

Developing Germplasm and New Products for South America

Emphasis on Yield Potential, Fiber
Quality and New Traits

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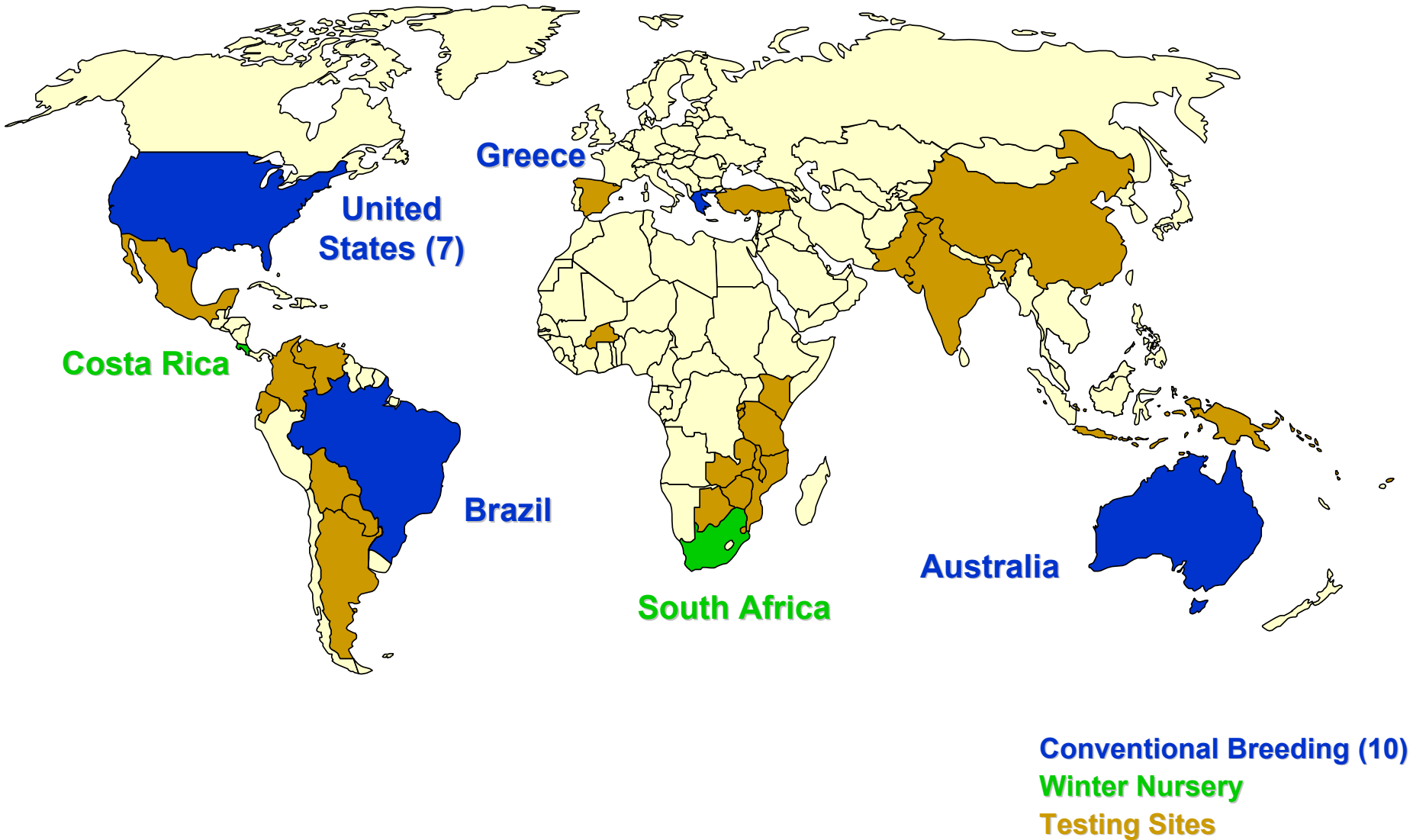
1. D&PL

- ✓ **Global structure**
- ✓ **Work flow**
- ✓ **Current situation**

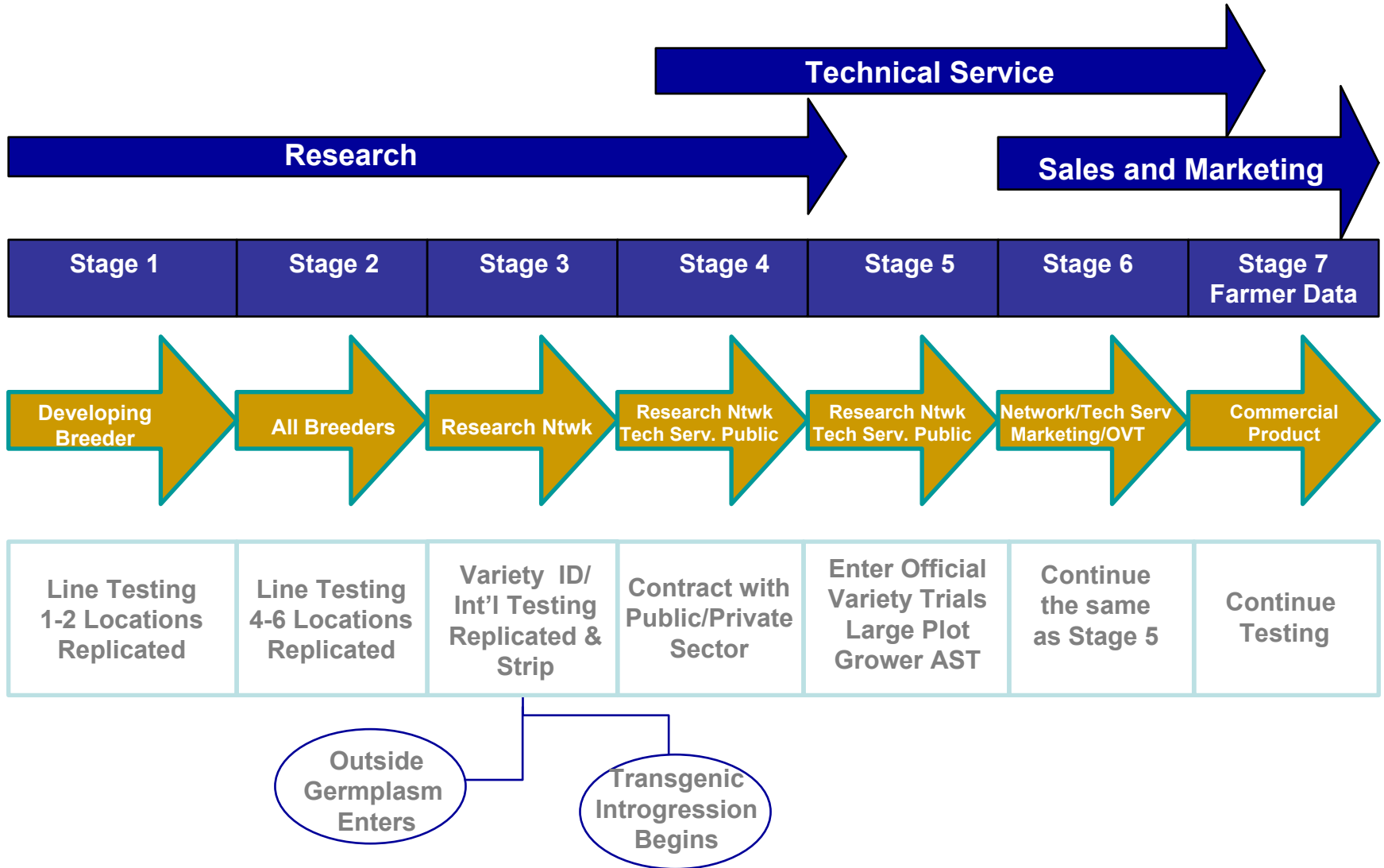
2. Yield Potential

3. Biotech products

Global Breeding Efforts



Product Development Plan



Where Are We?

- Past decade
 - Low yield potential with a range of quality
 - Some industry concerns about quality and attractiveness of cotton for export
- Current
 - High yield potential with good to excellent quality
- Future
 - Continue improvements!
 - Increase participation of SA in global market

