

# 10,000 years of genetic manipulation...

Specificity of change  
Power of modification  
Degree of control

Gene alteration by  
specific mutation  
Genomics  
Gene transformation

Tissue culture &  
somaclonal variation

Induced mutations

Broad crosses & hybrids

Quantitative genetics

Mendelian genetics

Hybridization

Domestication

Selection

Advanced  
Biotech

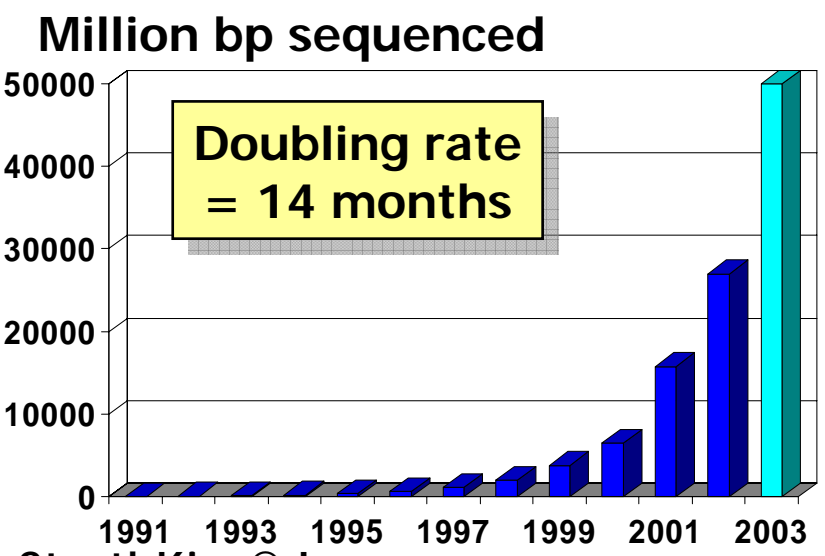
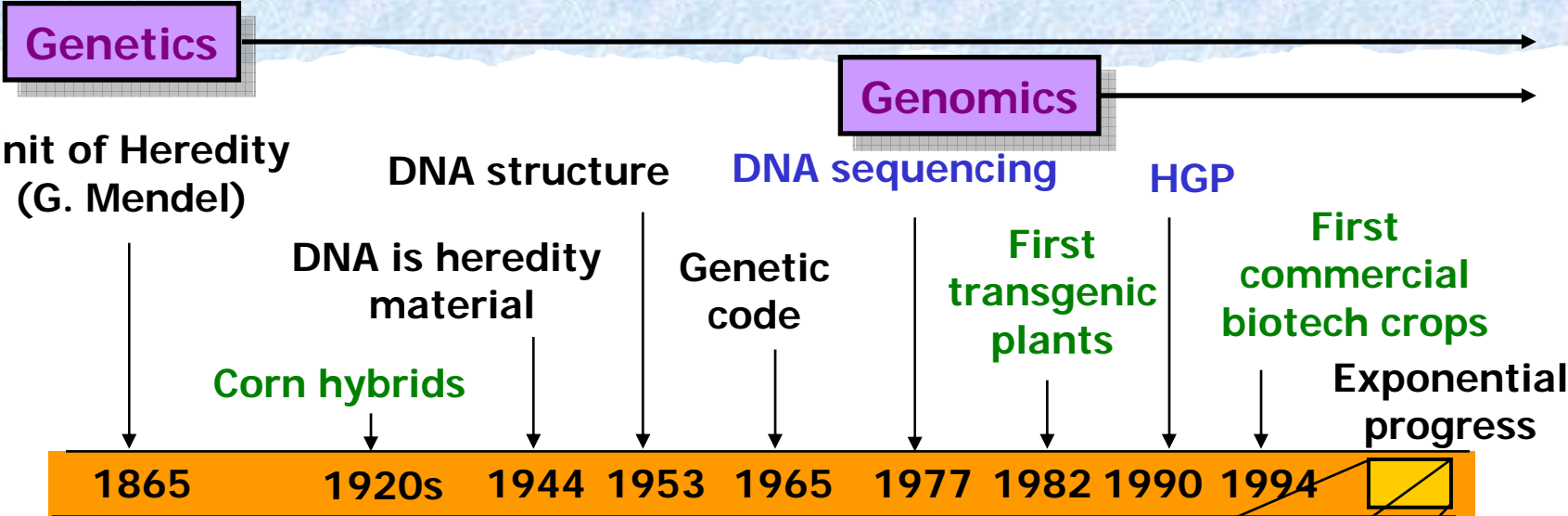
Biotech

Conventional

10,000 BC

Today

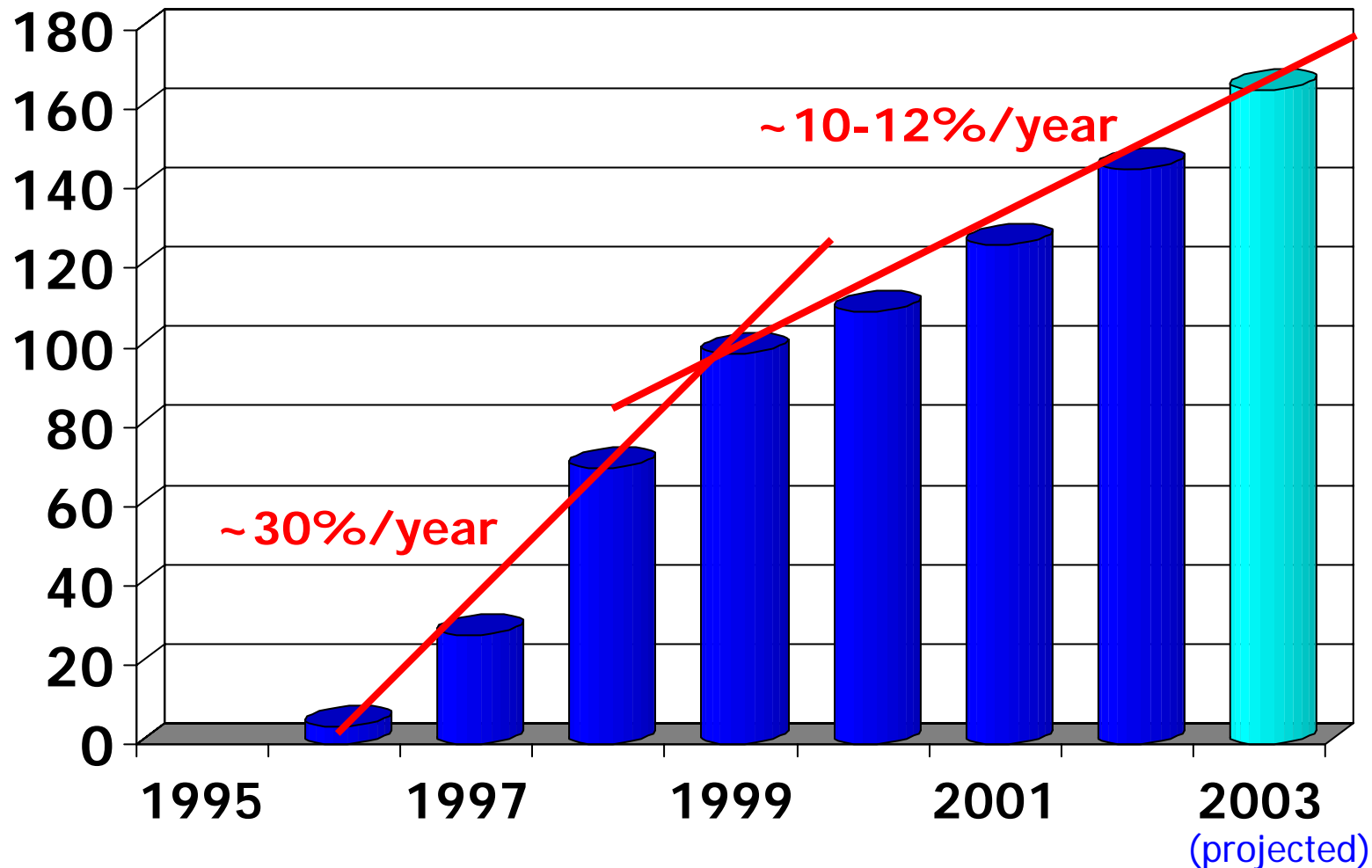
# The biotech/genomics platform is just emerging...



