

# DuPont

**Translating science to societal  
value**

Ganesh Kishore

Chief Biotechnology Officer

December 4 2006

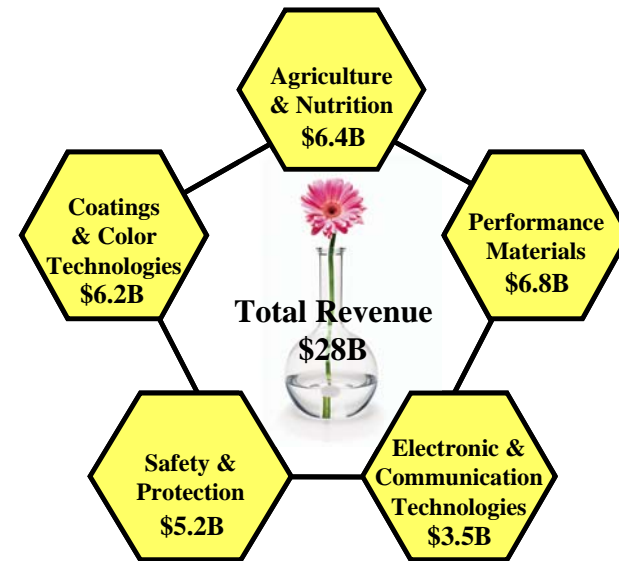
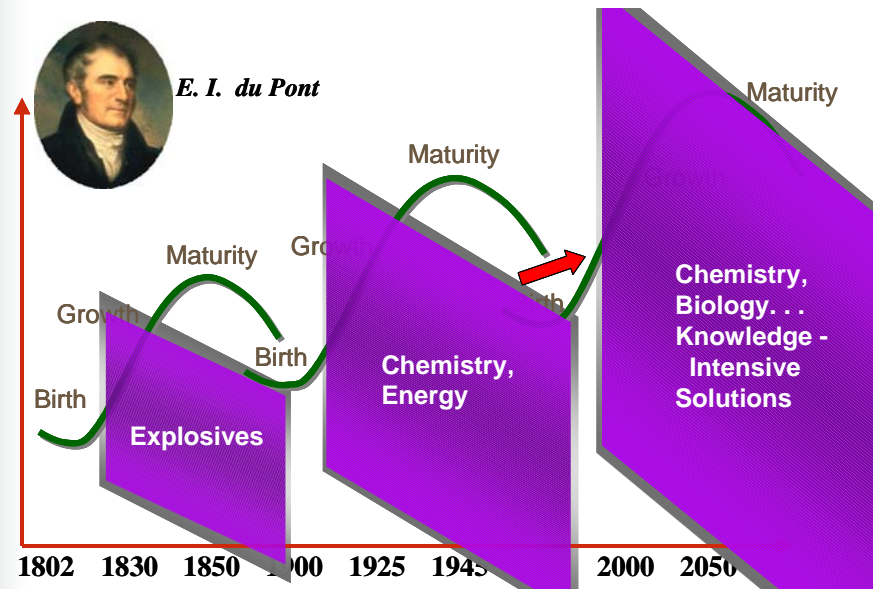
## DuPont's Vision

**To be the world's most dynamic science company,  
creating sustainable solutions essential  
to a better, safer, healthier life for people  
everywhere.**



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# DuPont – A 204 Year History of Innovation



*The 5 Platforms of DuPont*

## *Our Core Values*

### *The Foundation ...*

- Safety & Health
- Environmental Stewardship
- Ethics
- Respect for People

## *2010 Goals ...*

- 25% of revenues from businesses not requiring depletable raw materials  
*Today at 17%*
- 10% of energy needs derived from renewable sources  
*Today at 5 ½ %*



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# Driving Productivity in R&D

- More technical effort on growth.
  - Clear technology goals
  - Install a disciplined innovation process
  - Shift business unit resources from “sustain” to “grow”
  - Focus on critical few
- More patents; more end use patents.
- Faster product development cycles.



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# Project Selection and Execution Criteria

- Market Relevance
- Technology Uniqueness
- Commercialization Feasibility

**Continuously validated through life of project**  
**Special emphasis on Market Relevance prior to project initiation**



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# Global R&D Accelerates Growth

