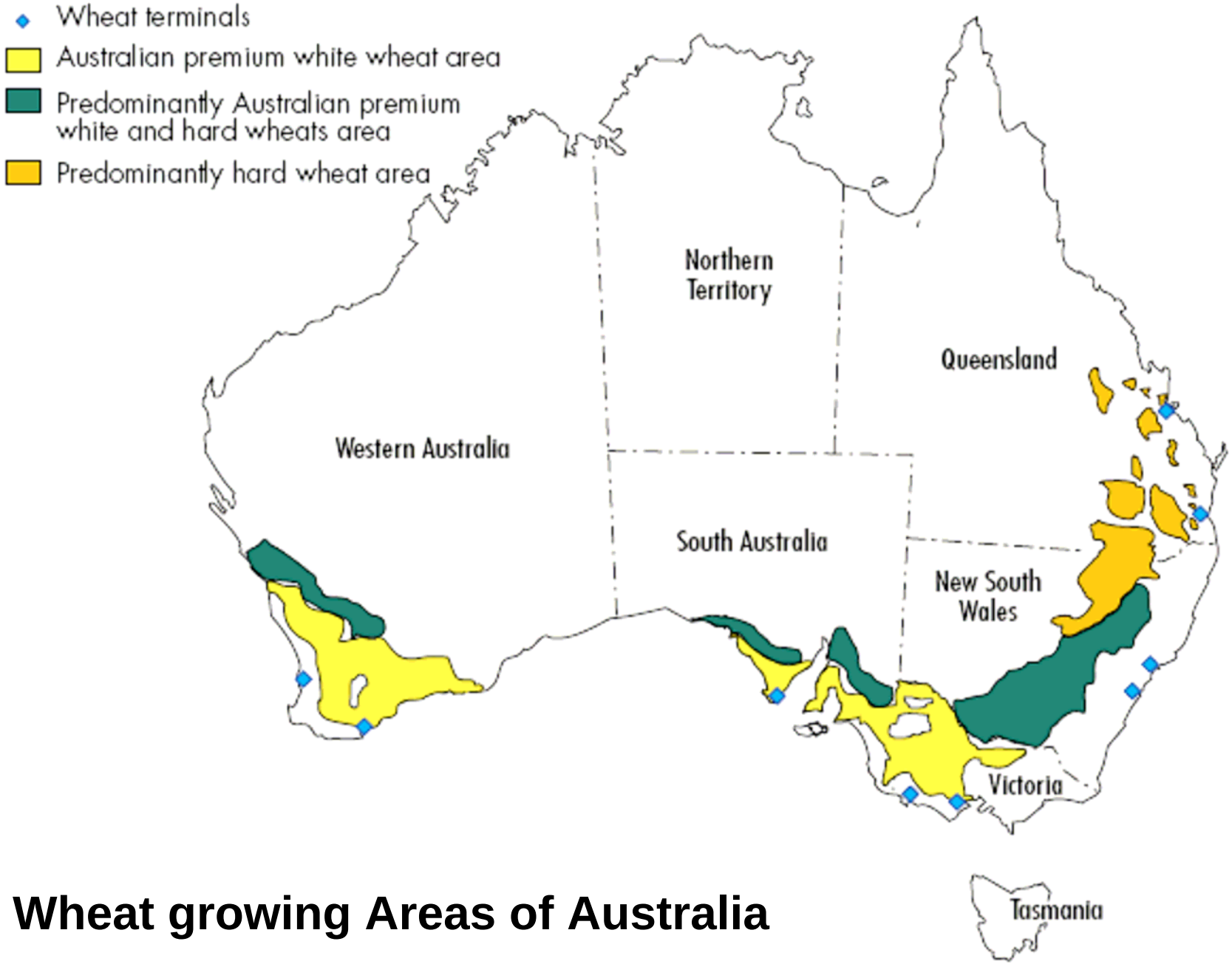
Conservation Tillage in Australia - the Benefits and Limitations

By

Jason Sabeeney



Wheat growing Areas of Australia

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Major benefit of no-till farming is reduced soil erosion

