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CREATE CHANGE

Grain Sorghum Modelling - Developing new production areas in NW NSW

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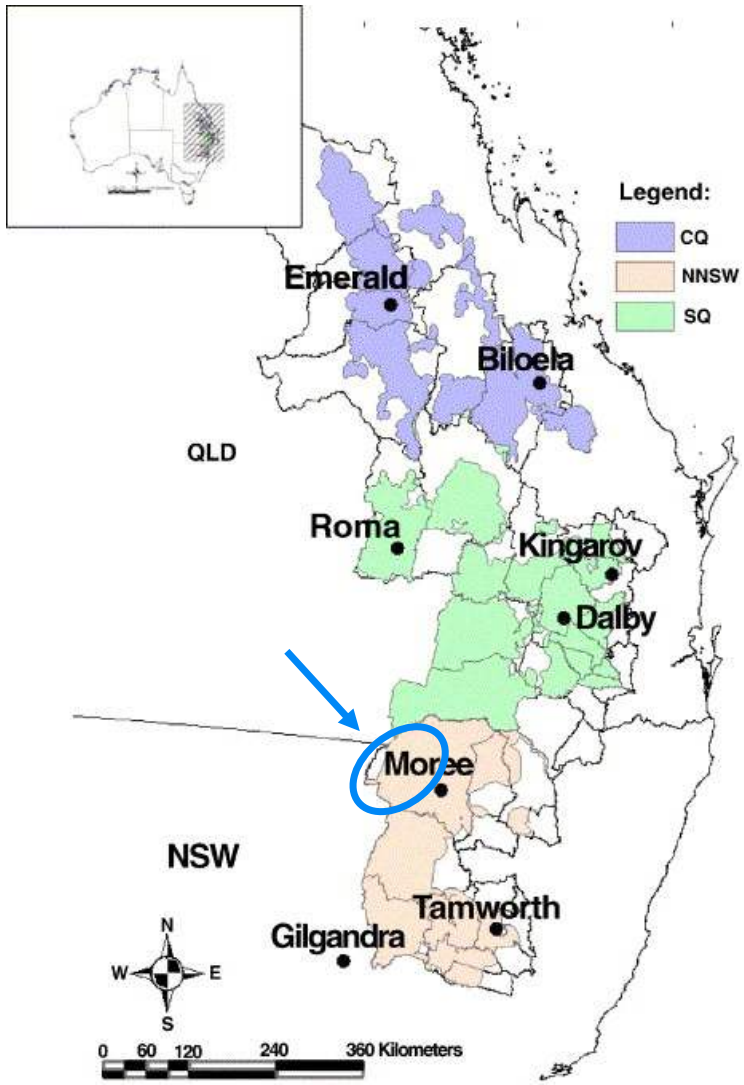

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Sorghum cropping in NW NSW

Farming systems in NW NSW typically rely on winter crop production

Interest in sorghum for the region is growing

- Rotational need
- Grower generation change
- Recent successful seasons

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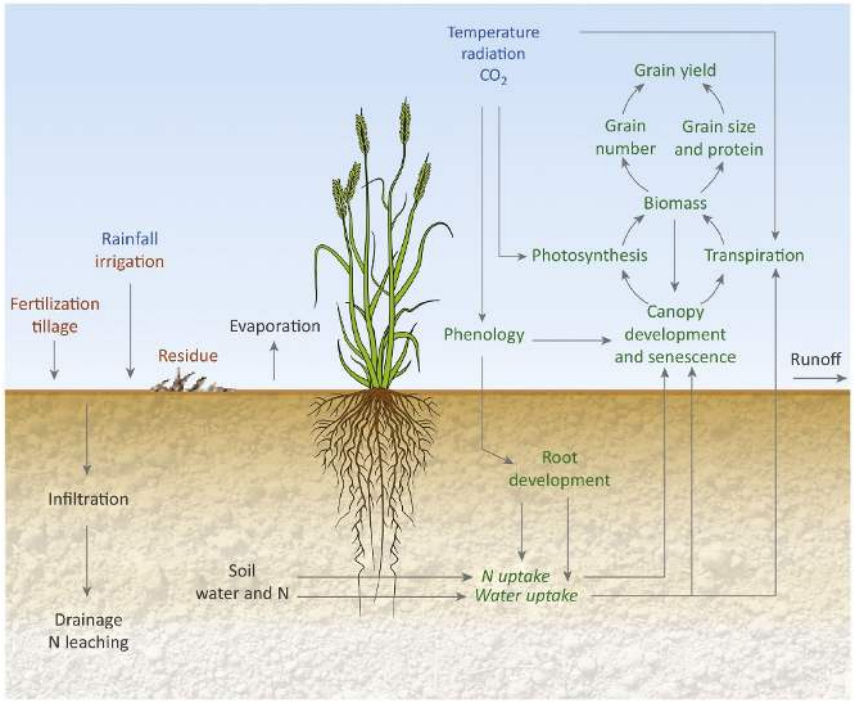
→

