



# CORN PIPELINE

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# Corn Pipeline Elevates the Power of Stacking with Next-Generation Leads Across Yield and Stress



TM

**CORN BORER III**

**CORN ROOTWORM III**

**HERBICIDE-TOLERANT**

**NITROGEN-USE EFFICIENCY**

**2<sup>ND</sup> -GEN DROUGHT-TOLERANT**

**HIGHER-YIELDING**

**ROUNDUP HYBRIDIZATION SYSTEM**

**DROUGHT-TOLERANT**

**GENUITY SMARTSTAX AND GENUITY VT DOUBLE PRO REFUGE IN A BAG**



**GENUITY SMARTSTAX**

## FARMER BENEFITS

**Broad Spectrum for Insect Control**

**Reduced Beetle Survival and Greater Durability**

**Enhanced Weed Management**

**Cost Benefit**

**Drought Insurance**

**Greater Yield**

**Maximizes Yield During Water Stress**

**Ultimate Convenience**

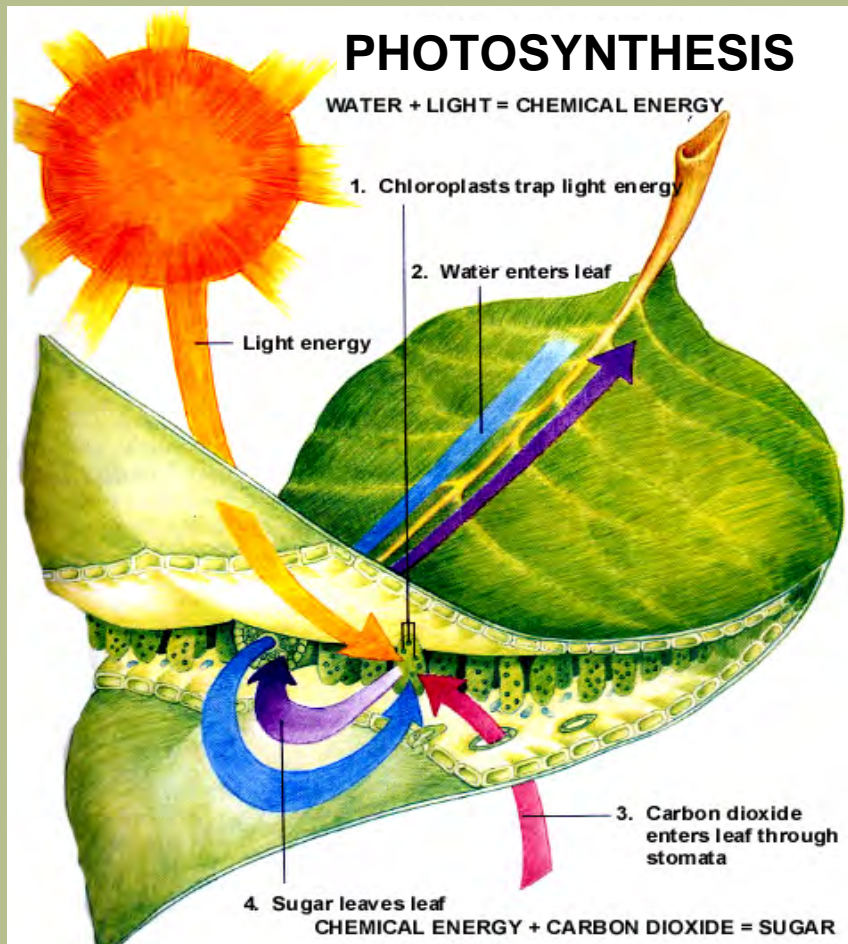
**Greater Insect Control and 5% Corn Belt Refuge and Platform for Future Traits**

**2010**



Commercialization Depends on Many Factors, Including Successful Conclusion of Regulatory Process

# Inherent Yield Can Be Enhanced By Improving Plant's Potential to Capture Light, Convert CO<sub>2</sub> to Carbohydrate, and Partition to Grain



<http://www.colorado.edu/UCB/AcademicAffairs/ArtsSciences/MCDB/MCDB5810/graphics/photosynthesis.jpg>

## YIELD POTENTIAL

- Based on academic studies and U.S. yield contests, corn has potential to achieve >300 bu/acre under optimal conditions
- Yield potential (YP) is determined by a combination of factors:
  - Ability to harvest light
  - Conversion of sunlight into carbohydrate
  - Partitioning carbohydrates to kernel development

Improvement in any one of these factors will increase plant's inherent yield potential