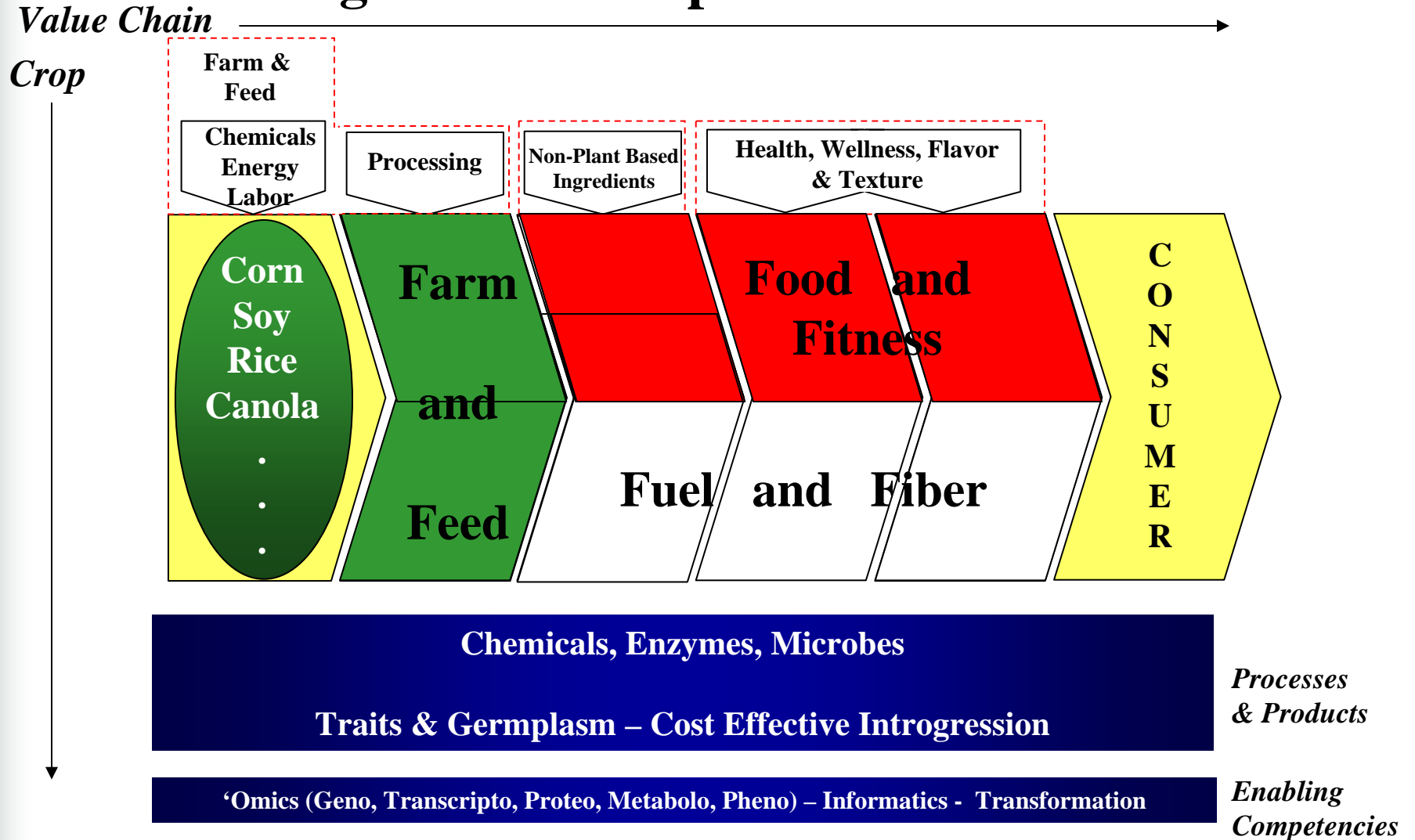


(Located at Korean Institute of Science & Technology)



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# Biotechnology Offers Significant Growth Potential Throughout the Crop and Value Chain



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# DuPont Businesses in Agriculture and Nutrition

## Chemistry

**Herbicides** \$1.5B  


**Insecticides** \$0.4B  


**Fungicides** \$0.4B  

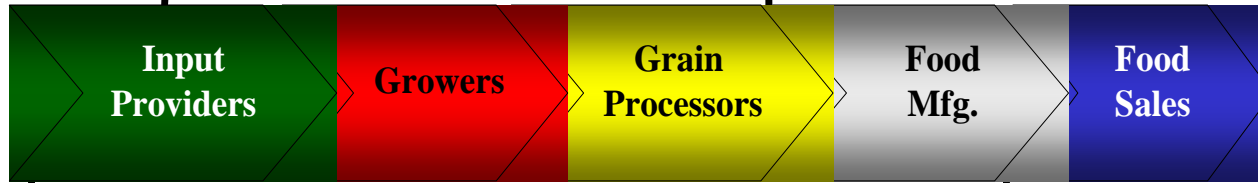

**The Solae Company**  
\$1.1B





Soy Protein & Lecithin  
Ingredients





## Food & Nutrition



**Pioneer** \$2.7B  


**Corn Seed** \$2.0B  


**Soy Seed** \$0.5B  


**Other Seeds** \$0.3B  


## Genetics

**Qualicon**  
**Bunge Biotech Alliance**  
**8th Continent**  
 \$0.3B



## Health Science



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# Our Crop Genetics Businesses are Leveraging Advancements in Biotech

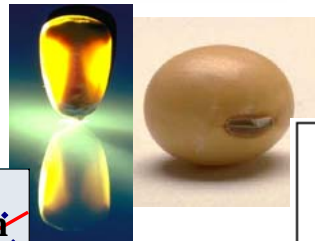


## Breeding

- ↑ productivity
- ↑ reliability
- ↑ quality

*Pioneer has been breeding corn since 1926*

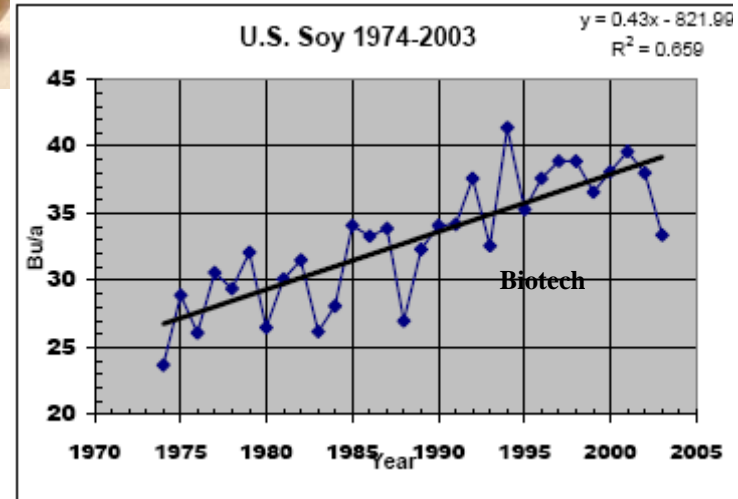
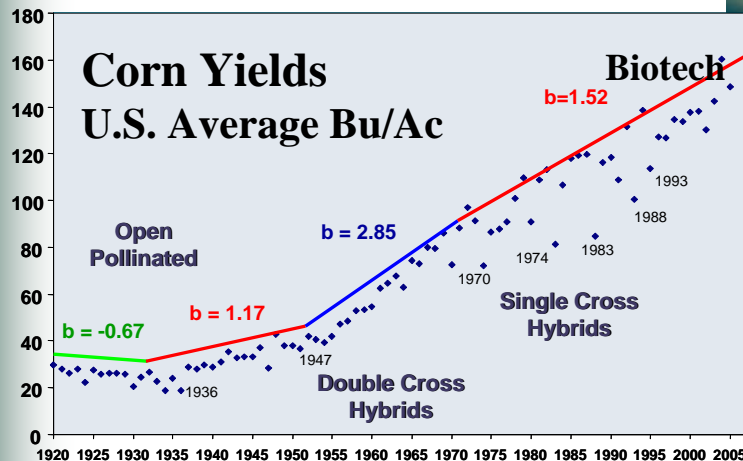
## Biotech