1. D&PL

2. Yield Potential

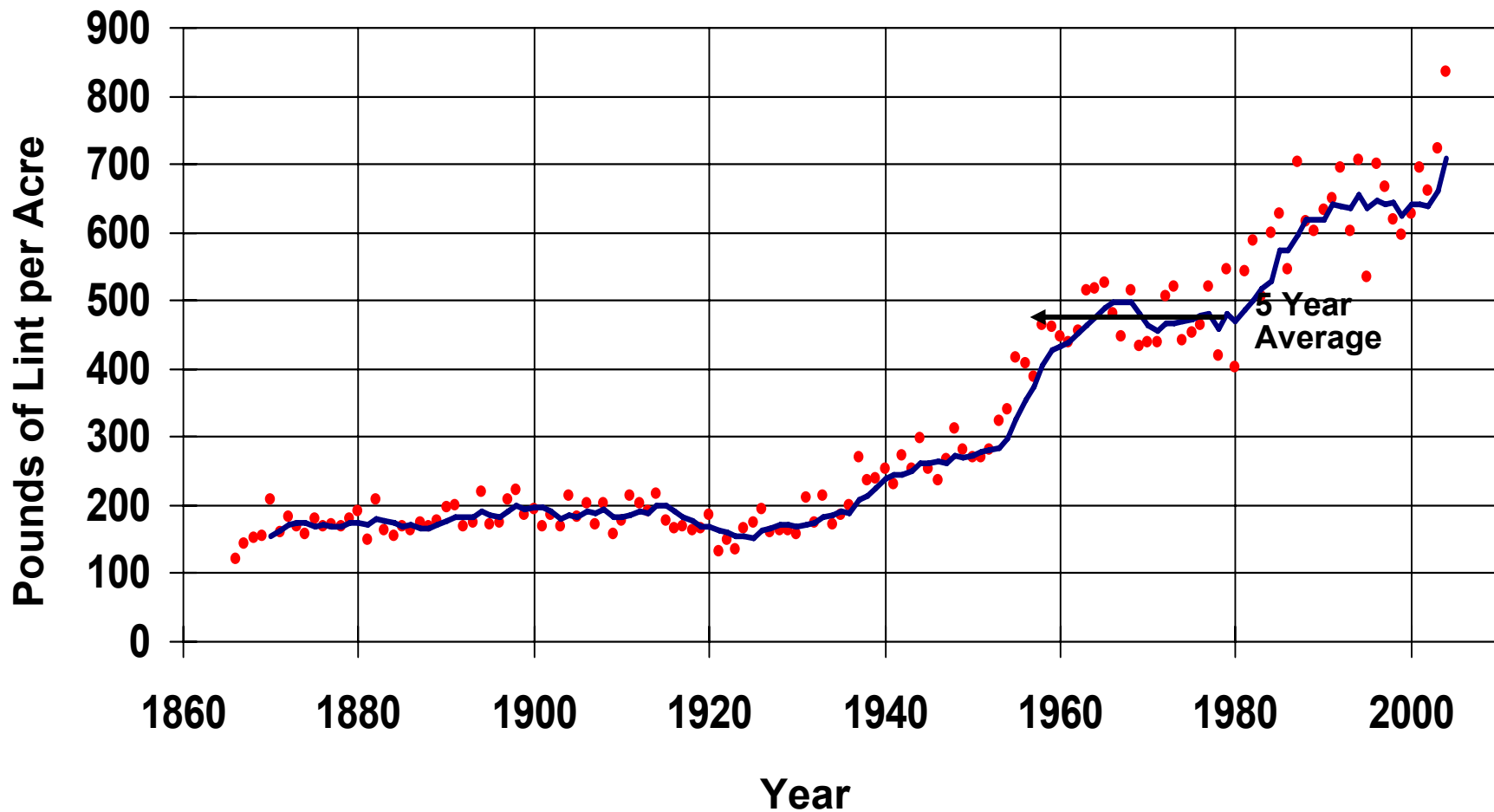
✓ Current situation

✓ Yield Potential + Quality = Pipeline

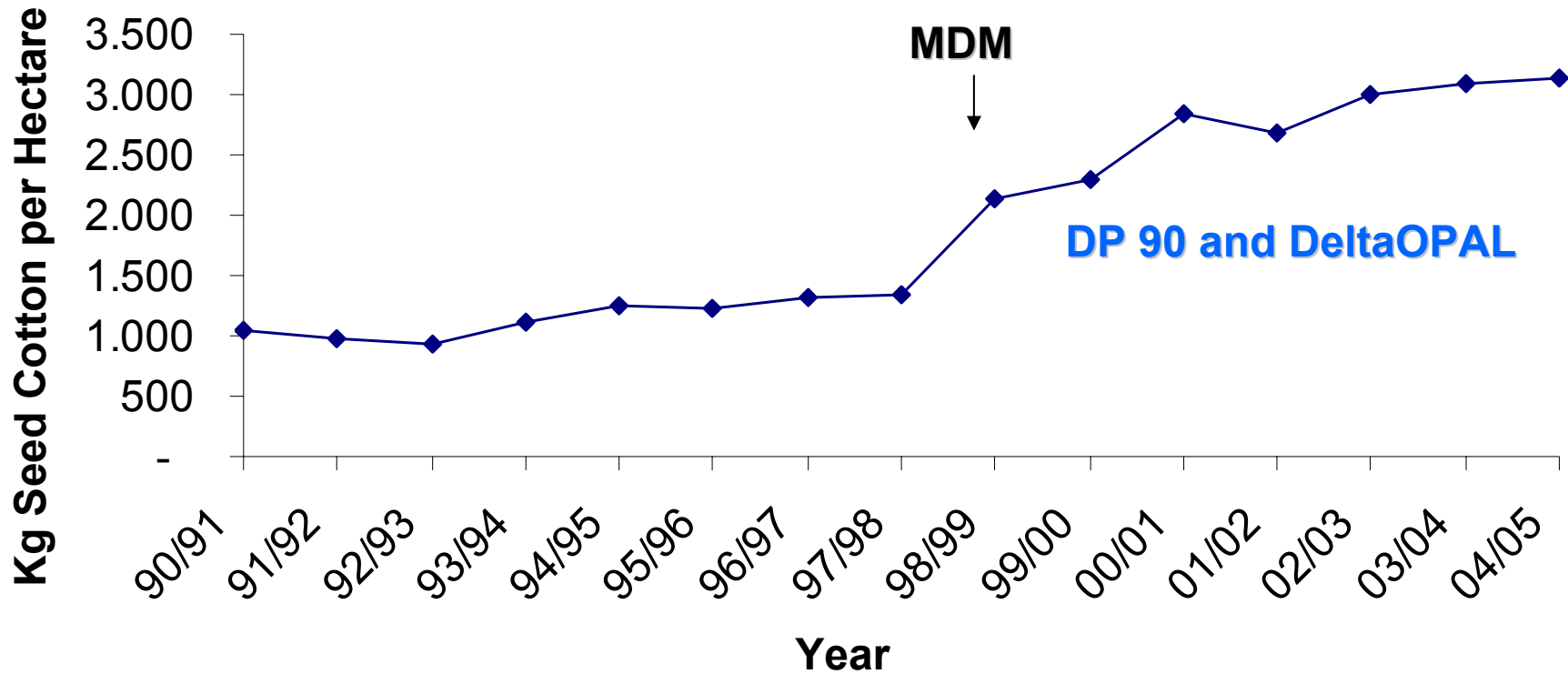
✓ Adding transgenics to the picture

3. Biotech products

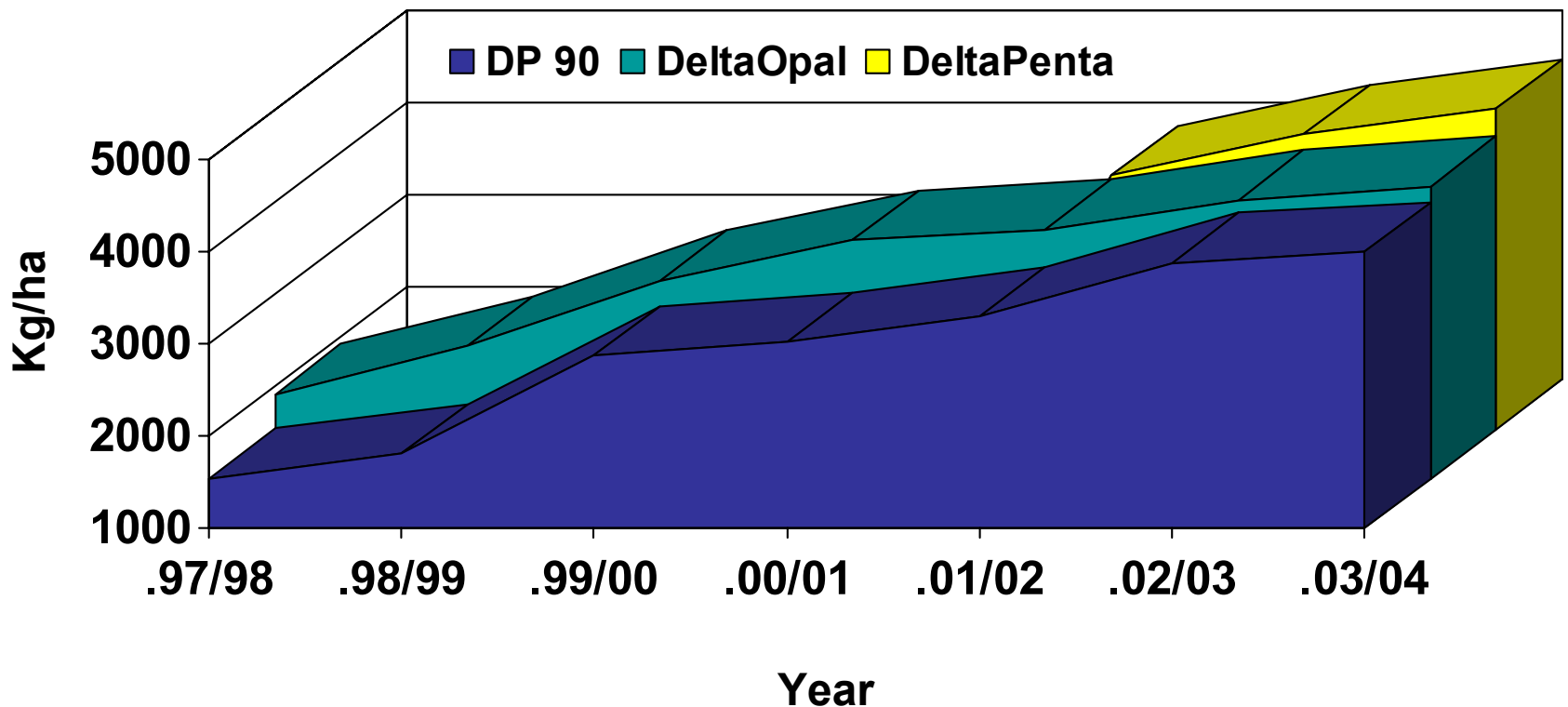
Average US Upland Cotton Yields



Average Brazil Upland Cotton Yields

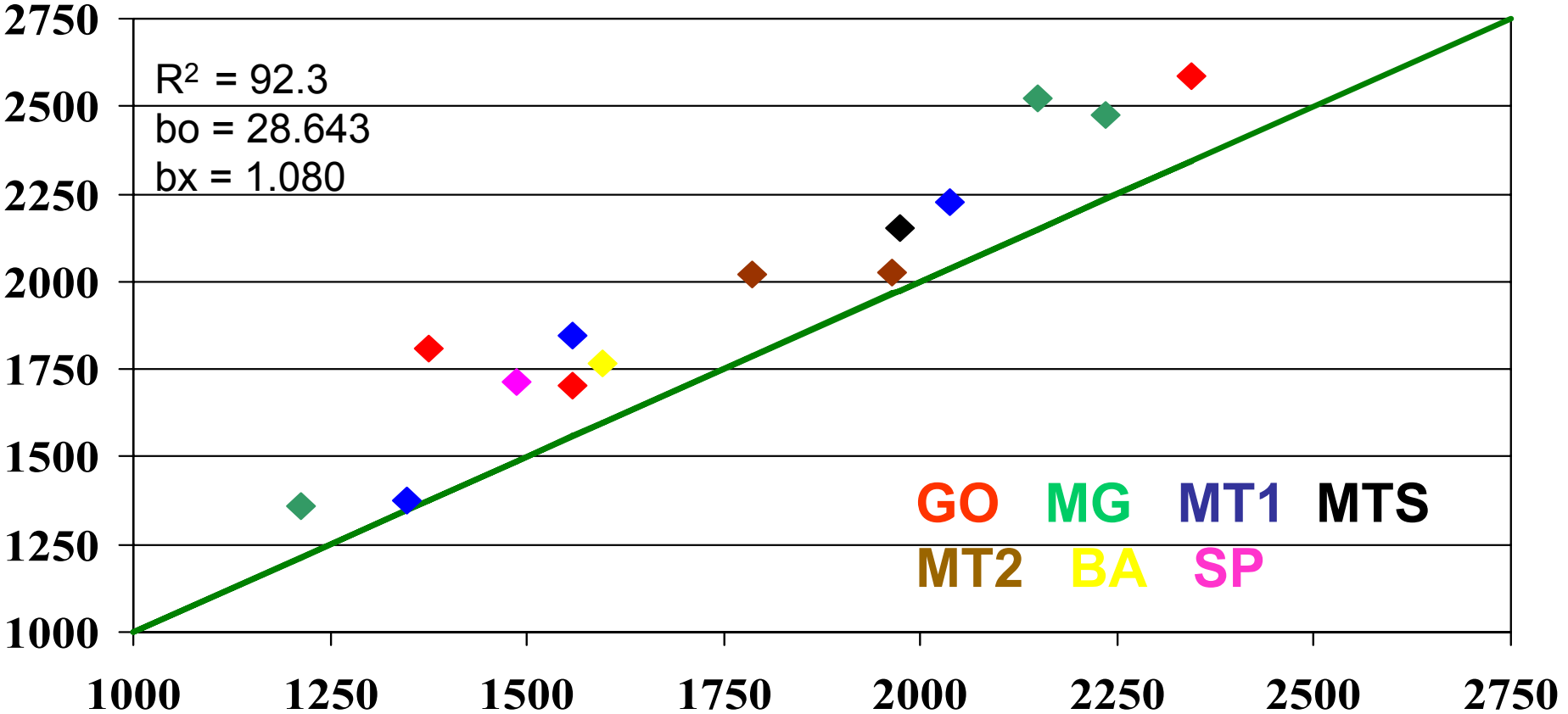


Top MDM varieties yield in Brazil (1997/2004)