- Today**
- Over 30 billion bp sequenced
  - > 80 genomes complete
  - > 800 genomes more than 50% done
  - 10,000 organisms with some sequence
  - Gene expression arrays, proteomics, regulation cascades, SNPs, RNAi....
  - Over 140 million acres biotech crops

# World increase in COMMERCIAL biotech crops....

Million Acres

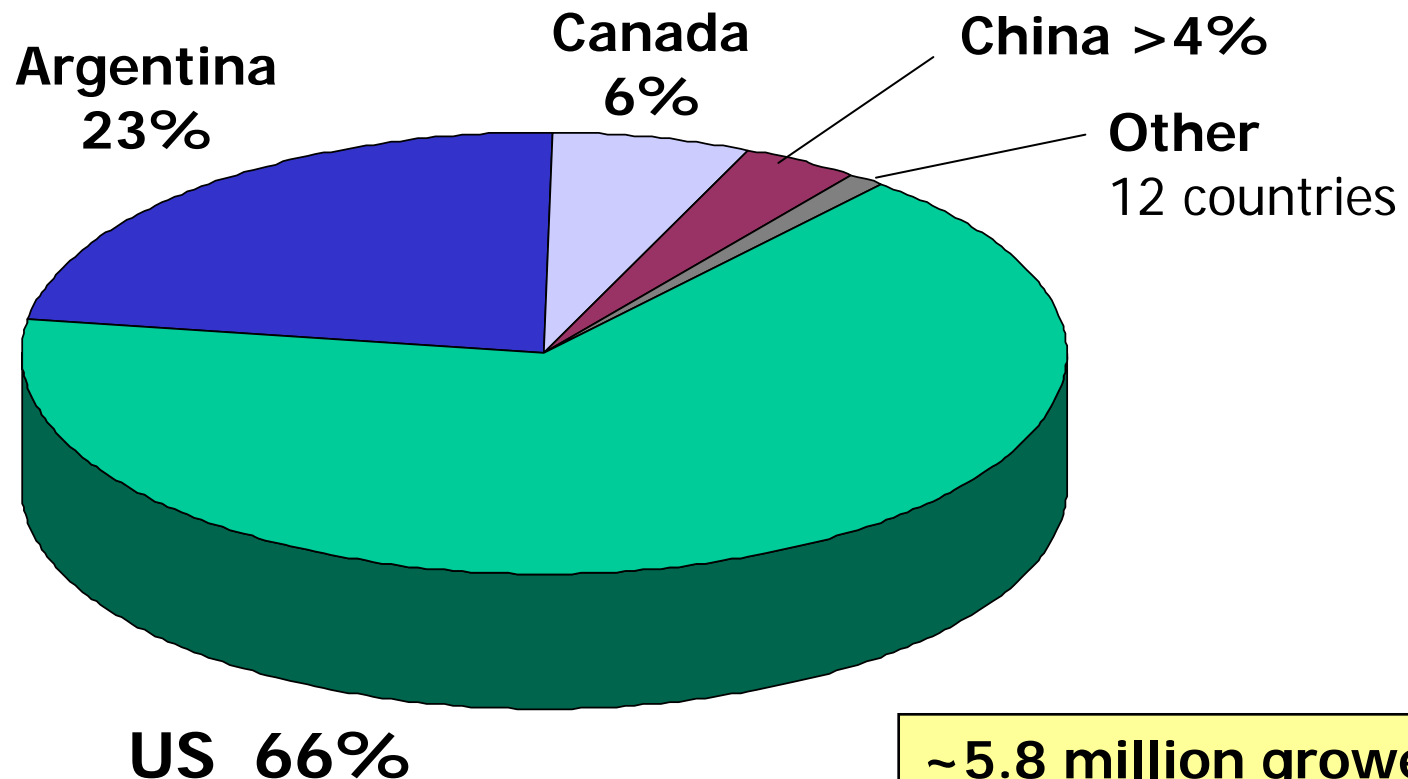


StrathKirn® Inc.