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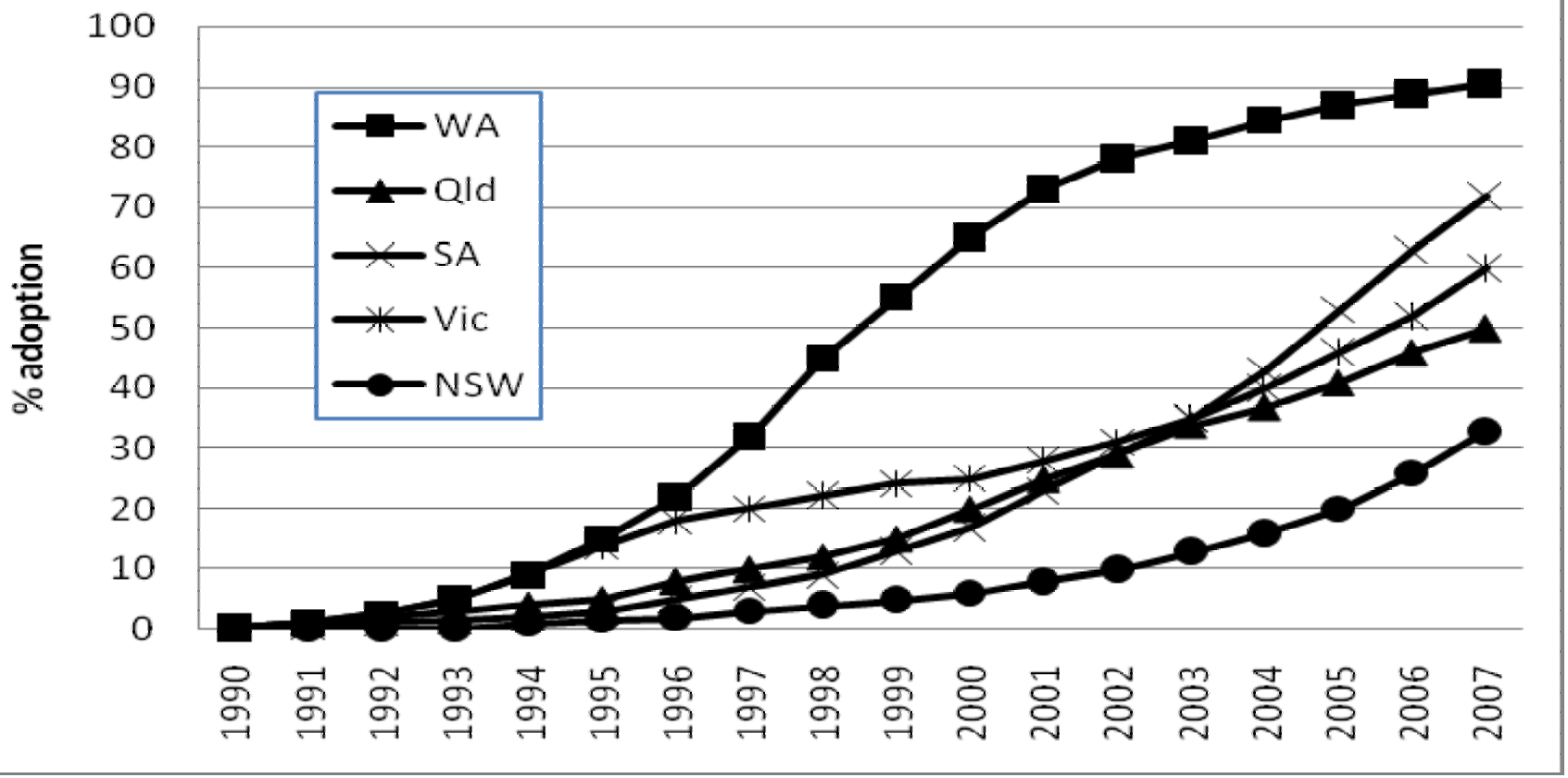
No-till adoption By State in Australia