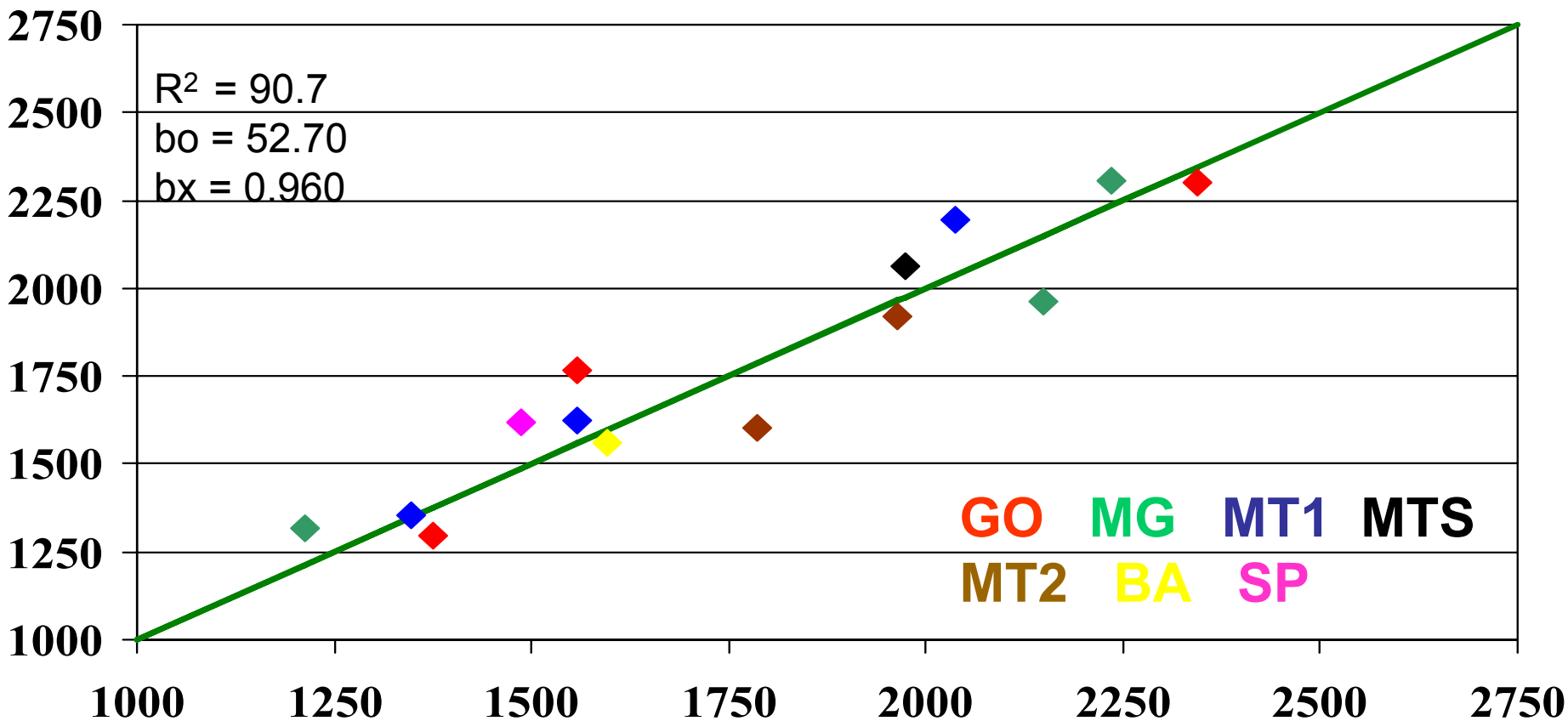
* Stage Five Data – Tech. Services - Brazil 97/04

DeltaPenta's variety vs. environment mean for lint yield (Kg/ha)*



* Stage Five Data – Tech. Services - Brazil 2003/04

DeltaOpal's variety vs. environment mean for lint yield (Kg/ha)*



*Stage Five Data – Tech. Services - Brazil 2003/04

1. D&PL

2. Yield Potential

✓ Current situation

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✓ Adding transgenics to the picture

3. Biotech products

MATCHING YIELD POTENTIAL WITH QUALITY

Our current pipeline shows even further improvements in both yield potential and quality!

DPX 40

Key Features

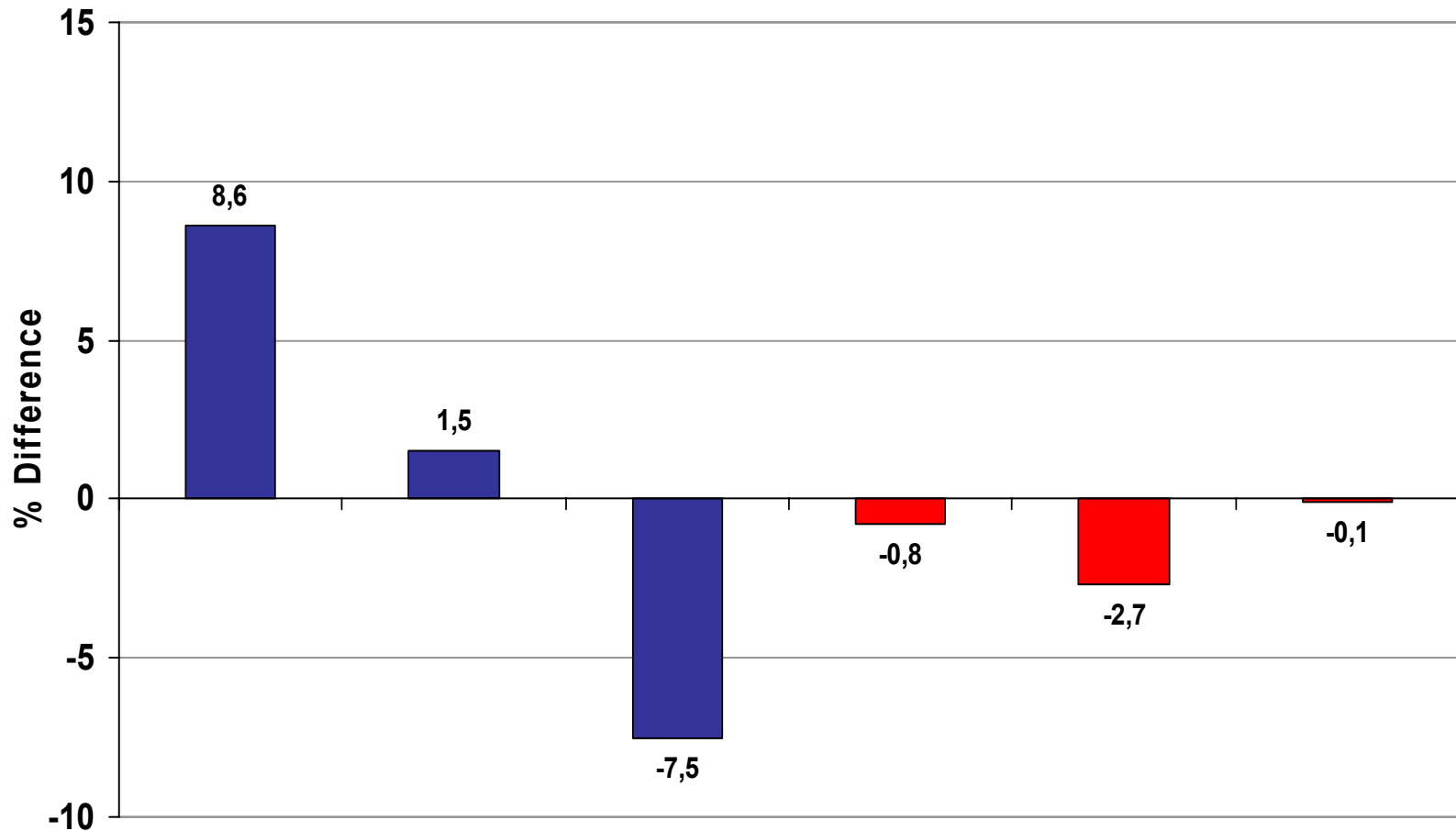
1 High yield potential

2 Excellent fiber quality

3 High turnout

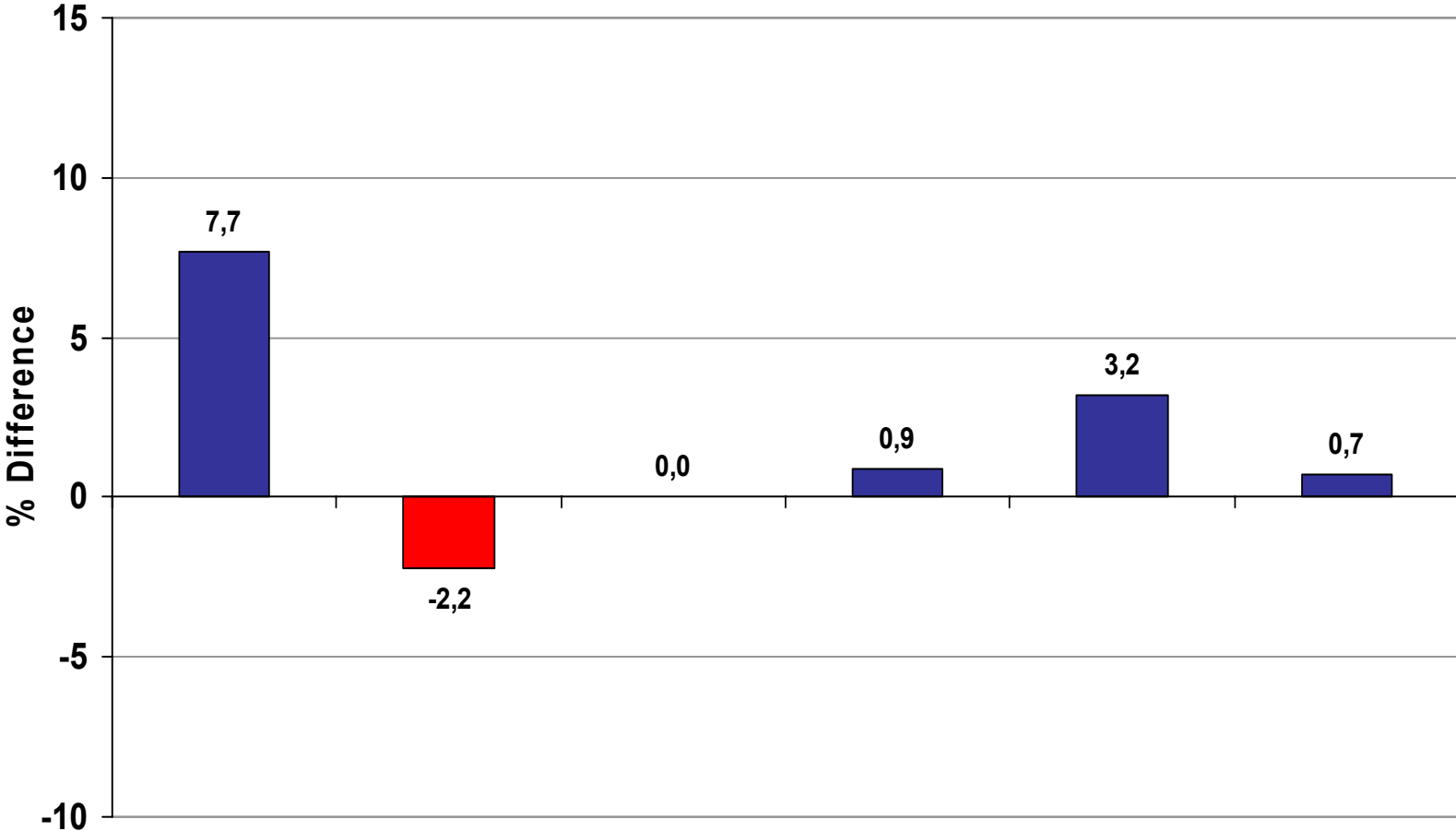
4 Resistance to Blue Disease

DPX 40 vs DeltaOPAL



	Yield	LP	Mic	Len	T1	UR
DPX 40	1971	40,3	4,0	1,17	32,4	84,2
DeltaOPAL	1815	39,7	4,3	1,18	33,3	84,3
No. Tests	6	6	6	6	6	6

