



# Trends in Crop Protection

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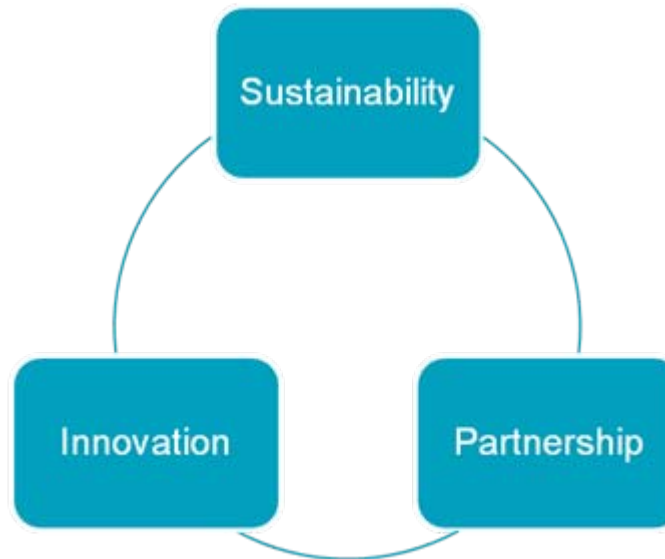
# Trends in crop Protection

- Overview Syngenta
- Productivity Challenge and Food security
- Opportunities and Threats for Crop Protection
  - Innovation
  - Partnership
  - Sustainability



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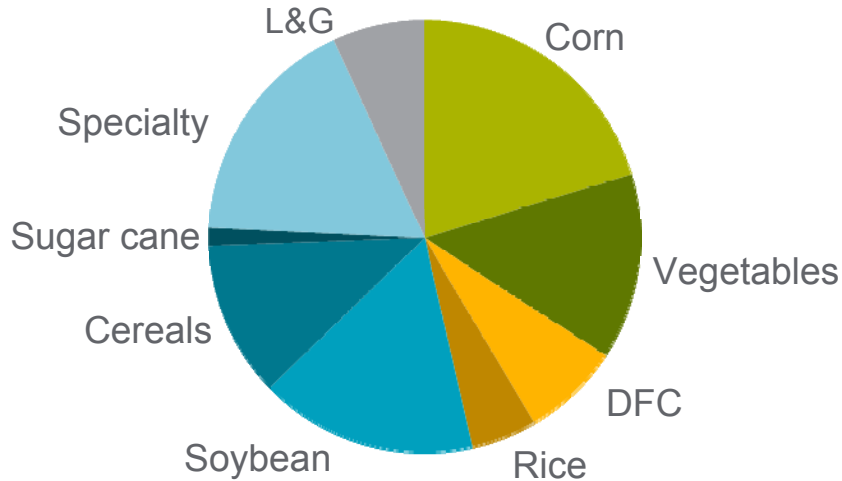
# Syngenta at a glance

- A uniquely broad product portfolio
  - A leader in crop protection
  - Third in high-value commercial seeds
- World-class science
  - \$1 billion R&D investments in 2009
  - 4,000 people in R&D around the world
- Global reach and experience
  - Over 25,000 employees in more than 90 countries
- Commitment to working with customers
  - Tailoring solutions to individual needs

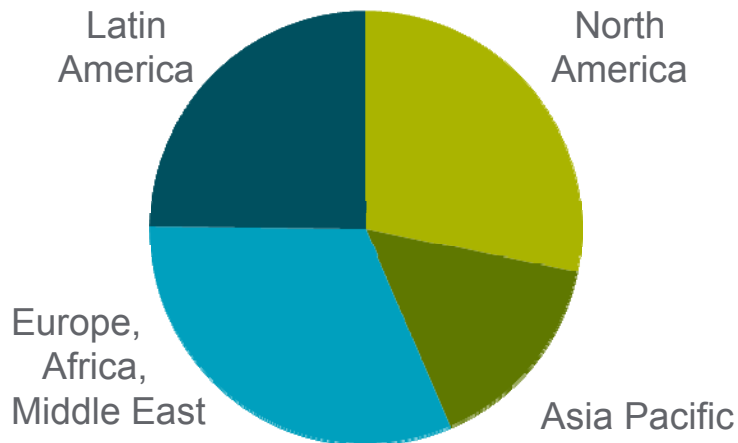


# Uniquely positioned to deliver value

## Sales by crop



## Sales by region



- Dedicated focus on agriculture
- #1 or 2 in all regions
- #1 or 2 in all CP product lines
- Proprietary GM traits and Seed Care: broad scope
- Combining chemicals and genetics
- Combining commercial operations

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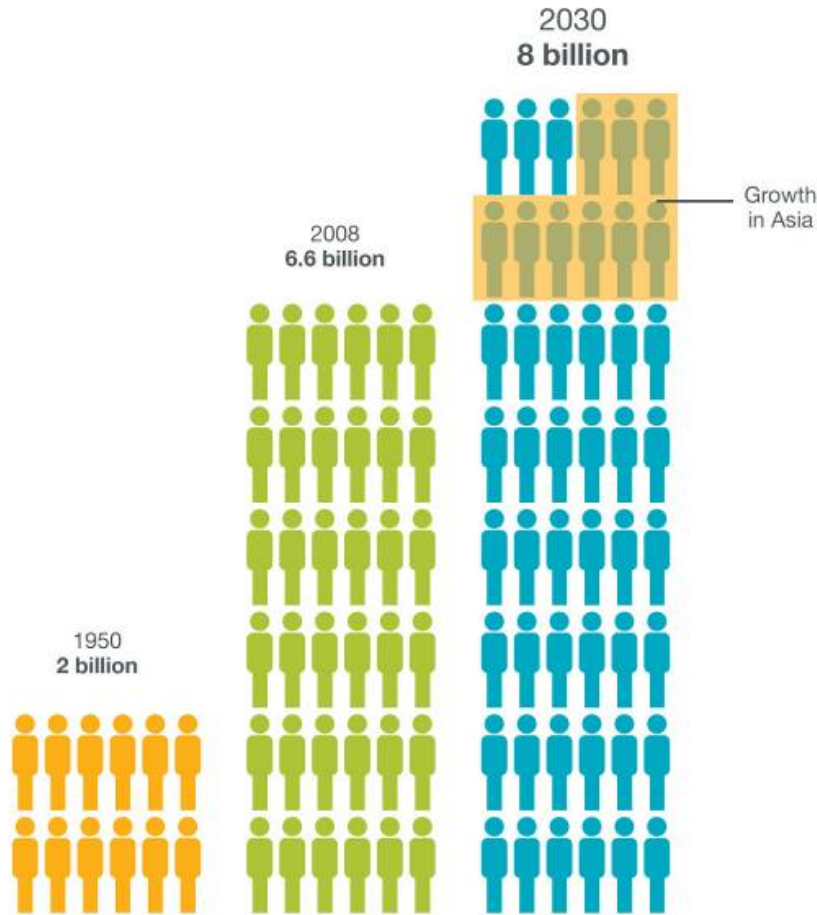
# Food security: better food systems using fewer resources



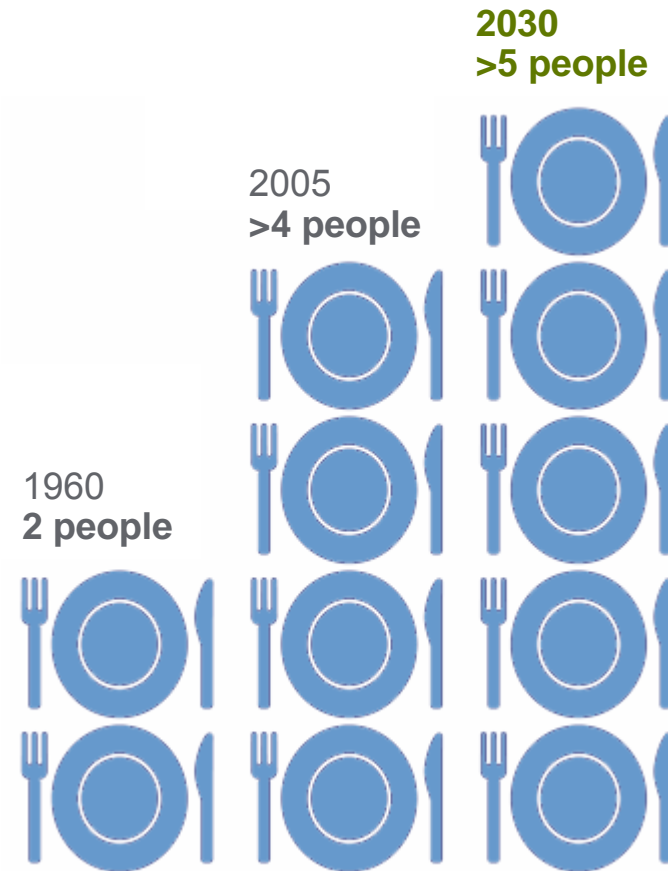
- Sustainable production system
  - recognizes connections between technology, land and people
- Limitation: availability of natural resources
- Improved access and distribution through enabling policies