## YIELD GAP (YP + ENVIRONMENT)

- 2009 USDA average corn yield = 165 bu/acre
- The difference between 165 and 300 bu/acre is due to suboptimal environmental conditions
  - Water (i.e., drought)
  - Fertility (i.e., nitrogen)
  - Disease/Insect /Weed pressure
  - Climate (heat or cold stress)

Improving the plant's ability to tolerate these stress factors will narrow the yield gap and ensure crop is yielding to its potential regardless of environmental factors

# Nitrogen-Utilization Corn Set in 2010 for Critical Evaluation of Leads

## NITROGEN-UTILIZATION CORN

### PROJECT CONCEPT:

Improve nitrogen utilization to produce yield sustainably as seen in higher yields or reduced nitrogen application rates

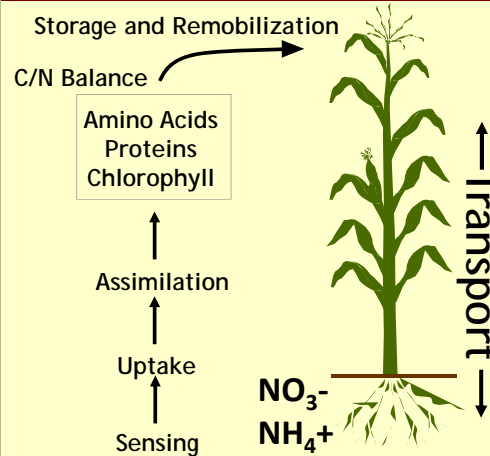
### PROJECT STATUS:

- Field testing protocol established
- Record number of leads identified
- Expanded field testing in 2010

### NITROGEN IMPACT ON CORN:

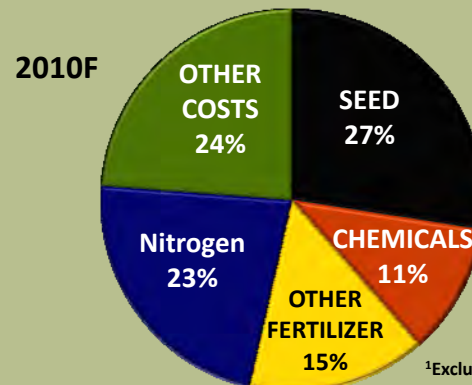
- USDA per acre average application is 168 pounds of nitrogen at a cost of approximately \$60
- Nitrogen accounts for approximately 60 percent of the total fertilizer cost for a corn producer
- Nitrogen efficiency offers farmers one way to reduce agriculture's impact on the environment

## PROCESSES THAT IMPACT NITROGEN USE



PATHWAY	LEADS
Enhanced Nitrogen Uptake/Transport	✓
Improved Nitrogen Assimilation	✓
Enhanced Protein Synthesis	✓
Improved Photosynthesis	✓
Improved General Stress Response	✓
Pathway Regulation	✓

## U.S. CORN PRODUCTION OPERATING COSTS PER ACRE<sup>1</sup>



- A 1% yield increase improves returns by ~\$6.00 per acre
- A 1% operating input cost reduction improves returns by ~\$1.00 per acre

<sup>1</sup>Excludes overhead costs, including hired labor and opportunity cost of land. Source: USDA and CBOT

Discovery

**Phase 1**  
Proof of Concept

Phase 2  
Early Development

Phase 3  
Adv. Development

Phase 4  
Pre-Launch

Launch

IN COLLABORATION WITH BASF

# Higher-Yielding Corn Represents the Next Step Change in Increasing the Intrinsic Yield for Corn

## HIGHER-YIELDING CORN

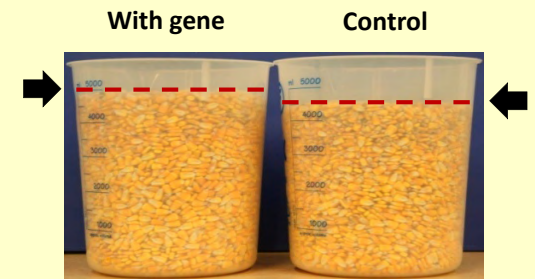
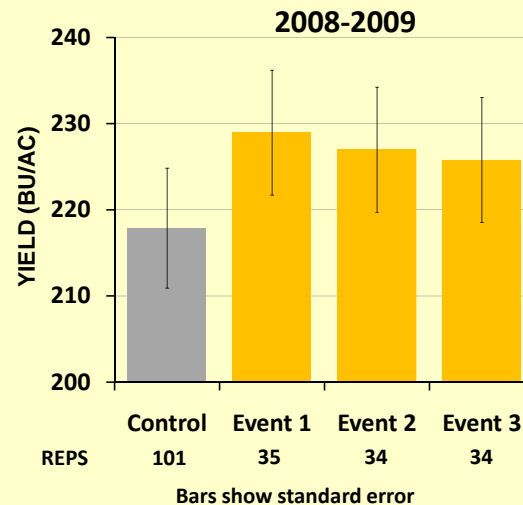
### PROJECT CONCEPT:

Higher-yielding corn is aimed at boosting the intrinsic yield potential of corn hybrids.