DPX 40 vs FM966



	Yield	LP	Mic	Len	T1	UR
DPX 40	1971	40,3	4,0	1,17	32,4	84,2
FM966	1830	41,2	4,0	1,16	31,4	83,6
No. Tests	6	6	6	6	6	6

DPX 92

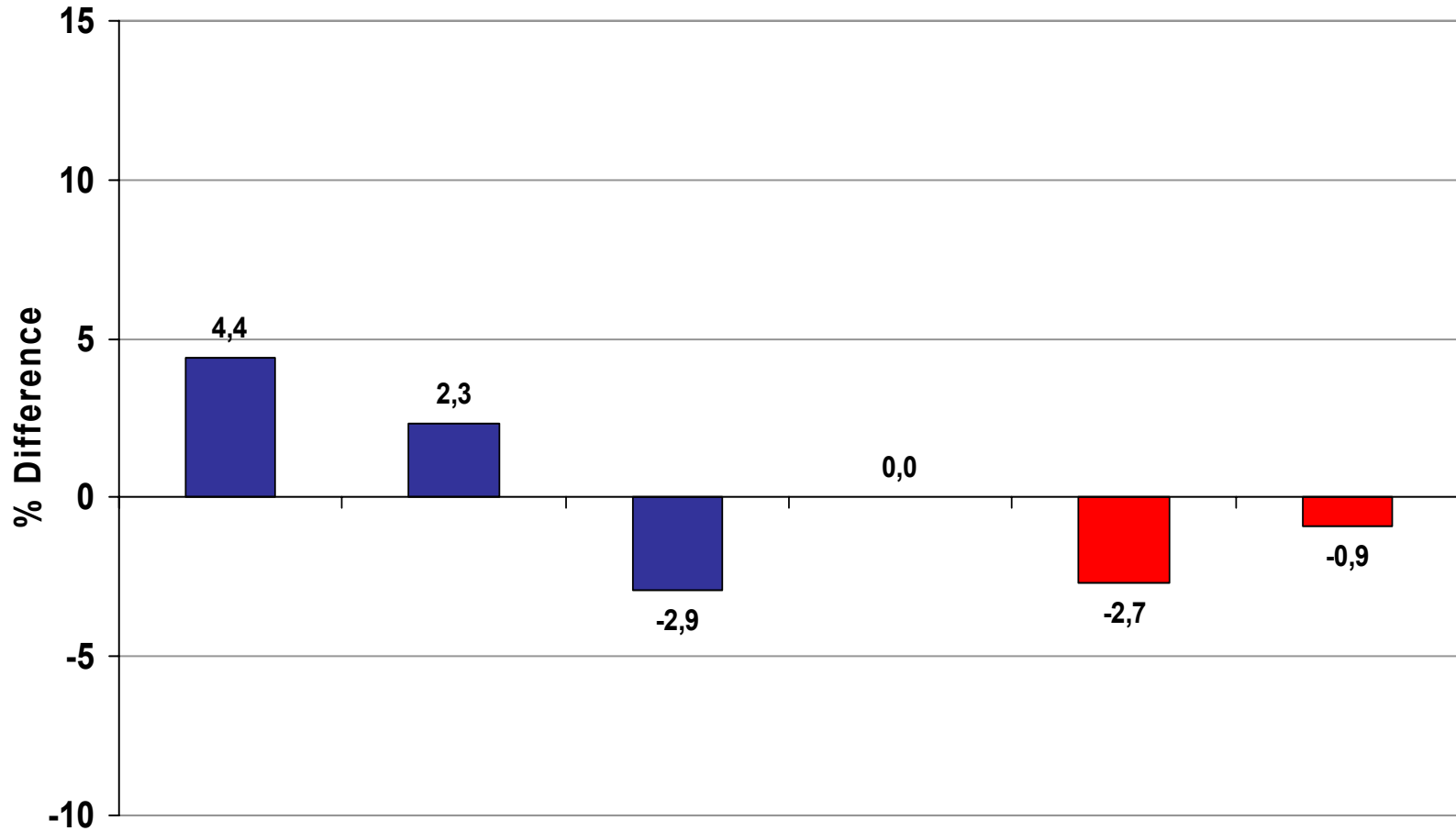
Key Features

1 Excellent fiber quality

2 Competitive Yield Potential

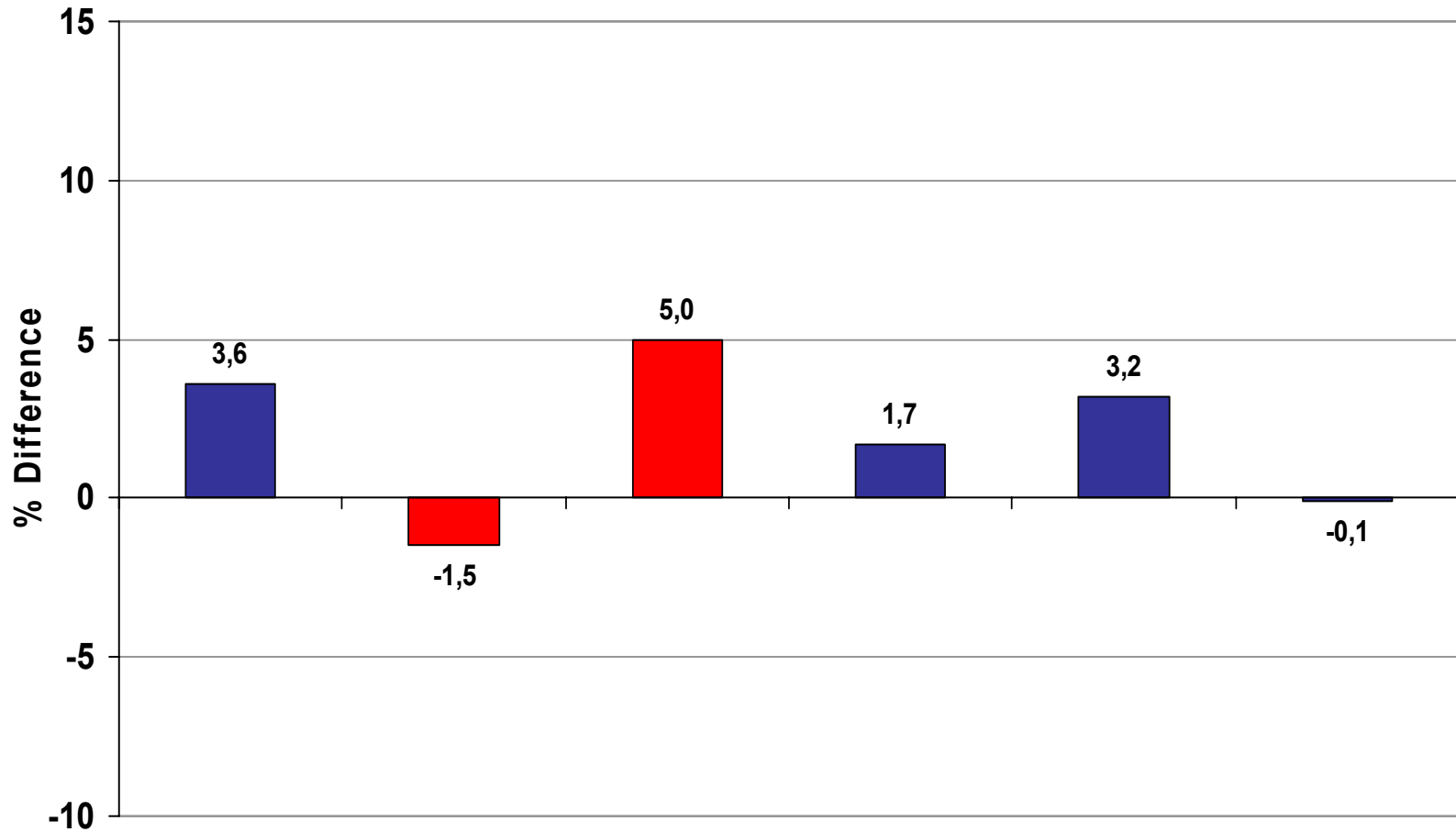
3 High turnout

DPX 92 vs DeltaOPAL



	Yield	LP	Mic	Len	T1	UR
DPX 92	1895	40,6	4,2	1,18	32,4	83,5
DeltaOPAL	1815	39,7	4,3	1,18	33,3	84,3
No. Tests	6	6	6	6	6	6

DPX 92 vs FM966



	Yield	LP	Mic	Len	T1	UR
DPX 92	1895	40,6	4,2	1,18	32,4	83,5
FM966	1830	41,2	4,0	1,16	31,4	83,6
No. Tests	6	6	6	6	6	6