# But to achieve food security - We have to do more with less

## World population Growth



## People fed per hectare



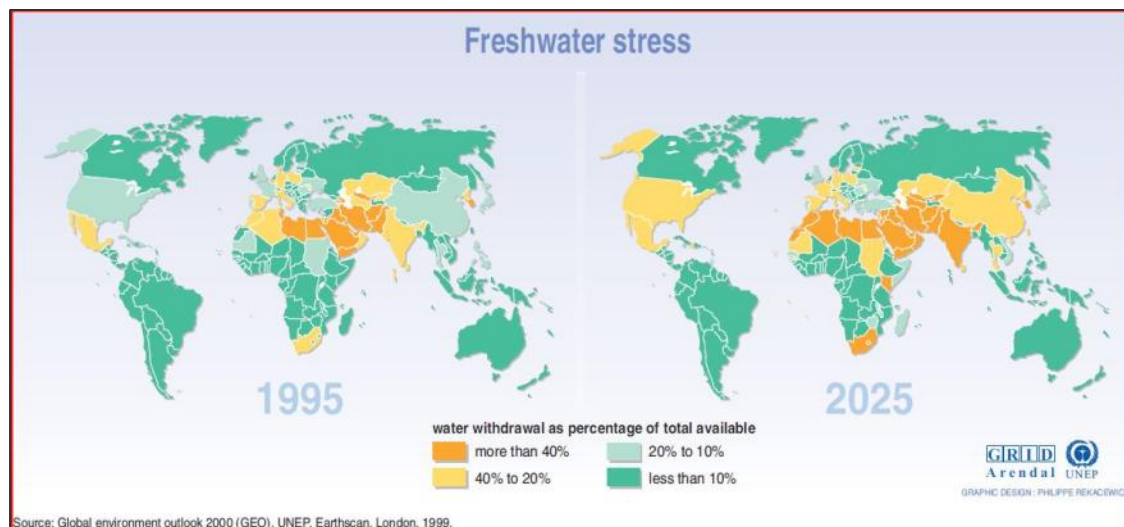
Source: FAO, World Bank statistics, Syngenta



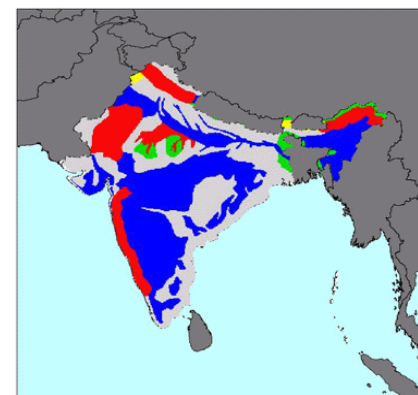
# Food production in turn is dependent on environmental resources which will be constrained and must be protected

India will face aggravated environmental problems – most linked to agriculture:

- **Water:** 85% is used in agriculture. By 2050, 33% less water will be available per capita
- **Soil degradation:** Estimate show about 50% of land is degraded due to deforestation, soil erosion, bad agriculture practices and livestock management, water logging and salinity
- **Climate change:** will result in higher temperatures, loss of arable land due to sea rise, and water stress



INDIA - Severity of Human Induced Soil Degradation



# Challenges for Global Agriculture

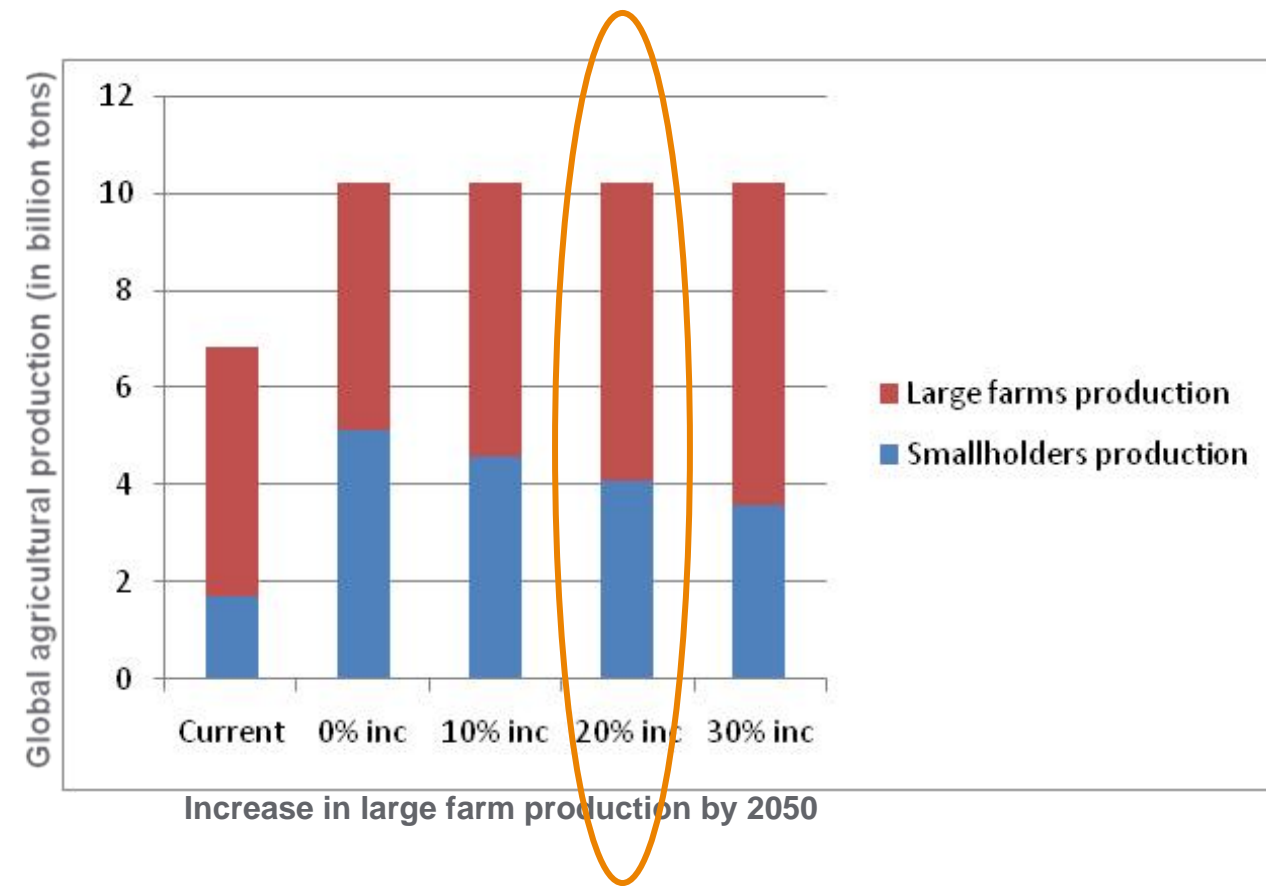
- Limited farmland, acreage not likely to increase
- Wheat demand to double by 2050
- Needs an increase of 1.6% a year in yield currently 0.9%
- Limited water supplies, fertilizer use restrictions