## Traits



- Pest protection
- Stress alleviation
- Superior nutrient use
- Enhanced nutrient density
- Elevated safety
- Processor friendly



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# DuPont's Current Biotechnology Business is Built Chiefly on Licensed and Co-Developed Traits

Licensed (Monsanto)

Co-Developed (Dow)

## Roundup Ready Soybeans & Corn

## Insect Resistant Corn



(1997)



### European Corn Borer

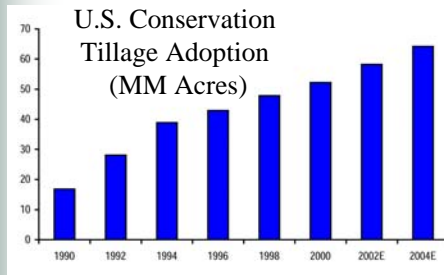


Bt Corn Non-Bt Corn

(1999)

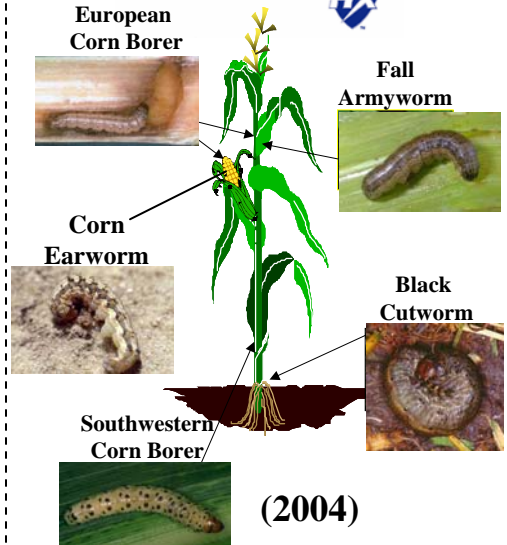
### Benefits ...

- Simple & flexible weed management
- Reduced pesticide application
- Conservation or no-tillage
- Reduced labor
- Reduced energy
- Greater resource efficiency
- Higher yield
- Improved quality
- Favorable economic returns



**Drought exacerbates weed-disease-insect pressure and chemical injury**

### Further Protection



(2004)

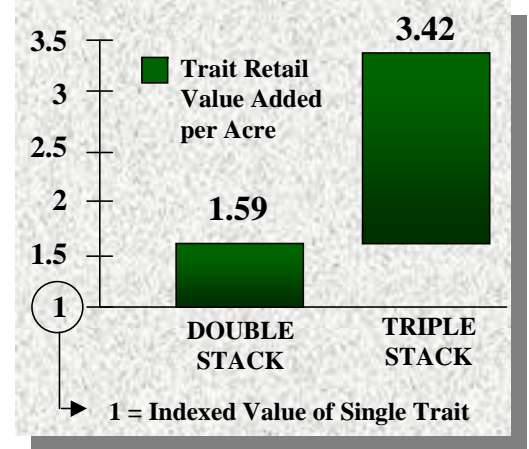
### Extending the Benefits



Control Chemical Insecticide Biotech Trait Protected

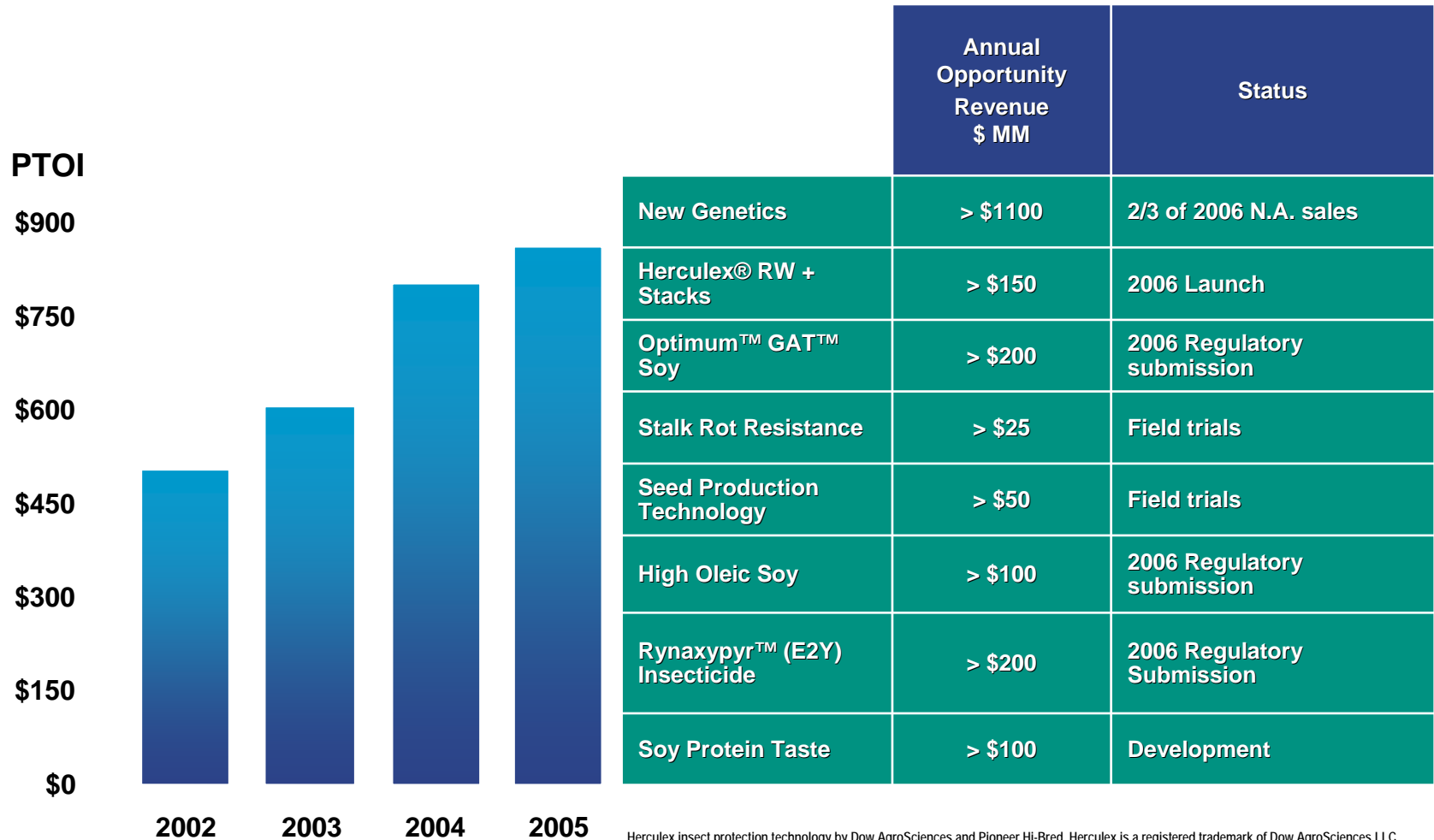
(2006)