Source: Based on industry reports & ISAAA data

# Worldwide commercial biotech crops... (by country)

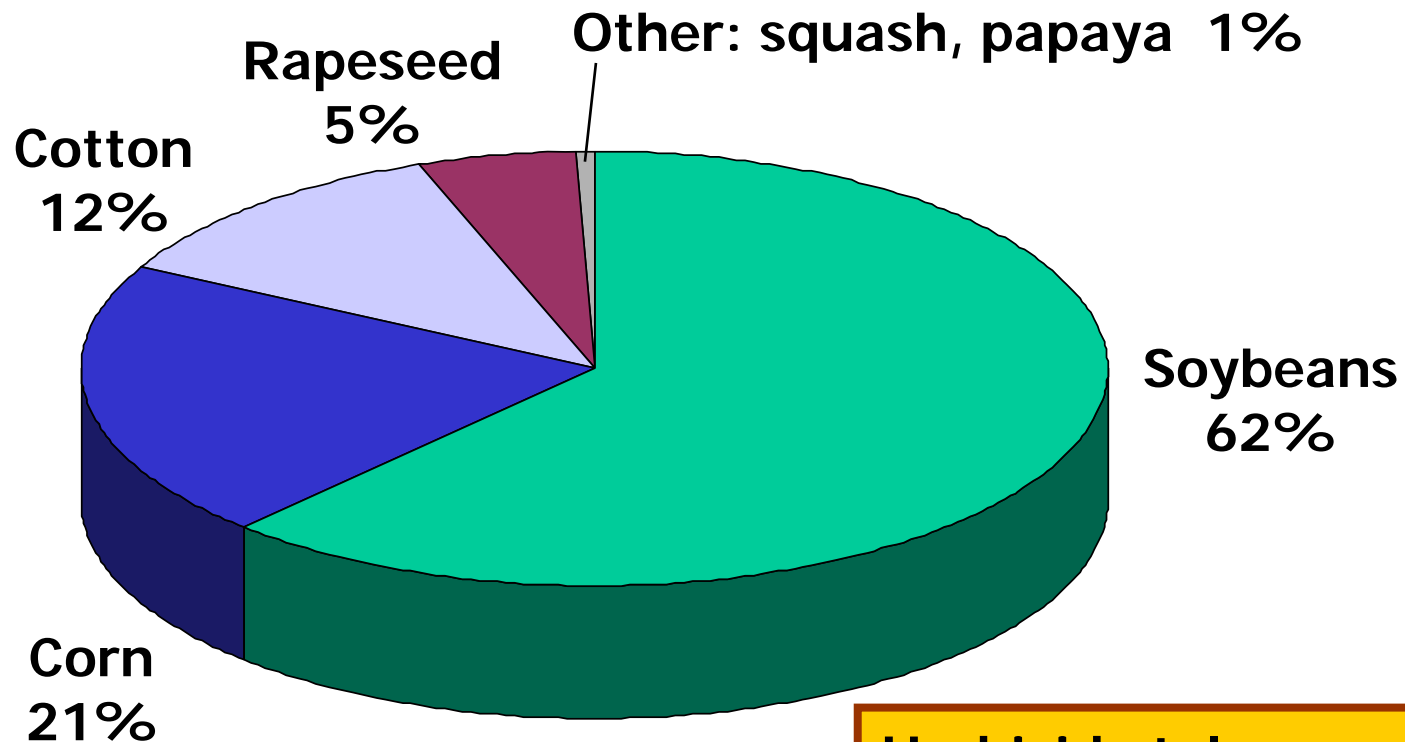
2002 commercial total = 145 million acres (58.7MM Ha)



~5.8 million growers  
across 16 countries

# Worldwide commercial biotech crops... (by crop and trait type)

2002 commercial total = 145 million acres (58.7 MM Ha)