**We must do more  
with less**

**The only sustainable approach is  
to unlock the potential of plants  
through innovation**



# Meaning that the contribution of smallholders is essential to ensuring food security



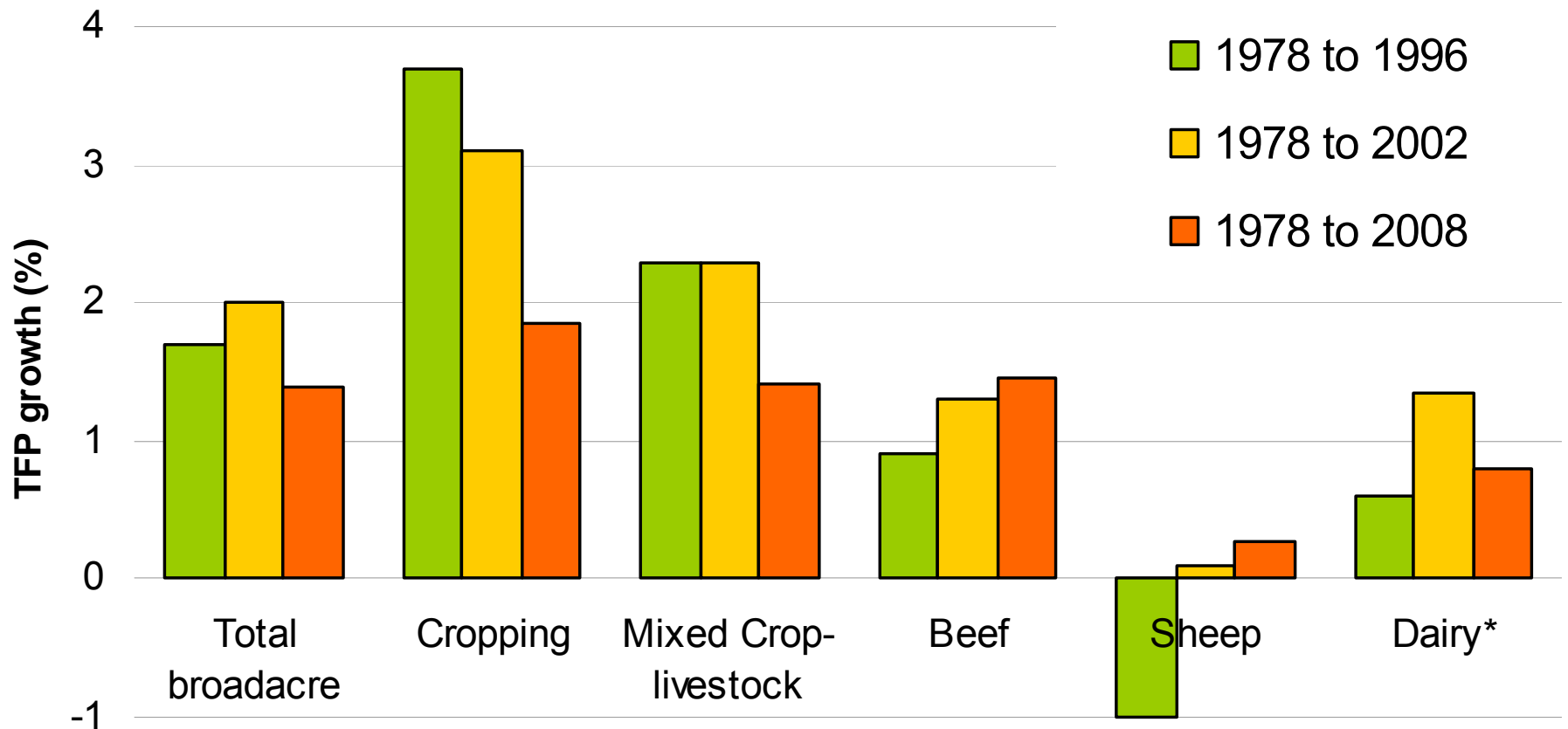
**Implication:** If large farms increase yield by 20% over today's levels, smallholders will need to increase output 2.4 times

To feed 9 billion on 2050 will require more than 10 billion tonnes of food production – almost 3 billion tonnes more than today. Smallholders contribute around 25% of total food production

# Food Security: A major opportunity for (Western) Australia

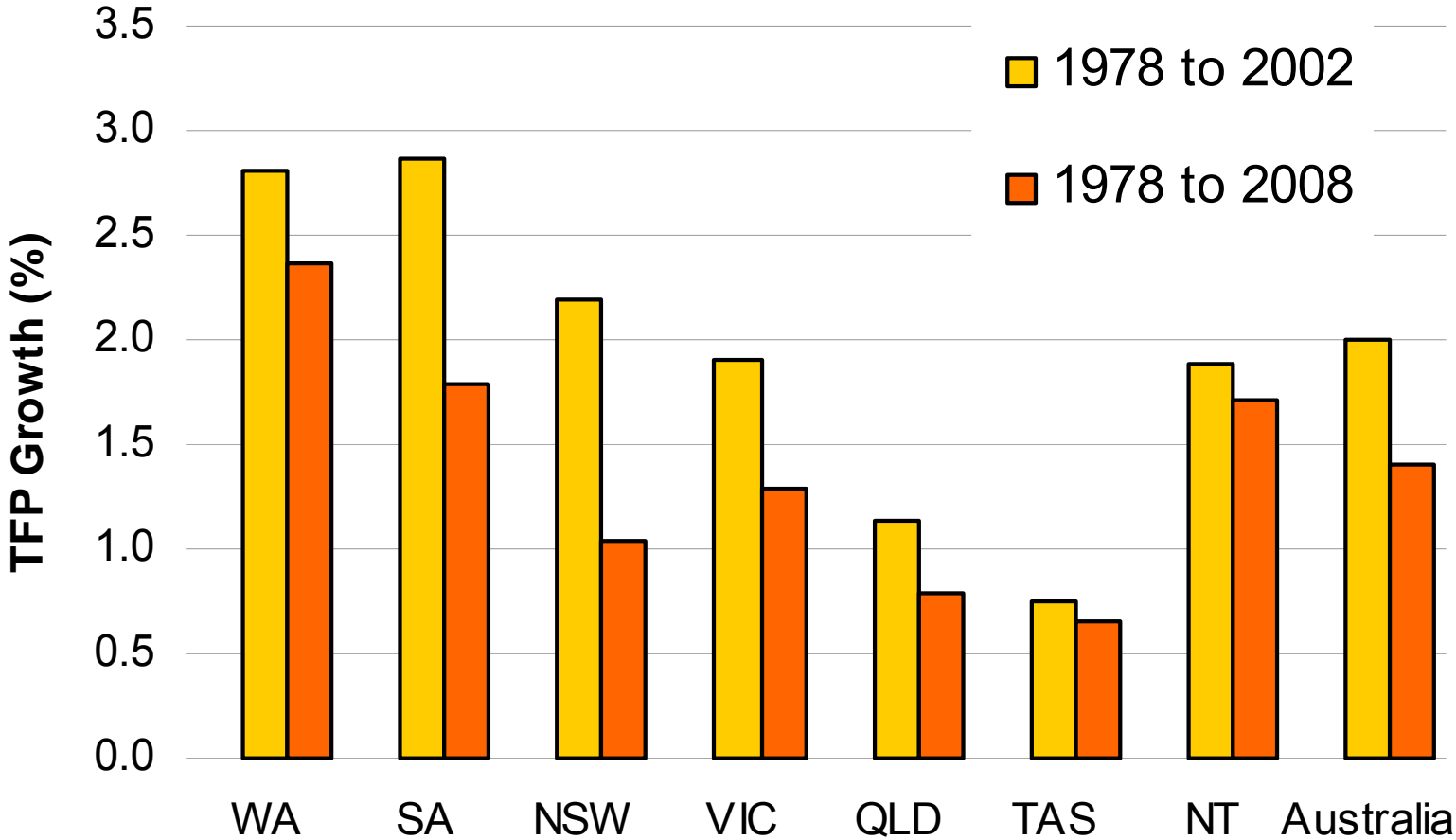
- Population growth and growing food demand presents an major opportunity for (Western) Australian cereal growers, **why**:
- **Track Record**
  - Australia's is one of the world's great agricultural exporting nations
    - Australia's growers already export enough to provide the annual recommended grain intake for nearly 1 billion people!
    - 50+% of Australia's current wheat exports are from WA
  - **Proximity**
  - By 2030, there will be an 1 billion more people living within 10 hours flying time of Perth!
    - **Ability to respond**
  - A strong track record of productivity improvement –
    - recent lags nationally/globally - although not to the same extent in WA
  - Willing to rapidly adopt of new solutions which “fit”
  - WA farmers epitomize what it takes “*to grow more from less*”!

# Recent trends in productivity growth



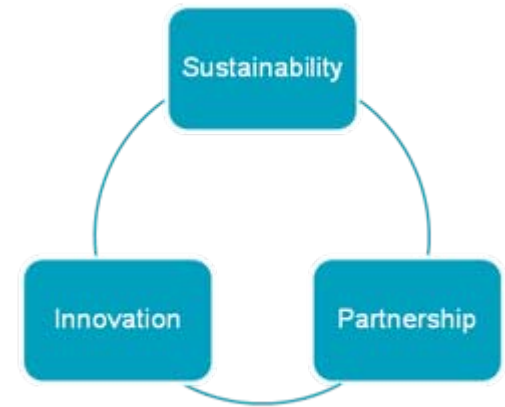
Note: Dairy trends begin from 1988-89 onwards

# Change in broadacre productivity: state by state



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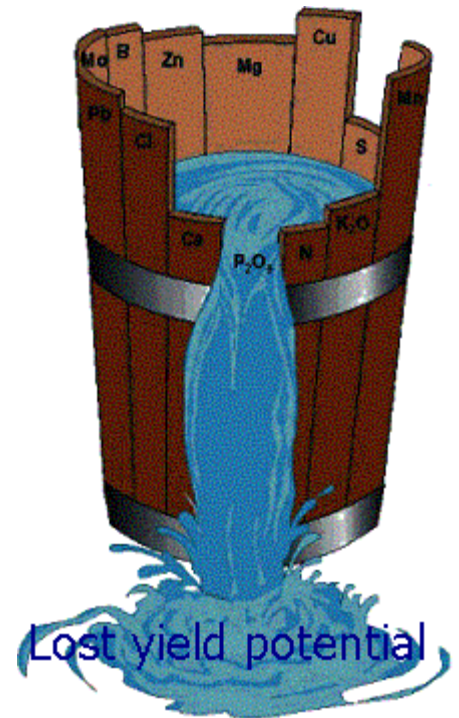