*Stacking Exponentially Increases Value*



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# Delivering Now, Positioning for the Future in Ag & Nutrition

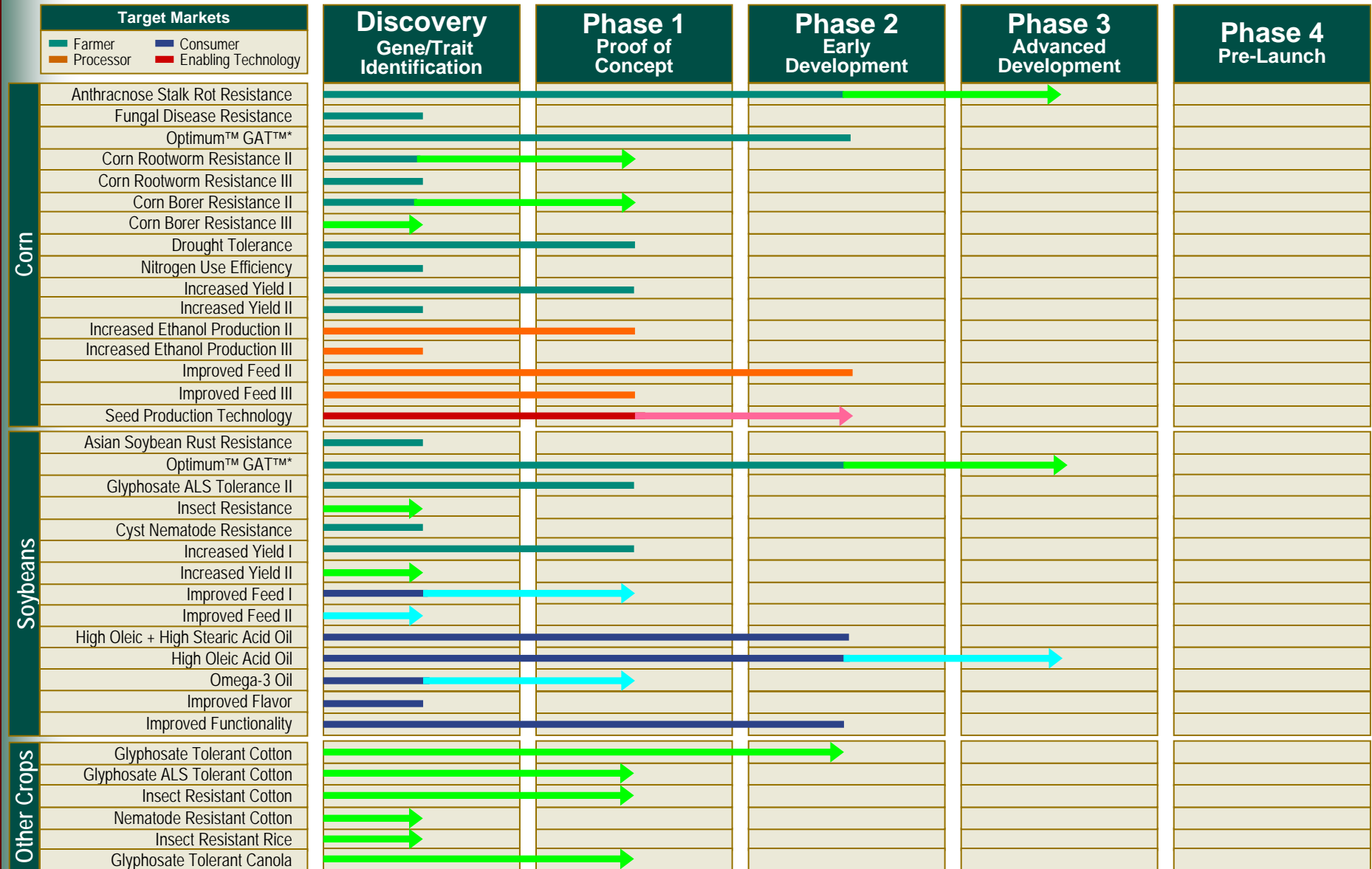


Herculex insect protection technology by Dow AgroSciences and Pioneer Hi-Bred. Herculex is a registered trademark of Dow AgroSciences LLC.



