Can we make better use of water available during the growing season in crop production?

An *in silico* exploration of in-season canopy adjustment in sorghum

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- **Approaches to maximise water use**
- **Possibility of in-season canopy adjustment**
- ***In silico*** study**
- **Results**
- **Summary / discussion**

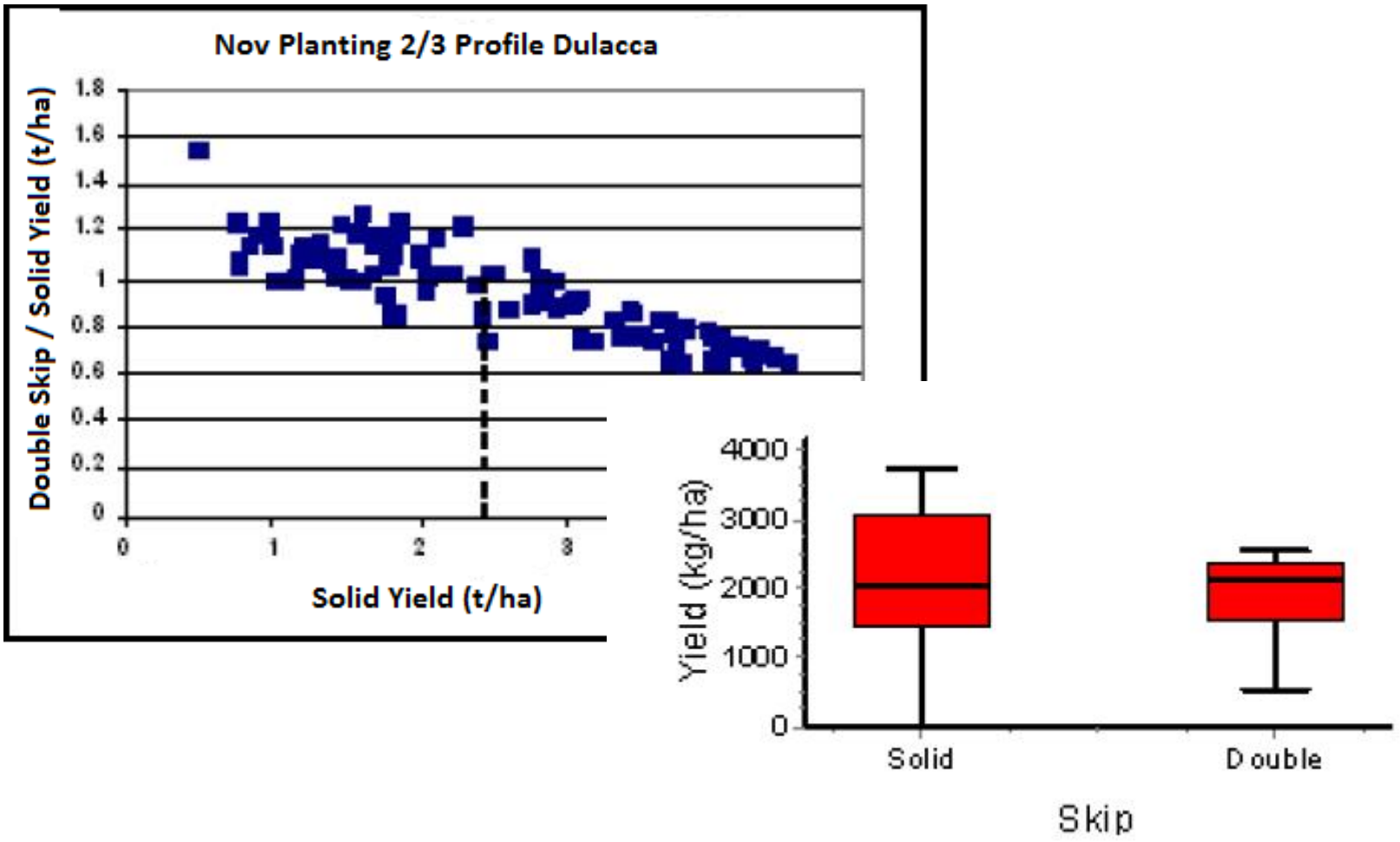
*** *In silico*** is an expression used to mean "performed on computer or via computer simulation."