- Innovation
  - New Productivity Horizons
  - Resistance Management
- Partnership
- Sustainability



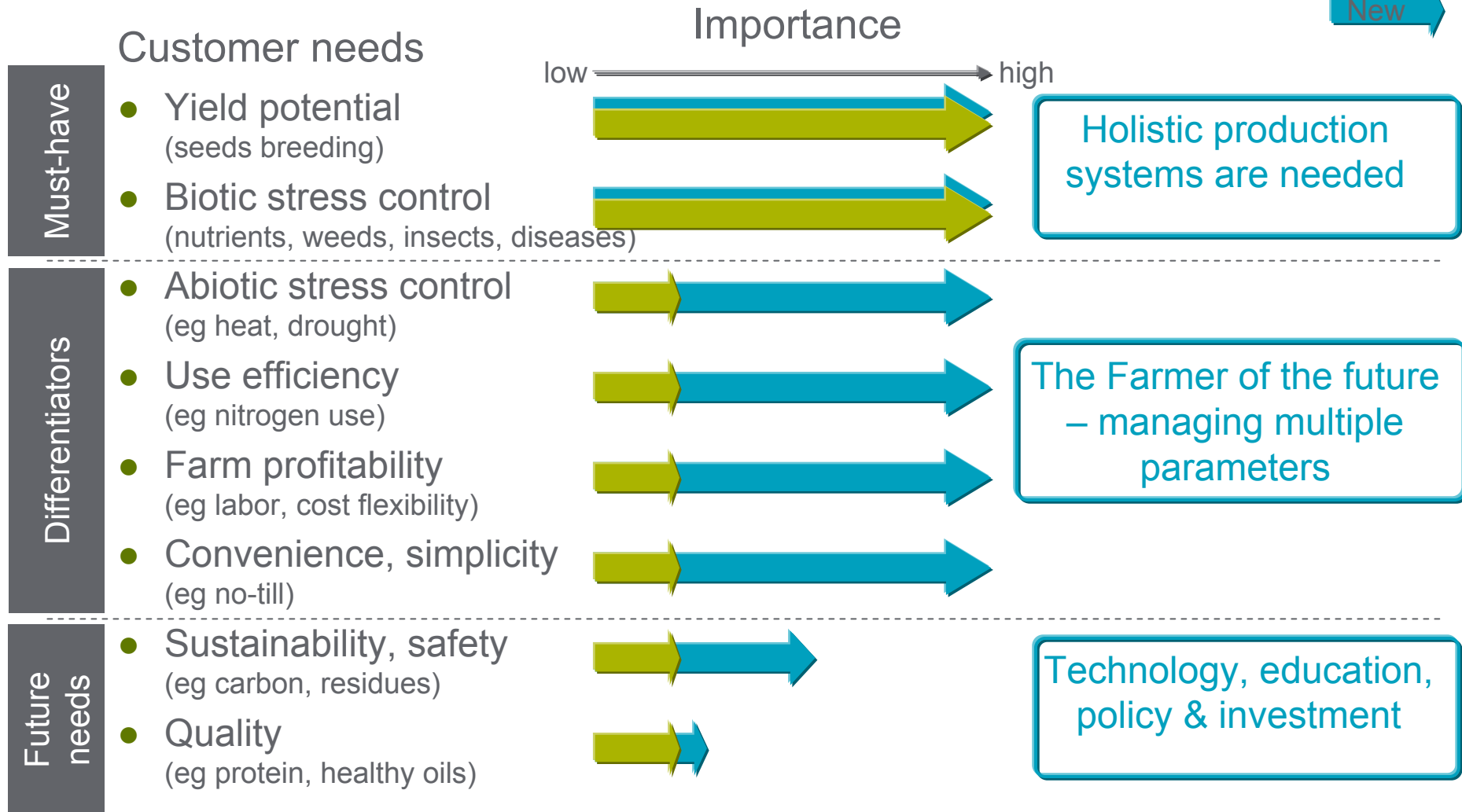
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# Because increasing yield from here will be a greater challenge – a more holistic approach is required



