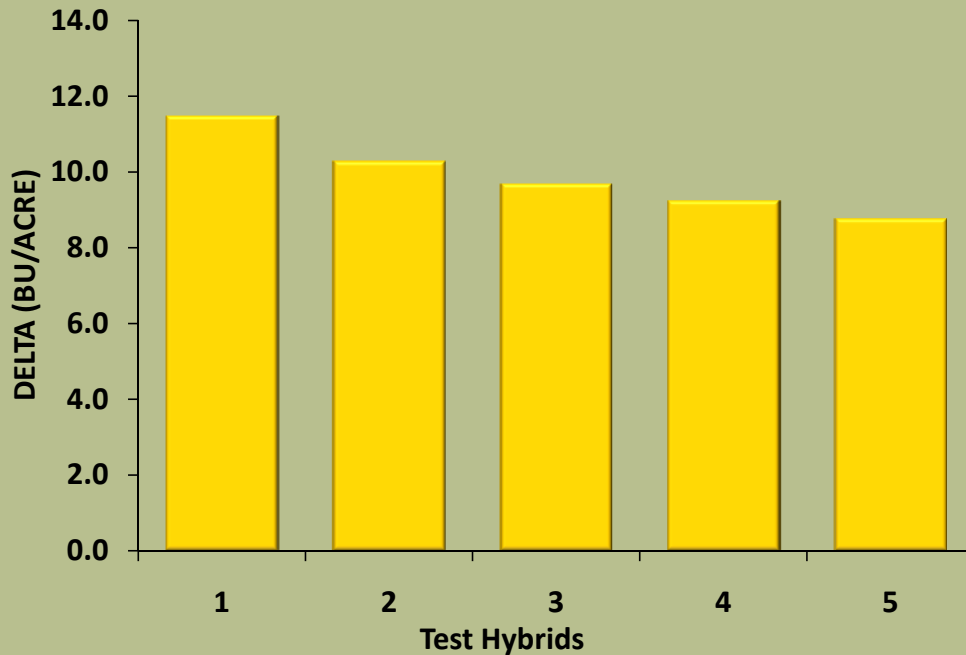
Control Hybrid (76 BU/AC)

With Gene (94 BU/AC)



First-Generation Drought Gene Performs in Elite Germplasm Combinations Despite Limited Drought Pressure

2009 FIELD TEST DATA



Data from sites identified as having drought stress
All differences significant at .05 level

2010 FIELD TESTING (Garden City, KS)



Control Hybrid

Hybrid with Gene

Discovery

Phase 1
Proof of Concept

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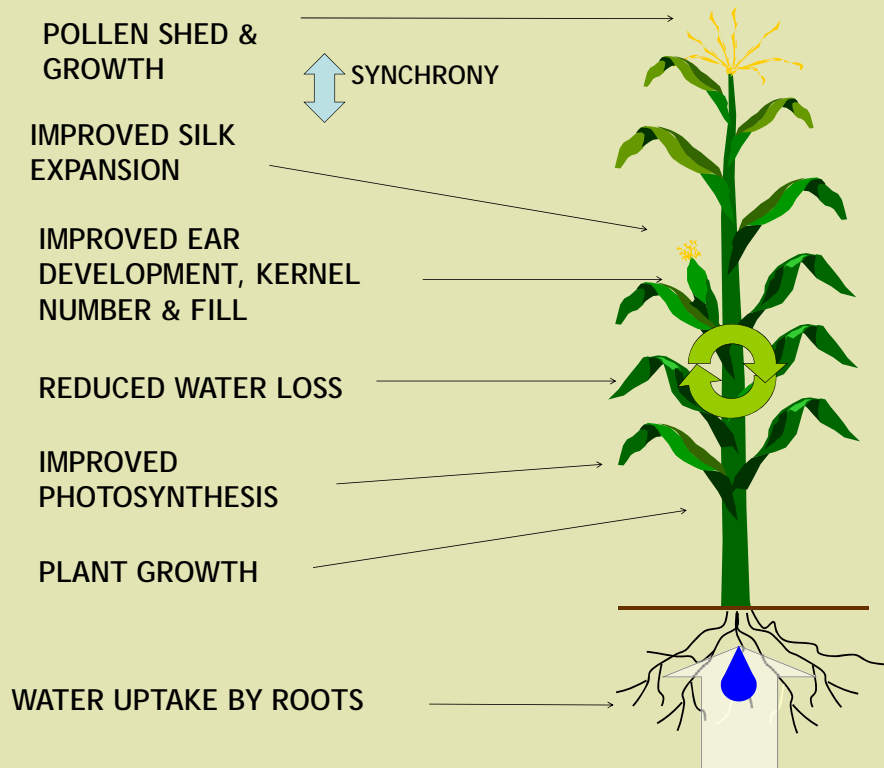
Launch

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Next-Generation of Drought-Tolerance Genes are in Testing Using Breeding and Biotechnology

THE COMPLEXITY OF PLANT BIOLOGY...

