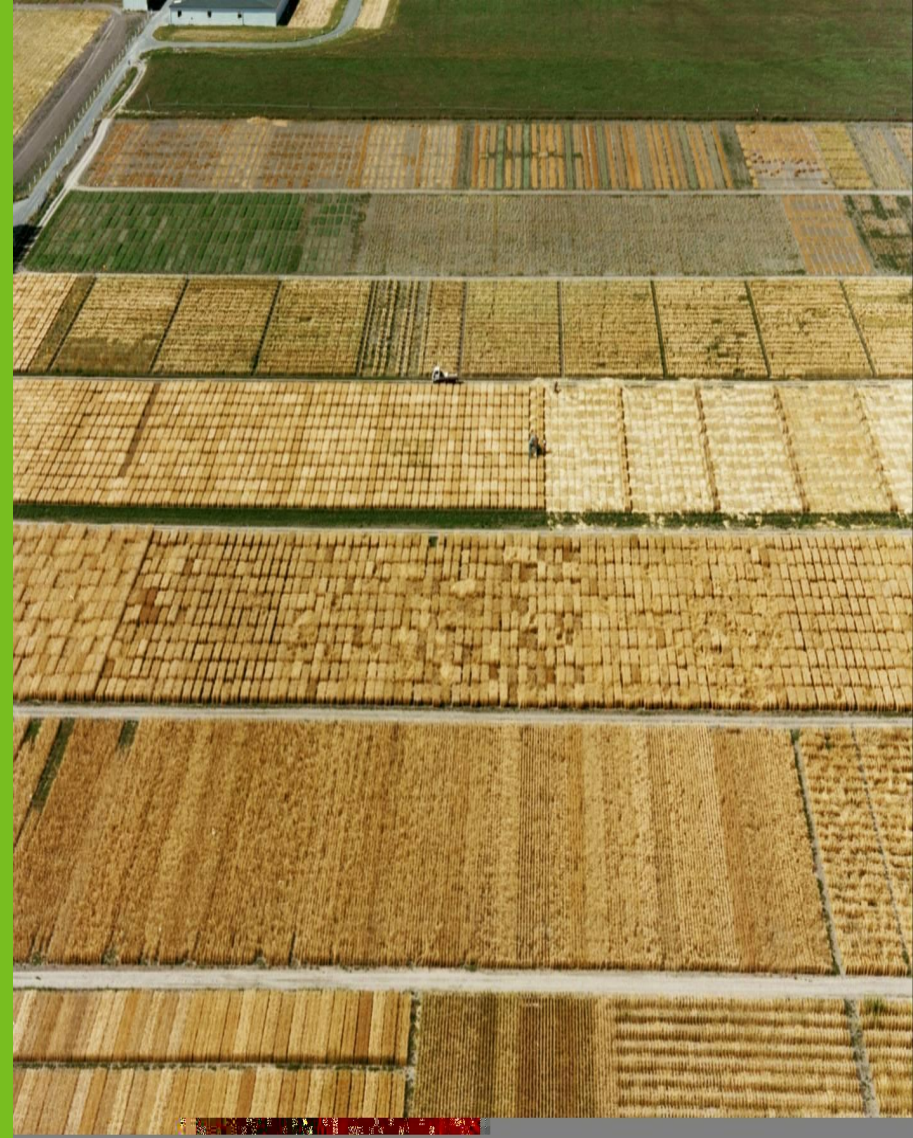


Wheat yield improvement in Australia: past, present and future

Richard Richards
CSIRO, Australia

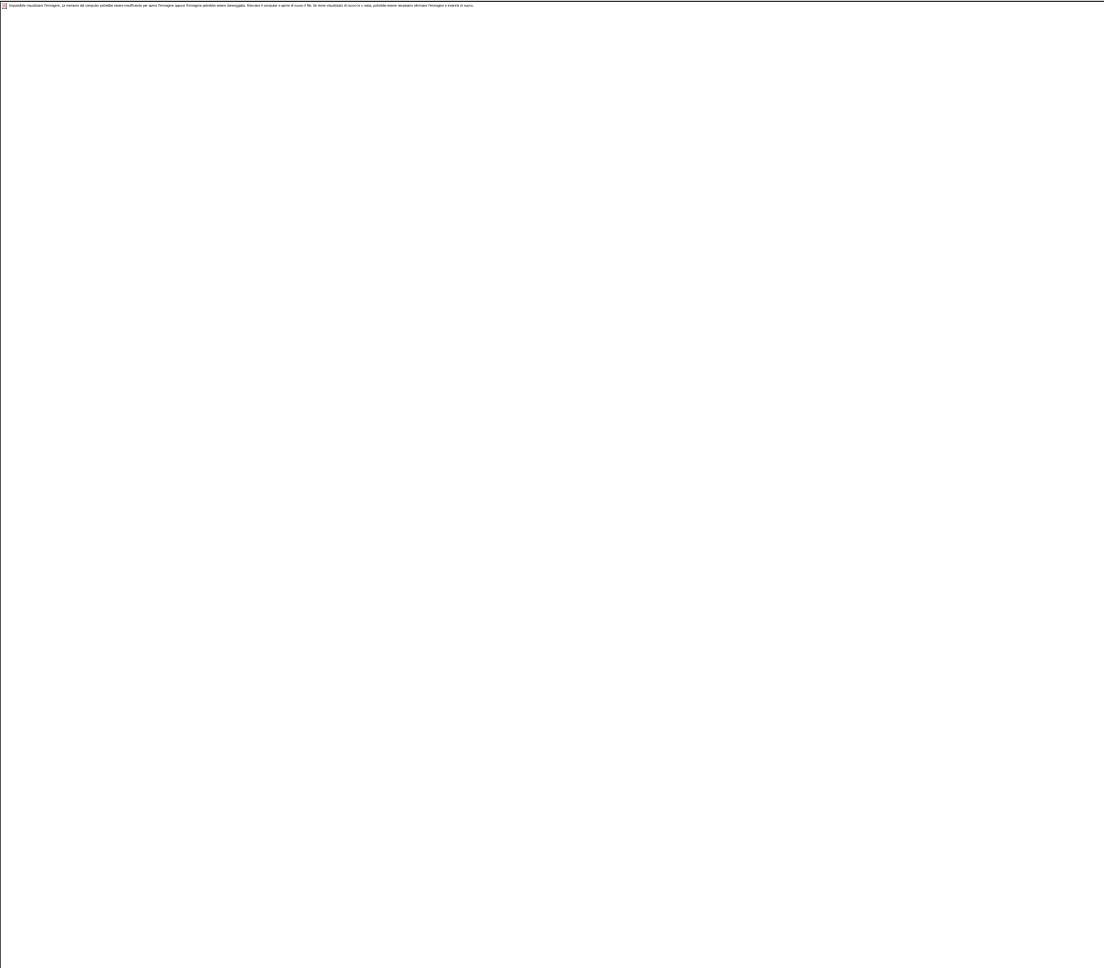