DPX 11

Key Features

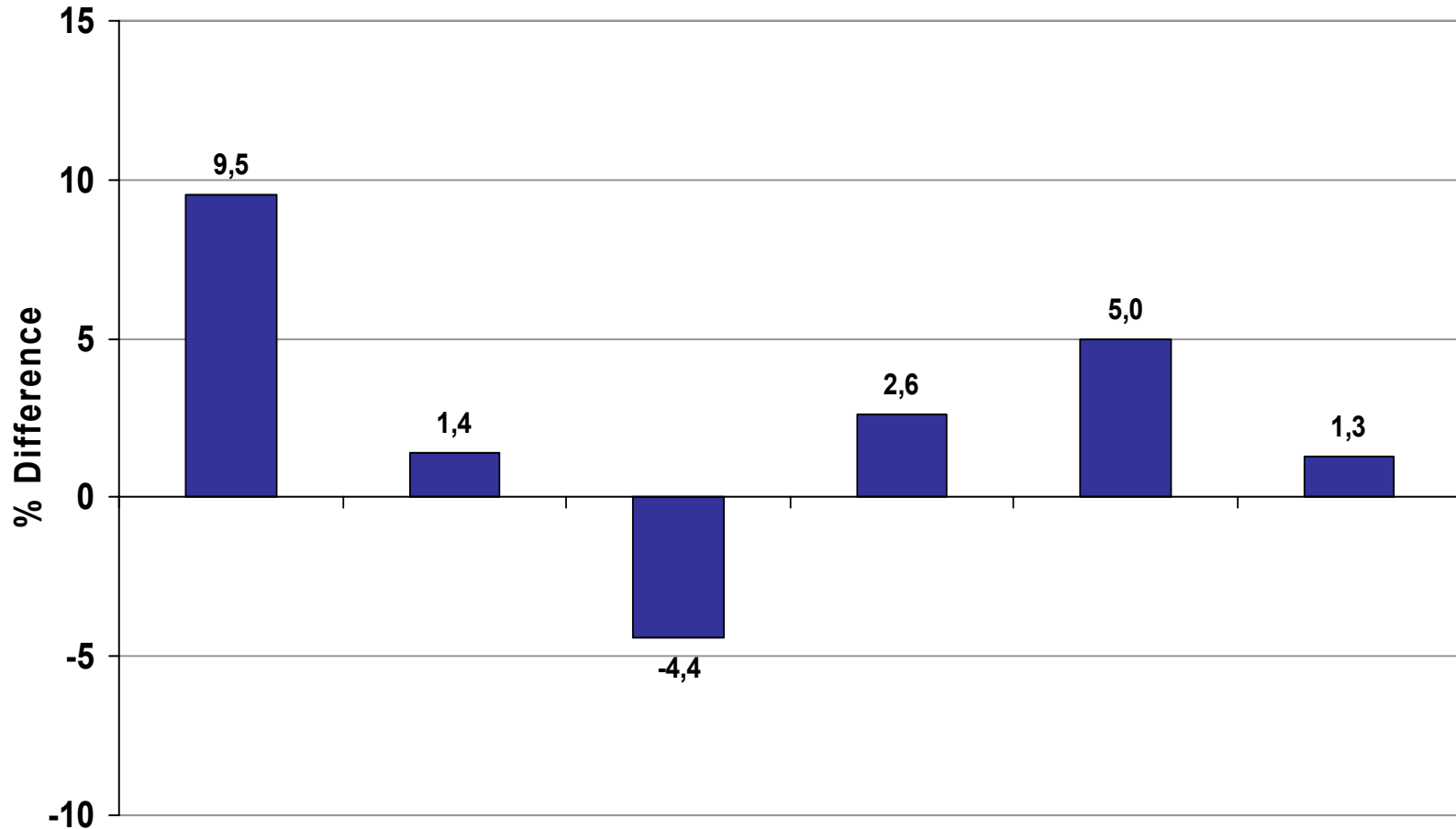
1 High yield Potential

2 Excellent fiber length and strength

3 High turnout

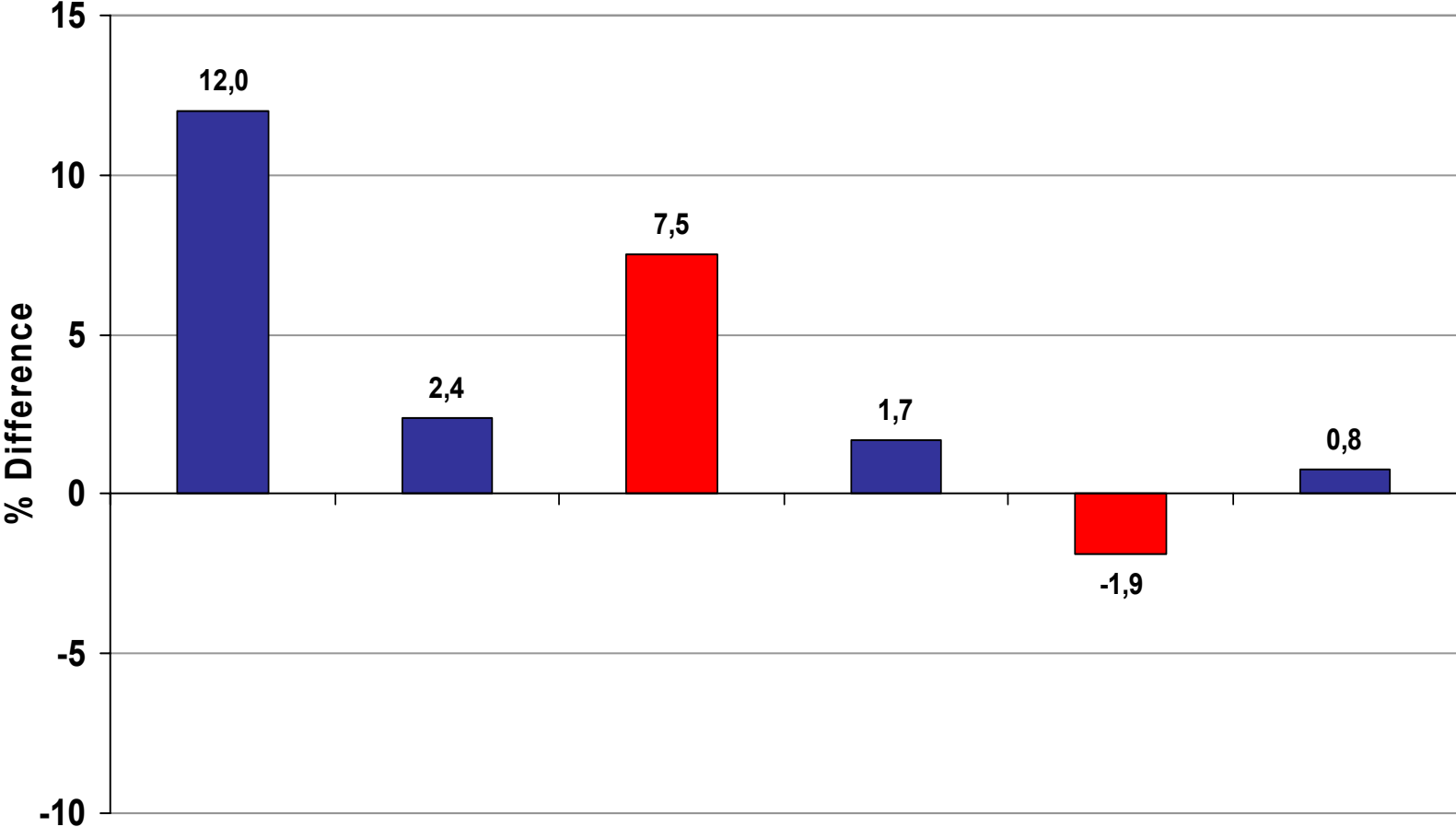
4 Resistance to Blue Disease

DPX 11 vs DeltaPENTA



	Yield	LP	Mic	Len	T1	UR
DPX 11	1973	42,4	4,3	1,17	31,6	83,9
DeltaPENTA	1802	41,8	4,5	1,14	30,1	82,8
No. Tests	3	3	3	3	3	3

DPX 11 vs FM966



	Yield	LP	Mic	Len	T1	UR
DPX 11	1973	42,4	4,3	1,17	31,6	83,9
FM966	1761	41,4	4,0	1,15	32,2	83,2
No. Tests	3	3	3	3	3	3