REQUIRES ADVANCED R&D RESOURCES



Early screening for leads is conducted with automated greenhouse and extensive field testing



Followed by physiological & biochemical characterization



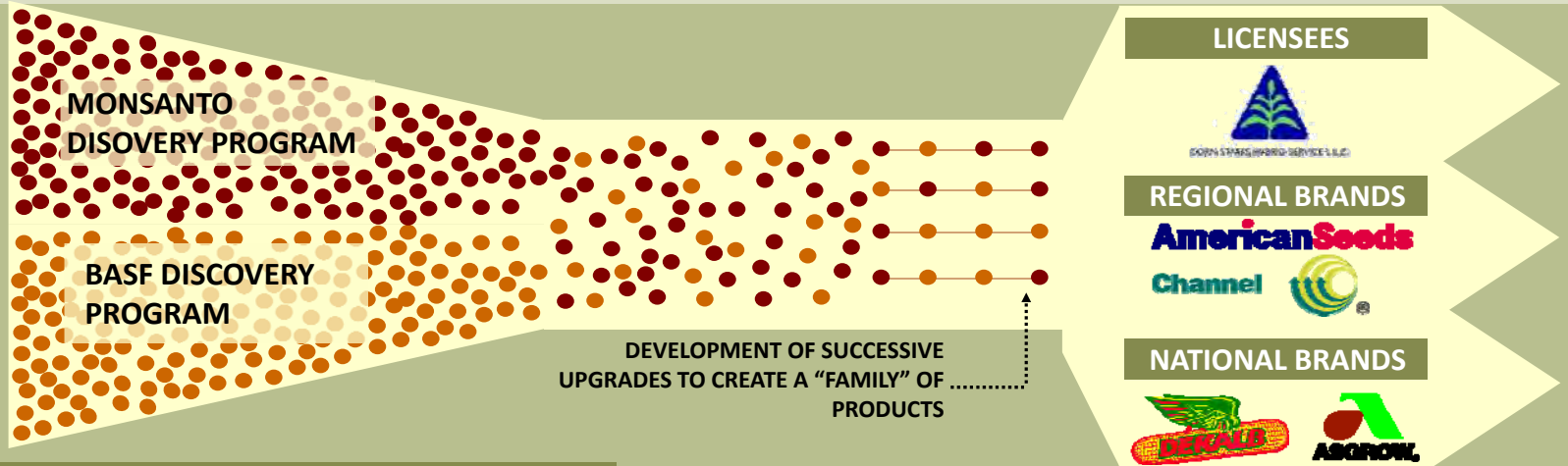
BUILDING A FAMILY OF TRAITS CONVEYING DROUGHT TOLERANCE IN CORN

IN COLLABORATION WITH BASF

Extension of Collaboration With BASF Continues Promising Discoveries of Higher-Yielding and Stress Traits – Wheat Added

INTENSIFIED YIELD & STRESS PIPELINE

Complimentary discovery programs producing unique solutions to yield and stress in corn, soybeans, cotton and canola. Efforts now includes wheat



CURRENT DEVELOPMENTS ▼

COLLABORATION EXTENSION	DISCOVERY	PHASE I: PROOF OF CONCEPT
<ul style="list-style-type: none"> • An additional investment, potentially over \$1 billion, by the companies to commercialize gene leads from strong discovery programs of both companies • Wheat added as a fifth crop to the companies' joint plant biotechnology pipeline to bring biotech benefit to wheat farmers 	<ul style="list-style-type: none"> • Thousands of new gene leads generated: >90 percent unique • Expanded constructs for Yield, Nitrogen, and Drought as multi-year performance shows repeated efficacy – incorporate into testing network 	<ul style="list-style-type: none"> • Improved success rate of Phase I genes indicating stronger discovery programs • Significant expansion of field testing program to ensure early testing of the products in conditions most relevant to farmers • Second-generation higher-yielding soybean construct lead list expanded • Drought-tolerant cotton gene lead repeated performance at product concept level • Continue Nitrogen-utilization corn testing at product concept level