# Crop protection compounds: the long road to market

150'000  
compounds



Discover



Profile

5000  
compounds

30



Evaluate

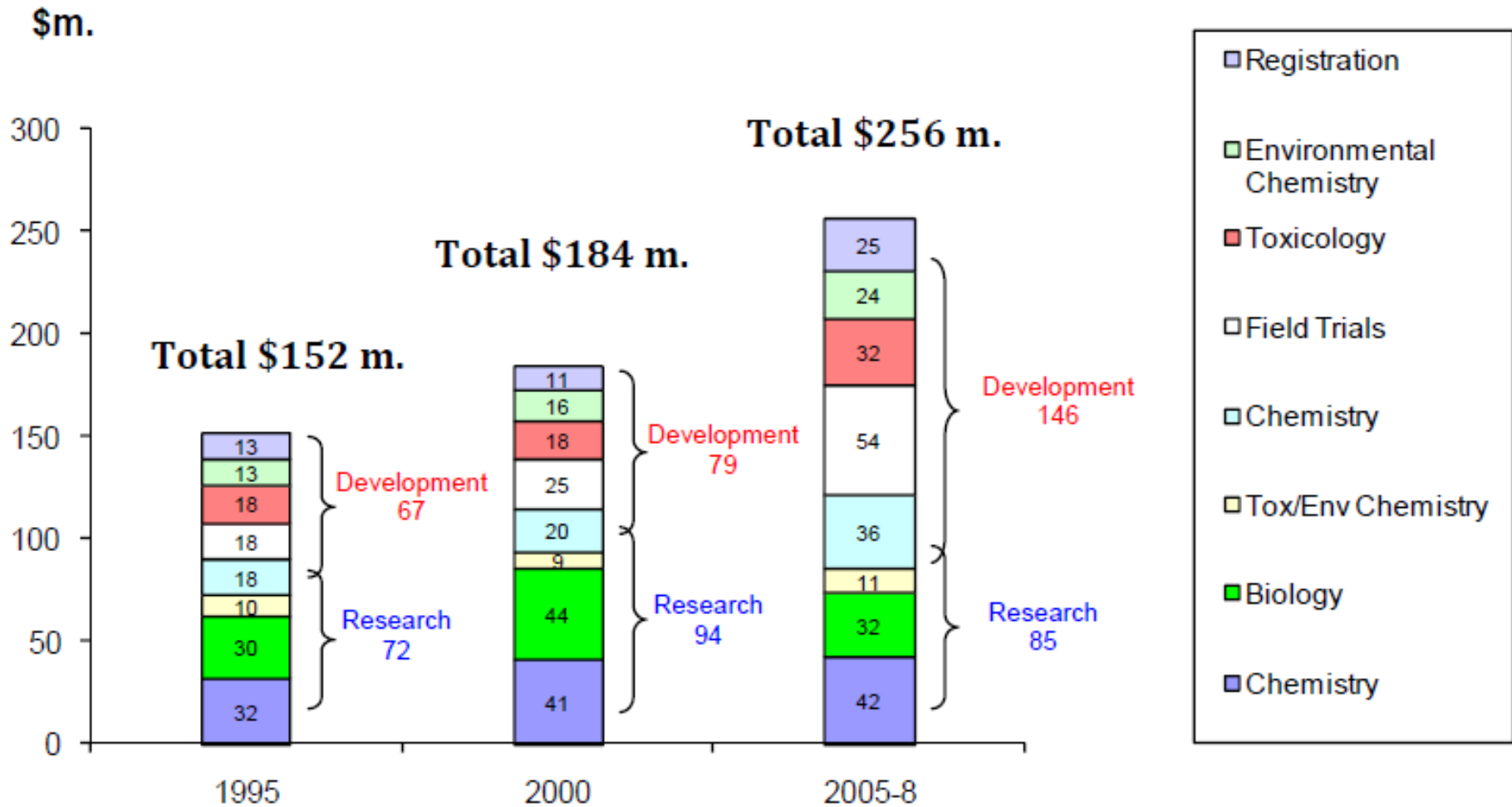


Support

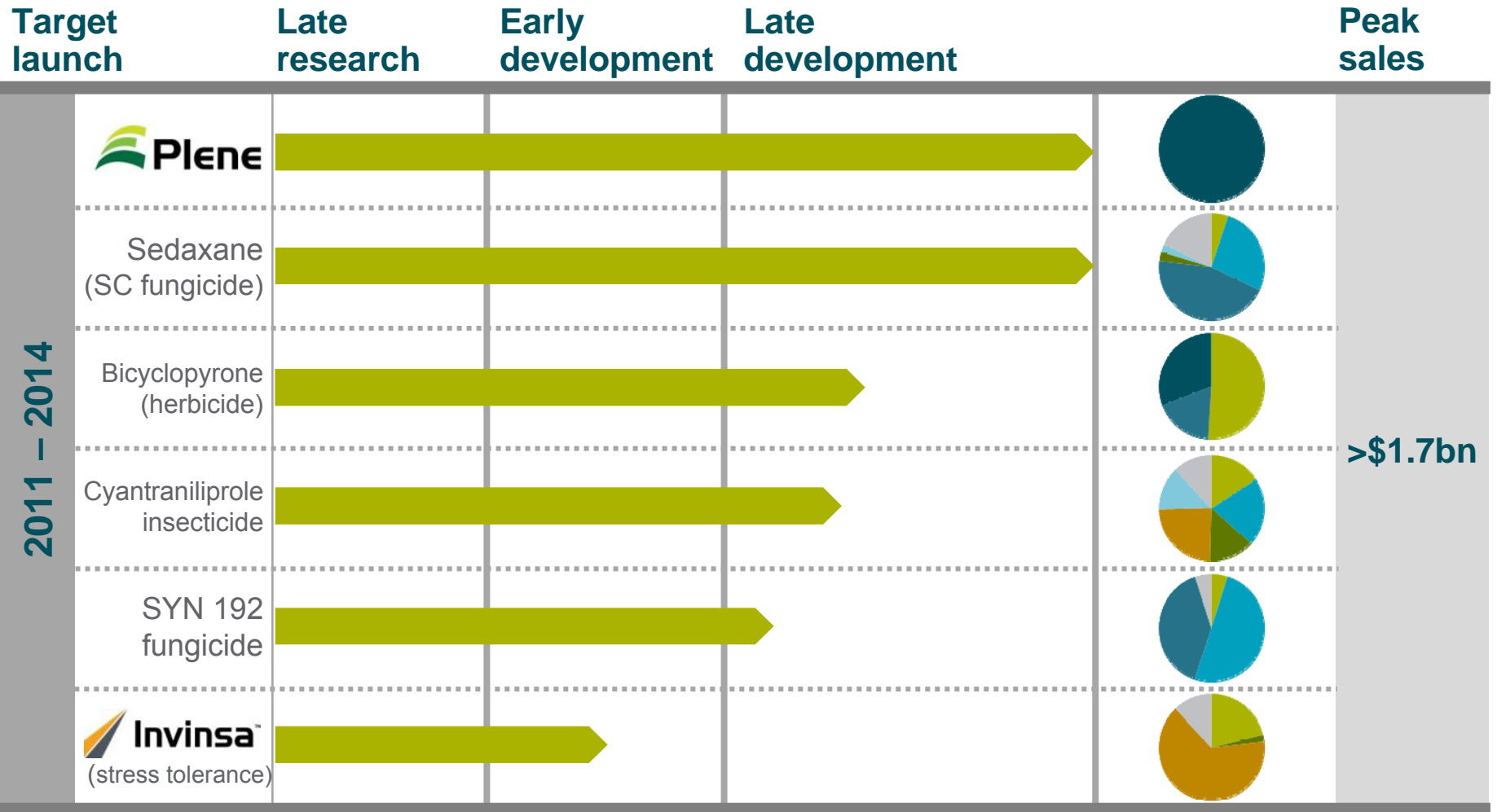
1 - 2

Time

# Research & Development Costs of a new Crop Protection Product



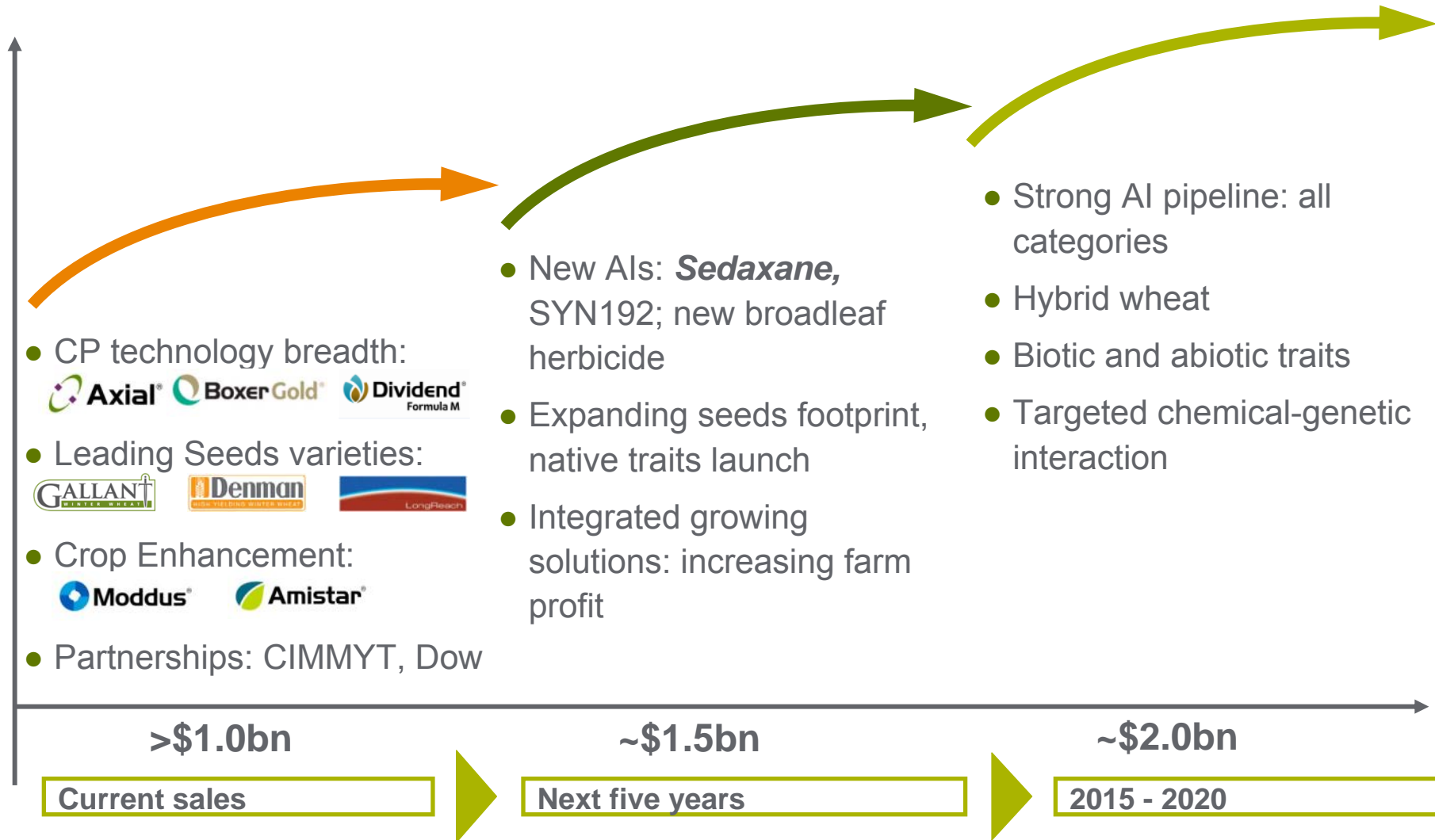
# Crop Protection pipeline: multi-crop potential



■ Corn 
 ■ Soybean 
 ■ Cereals 
 ■ Vegetables 
 ■ Rice 
 ■ Sugar cane 
 ■ Specialty 
 ■ Others

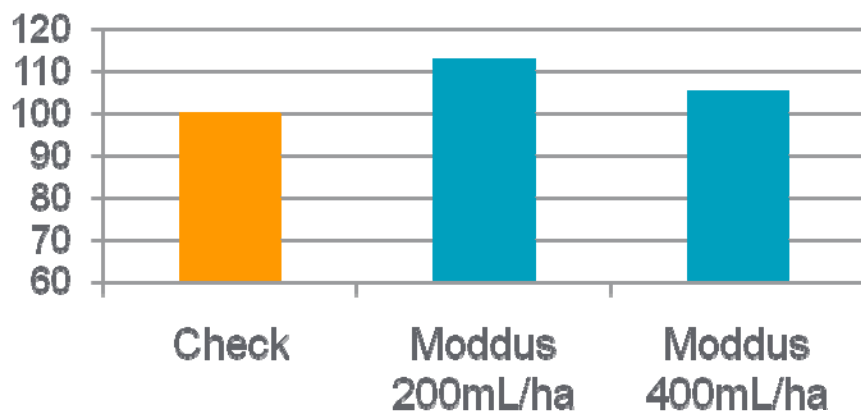
Invinsa™, a trademark of AgroFresh Inc., a subsidiary of DAS