1. D&PL

2. Yield Potential

✓ Current situation

✓ Yield Potential + Quality = Pipeline

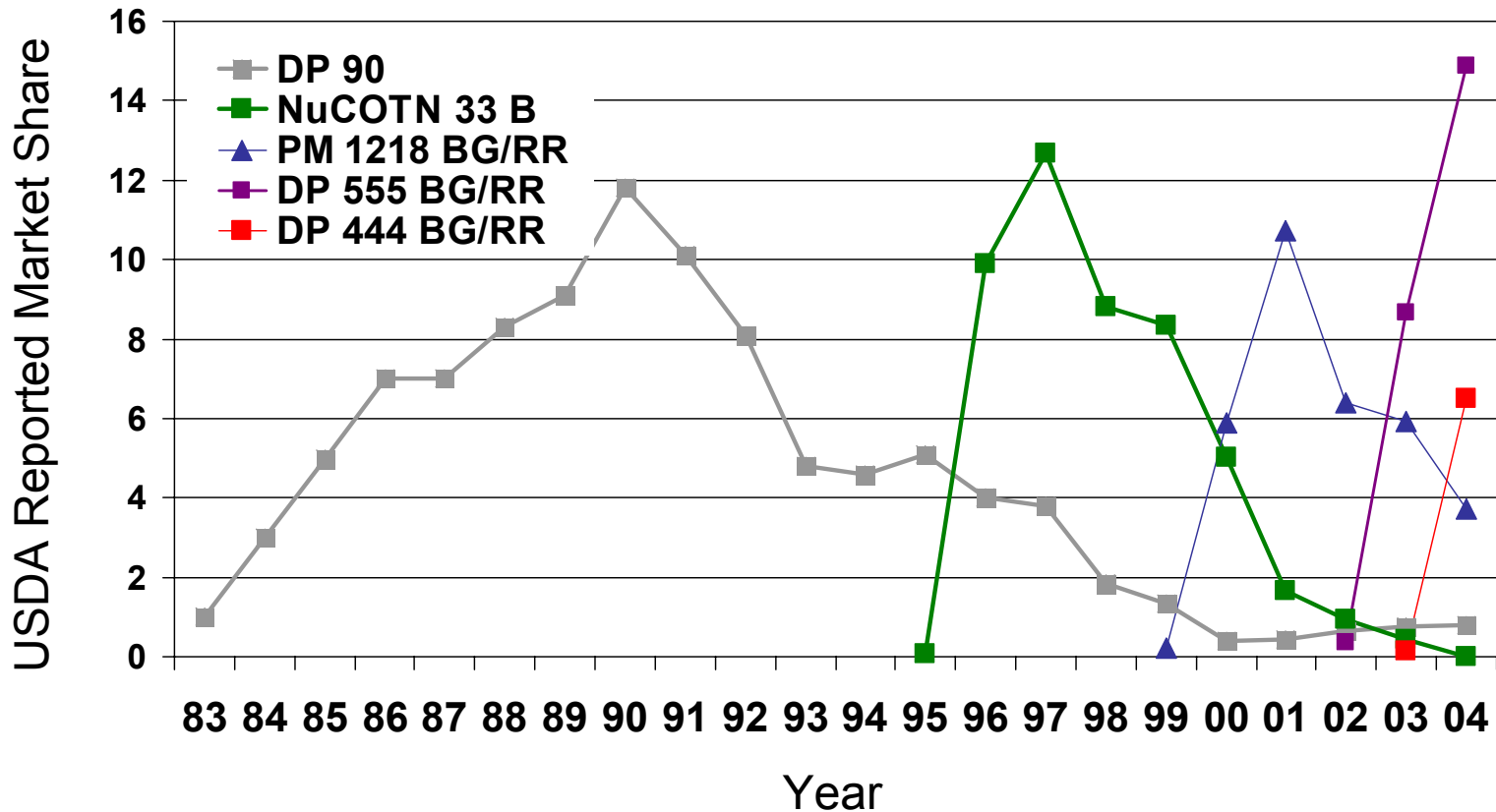
✓ Adding transgenics to the picture

3. Biotech products

**At D&PL we are breeding
conventional lines and
adding transgenes**

Speed to Market

Life cycles for varieties and transgenes move quickly



Potential Change in Grower Selection

New

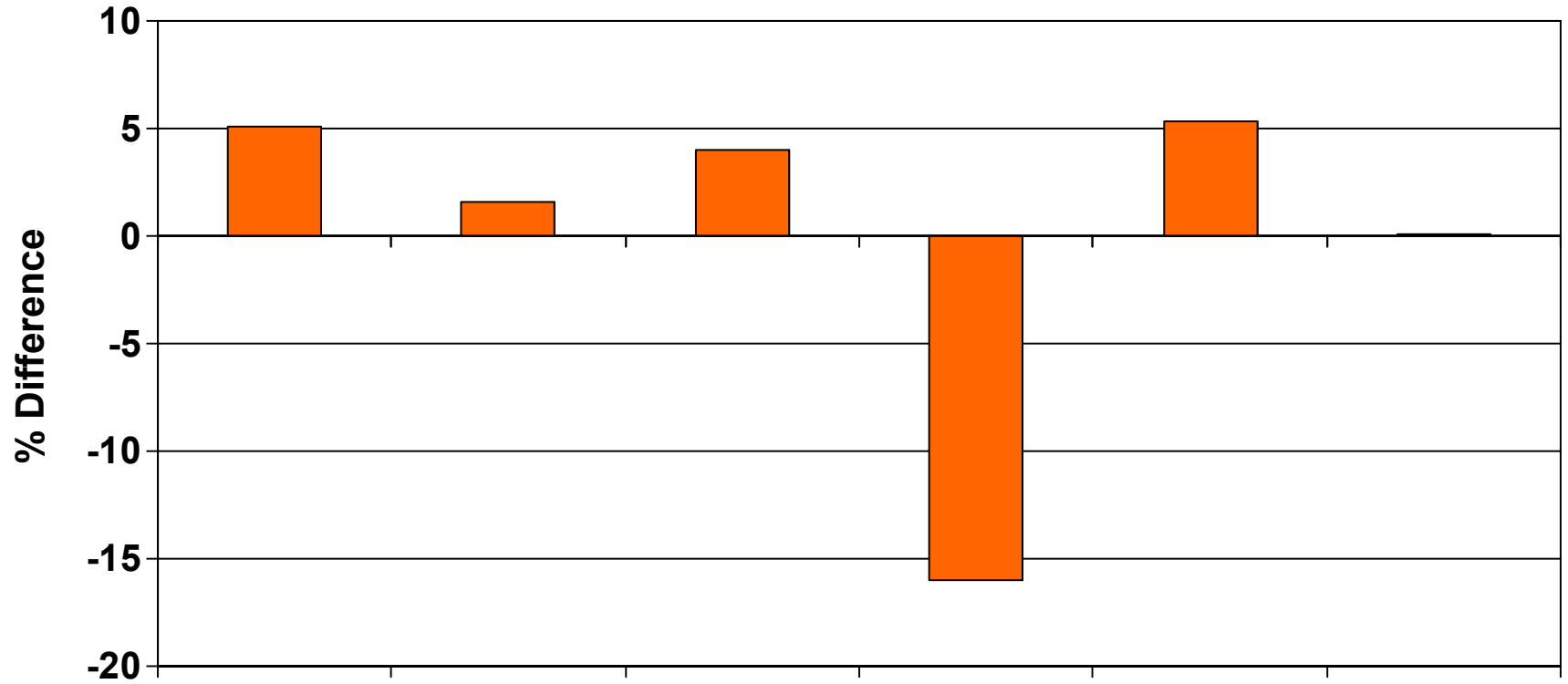
- **BG/RR & BGII/RR**
 - DP 555 BG/RR
 - DP 488 BG/RR
 - DP 449 BG/RR
 - DP 444 BG/RR
 - DP 424 BGII/RR
- **RR**
 - DP 432 RR
 - DP 434 RR
 - DP 494 RR
- **Conventional**
 - DP 491
 - DP 393

Old

- **BG/RR**
 - DP 655 B/RR
 - DP 458 B/RR
 - PM 1218 BG/RR
 - SG 215 BG/RR
 - ST 4892BR
- **RR**
 - DP 5690 RR
 - DP 5415 RR
 - PM 1199 RR
 - SG 521R
 - ST 4793R

DP 444 BG/RR vs PM 1218 BG/RR

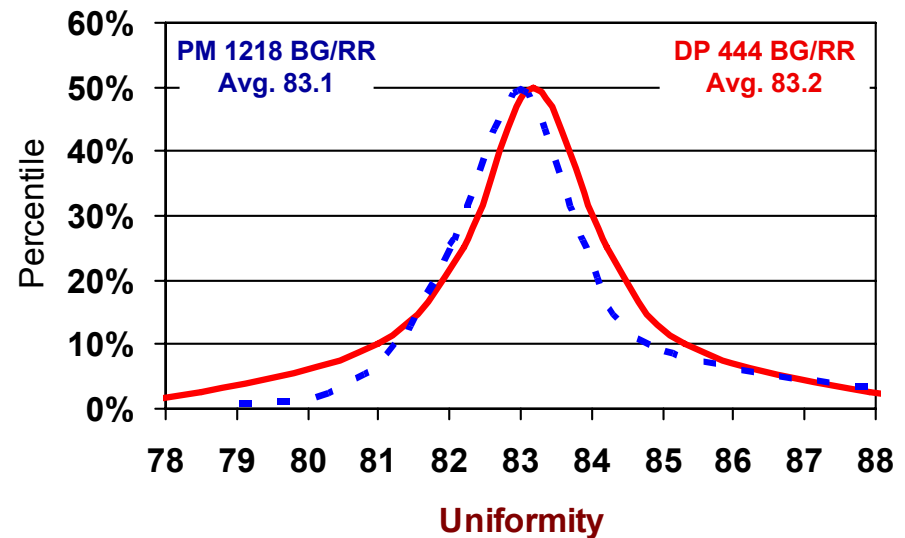
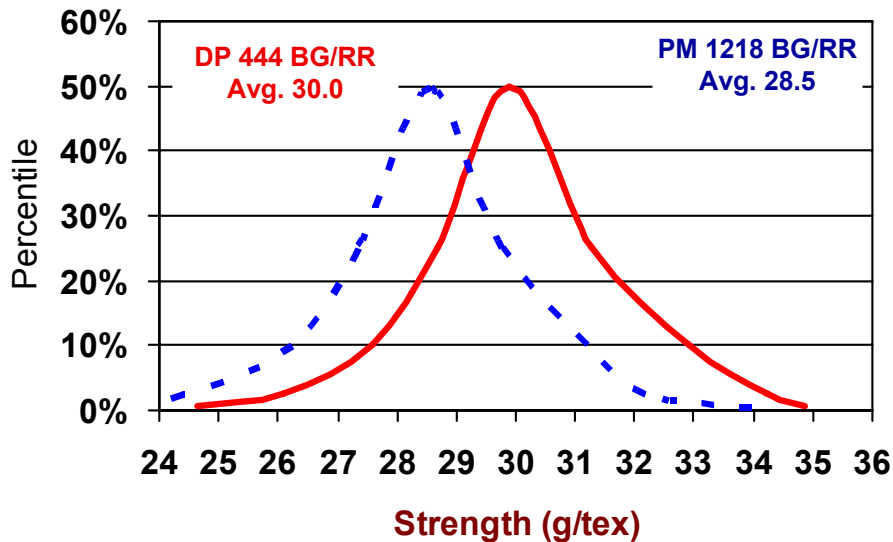
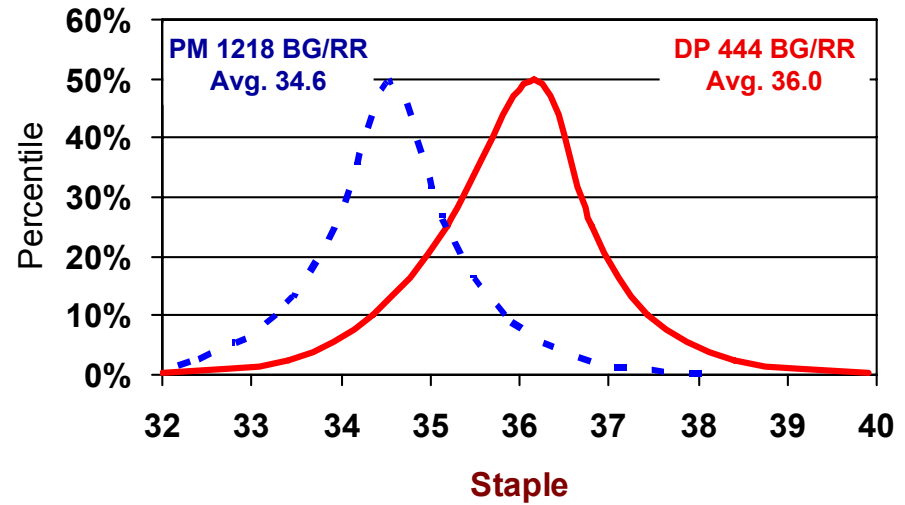
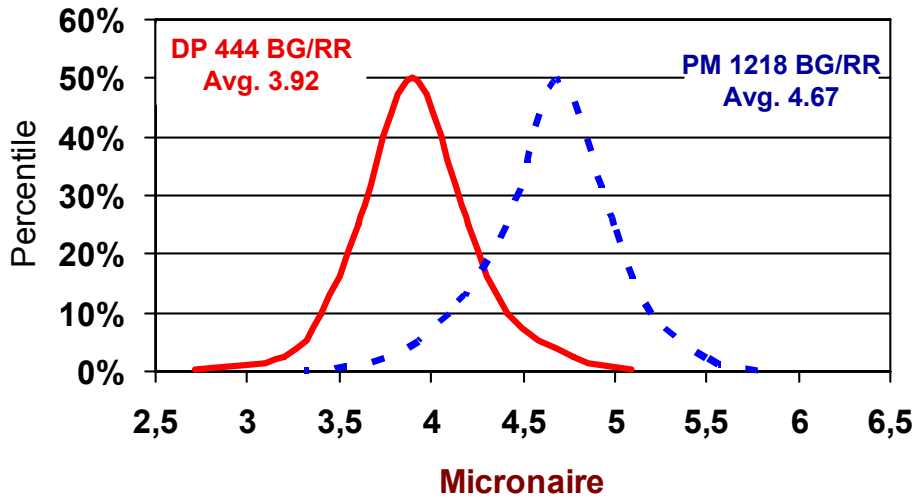
All Data Sources (Updated 28 Dec 04)



	Lint	% GTO	Staple	Mike	g/tex	Unif
DP 444 BG/RR	1220	39.3	36.0	3.92	30.0	83.2
PM 1218 BG/RR	1161	38.7	34.6	4.67	28.5	83.1
N	438	429	429	429	429	429