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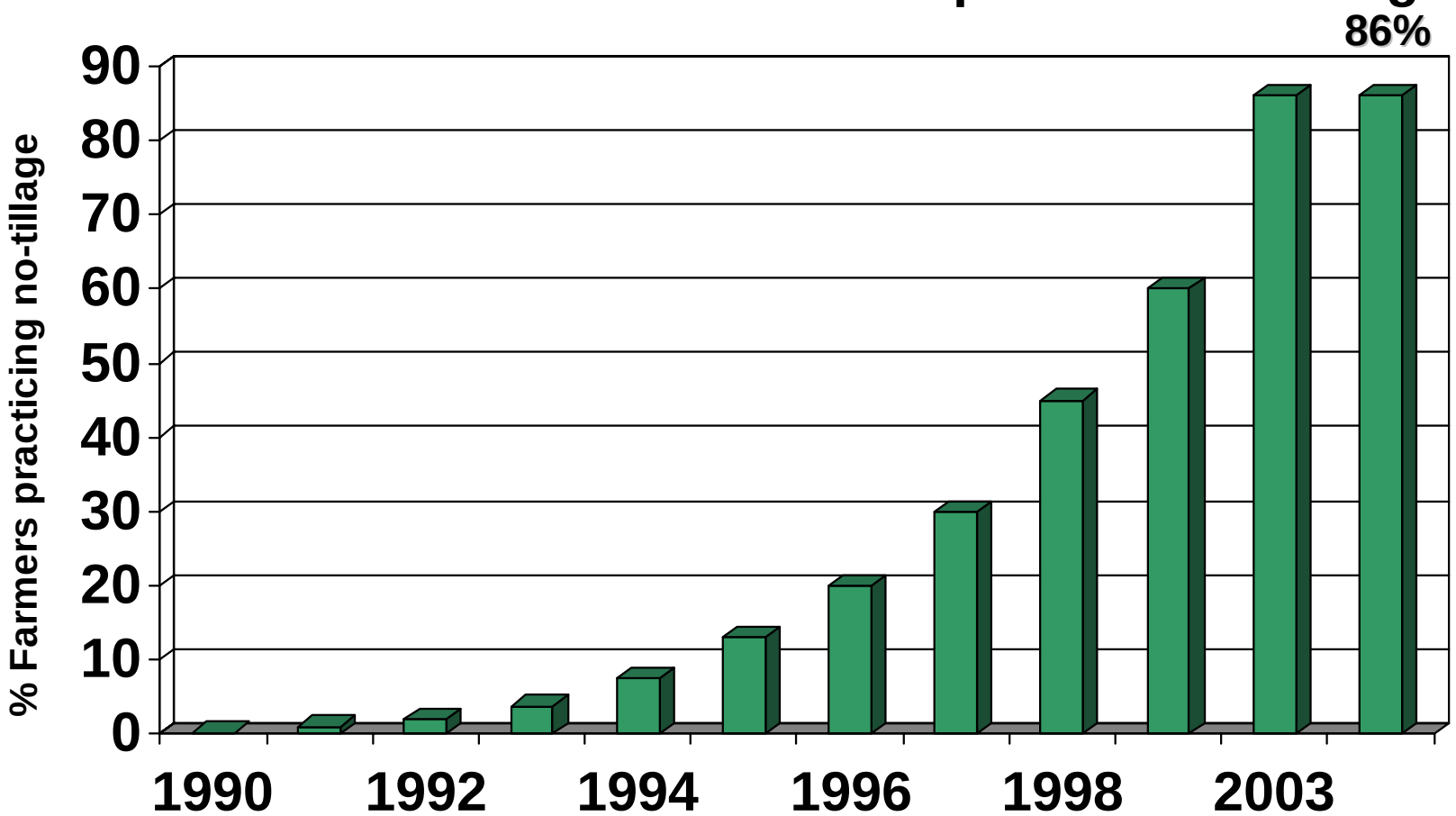
WA - Estimated Farmer Adoption of No-Tillage



Benefits of no-till farming

- Increased farm efficiency
- Lower costs
- Reduced wind & water erosion
- Lower input costs
- More timely crop sowing
- Improved yields
- Increased cropping intensity
- Improved soil structure
- Improved water use efficiency
- Lower weed germinations
- Improved quality of life

Definition:

2.High quality no-till:

- Cropping system
- Diverse rotations
- Crops are sown in narrow strips into untilled soil
- Weeds are predominantly controlled by herbicides, through an integrated weed management approach
- Most of the residue from the previous crop remains on the soil surface for moisture and soil conservation

Precision Agriculture and No Tillage

What is common to successful no-till systems?