# Sustained value creation: Wheat

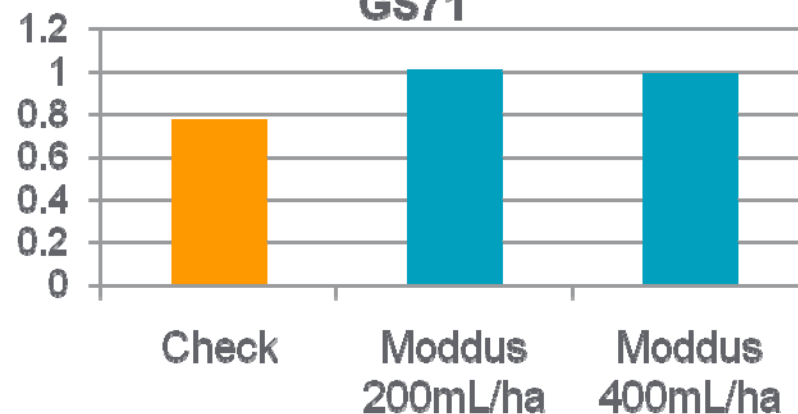


# Moddus: Crop Enhancement in Oats (Applied GS 31/32) (Mean of 2 trials)

### Crop Yield (% of Check)

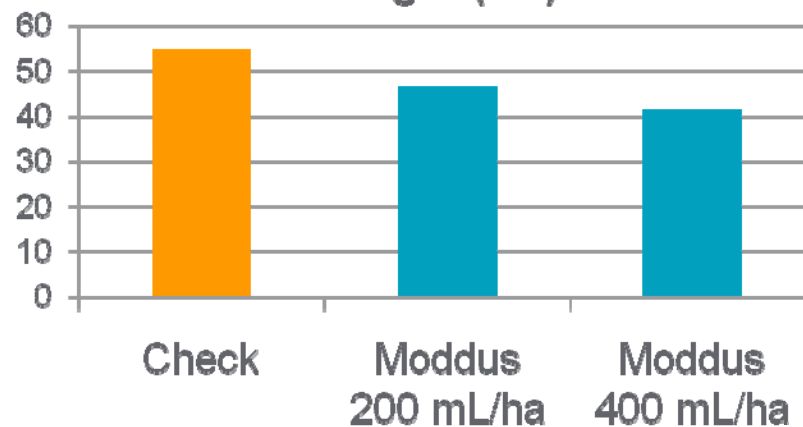


### Stem Wall Thickness (mm) – GS71



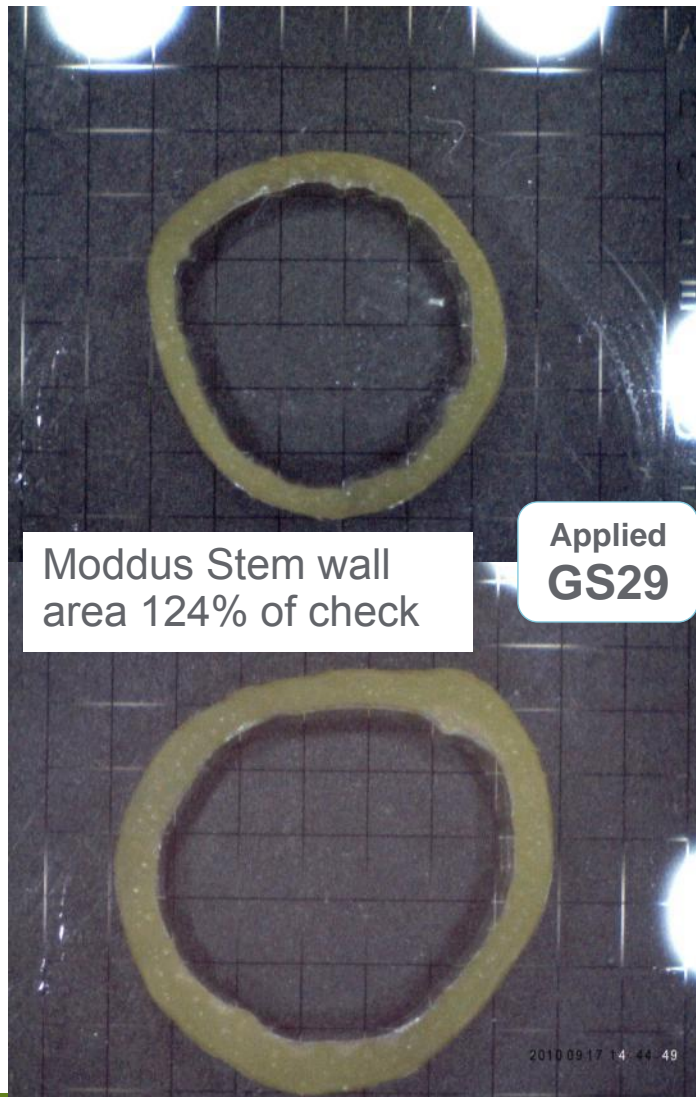
- Site 1 - York, WA 2010
- Site 2 – Point Pass, SA 2010

### Culm Length (cm) – GS71



# Moddus: Crop Enhancement and Lodging Management

Barley – Bathurst NSW 2010



Check

Moddus  
400mL/ha

Barley – Wagga Wagga NSW 2010



Applied  
**GS31**



# Trends in Crop Protection

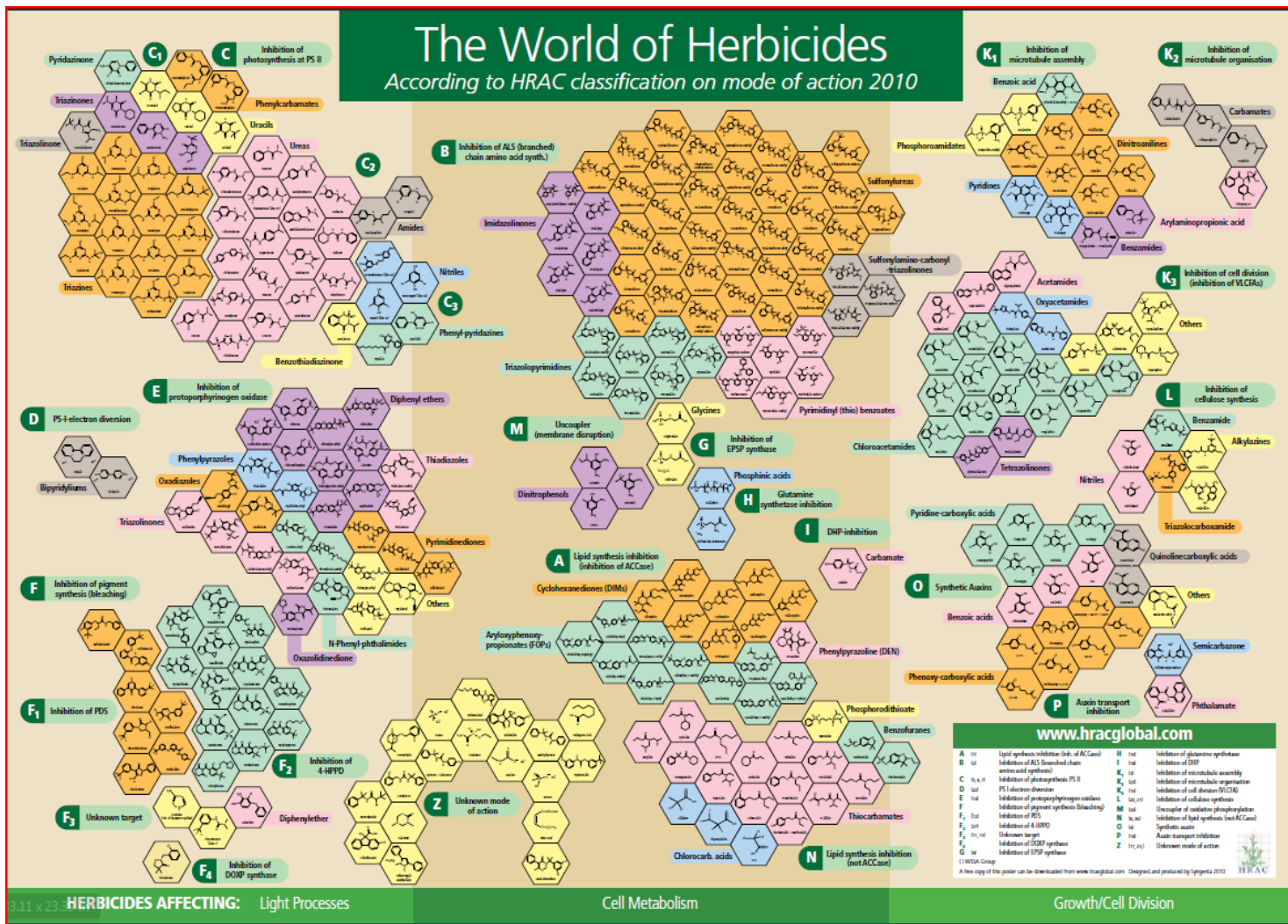
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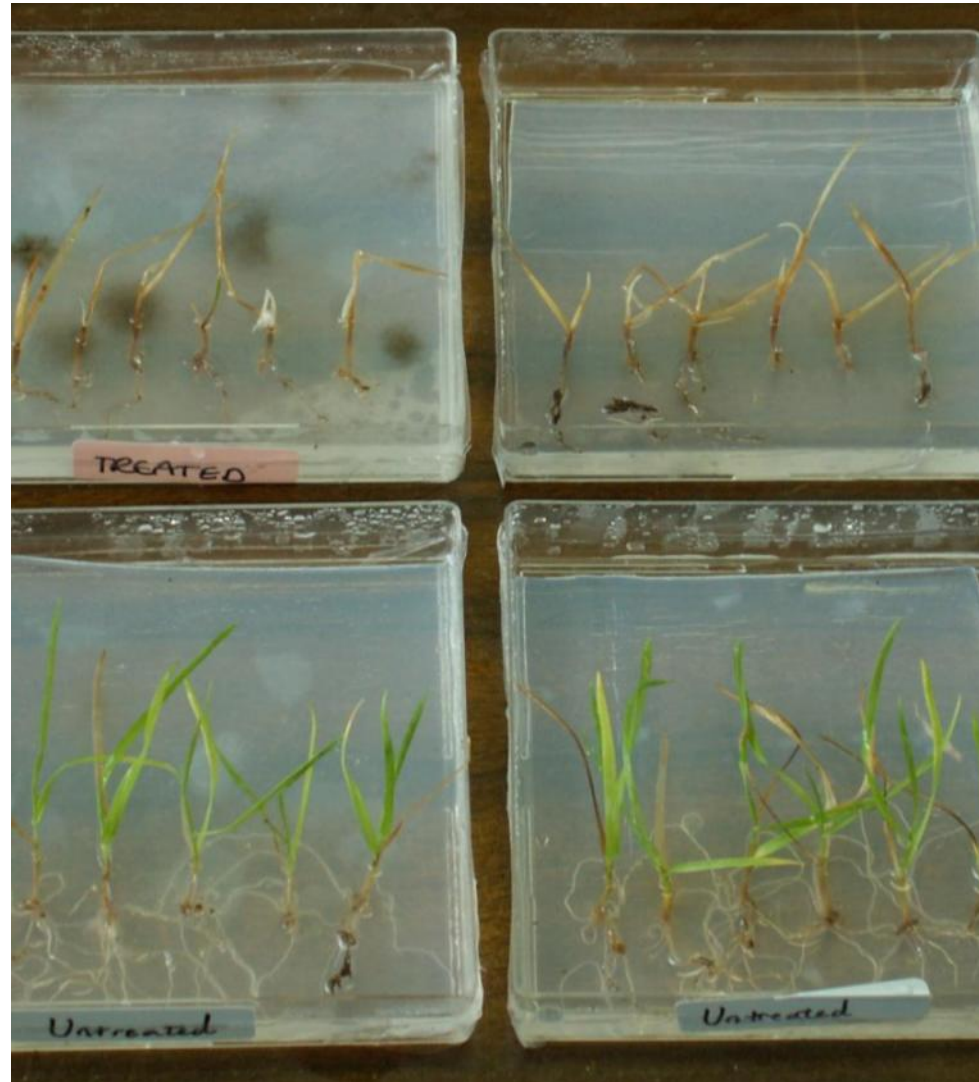