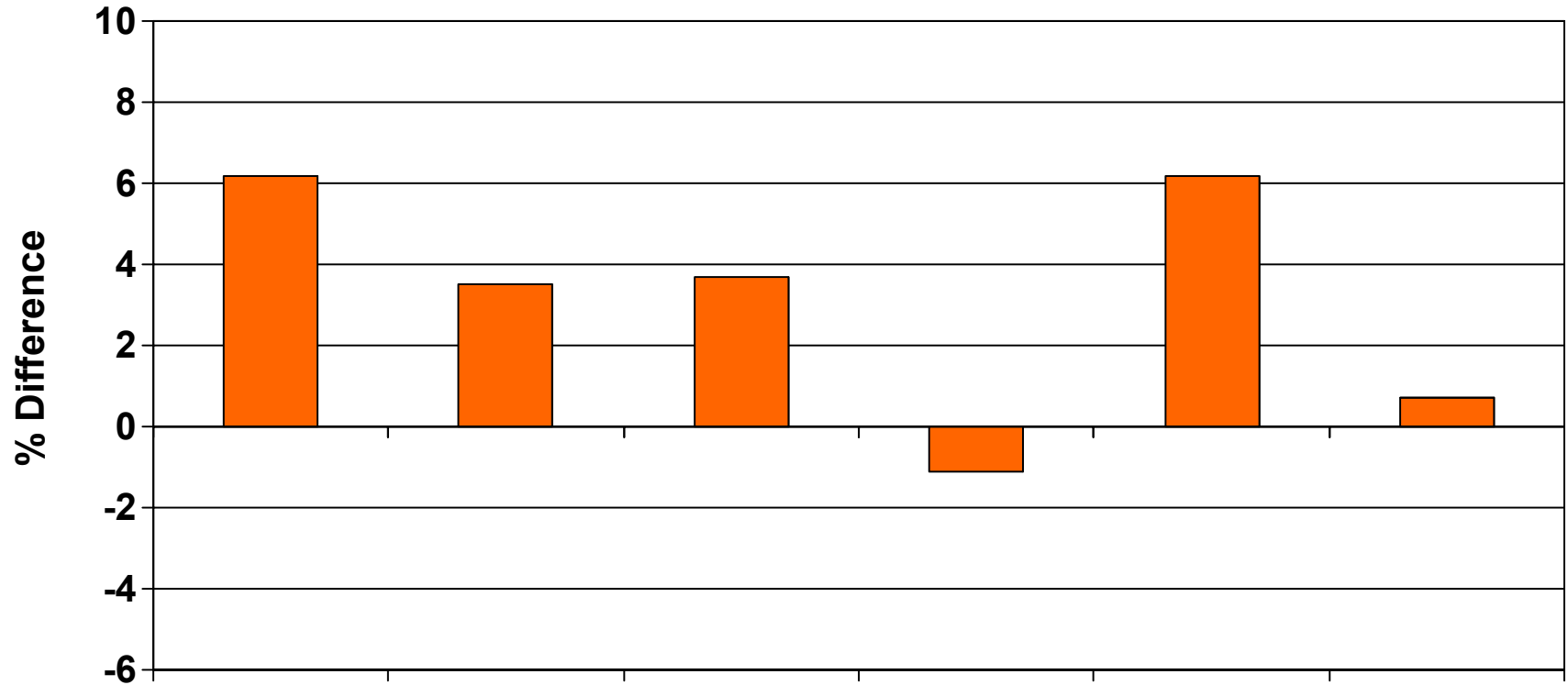
DP 444 BG/RR vs. PM 1218 BG/RR

N = 429 H2H Comparisons (All Data Sources, Regions, and Years 12-28-04)



DP 494 RR vs DP 5415 RR

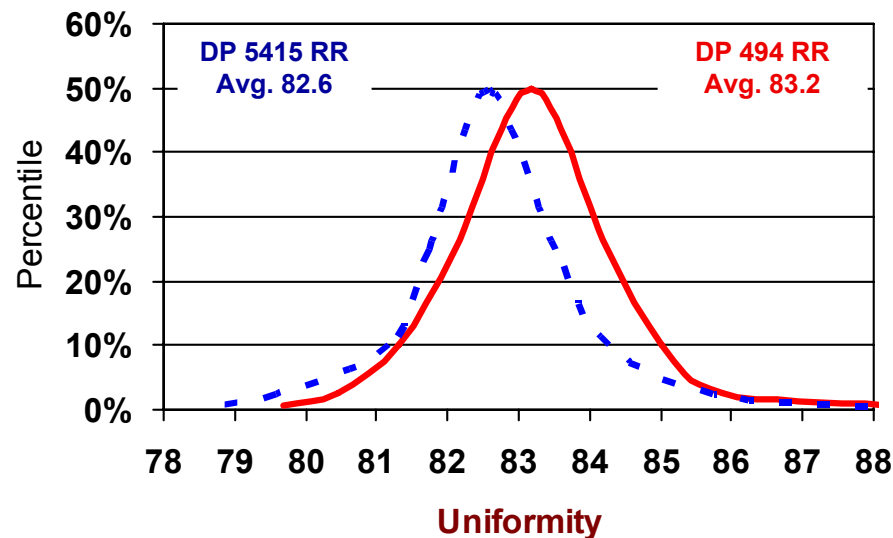
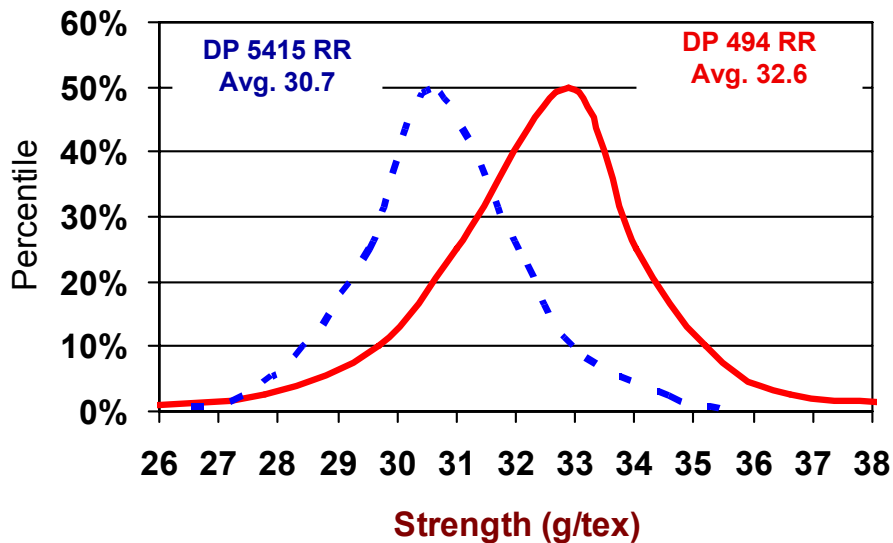
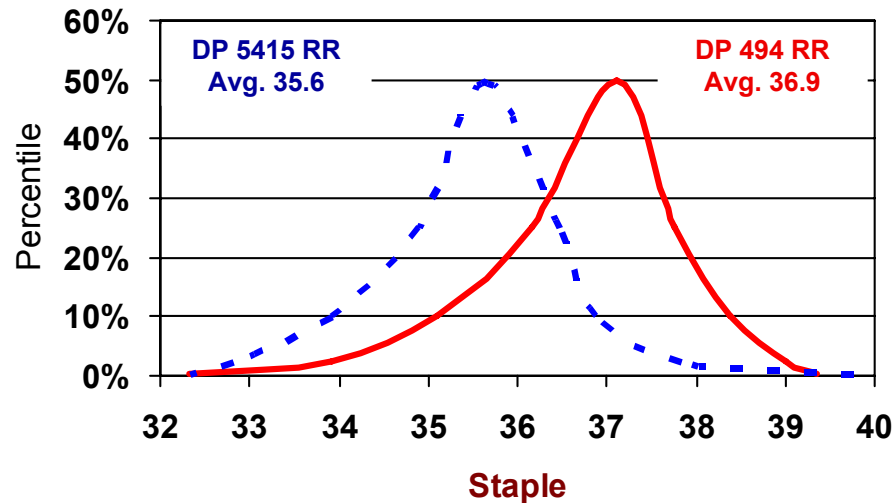
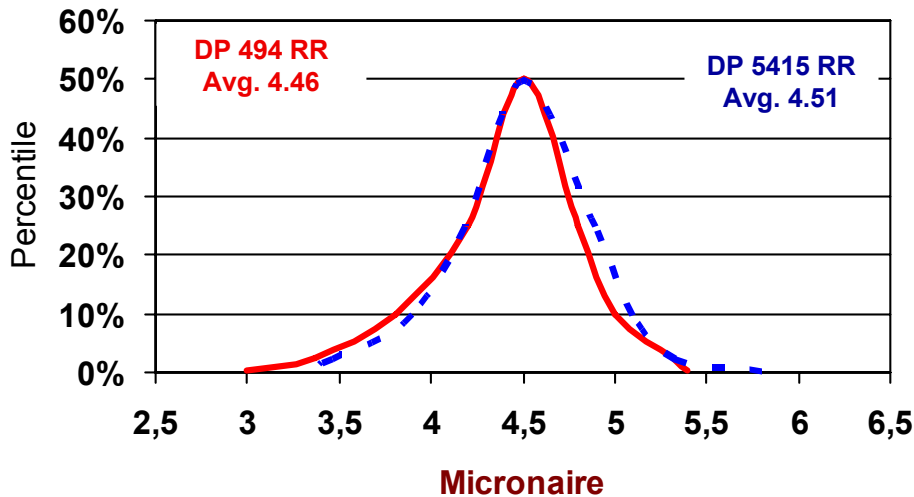
All Data Sources (Updated 27 Dec 04)



	Lint	% GTO	Staple	Mike	g/tex	Unif
DP 494 /RR	1116	38.5	36.9	4.46	32.6	83.2
DP 5415 RR	1051	37.2	35.6	4.51	30.7	82.6
N	190	190	179	179	179	179

DP 494 RR vs. DP 5415 RR

N = 179 H2H Comparisons (All Data Sources, Regions, and Years 12-27-04)



1. D&PL

2. Yield Potential

3. Biotech products

- ✓ Bollgard (BG) & Round Ready (RR)
- ✓ New products
- ✓ Future of cotton biotech products

Bollgard - Target insects

- *Alabama argillacea*
(Curuquerê - Leaf worm)
- *Heliothis virescens*
(Lagarta da maçã - Tobacco budworm)
- *Pectinophora Gossypiella*
(Lagarta rosada - Pink boll worm)



Permanent target insect control



Traditional

Bollgard

Protection until harvest



Traditional

Bollgard

Roundup Ready

- Genetically modified cotton tolerant to Roundup herbicide
- Excellent for no-till systems