(South Dakota State University)

1. **Diverse rotations**
2. **Low disturbance**
3. **Permanent soil cover**
4. **Heavy emphasis on integrated pest management**

What is common to successful no-till systems?

1. Diverse rotations

"Variety is the spice of life"

- Spreads risk (production and marketing)
- Spreads work load
- Reduces weed, disease and insect pest pressure
- **Allows more varied management choices**
  - More pesticide groups, particularly herbicides
  - Different sowing dates
  - Different cultural options

What is common to successful no-till systems?

2. Low disturbance

- Need minimal disturbance

What is common to successful no-till systems?

3. Permanent soil cover

- Prevent erosion
- Increase infiltration of moisture
- Reduce soil temperatures
- Feed soil biota and promote nutrient cycling

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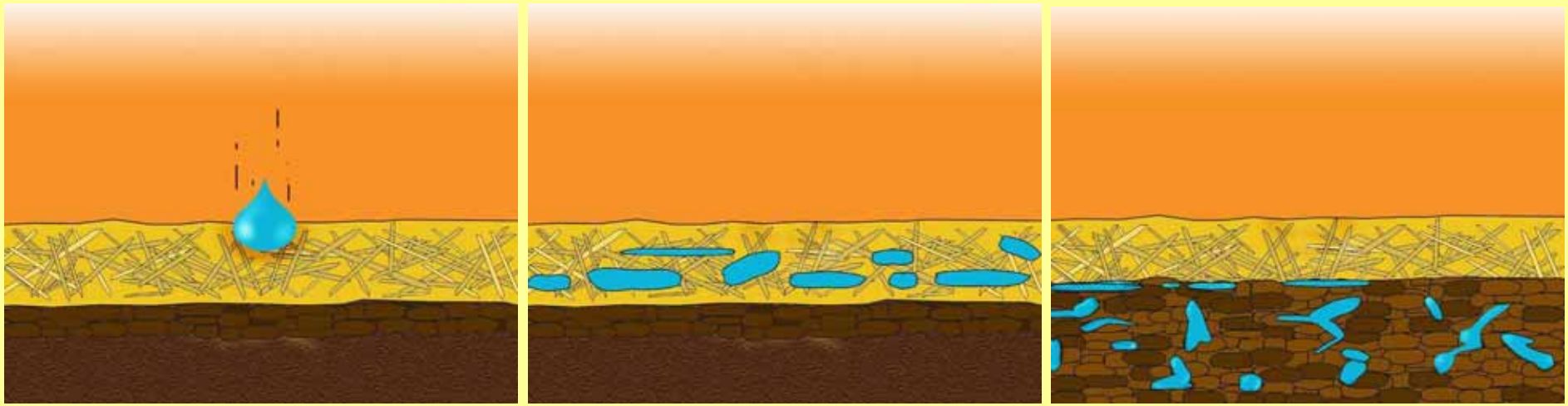
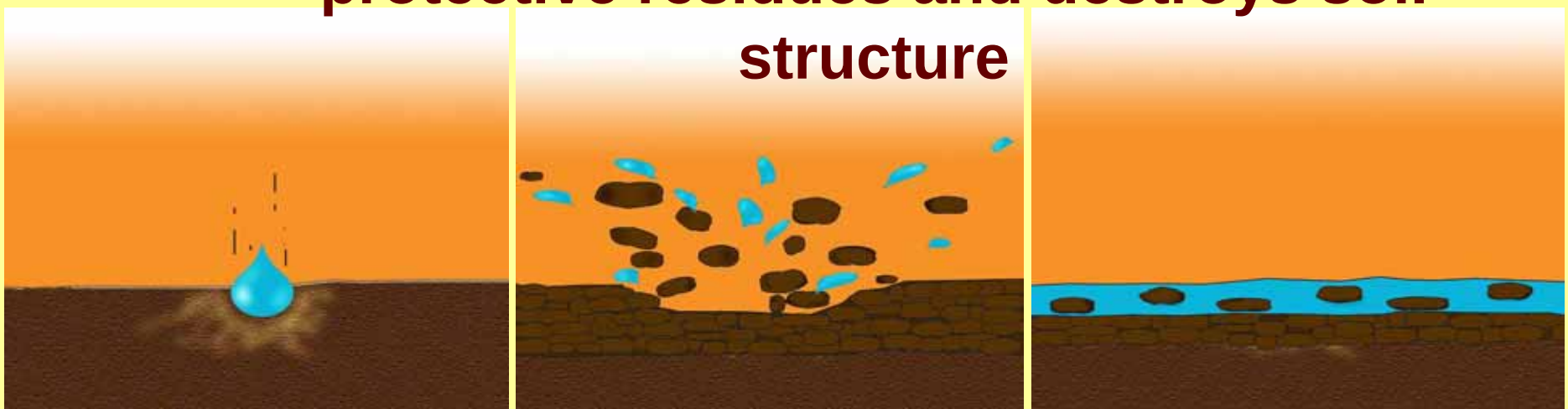


