



Bayer CropScience BioScience

Plant Biotechnology at Bayer: Stepping into the Bio-Based Economy

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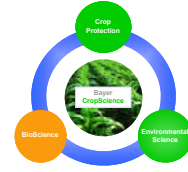
Bayer Strategy

Science for a Better Life



- A focus on core businesses in healthcare, nutrition and innovative materials
- A portfolio aligned toward innovation and growth

- Intention to capitalize on innovation drivers such as biotechnology and genetic engineering
- BioScience positioned as a key development business



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BioScience Activities

Dedicated Focus

3 Business Fields	3 Complementary Activities	7 Market Areas
Vegetable Seed	High quality, high performance vegetables seed varieties	• Vegetables
Agricultural Crops	Improved productivity, performance and quality	• Cotton • Canola • Rice
New Business Ventures	Innovative plant-based products	• Nutrition • Health • BioMaterials

BioScience:
• 2,000 employees
• 360 M€ 2005 sales

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Plant-Based Raw Material Innovation

Driving Down-Stream Business Development of Ag-Biotech Players



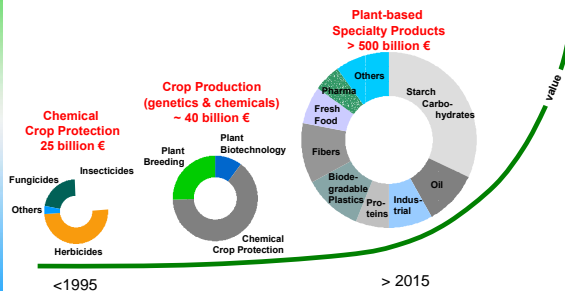
- **Trends:**
 - Value Innovation through traits
 - Fragmentation of existing commodity markets
 - New non-food/feed/fiber markets (BioFuel & BioMaterials)
- **Market Player Response:**
 - Industry Consolidation
 - Crop Production Concept
 - Seed/Trait/Chemical Marketing Alliances
 - R&D investment to develop de-commoditizing traits
- **Trends:**
 - Cost Innovation at processing level
 - Differentiation & diversification at raw material level
- **Market Player Response:**
 - Focus on economies of scale & marketing
 - Spin-out of diversifying market opportunities requiring raw material innovation
 - Outsourcing of raw materials supply
 - Based on open innovation concept

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Emergence of the Bio-based Economy

A new value proposition for the (end-)customer



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Transition towards the Bio-based Economy

Case example: our Canola (Rapeseed) Business

Two-step strategy:


1. Building a Crop Production company
2. Diversification



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Canola Seeds of Success

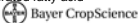
Rapeseed is a Commodity Crop Today



Rapeseed World Production (M tonnes)

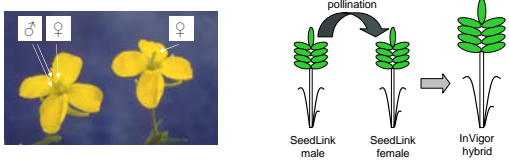
Region	Production (M tonnes)
China	11.00
European Union	10.00
Canada	5.00
India	5.00
Central Europe	3.00
Others	4.00

- ◆ Global, off-farm rapeseed value is €5-6 billion
- ◆ Seed, trait, crop protection value €0.6 billion
- ◆ Bio-Diesel opportunity
- ◆ Canola oil
 - unrivalled in oil and meal profile
 - lowest in saturated fatty acids
 - high levels of mono-unsaturated fatty acid

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SeedLink®-based InVigor® Hybrids

Game changer of the Canola Seed Business




SeedLink
Pollination Control


Launched in 1997

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SeedLink®-based InVigor® Hybrids


Differentiation through yield and yield stability



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SeedLink®-based InVigor® Hybrids

Differentiation through yield and yield stability




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SeedLink®-based InVigor® Hybrids

Farmer satisfaction has led to #1 market position

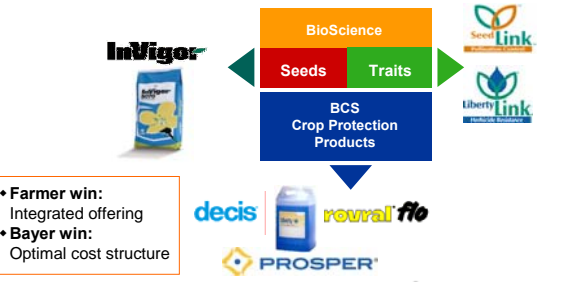
Canada Market Share (Acreage)

Year	Market Share (%)
1997	2
1998	5
1999	11
2000	10
2001	11
2002	22
2003	19
2004	26


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Bayer CropScience Canola Business

Crop Production: a win-win for Farmer and Bayer





- ◆ **Farmer win:** Integrated offering
- ◆ **Bayer win:** Optimal cost structure

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Canola Innovation

Keeping the lead in the Crop Production game





The stress test protocol:

- Sow Seeds 10 days
- 45°C
- 9 days
- Drought + 45°C 3 days
- Wilted Plants
- Watering + 23°C 2 days
- Picture

RNAi-PARP line control

Engineering abiotic stress tolerance through inhibition of Poly-ADP Ribose Polymerase (PARP)

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Canola Innovation

Keeping the lead in the Crop Production game






Field trial results for Summer 2006 harvest show relative yield difference of up to +44% compared to control

RNAi-PARP line control

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Canola Innovation

Enabling the Bio-Diesel oil yield challenge







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From a Crop Production to a specialty oils company

Second step: Towards diversification



Saturated fatty acids

myristic acid C14:0 → Palmitic acid C16:0 → Stearic acid C18:0

↓ FAE enzyme

Oleic acid C18:1 → Eicosenoic acid C20:1 → Erucic acid C22:1

↓ FAD2 enzyme


Linoleic acid C18:2

↓ FAD3 enzyme

Linolenic acid C18:3

Unsaturated fatty acids

Healthiness




Functionality

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Canola Innovation

Selective pathway optimization: Fatty Acids



Saturated fatty acids

myristic acid C14:0 → Palmitic acid C16:0 → Stearic acid C18:0

↓ Crippled FAE enzyme

Oleic acid C18:1 → Eicosenoic acid C20:1 → Erucic acid C22:1

↓ Crippled FAD2 enzyme

Linoleic acid C18:2

↓ Crippled FAD3 enzyme

Linolenic acid C18:3

Unsaturated fatty acids

End achievement:


- Healthier oil profile
 - Reduced saturated fats
 - Increased stability
 - Market introduction 2007
- Unmet customer need
 - Added value recognized
 - Identity preserved
 - Contract growing

InVigor hybrids with special oil profiles expected to be commercially grown in North America as of 2007

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Canola Innovation

Partnerships managing the value chain



A new market dimension for the seed business

- Total oil seed production representing a 30 B€ market growing at 3 % per year
- Canola oil alone accounts for a market of more than 8 B€ versus 0.6 B€ for Crop Production

Partnership between Cargill and Bayer

- Links customer oriented know-how, distribution, and processing with state-of-the-art breeding
- Bridges the fragmented value chain through contract growing
- Opportunity for plant biotechnology and genetics to create value beyond the farm gate

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