### PROJECT STATUS:

- Two years of consistent yield performance across multiple testers and events in high yielding hybrids
- 2010 testing expanded to a broad range of environments
- Performance of lead events being tested in a variety of backgrounds and relative maturities

## HIGHER-YIELDING CORN



Discovery

Phase 1  
Proof of Concept

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Pre-Launch

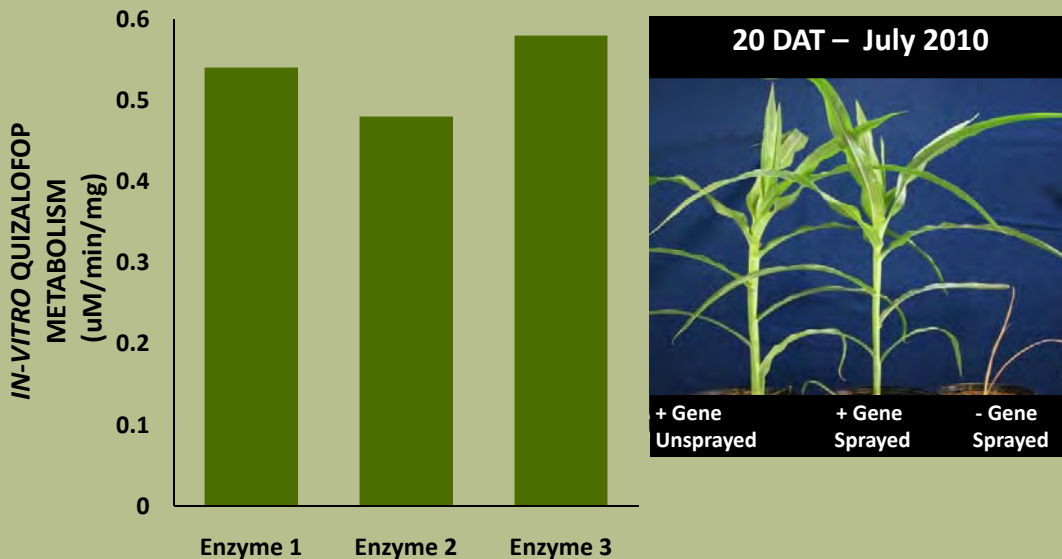
Launch

IN COLLABORATION WITH BASF

# Future Stacked Herbicide-Tolerance Corn Genes To Enhance Over-the-Top Spraying for Effective and Affordable Weed Management Solutions

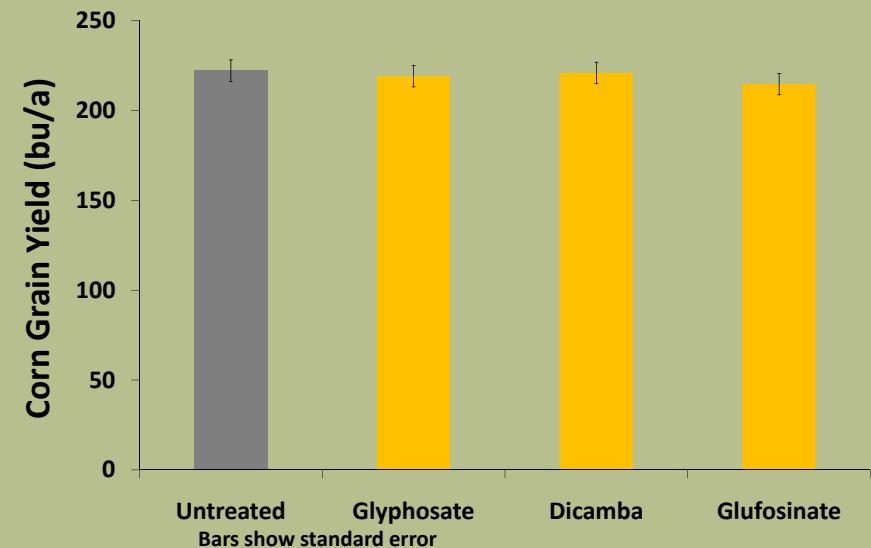
## FOPS-TOLERANT

### PHASE 1



## Dicamba-, Glufosinate-, and Glyphosate- Tolerant

### PHASE 2



- Multiple enzyme variants demonstrate the ability to metabolize quinalofop *in-vitro*. These variants are being tested in stable corn plants in FY10 to demonstrate efficacy *in-planta*