# Herbicide Resistance Action Committee



## Principles of Syngenta RISQ test

- Seedlings at the 1-3 leaf stages collected and transplanted on agar containing discriminating rates of herbicides
- Standard comparisons: sensitive and resistant populations
- Survivors scored 7 to 12 days after transplanting, based on new root and leaf development



# Syngenta RISQ test: comparison with whole plant pot test

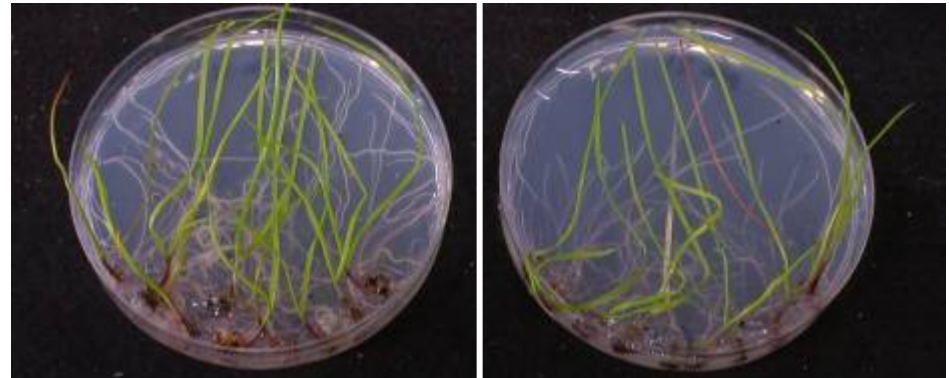
Standard Sensitive      LL1781 ACCase resistant



Untreated

Standard Sensitive

LL1781 ACCase resistant



Treated



Sensitive: dead      Resistant: alive

Classical whole plant pot assay  
From seeds plants grown to 2 leaf stage and  
treated with **45g ai PXD**; Results 21 days



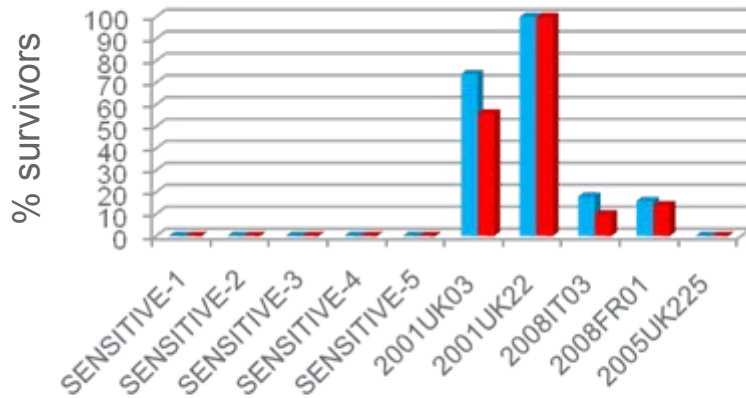
Sensitive: dead

Resistant: alive

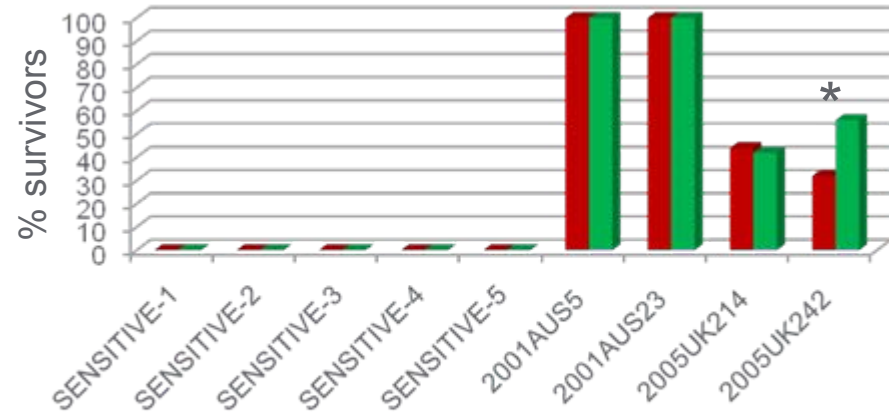
7 cm seedlings transplanted in **0.16  $\mu$ M PXD** in agar; results 7-12 days

Strong correlation between whole plant pot and Syngenta RISQ tests for standard sensitive and pure homozygous ACCase target site mutant population