Productivity in Australian field crops is limited largely by water – timing and availability

Current management

- Select row configurations to adapt canopy configurations
- Adjustment at planting
- Missed opportunities

Yield comparisons for skip-row planting



McLean, G. and Whish, J. and Routley, R. and Broad, I. and Hammer, G. (2003) *The effect of row configuration on yield reliability in grain sorghum: II. Modelling the effects of row configuration.* 11th Australian Agronomy Conference, 2-6 February 2003

The question for discussion is:

- Can we use **in season** canopy reduction to make more effective use of available water

- Advantage in good years and not be disadvantaged in bad years – generally better.

- If technologies for canopy adjustment were available – spray-out / genetic is it worthwhile?

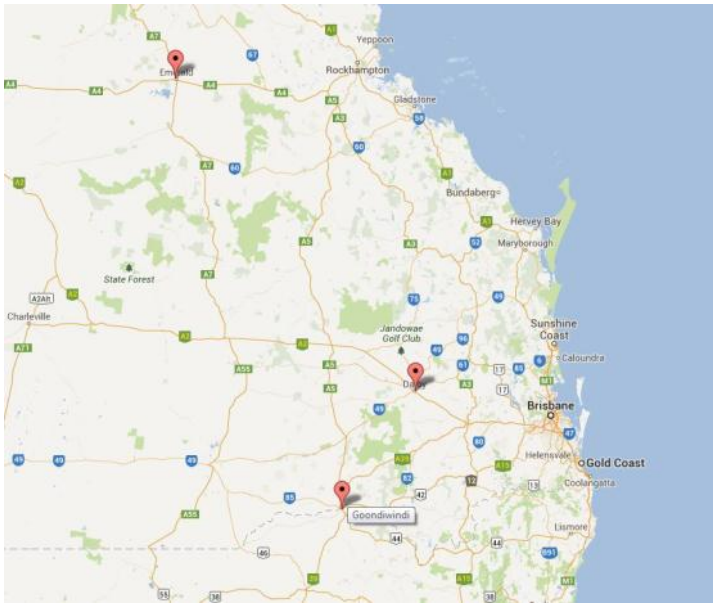
- How can we explore this idea? – simulation study.

ASGC 2013

Simulation Study Scenarios:

Sites :

- Emerald (150mm)
- Dalby (200mm)
- Goondiwindi (180mm)



Sowing :

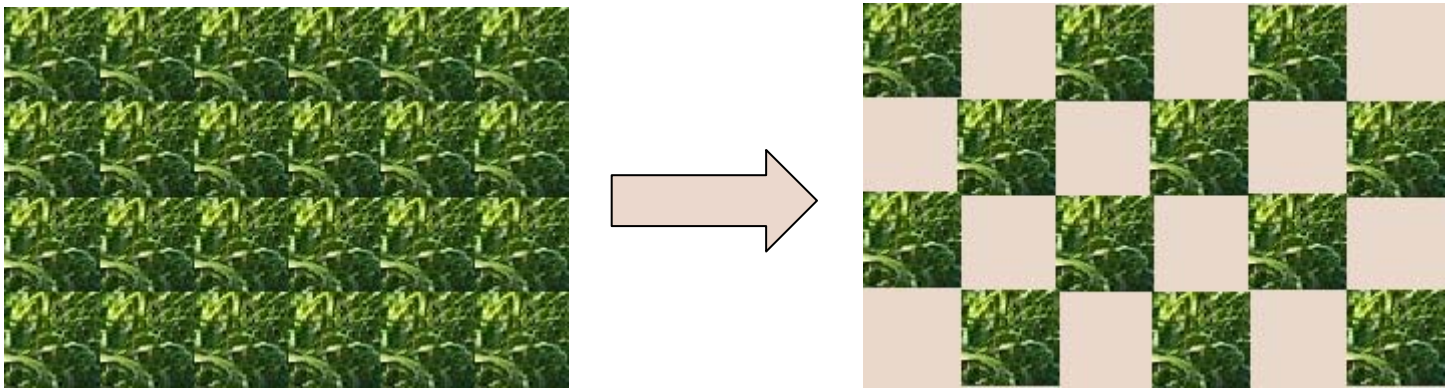
- Monthly 15-Aug to 15-Feb
- Buster, 1m row solid and skip
- 100K, 50K, 25K plant populations
- Non-limiting N
- Starting Soil Water 90mm