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NEW PRODUCTS

- Bollgard II
- Bollgard II/RR
- VipCot
- Round Ready Flex

The new types of Bt cotton are active against beetles, loopers, and falls



Spodoptera exigua

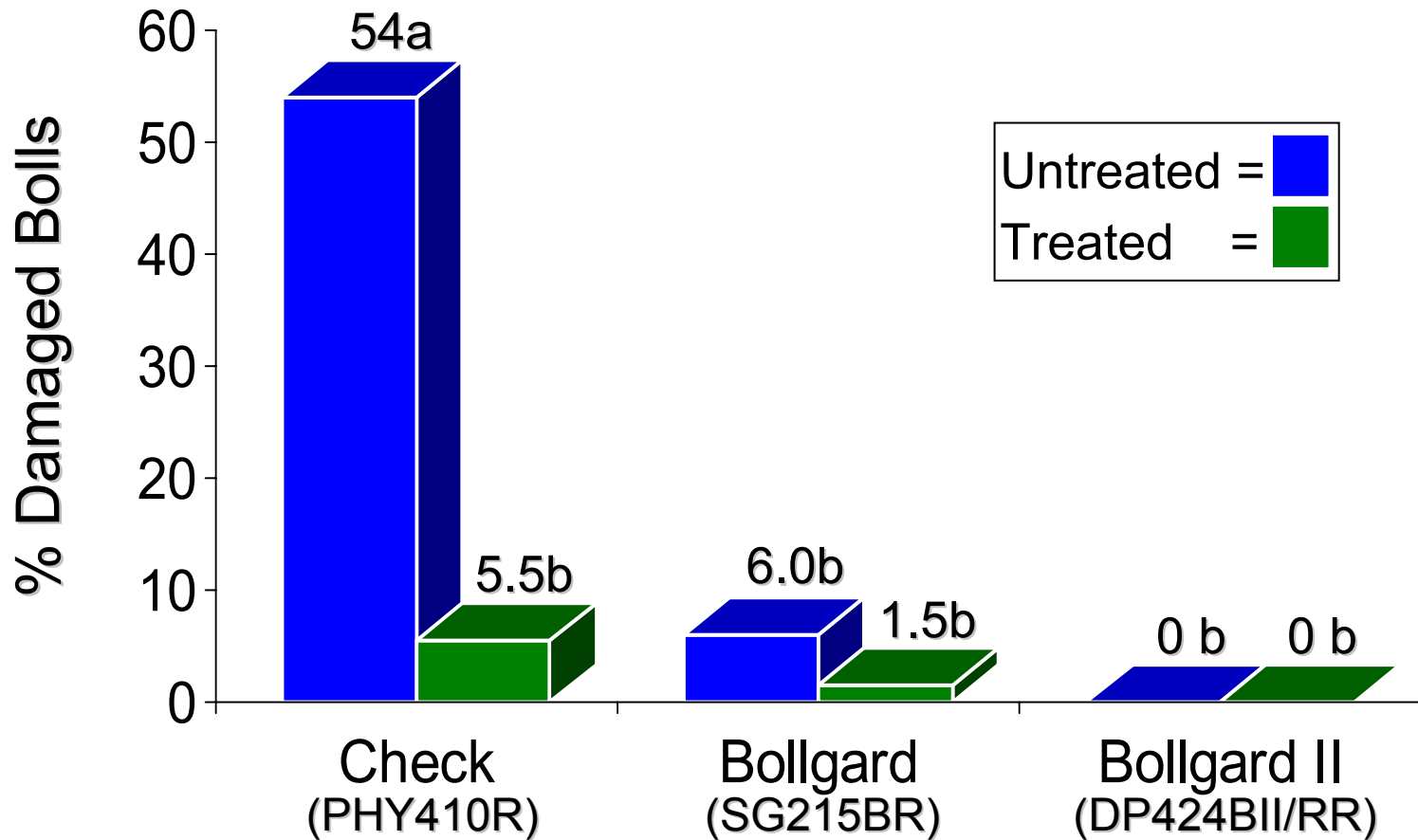


Trichoplusia ni

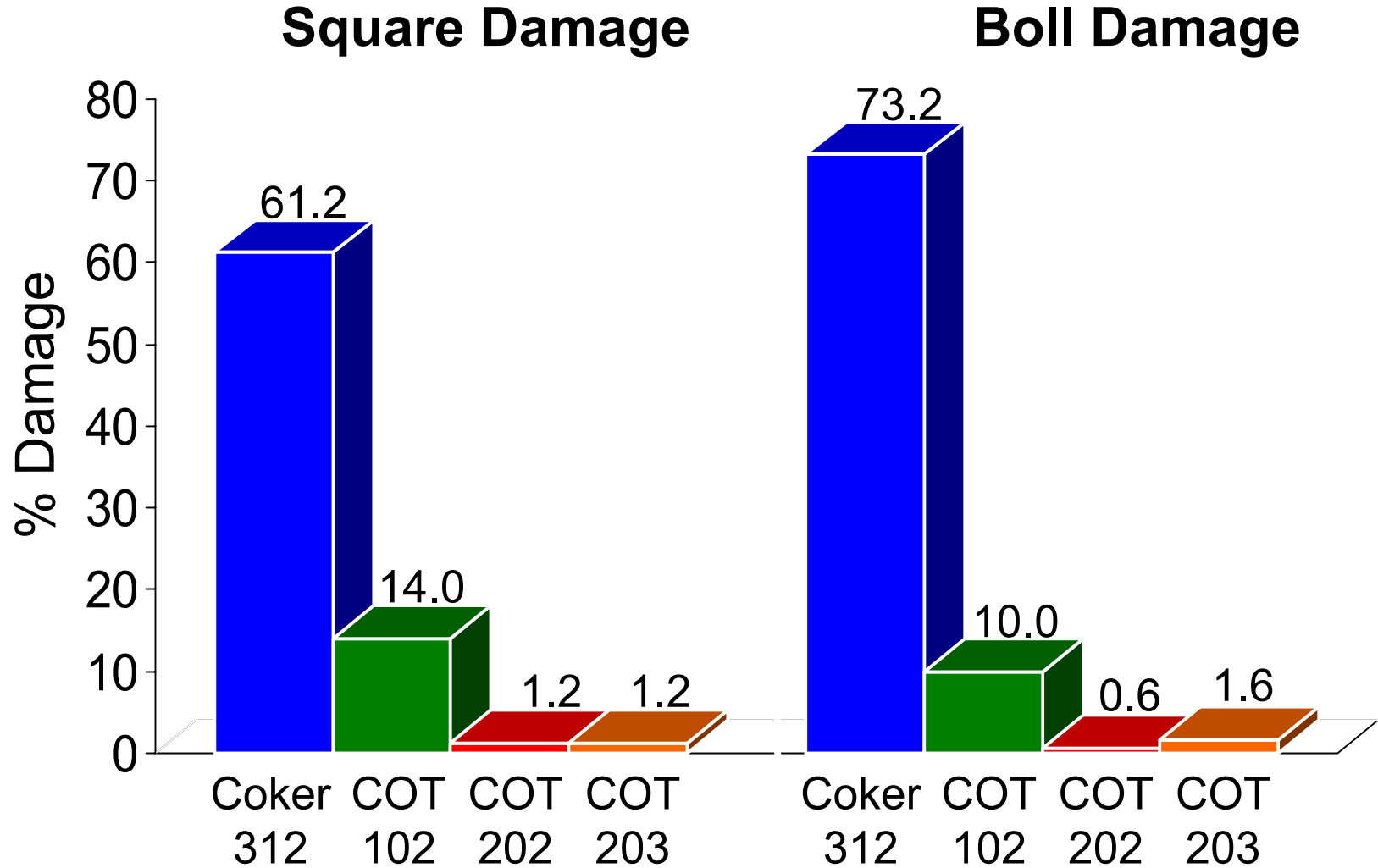


Spodoptera frugiperda

Impact of Bollworms on Damaged Bolls of Bollgard & BG II Cotton in Rocky Mount, NC, 2004



Efficacy of Three VIPCOT Lines Against High Bollworm Levels, Martin County, NC, 2003



Roundup Ready Flex

- Genetically modified cotton tolerant to Roundup herbicide
- Excellent for no-till systems
- Time for herbicide application becomes more flexible



1. D&PL

2. Yield Potential

3. Biotech products

✓ Bollgard (BG) & Round Ready (RR)

✓ New products

✓ Future of cotton biotech products

Future of Cotton Biotech

- Short Term: More transgenic products available for insect resistance and herbicide tolerance
- Long Term: New technologies associated with fiber quality, yield potential and novel insect or herbicide technologies

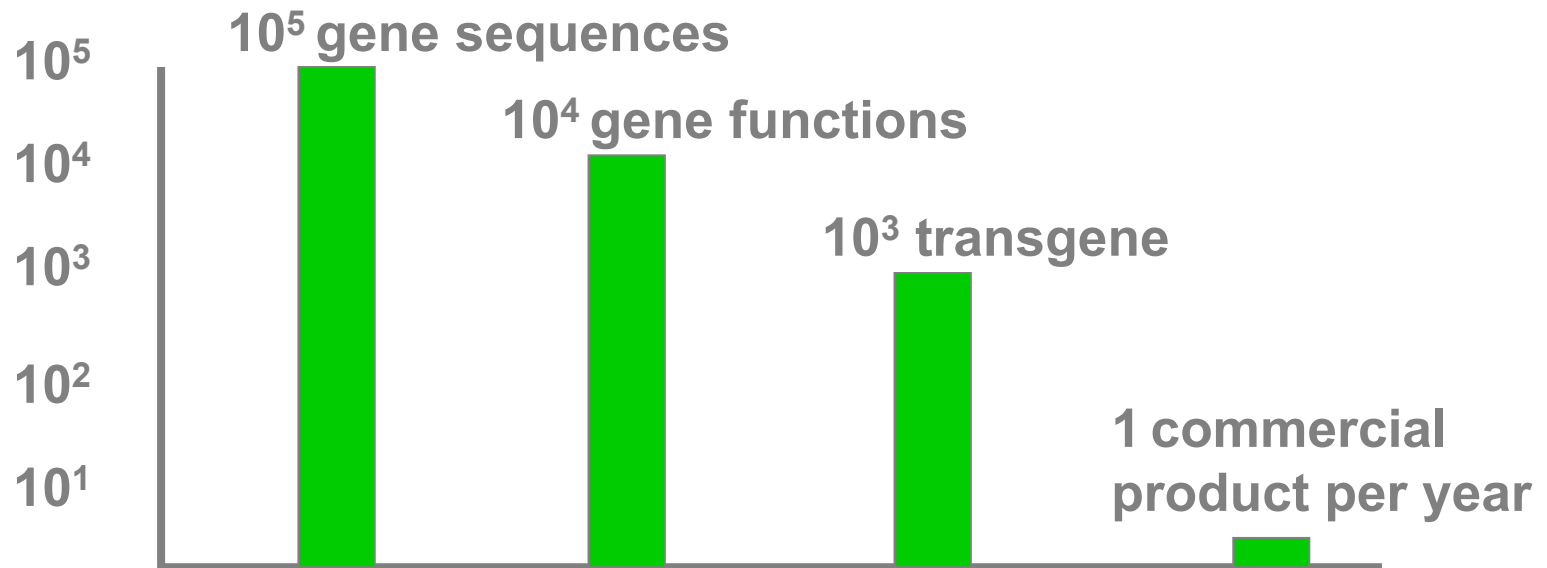


Limitations to Commercialization

- Exorbitant regulatory costs of technology
- Uncertainty with regards to technology development and regulatory approval
- Long lead times required for investment of personnel and dollars
- Combining modern biotechnology with professional seed company activities

Regulatory Challenge

- Many exciting biotech concepts and genes
- Very few new commercial releases
- Traits for small or uncertain markets will be delayed



Regulatory Approval Limits New Technologies

- Regulatory costs for new products, ranging from \$20 to \$50 million per event,
 - Limit new products developed by small companies or the public sector.
 - Limit biotech approvals in small markets
- Need for multiple approvals in countries where the food or feed is shipped
- Regulations designed to protect local markets or block grower access to GM seed restrict good concepts from moving to the field

Biotechnology Stewardship

- To insure long term grower benefits, product stewardship must accompany every Biotech introduction
 - Product labeling and identification
 - Gene purity & Gene efficacy
 - Insect and weed resistance monitoring
 - Resistance management where necessary
 - Governmental regulation compliance
 - Grower education to optimize benefits from utilization
 - In-field customer satisfaction and follow-up
 - Continued product testing
- These activities are best accomplished by professional seed companies that can make the needed long term financial and technical commitment, supported by sustained product sales

Economic benefits occur when the whole package is put together well:

- ✓ **Genetics**
- ✓ **Traits**
- ✓ **Seed performance**
- ✓ **Inventory management**
- ✓ **Product education/support**
- ✓ **Stewardship**
- ✓ **Marketing**

Thank You

Time for Questions

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