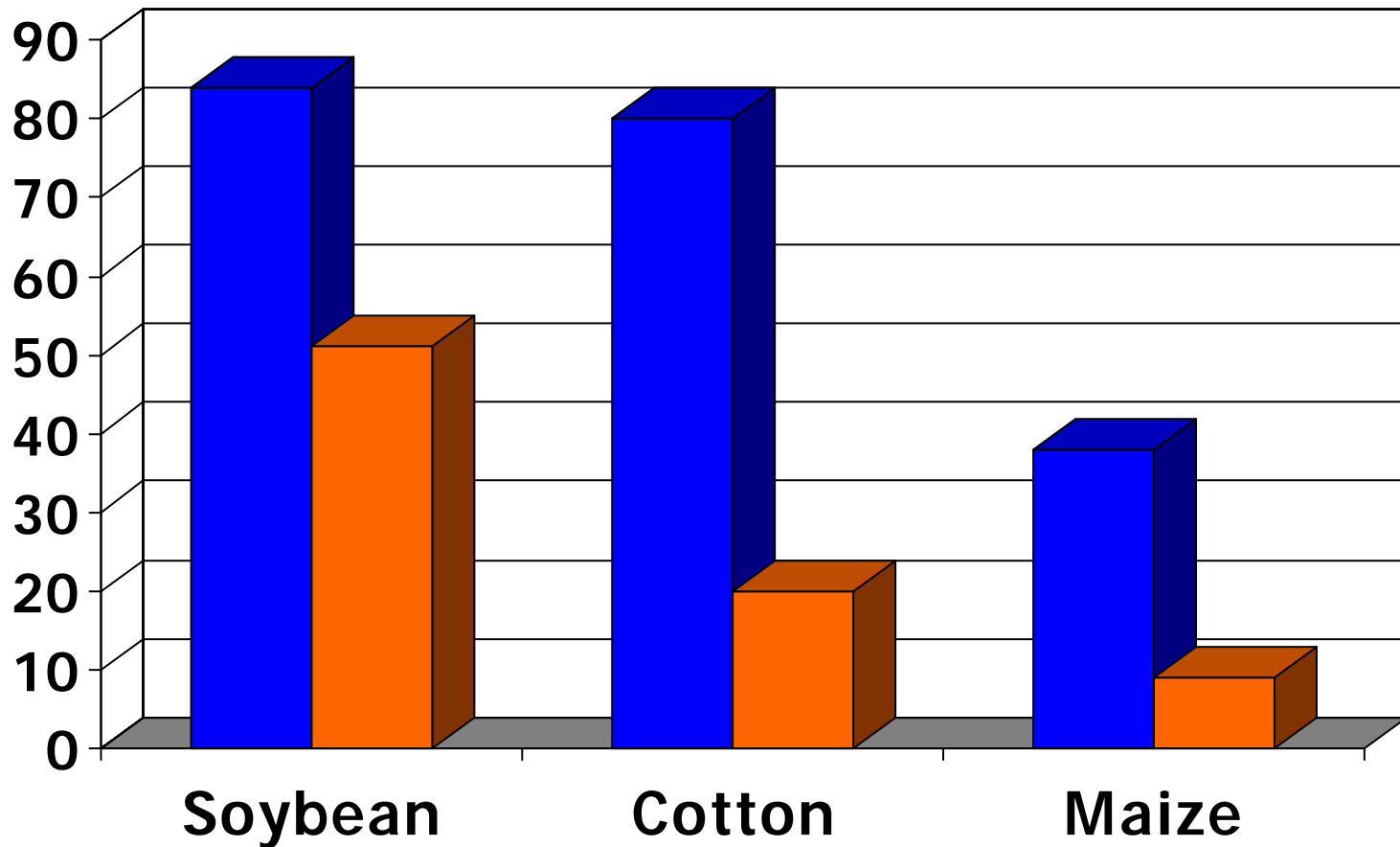


Herbicide tolerance = 73%  
Insect resistance = 17%  
Both traits, stacked = 10%

# Commercial biotech crops as a % of total planted... (based