Canopy Reduction :

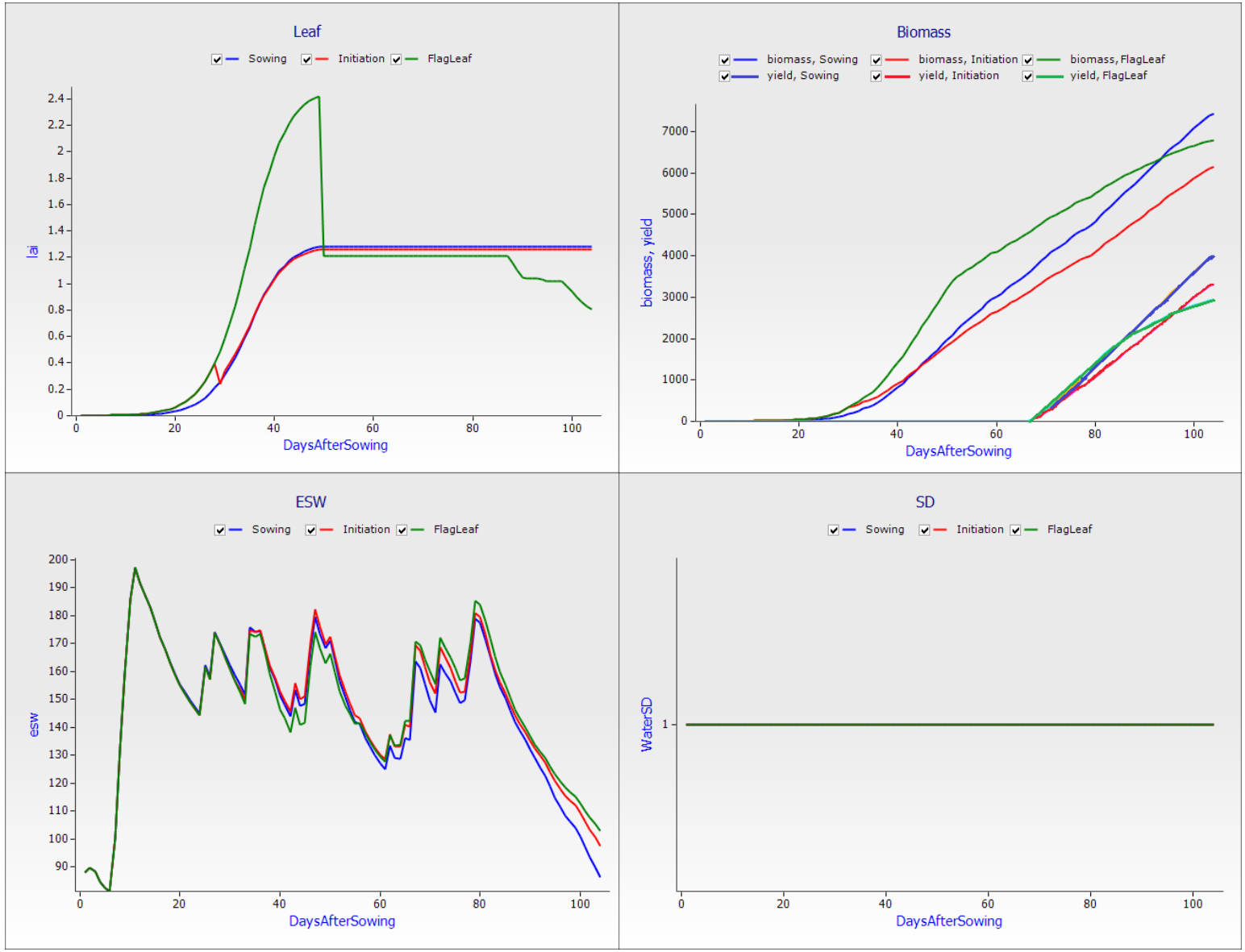
- Reduce canopy size to 50% by reducing population at different development stages