Tillage and/or over grazing removes protective residues and destroys soil structure



What is common to successful no-till systems?

4. Heavy emphasis on integrated pest management, especially weeds

- Sanitation
  - Clean equipment, clean seed, remove and feed chaff.
- Crop competition
  - Accurate seeding depth, starter fertilizers, good seed quality and seedling vigour, narrow rows.

Initial Phase	Transition Phase	Consolidation	Maintenance
•Rebuild aggregates •Low OM •Low residue •Require N	•Increase OM •Increase crop residue •Require N	•High OM •High crop residue •Increase moisture •Less N – higher microbial turnover	•High OM •High crop residue •> moisture •Nutrient cycling •Less N -
0-5 Yrs	5-10 Yrs	10-20 Yrs	>20 Yrs

Timescale of no-till

Limitations or challenges of no-till farming

- Increased risk of herbicide resistance
- Increased incidence of rhizoctonia disease
- High initial capital outlay for new machinery
- Lack of expertise in managing the system
- Managing livestock in the system
- Limited crop diversity
- Pre emergent herbicide efficacy
- Insufficient crop residue left on the soil surface

Glyphosate resistance in Australia – The biggest challenge facing no-till farming

- 64 confirmed cases of Annual Ryegrass (Lolium *rigidum*) resistance to glyphosate in Australia
- 1 confirmed case of Awnless Barnyard Grass (Echinochloa *colona*) resistance to glyphosate
- Each case linked with the exclusive and/or prolonged use of glyphosate over many years, combined with minimum or zero-tillage cropping systems
- Another 5 weeds at risk in northern Australia
- Bishop's weed, Liverseed grass, Sowthistle, Sweet summer grass, Wild oats

As reported by Walker & Storrie et al in "The Northern Herbicide Resistance Reporter", from a survey of 240 growers and agronomists, 2004