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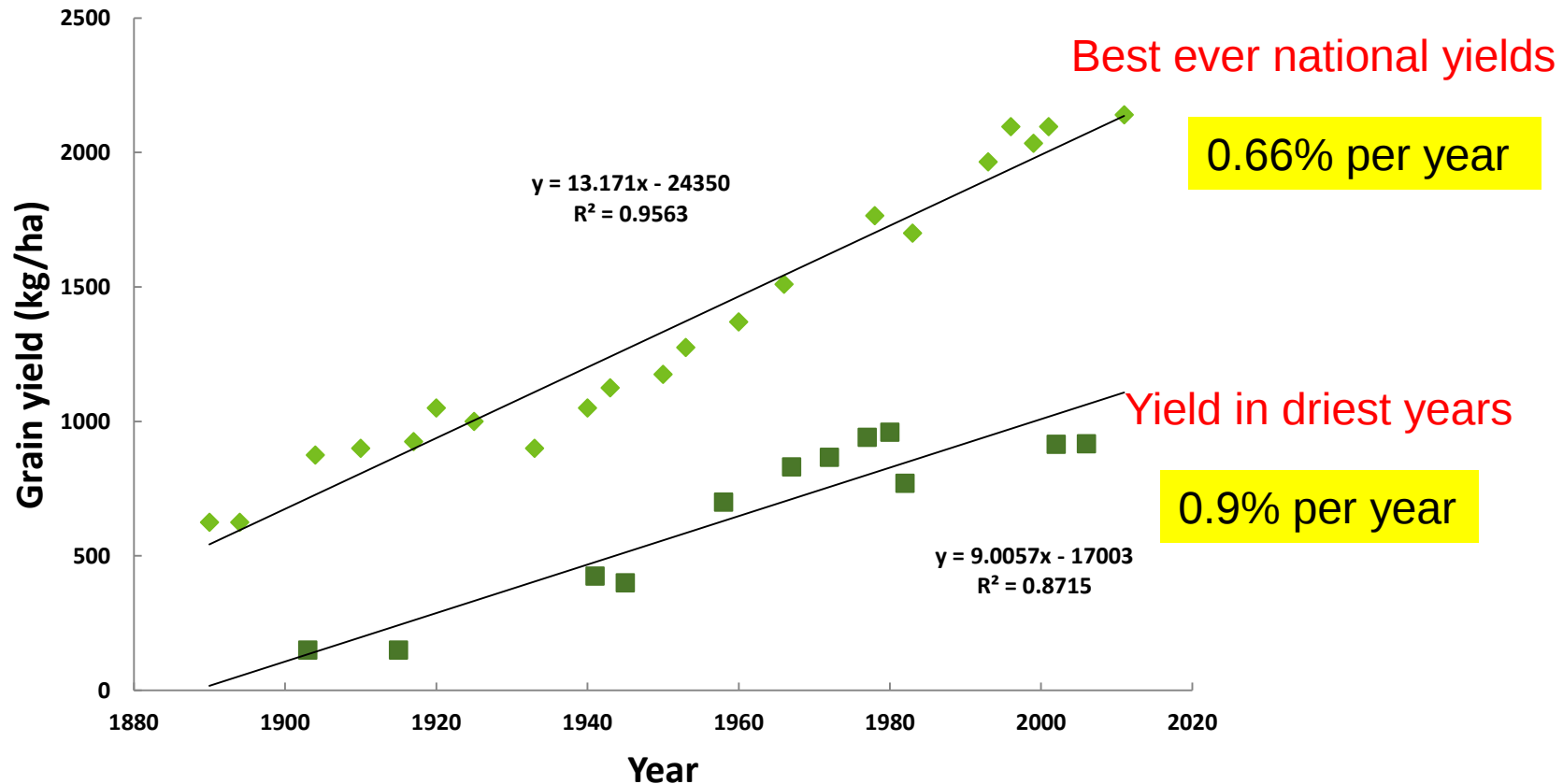


A typical wheat farm in Australia



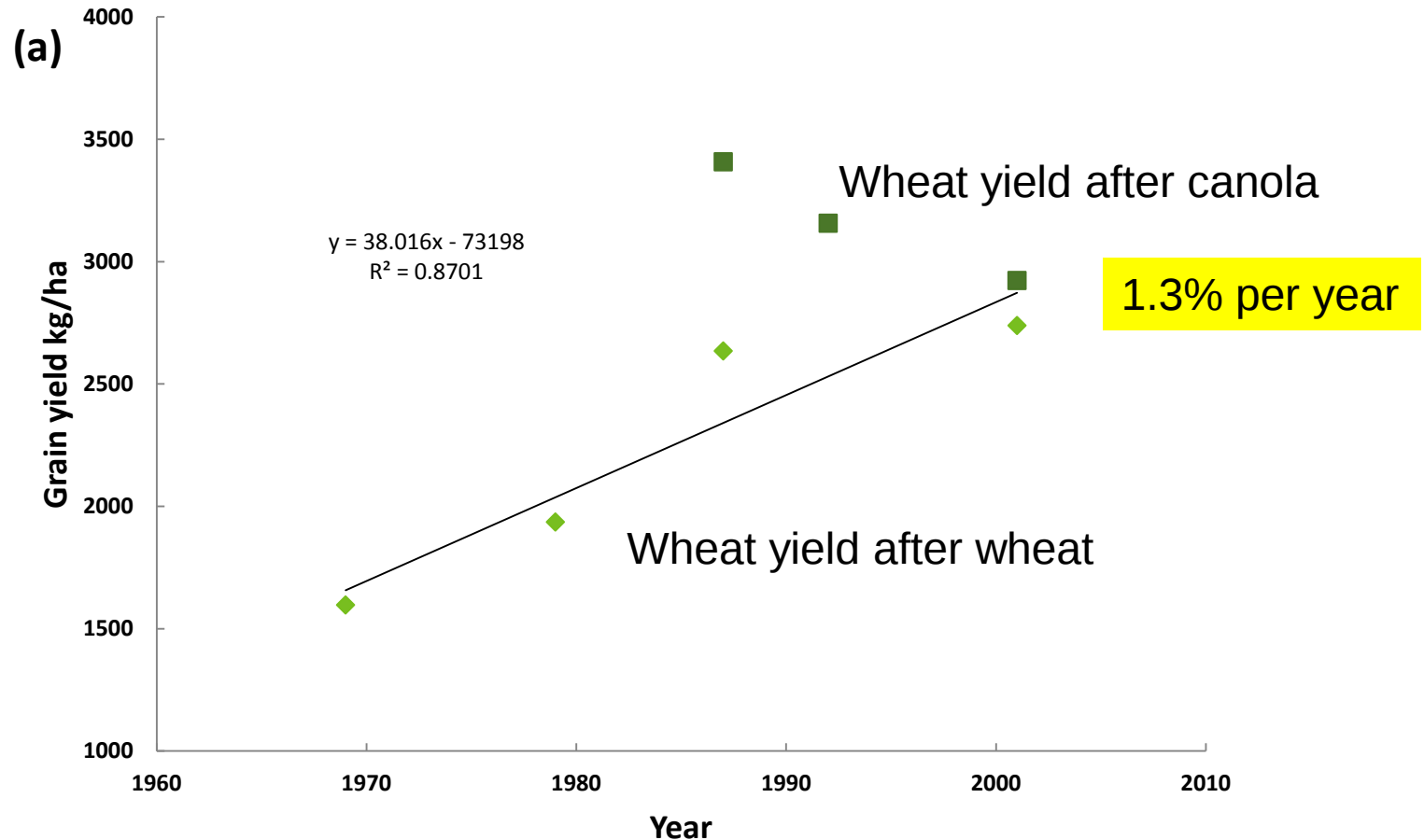
- Rainfall, low, highly variable and largely unpredictable
- No irrigation
- Sow in autumn, harvest late spring/summer.
- Terminal drought, frost at flowering is a risk
- Mixed farms with some livestock
- Farms are large
- Conservation farming, chemical weed control
- Inputs typically low