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# 2006 Rich Crop Genetics Pipeline



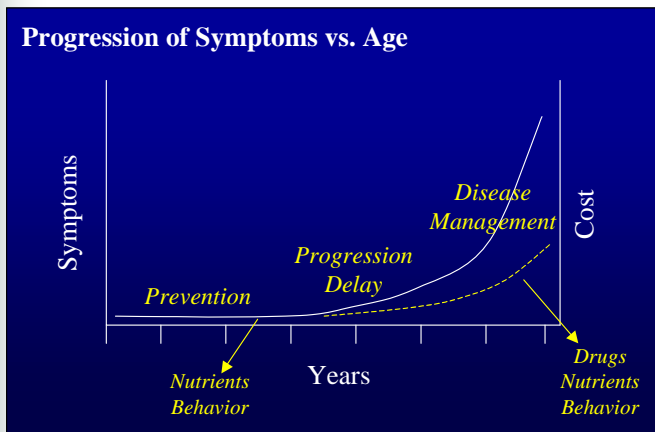
\* Proprietary Pioneer Glyphosate ALS Tolerant trait



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# Nutrition – Opportunities in Nutrition Create a Critical, Major Growth Wave for Next Generation Products

## Prevention vs. Treatment



## Current Products

### Solae Soy Protein



- Isolated soy protein
- Meat Emulsifiers
- Bars & Shakes
- Beverages

Qualified Health Claim  
 “Heart Health”  
 Taste Improvements

Nutrition Facts	
Serving Size 100 grams	
Amount Per Serving	
<b>Calories</b> 52	Calories from Fat 1
<b>% Daily Value*</b>	
<b>Total Fat</b> 0g	0%
Saturated Fat 0g	0%
Trans Fat	
<b>Cholesterol</b> 0mg	0%
Sodium 1mg	0%
<b>Total Carbohydrate</b> 14g	2%
Dietary Fiber 2g	10%
Sugars 10g	
<b>Protein</b> 0g	
Vitamin A 1%	Vitamin C 8%
Calcium 1%	Iron 1%

## TReUS™

Soy Technologies



### Low Linolenic Soybean Oil

- Trans fat free
- Eliminates chemical hydrogenation
- Protects HDL level

### Corn

White Corn



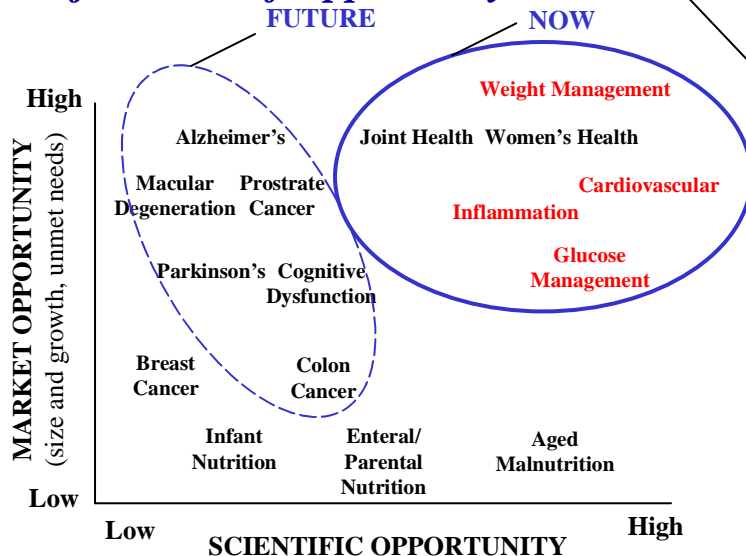
### Seed

- High oleic sunflower
- Oil-modified canola
- Cardio friendly oils

*"Let thy food be thy medicine and thy medicine be thy food."*

Hippocrates  
 (460-377 BC)

## Major Areas of Opportunity



## Future

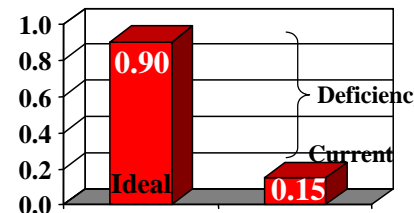
### Solae Soy Protein

- Superior tasting
- Improved texture
- Consistent health efficacy

### Nutrium

- High oleic soy oil
- High oleic / high stearate soy oil
- Omega-3 soy oils

Omega-3 Intake of EPA-DHA  
 (Grams per Day)