Method:

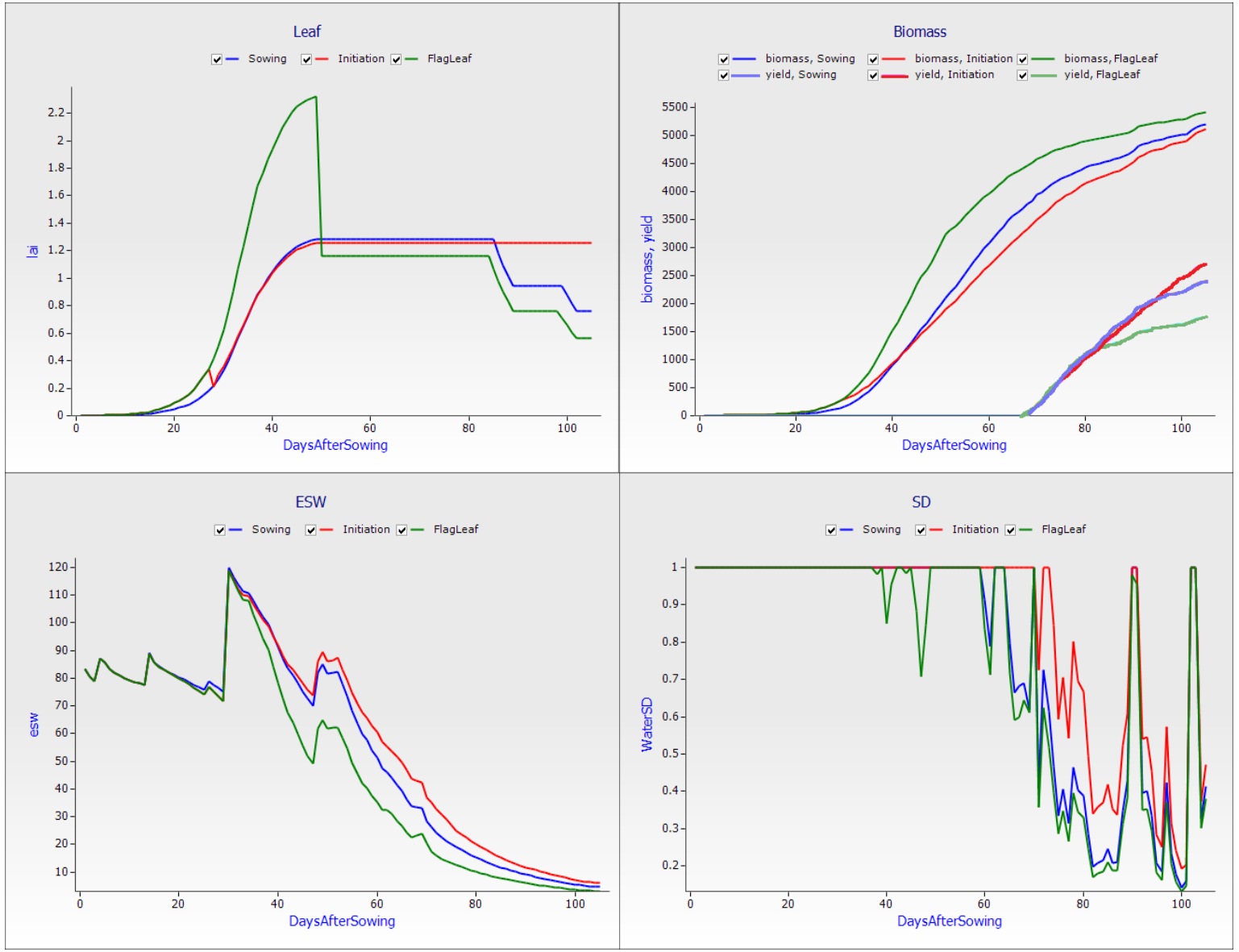
- Change canopy leaf area at different times to 50% by reducing the live population.
- This changes light interception which then affects potential growth and crop water use.
- Simulate yield as an indicator. The relative yield is our indication of effective use of water