on year 2002 area)

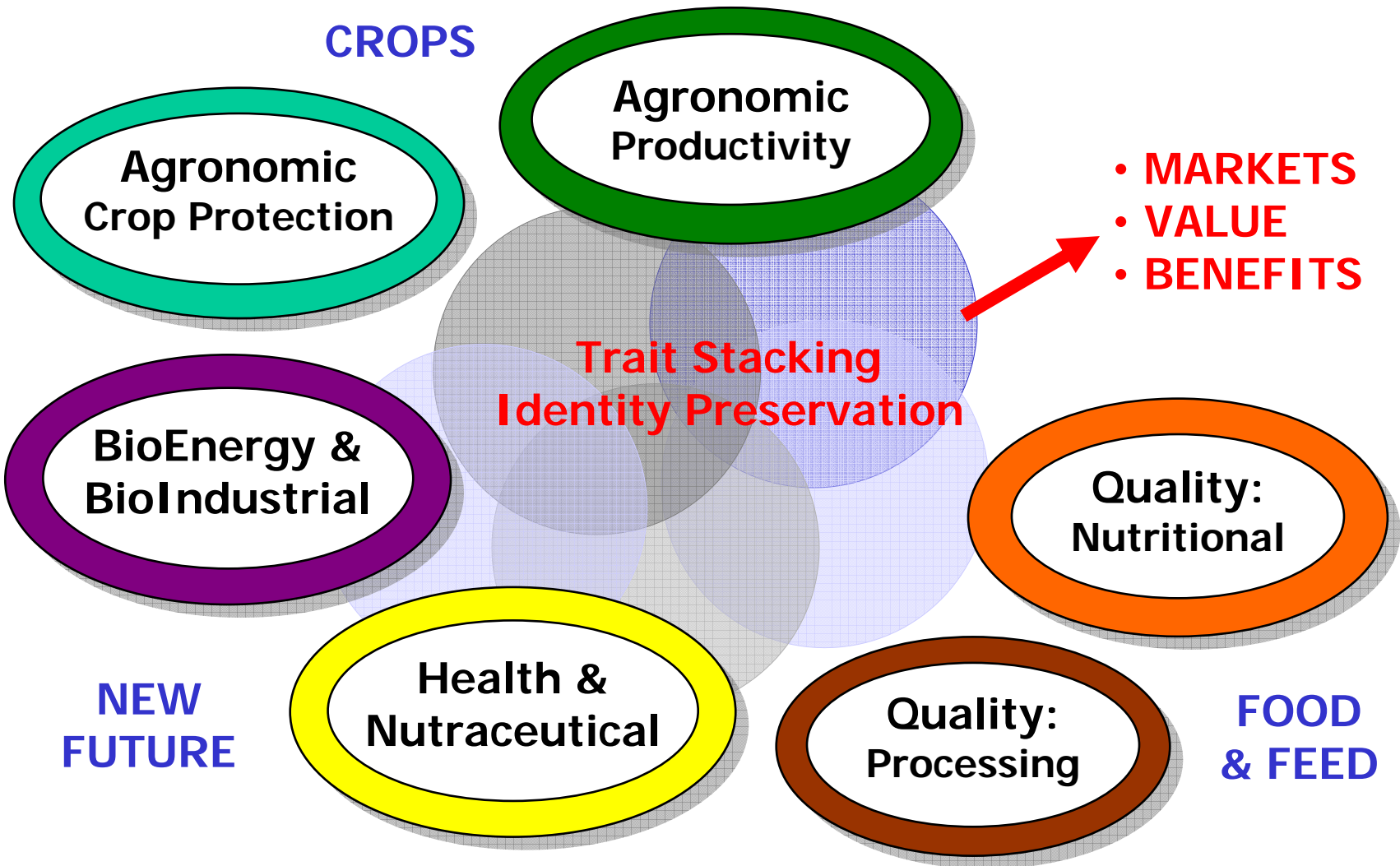
% of planted acres

■ US ■ World



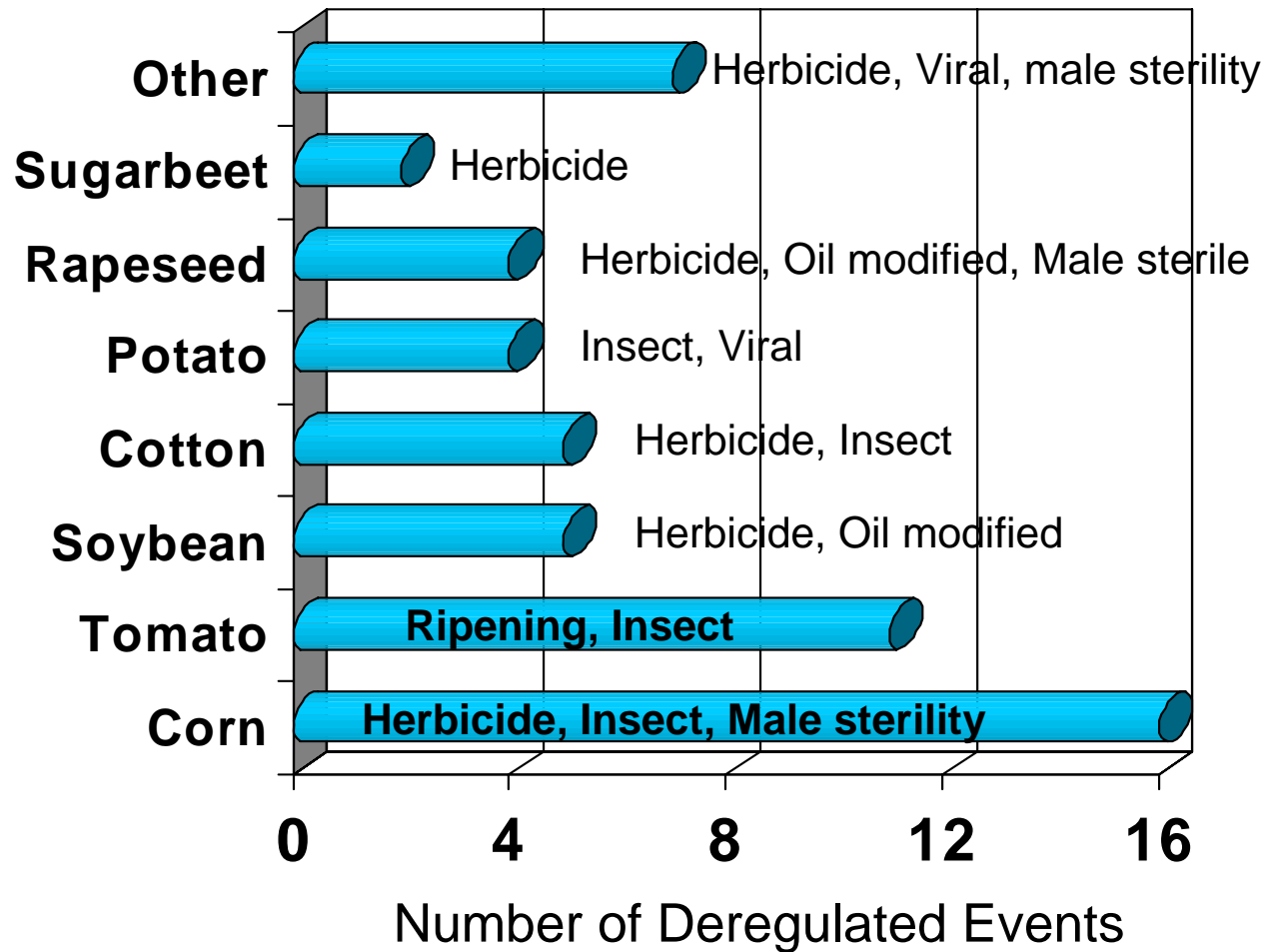
# Six trait type designations...