- Lead events demonstrate strong herbicide tolerance and yield parity with current *Roundup Ready Corn 2* following multiple combined treatments at more than double the expected label rates<sup>1</sup>

<sup>1</sup> Use rates for experimental purposes only – always read and follow label instructions

# Next-Generation Insect Traits in Phase II Deliver Greater Efficacy Through Novel Technologies with Multiple Modes of Action

## YIELDGARD ROOTWORM III

### PROJECT CONCEPT:

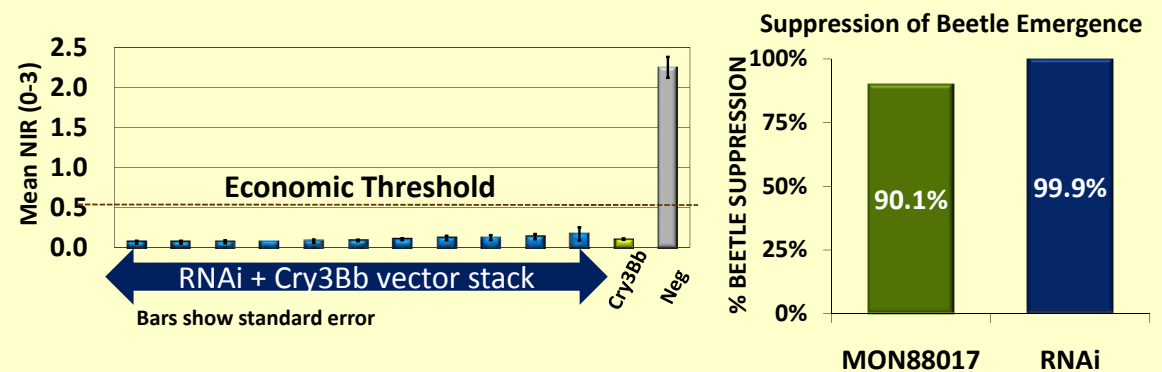
This next generation product aims to use two distinct modes of action below-ground providing two different approaches to insect control

### SOURCES OF VALUE:

Vector stack of RNAi and Cry3Bb provides commercial level control with two modes of action:

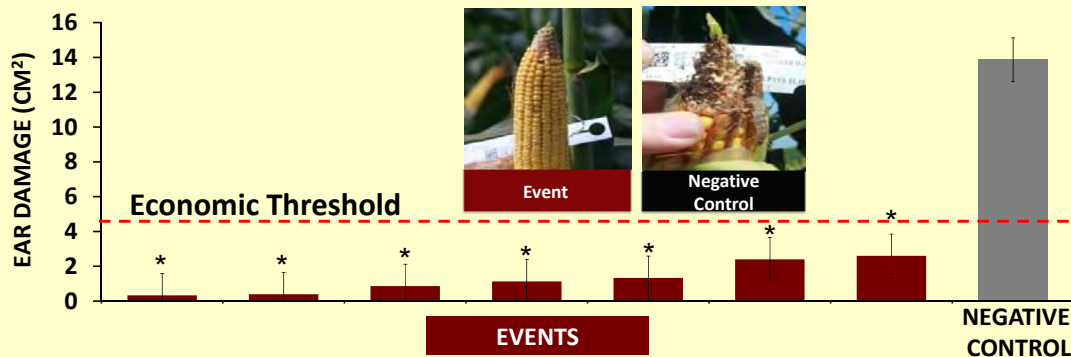
- RNAi alone suppresses adult beetle emergence more than Cry3Bb
- Root-preferred promoter

### GROWTH CHAMBER EFFICACY



## YIELDGARD CORN BORER III

### MULTIPLE EVENTS CONTROLLED WESTERN BEAN CUTWORM DAMAGE IN 2009 FIELD TRIALS



### PROJECT CONCEPT:

This next generation product is designed to use multiple modes of action above-ground providing different approaches to insect control

### SOURCES OF VALUE:

- Broad spectrum of efficacy for above-ground pests
- Potential for improved control of Black Cutworm and Western Bean Cutworm
- Enhanced durability