# Comparison between whole plant pot and Syngenta RISQ tests for pinoxaden and iodo-mesosulfuron



■ 0.16µM PXD in Syngenta RISQ test  
 ■ 45 gai/ha PXD in whole plant pot test



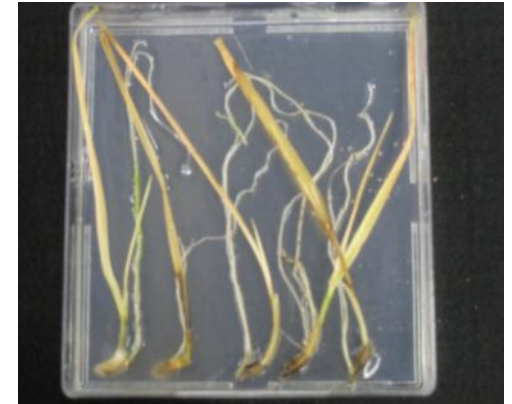
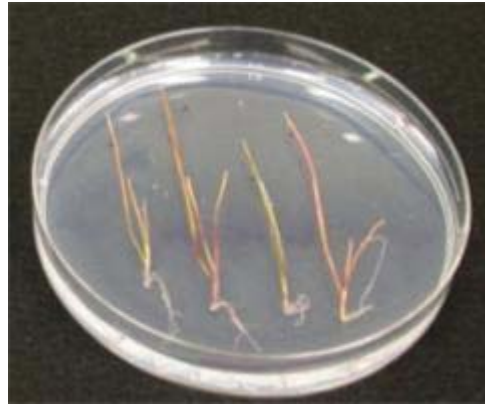
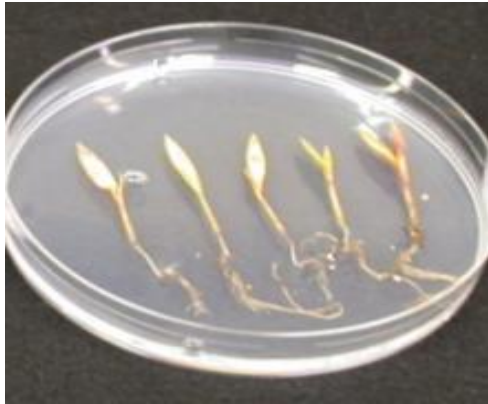
■ 0.05 µM Iodo-mesosulfuron in Syngenta RISQ test  
 ■ 14.4 gai/ha iodo-mesosulfuron in whole plant pot test

\* Only case of non-correlation between the two methods

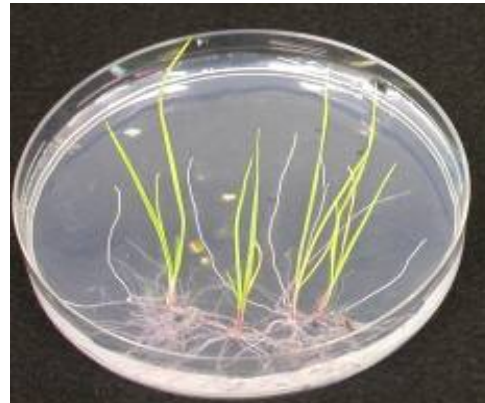
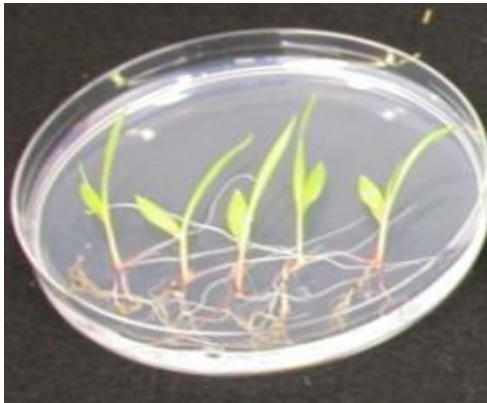
Very good correlation between whole plant pot and Syngenta RISQ tests at the discriminating rates

# Transferability to other grass weed species

Sensitive  
0.16  $\mu$ M PXD



Resistant  
0.16  $\mu$ M PXD



*Setaria*

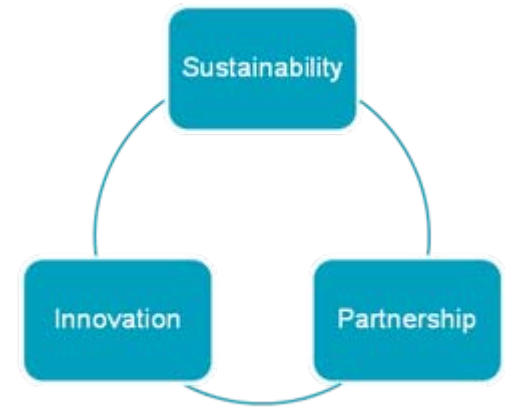
*Apera*

*Avena*

Method easily transferable to other grass weed species

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# **Plene**: focus on efficiency and sustainability

**Existing**

**Operational complexity**



 **Plene**

**Less equipment, faster, more efficient**



**Intense soil preparation**



**Minimum tillage, better soil preservation**



**High labor need in poor work conditions**

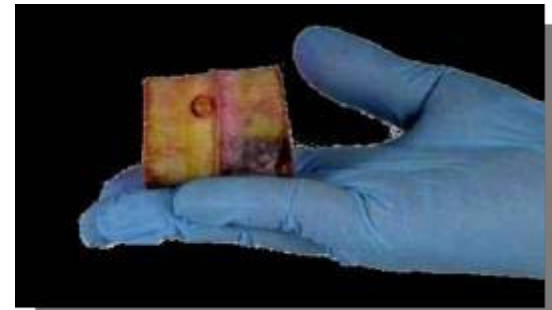


**Better work conditions, more qualified**



# Private Partnership - Plene™ Concept

- Plene™ is a new planting technology developed by Syngenta.
- Based on single bud setts treated with proprietary products.
- 100% mechanized
- Requires lighter planter than usual
- Brings simplification and savings in the operations with environmental sustainability



Plene  
Planter

Conventional  
Planter



# Private/Public Collaboration

- GrainGene
- Partnership between Syngenta and CSIRO
- Collaboration terminated in 2007
  
- Discovery, introduction and deployment of novel genes into commercial varieties
- Development of markers and phenotypic screens to select for target genes
  
- Variety of traits
  - Transpiration efficiency (TE)
  - Alternative dwarfing genes
  - Reduced tillering
  - Longer coleoptiles
  - Aluminium tolerance
  - Rust resistance
  - Improved quality
  
- Success story
  - LongReach Scout



## Private/Public Collaboration



### LongReach Scout

- APW variety suited to WA, Victoria and South Australia
- Improved TE in Yitpi background
- TE is the ability to discriminate between C12 and C13 carbon molecules
- High WUE varieties have the ability to accumulate more C13 molecules than low WUE varieties. This results in improved water use efficiency through a better harvest index, greater biomass and yield. (Richard Richards, 2009)



© Pacific Seeds

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  - Sustainability
    - Trade – MRLs and Import Tolerances
    - Stewardship & Application



# Growing Trade of Food/Feed Commodities



Source: UN Comtrade

# MRL – Maximum Residue Level

## What is a MRL (food tolerance)?

- Maximum Residue Level legally allowed in/on food or animal feedstuff after use of crop protection chemicals according to good agricultural practice (label recommendations)

## Why do we need MRLs?

- MRLs = international trading standards that ensure consumer safety

## Who sets MRLs?

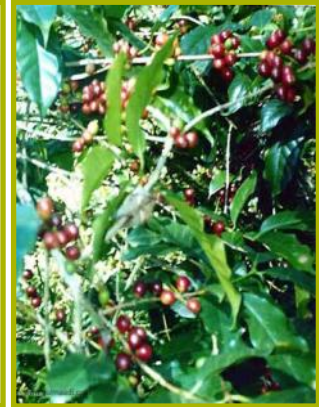
- MRLs are set by national regulatory authorities and independent expert bodies such as the Codex alimentarius Commission in cooperation with FAO and WHO



# Trading Standard For Food Commodities

## Why do we need import tolerances?

- Commodity is not grown in the importing country
- Crop protection chemical is not registered in importing country
- Residue in commodity is higher in export country than in same produce of the importing country



# MRL Exceedence

## What happens if MRLs are exceeded?

- Commodity is rejected in the port of entry
- Commodity exporter/handler/merchant does not get paid
- Negative publicity for exporting country and its growers
- As a consequence
  - Strict conditions for exporting country (i.e. certification of residue levels in commodity)



## MRL Disharmony examples on cereal grains

Active ingredient	MRL (mg/kg)			
	Australia	Codex	JP	EU
Difenoconazole	Barley: 0.01 Wheat: 0.01	Wheat: 0.02	Barley: 0.1 Wheat: 0.1	Barley: 0.05 Wheat: 0.1
Propiconazole	Cereals: 0.05	Barley: 0.2 Wheat: 0.02	Barley: 1.0 Wheat: 1.0	Barley: 0.2 Wheat: 0.05
Trinexapac-ethyl	Barley: 0.3 Wheat: 0.3		Barley: 0.02 Wheat: 0.02	Barley: 0.5 Wheat: 0.5



# MRL Disharmony

## Why do we find diverging MRLs in the world?

- Different agricultural practices and label recommendations
- Different definition of residue of concern to be monitored in commodities
- Different ways of calculating MRLs
- Different dietary risk assessment schemes applied for MRL evaluation
- Different approaches to assign commodities to crop groups



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## Proactive stewardship to ensure freedom to operate





# SPRAY AWARDS

**Kevin Davies** - *State Winner – Western Australia*

York WA farmer, Kevin Davies, put in 2000 hectares of wheat, barley, canola and lupins on his 3000ha Hillgate property this year.

## **What the judges thought ...**

- Displays a very strong understanding of application technology and nozzle selection
- Environmental factors are well-considered
- High awareness of industry factors and has sought accreditation to SQF1000 standards



*Bringing plant potential to life*