(transgenic plants)



There are now 55 deregulated transgenic events in various U.S. crops...

CROPS AND TRAITS

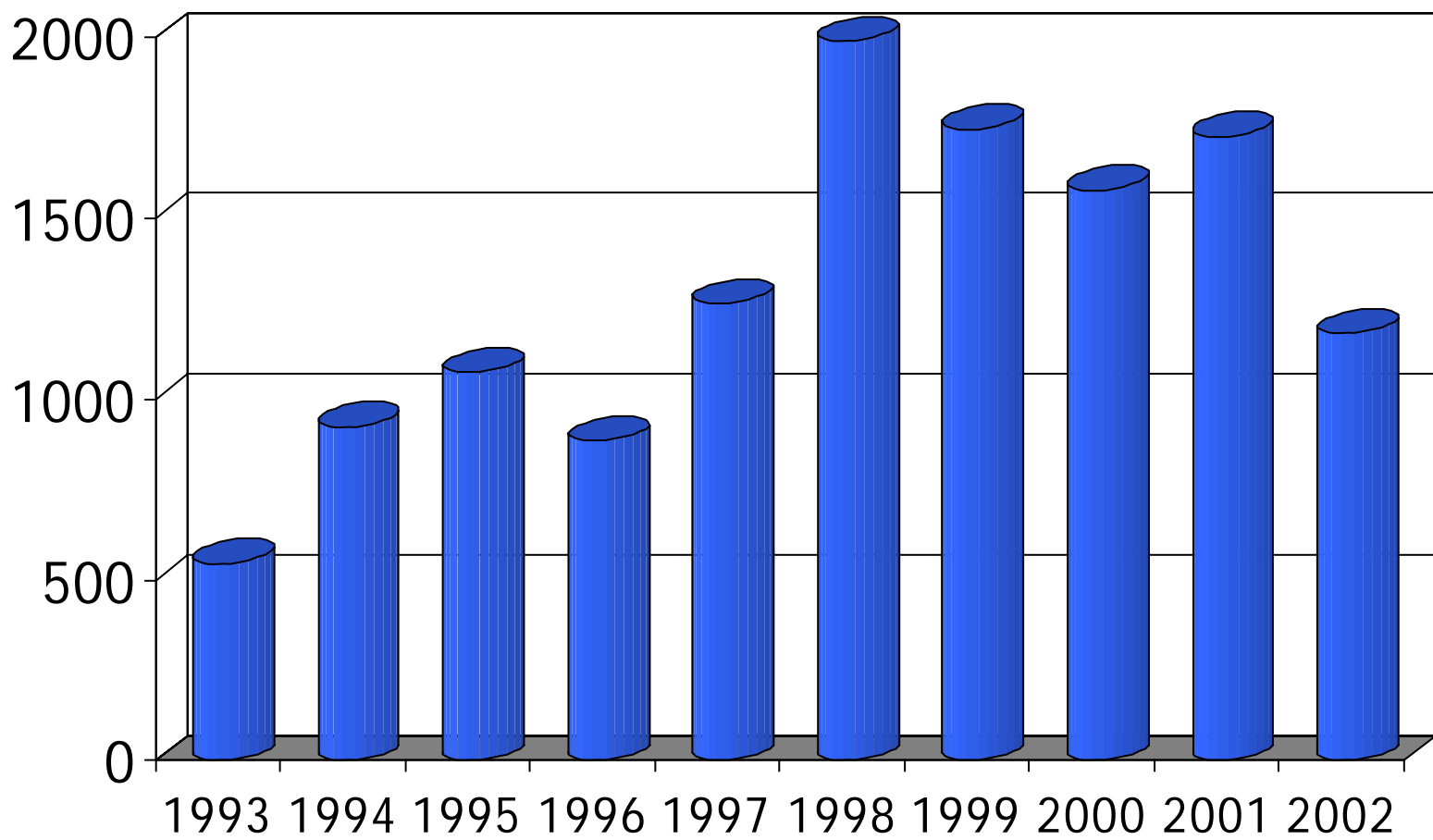


THE PLAYERS

- Bayer - 12
- Bejo - 1
- Cornell U. - 1
- Dow AgroS - 1
- DuPont - 3
- Exelixis - 1
- Monsanto - 27
- Saskatch. U. - 1
- Savia - 2
- Syngenta - 4