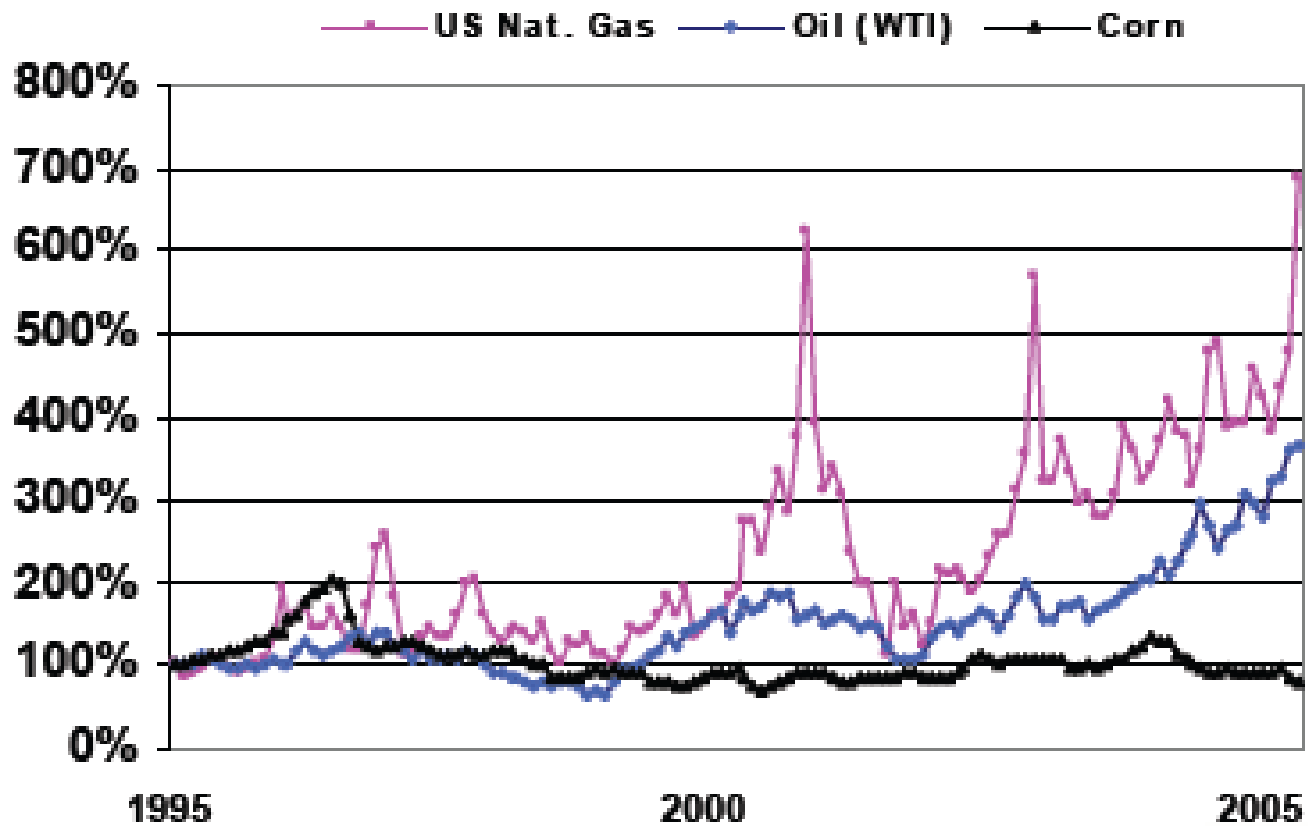


Also in Solae pipeline:

- SoleCina
- High 7S
- Mixes with other proteins
- Peptides

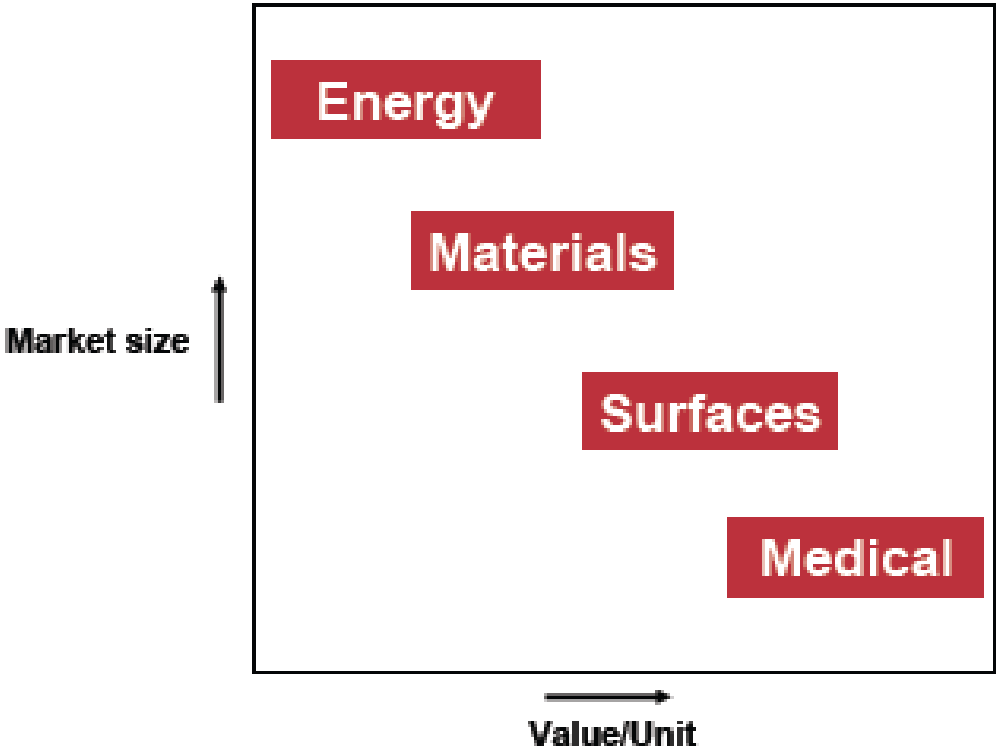
Taste – Texture – Nutrition – Convenience – Cost - Personalization

## Bio Based Materials – *The Right Science at the Right Time*



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# Bio Based Materials

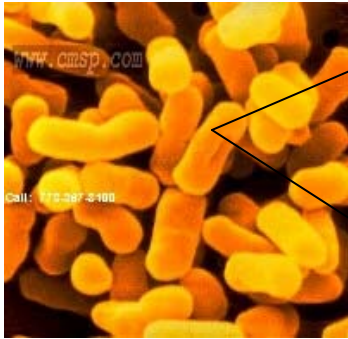


**Enabling Technology and IP Leverage in All Four Areas**

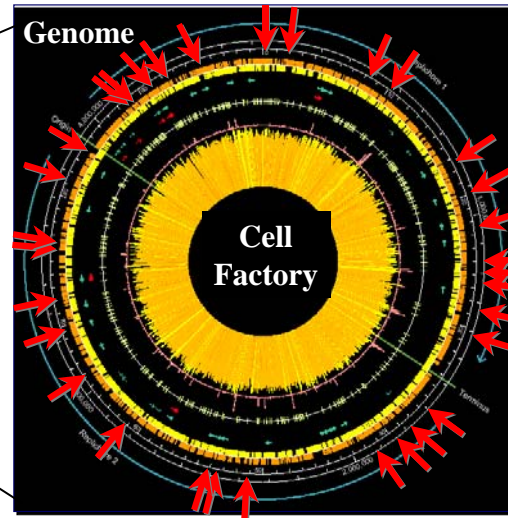


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# Bio-Based Materials – *Bio-PDO*<sup>TM</sup> (1,3 Propanediol, 3G)