Increase in wheat yield in Australia since 1890 (due to both management and breeding)



To meet global food needs by 2050 we need global growth of 1.25% per year
(Hall and Richards, 2013)

Yield improvement on a well-managed farm over 40 years (southern NSW)



(Fischer, 2009)

Improvements from breeding



Selection for:

Appearance

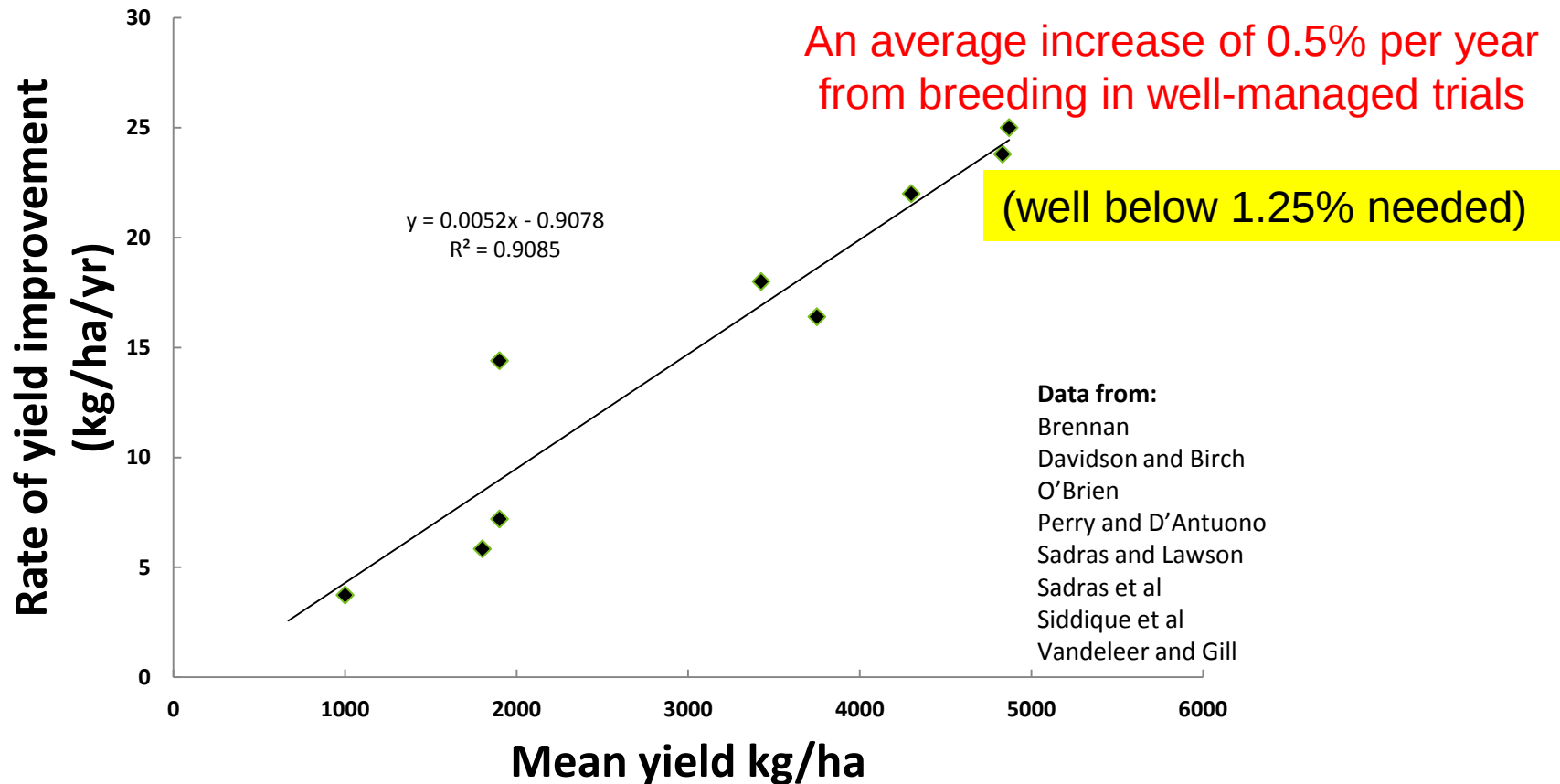
Disease
resistance

Grain quality

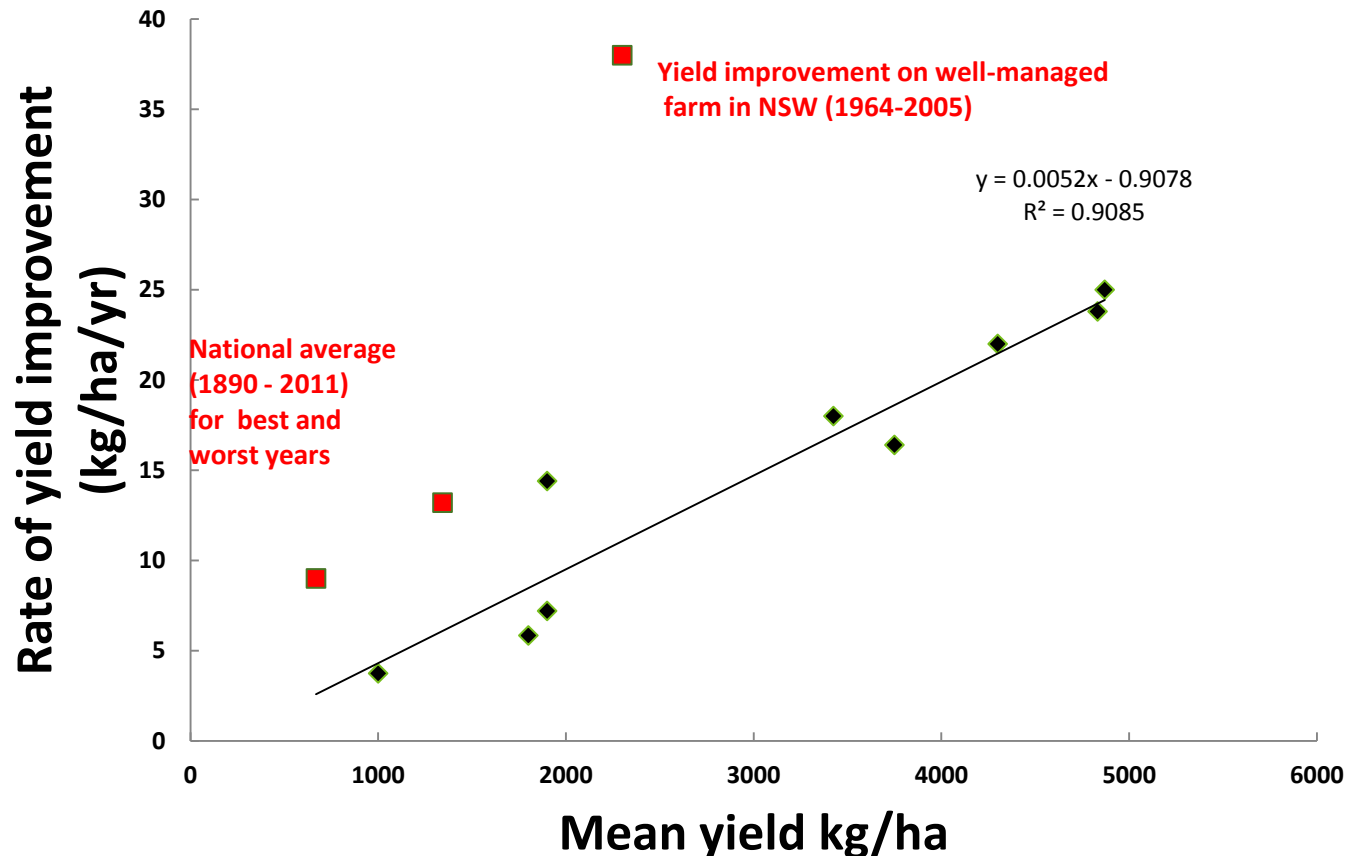
Grain yield

Improvements from breeding

(9 studies of historical sets of varieties)



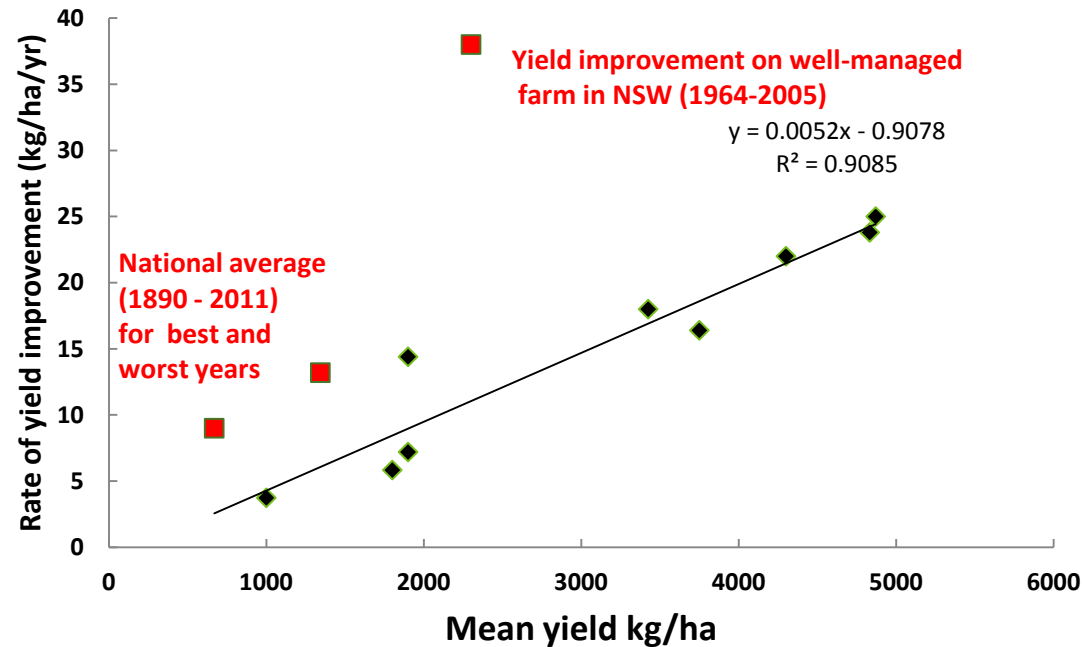
Improvements from breeding (9 studies of historical sets of varieties)



Data from:

Brennan
Davidson and Birch
Fischer
O'Brien
Perry and D'Antuono
Sadras and Lawson
Sadras et al
Siddique et al
Vandeleer and Gill

Contributions to yield increases in Australia



Breeding

30%

Agronomy

70%

Similar data from Black, 2008 in eastern Australia and Anderson (2010) in Western Australia

Changes in crop management that have increased wheat yields

Changes in crop management that have increased wheat yields

Improved plant nutrition
(eg chemical fertilizers, legume pastures)

Improved timing of operations
(eg mechanisation, herbicides, reduced tillage, stubble retention)

Break crops
(to reduce soil pathogens, crop weeds, improve nutrition)



Some lessons – wheat yield improvement in Australia

- History suggests that management leads and breeding follows (although there are some exceptions).
- Rates of improvement are too slow
- Breeding progress is slow and gradual (no miracles)
- Working with a receptive agronomist or a receptive breeder will enhance progress
- Delivery and impact needs to be improved