# US field trials with transgenic crops...

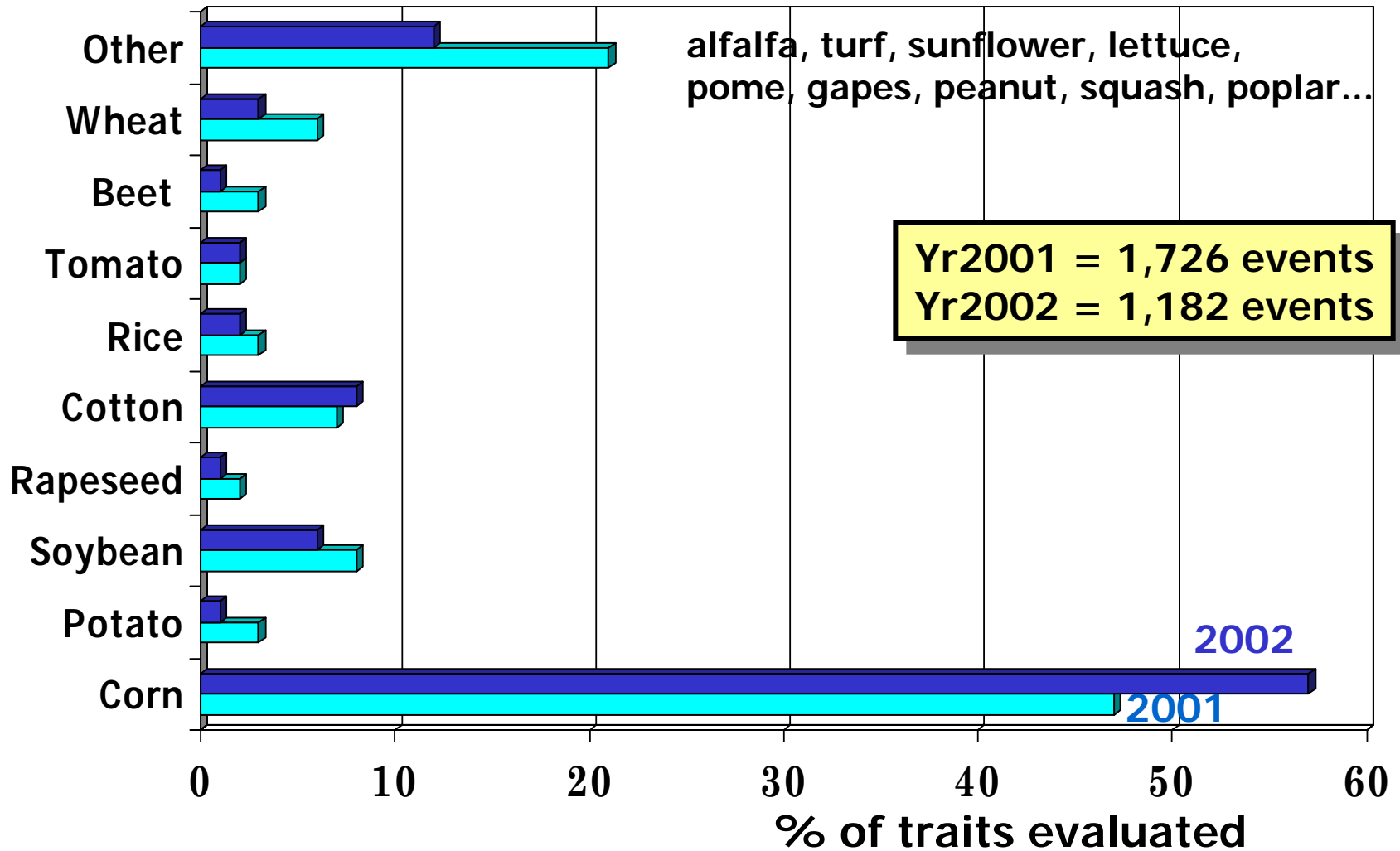
# notifications & releases



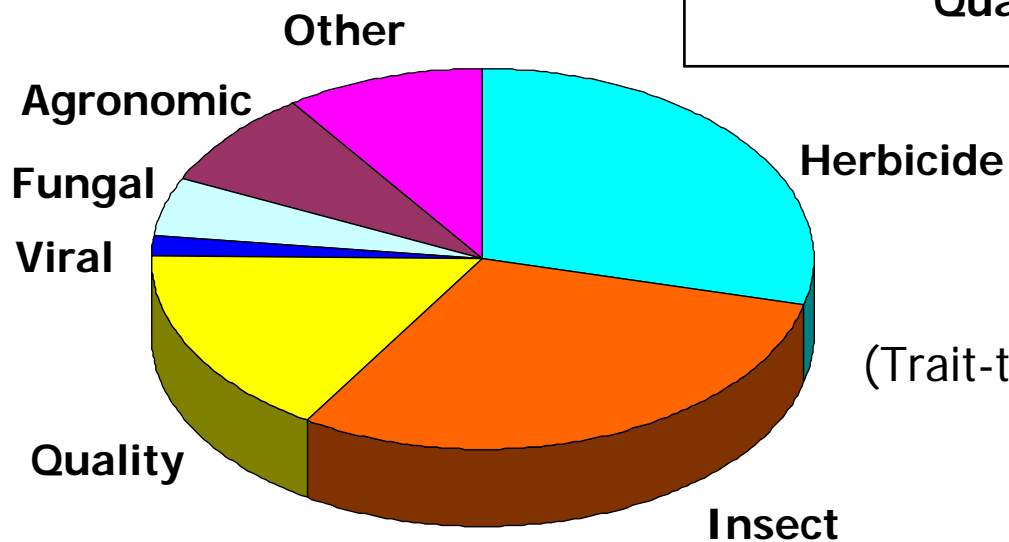
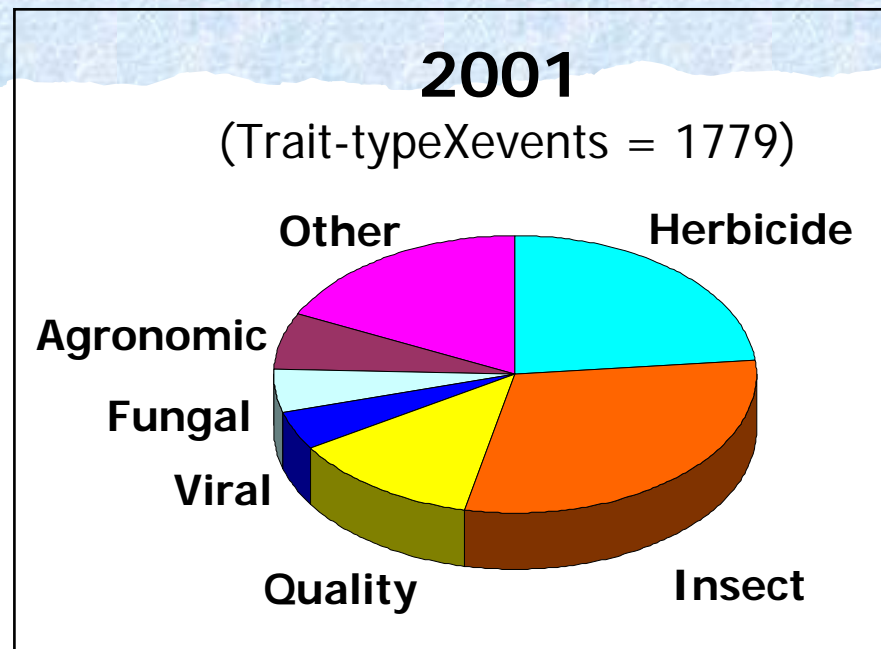
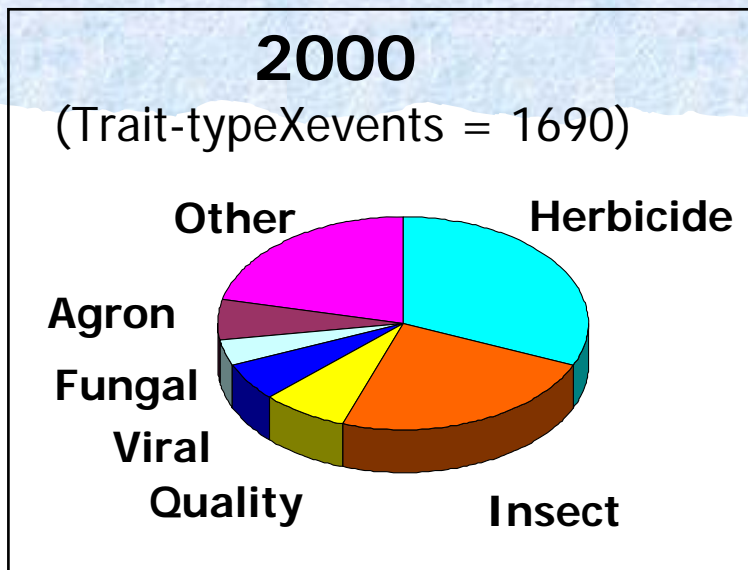
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Source: APHIS