Seasonal Simulation – No Stress

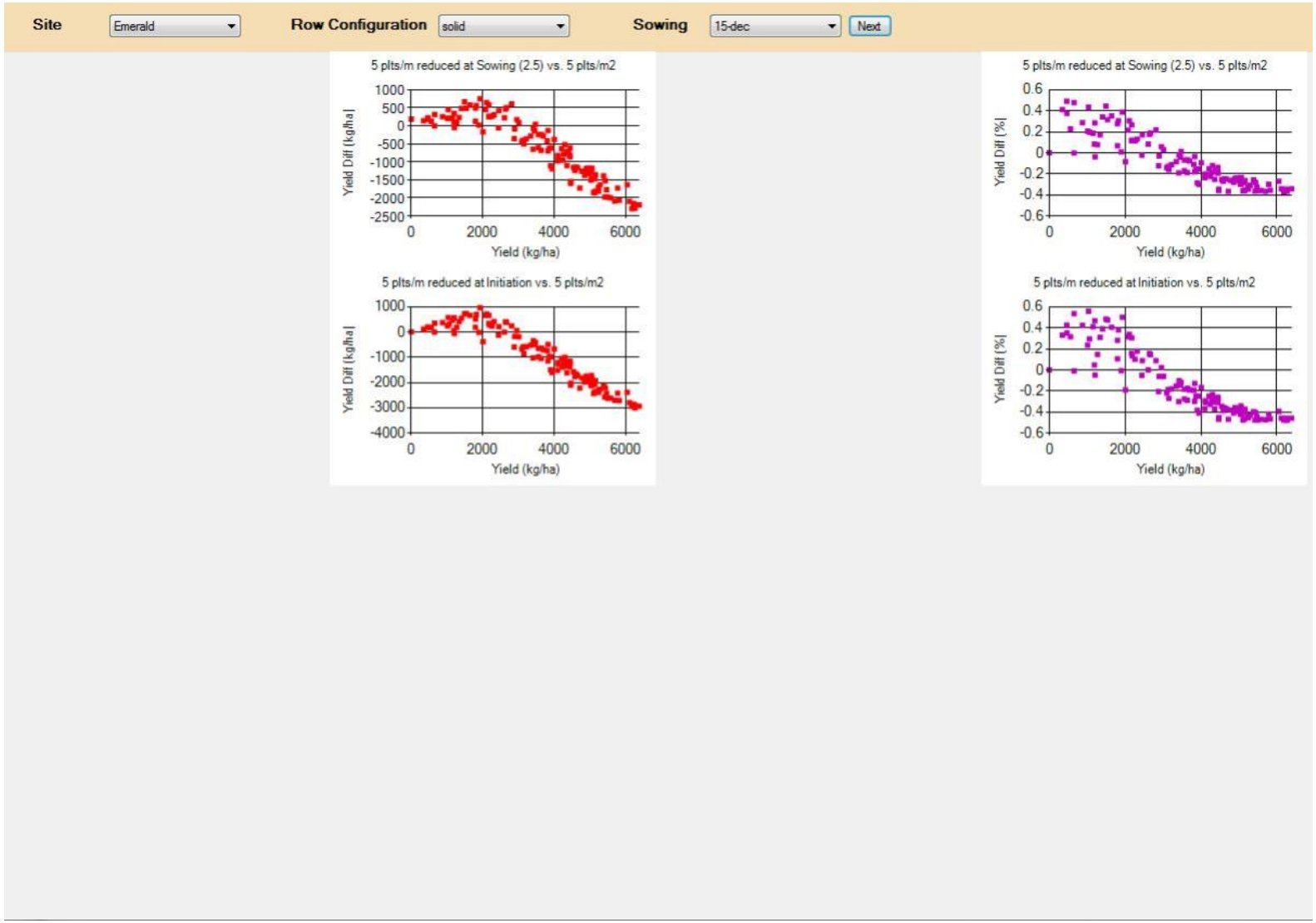


Seasonal Simulation – Terminal Stress



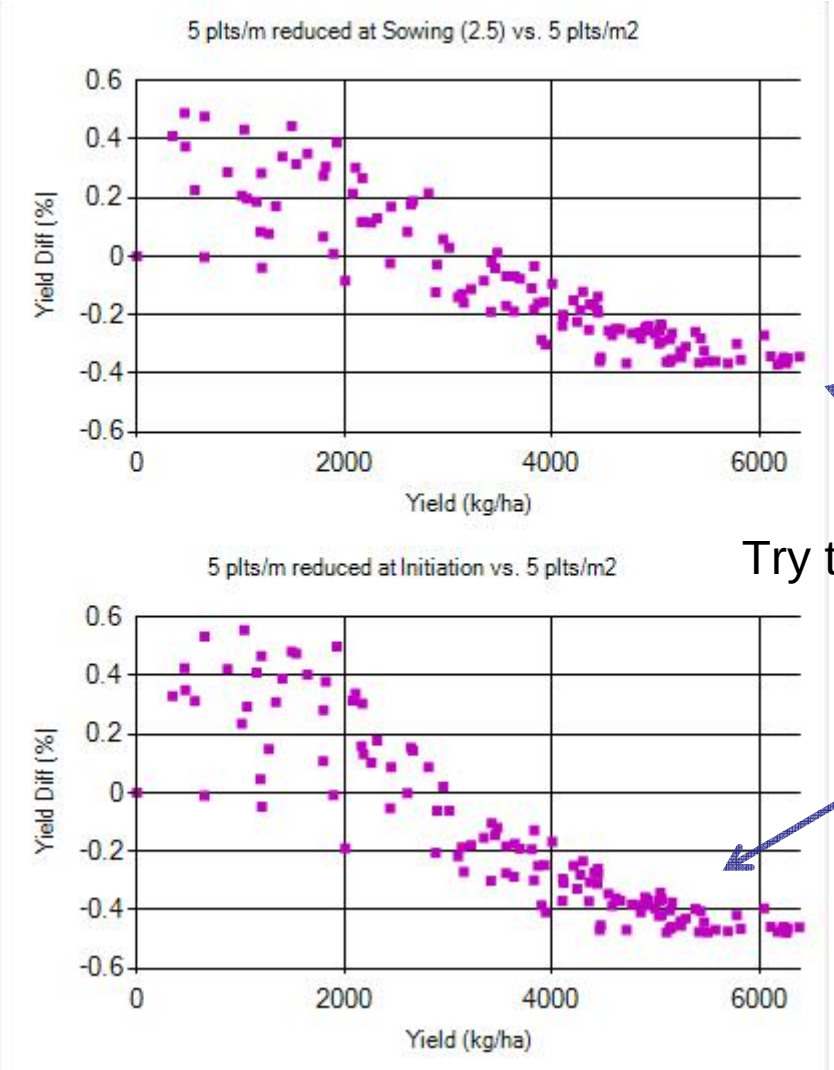
Long Term Simulations

Timing