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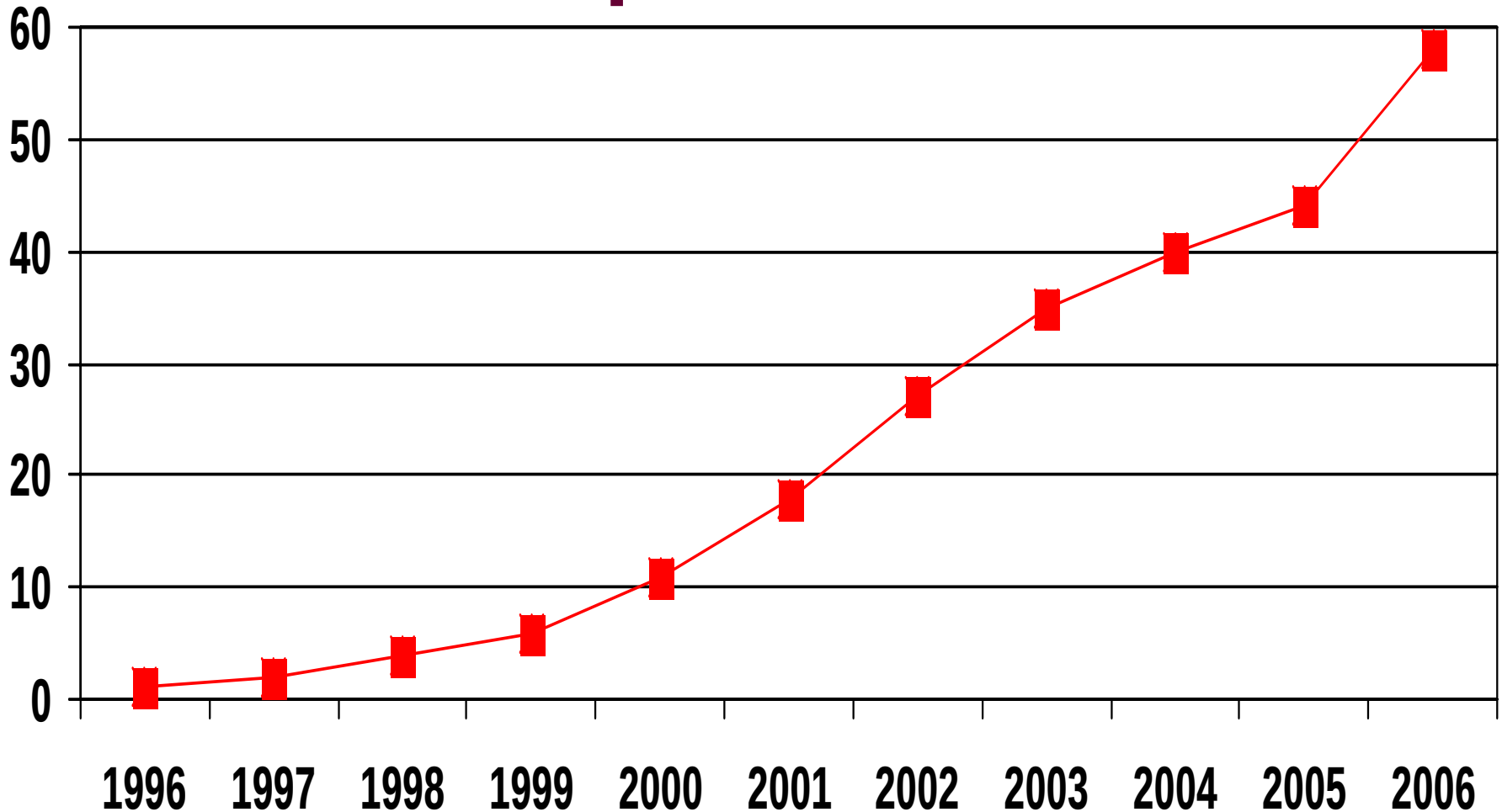
NATIONAL Glyphosate Sustainability Working Group