# US field transgenic tests by crop...

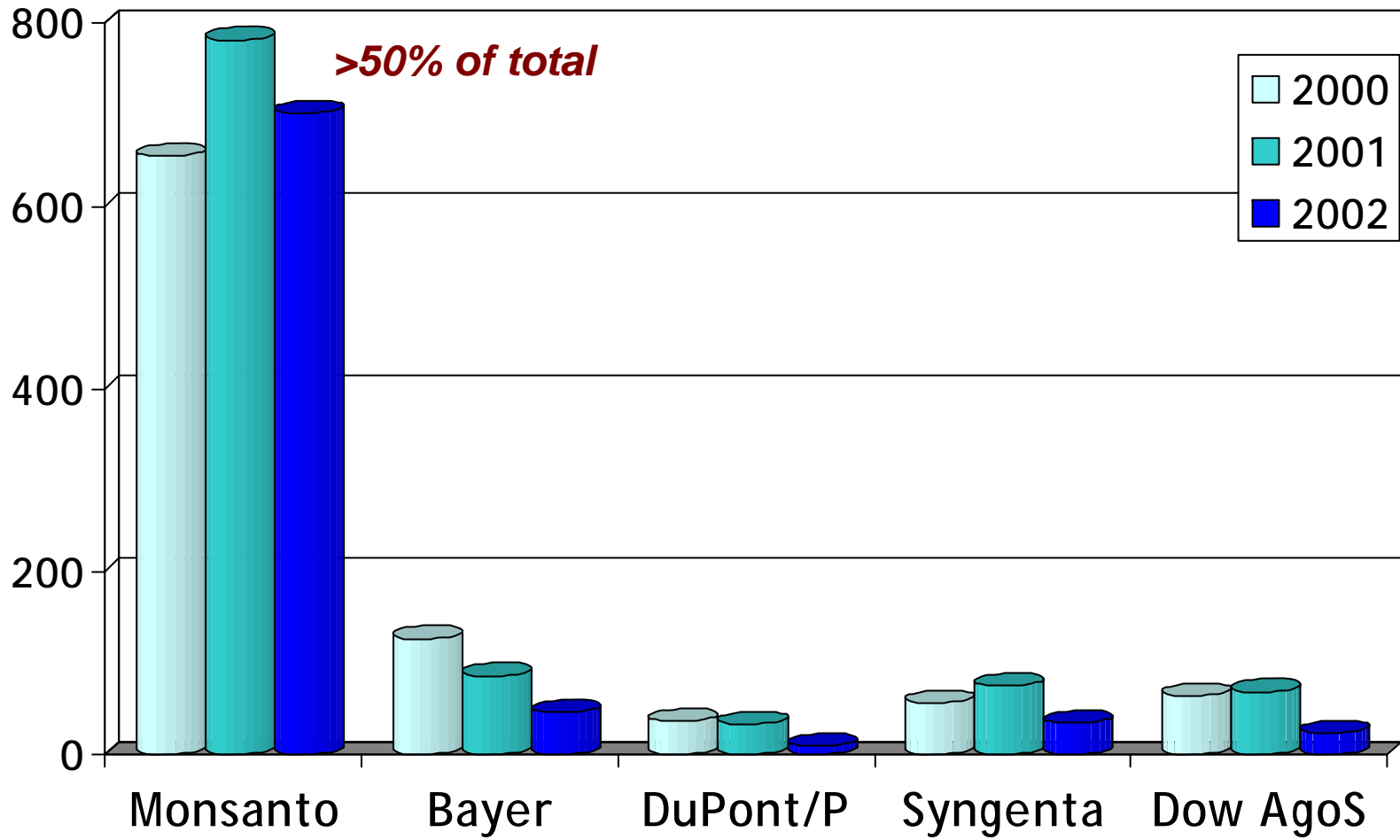


# Trends in transgenic field trials by trait type...



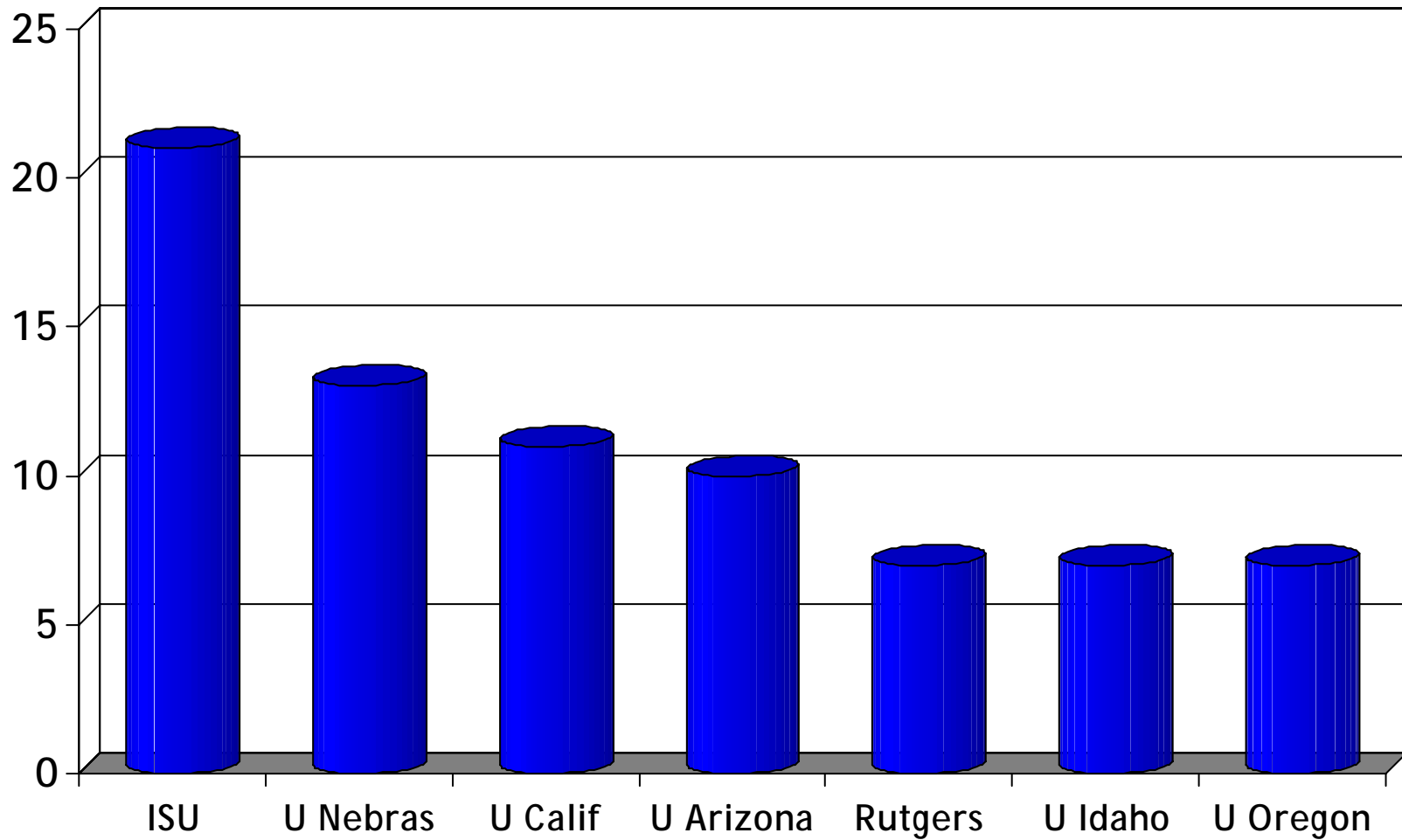
# Transgenic field trial activity for the leading companies since 1998...

APHIS Notifications

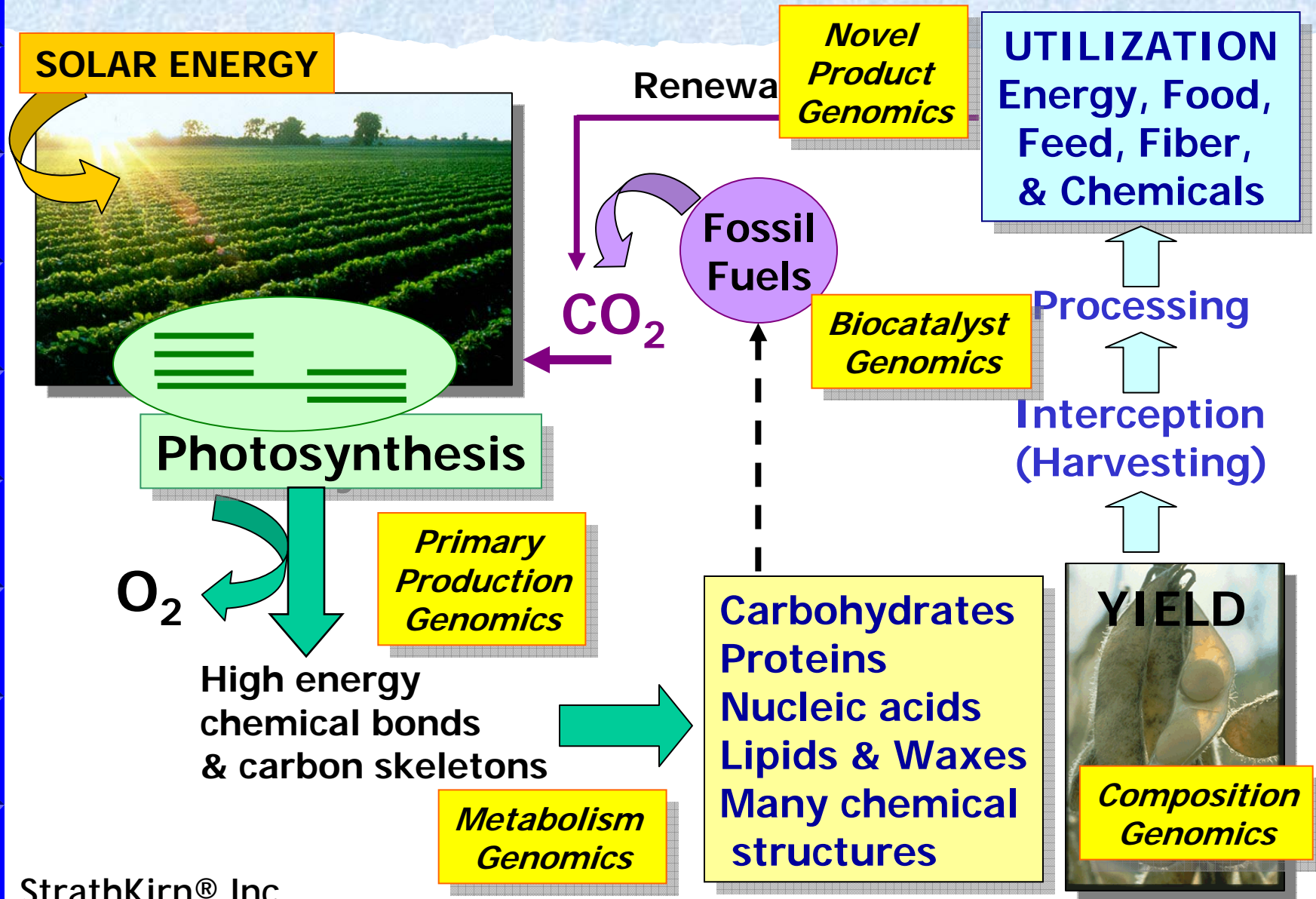


# Transgenic field trial activity for the most active universities...

APHIS Notifications, 2002



# Within 10 years genomics will impact all aspects of production and processing...



# Physical genome size varies among crops...