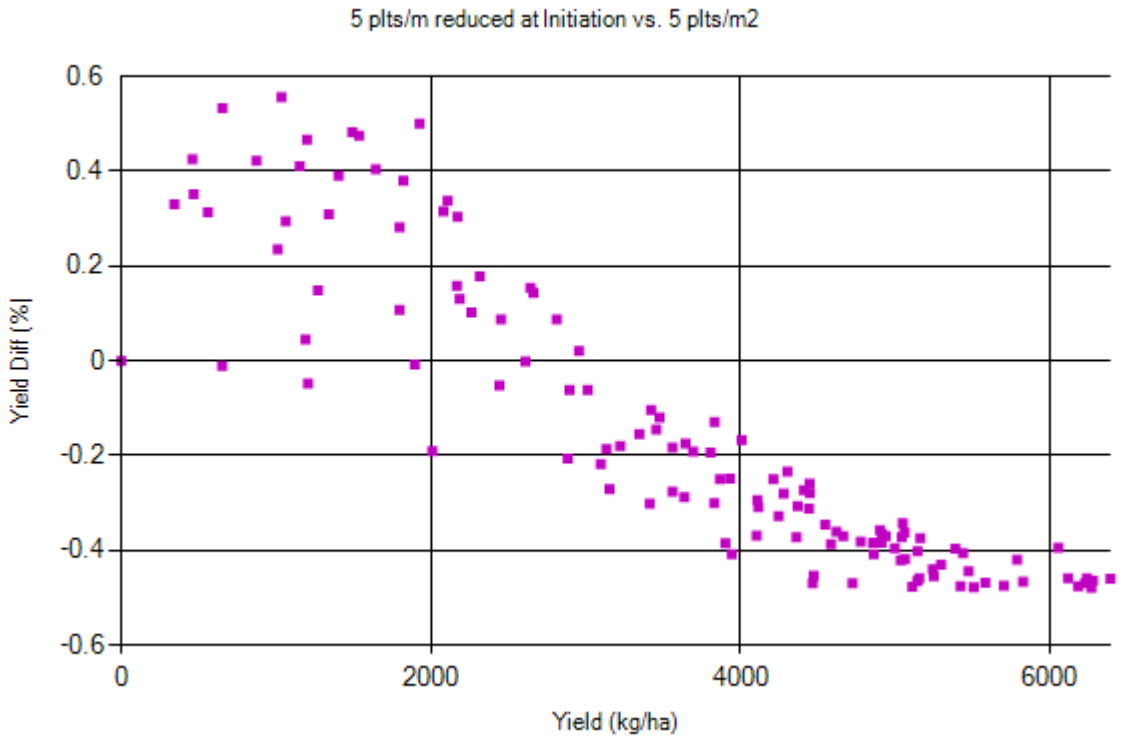


Population

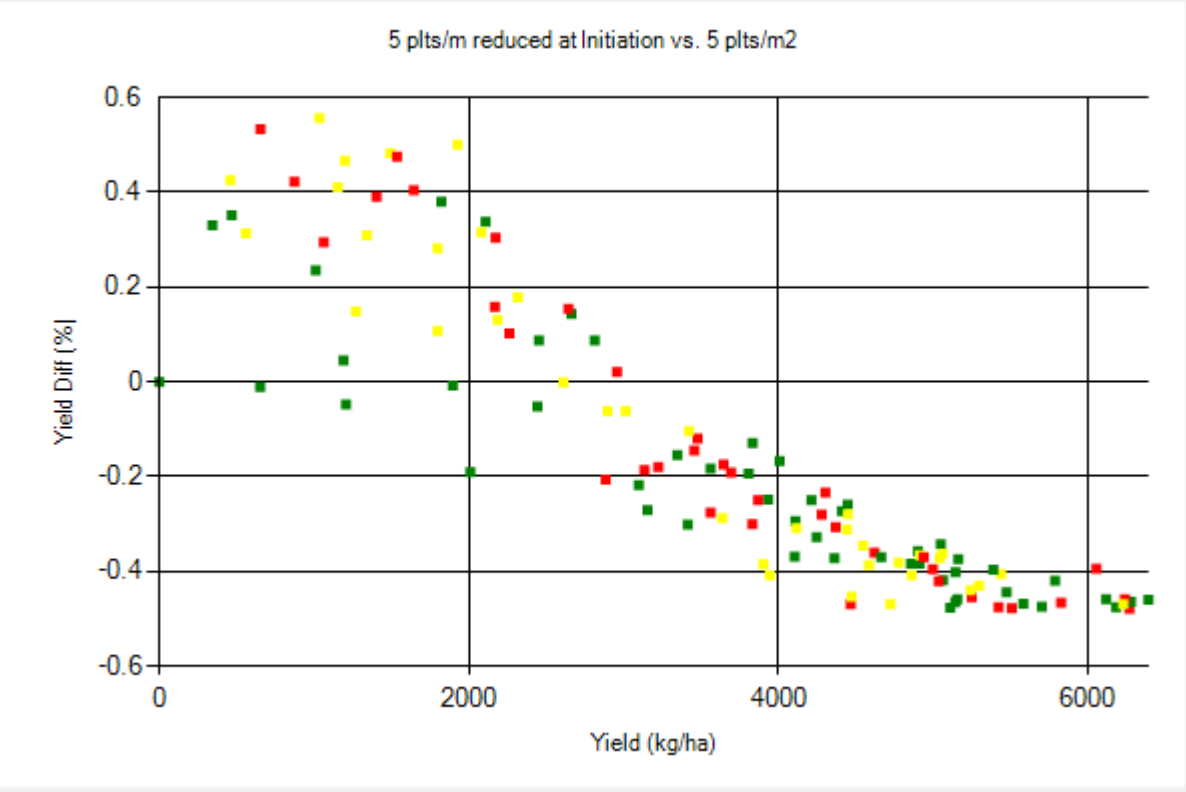
Long Term Simulations



Try to capture these years



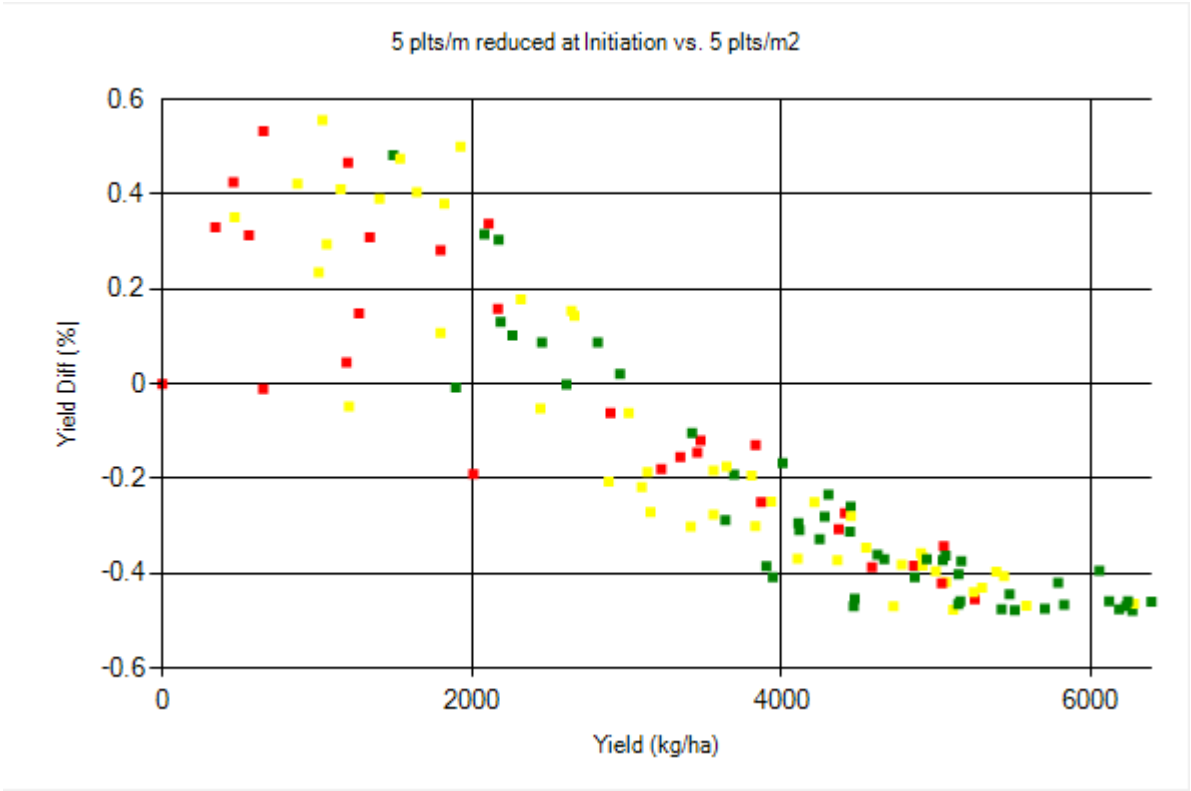
How can we decide?



How can we decide?

ENSO

- Positive
- Negative
- None



How can we decide?

Soil Water

- High
- Medium
- Low

Points for discussion

- In season canopy adjustment can provide potential benefit in lower yielding years
- Decision needs to be made early
- We need better predictors of seasonal trends
- Value if in silico experiments - impossible to do in any other way with the large variation in seasons

- Thank you