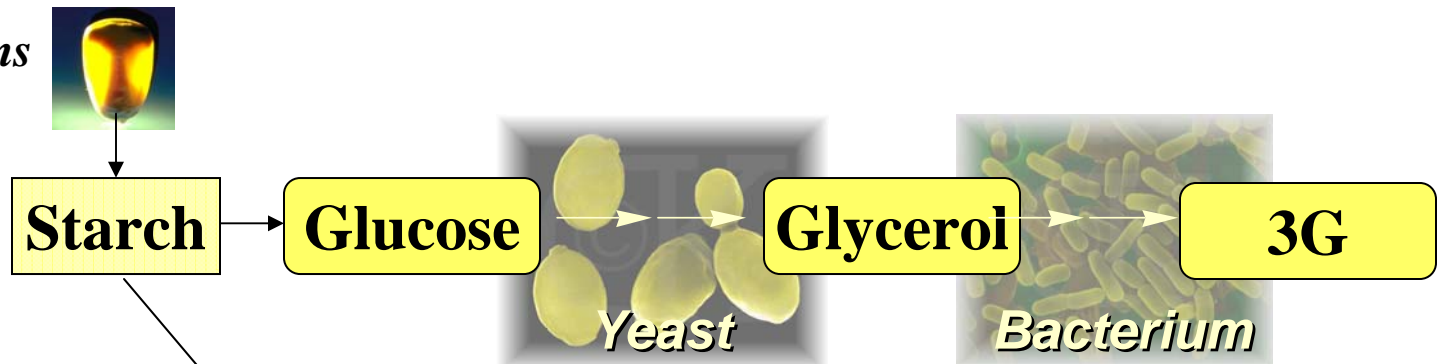
Economic Production of 3G



*E. coli* has been programmed to increase Bio-PDO<sup>TM</sup> production 500-fold

## In Nature:

*two microorganisms convert glucose to 3G stepwise*



**Biotech Application:**  
*a single microorganism to effect the conversion*

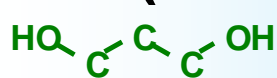


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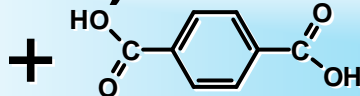


# Sorona® (3GT) – An Advanced Polymer/Fiber

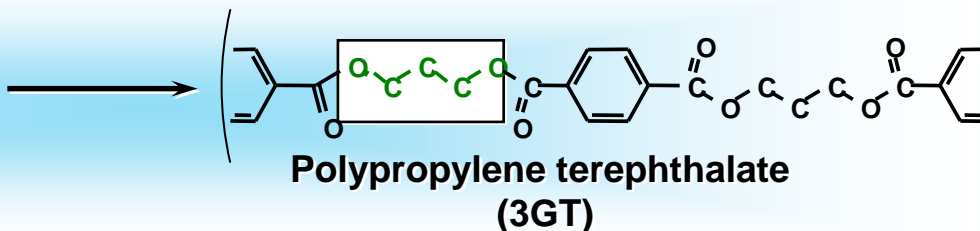
## 3GT (Sorona®)



1,3-Propanediol  
(3G)

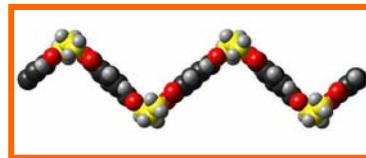


Terephthalic Acid



## Superior Properties

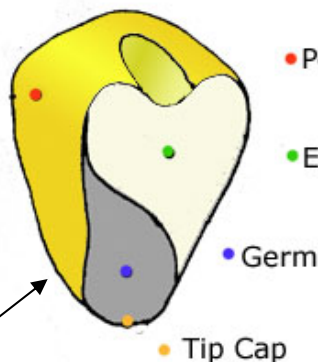
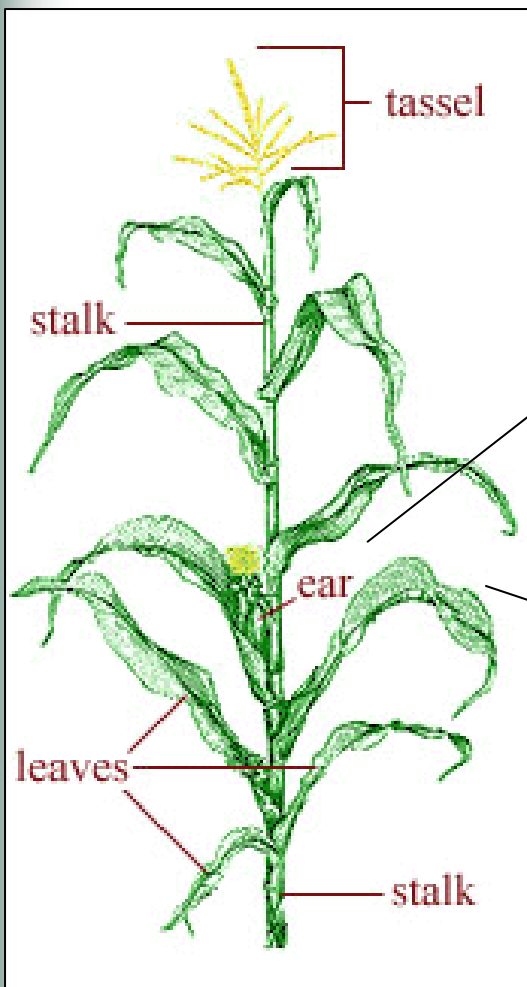
- *Stretch & Recovery*
- *Softness*
- *Vibrant Color*
- *Stain Resistance*
- *UV & Chlorine Resistance*
- *Easy Care*