Glyphosate resistance development in Australia

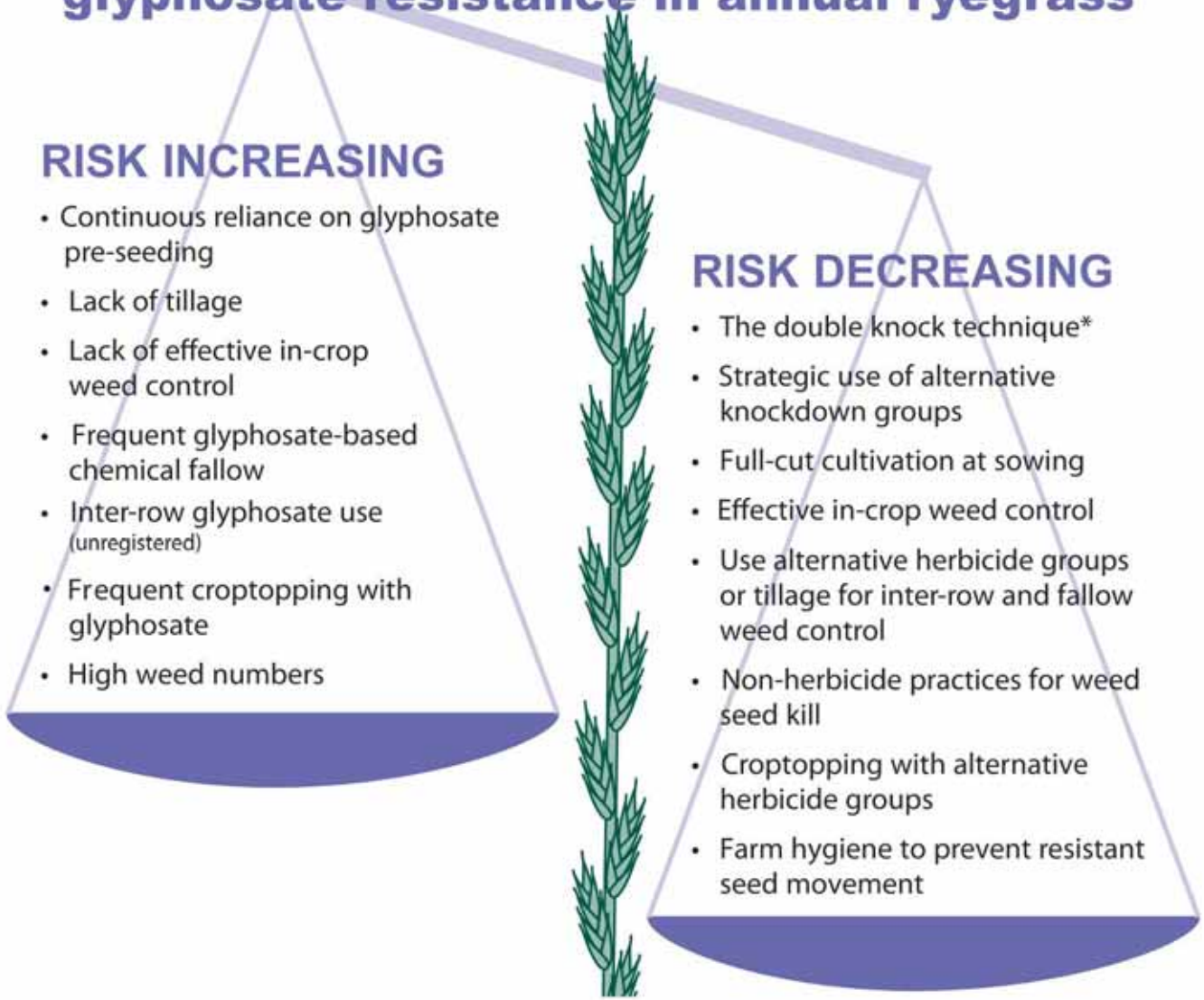


Source: National Glyphosate Sustainability Working Group, 2006

Glyphosate resistant annual ryegrass, Liverpool Plains, NSW

Photo courtesy of Andrew Storrie, NSW Department of Primary Industries

Tip the scales in your favor to minimise the risk of glyphosate resistance in annual ryegrass



*The double knock technique is defined as using a full cut cultivation OR the full label rate of a paraquat-based product **(Herbicide Group L)** following the glyphosate **(Herbicide Group M)** knockdown application.

Table based on original concept for minimising glyphosate resistance in annual ryegrass in southern Australian grain growing by Paul Neve, WAHRI, University of WA. Optimal management techniques for other weed species may differ.

All Group M herbicides are glyphosate herbicides

Courtesy: National Glyphosate Sustainability Working Group, 2005

NATIONAL Glyphosate Sustainability Working Group

Herbicide rotation considerations

- Select the top 25–33% of paddocks that have had a high usage of glyphosate and rotate
- Assess the weed burden and species
- Adopt one of three methods in herbicide rotation:
  - SPRAY.SEED (paraquat + diquat) at lower label rate followed by full soil disturbance (i.e. “double knock”)
  - SPRAY.SEED at higher label rates if in a no-till system
  - Glyphosate at full rate followed by SPRAY.SEED at full rate 1–5 days later (i.e. “double knockdown”)

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