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# Corn has Significant Potential for Biofuels

## Ethanol Productivity



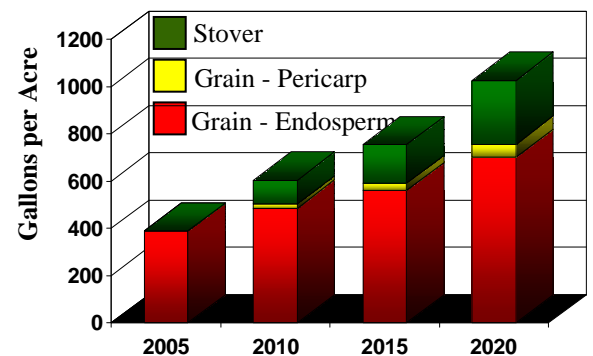
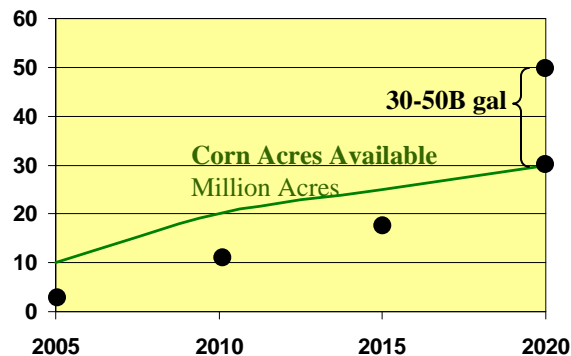
• Pericarp → **18 Gal/Acre**  
 • Endosperm → **390 Gal/Acre**  
 @ 150 bu/ac grain yield



→ **100 Gal/Acre**

**The Potential: 30 - 50 Billion Gallons**

● Corn Ethanol Produced Billion Gallons



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# Integrated Corn Biorefinery Strategy

## Sustainable Materials, Chemicals & Energy

Feedstock Harvest & Transport



Feedstock Conversion



Fermentation Production



Separate, Refine



Feedstock Production



Produce Chemicals & Fuels



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# To Summarize ... An Expectation is Set that Makes the Biotechnology Vision Strategically Critical for DuPont

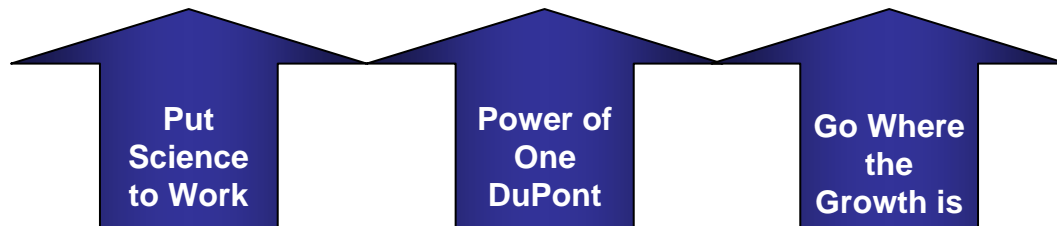
## DuPont Vision

To be the world's most dynamic **science** company, creating **sustainable** solutions essential to a **better, safer, healthier** life for **people everywhere**.

## Biotechnology Vision

Unlocking **genetic** secrets to meet **societal** needs in a **sustainable** manner

The best way to predict the future is to invent it.  
--- Peter Drucker



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# Plant Sciences, an important building block of the future

- **Agriculture is a major strength of US economy – traditionally \$45 B + trade surplus**
- **US is not only a producer of 25% of worlds grain but also a leading technology developer**
- **Plant sciences will migrate from food and feed to include fuel, fiber and fitness – tremendous value addition**
- **Eco Agriculture can be effectively delivered through plant sciences**



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# Several aspects of plant science research are critical

- **Pest control through genetics**
- **Stress resistance to reduce variability**
- **Nutrient and energy assimilation and transformation (N, Water, Light, C)**
- **Biomass distribution (architecture)**
- **Metabolic partitioning and distribution**
- **Process friendly**
- **Environmental and eco safety**
- **Human safety and nutrition**



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Traditionally, plant sciences has been a poor cousin of human sciences

- **Most investments for scientific and technological development by the private sector**
- **Tools borrowed from human and microbial sciences**
- **Food availability not a main stream issue**
- **Poor appreciation of the potential**
- **No National Institute of Plant Sciences**
- **Little funding in the competitive granting arena in relationship to health**



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# Global competition in Plant Sciences is intensifying

- China has made plant sciences a strategic national priority
- Substantial commitment to Plant Science Centers at Beijing, Shanghai
- Focus on rice as a model and commercial crop
- Large US, Europe trained personnel
- State of art facilities
- Integrated basic and applied research



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## Expanded investments in plant sciences has broad societal and global impact

- Hunger
- Sustainability and eco enhancement
- Disease prevention and better management
- Rural economic development and industrialization
- New paradigms for new industries (tech providers, value chain)
- Global trade harmonization



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# To accelerate returns on investments, a number of breakthroughs are needed

- **Technology (current timeframe: 8-15 years)**
  - molecular understanding of key physiological processes @ cell, tissue, organism and ecosystems
  - early identification of fruitful pursuits
  - transparent, science-based regulatory processes
- **Significant private/public sector interaction**
  - Greater participation of academic community in Translation research
  - Novel ways of approaching the research component of training and education
- **Seed money for early stage commercial work**
- **People – leadership and execution capabilities in multi-disciplinary environment**
- **Social Acceptance and Freedom to practice**



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