What is the potential for sorghum in the region?

How do we know when not to plant, and how do we maximise production when we do?

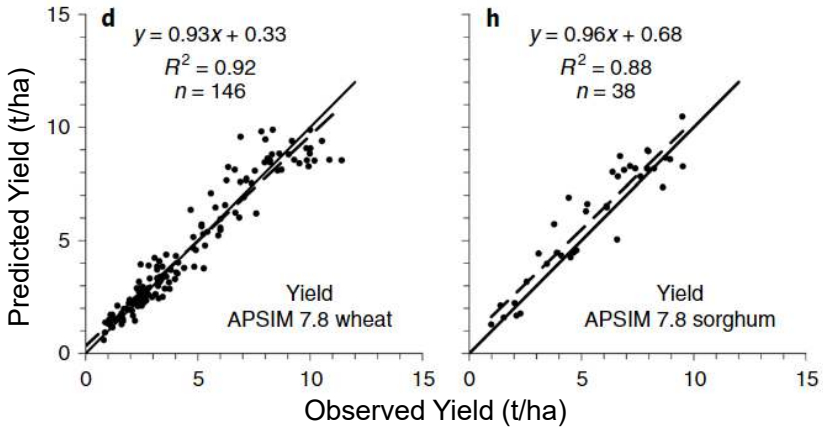
1. Chance of getting planting opportunities
2. Combinations of soil water x forecast = no planting?
3. Best trait x management strategies

We can use APSIM to simulate crop production and explore GxMxE interactions



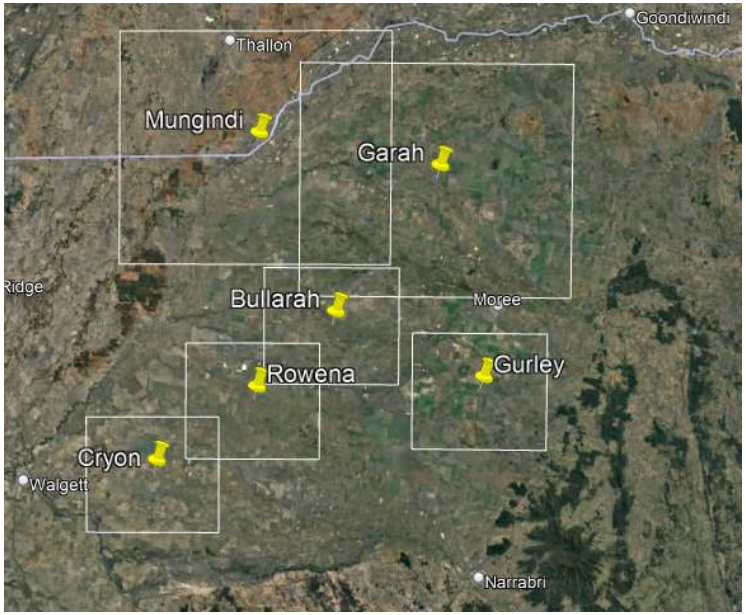
Trends in Plant Science

- Captures dynamics of crop growth and development through the life cycle
  - Incorporates water balance, N balance, and energy balance
  - Organ/ plant level and crop yield predictions
- Capacity to simulate consequences of trait variation and crop management for diverse E
- Attention to validation on field data



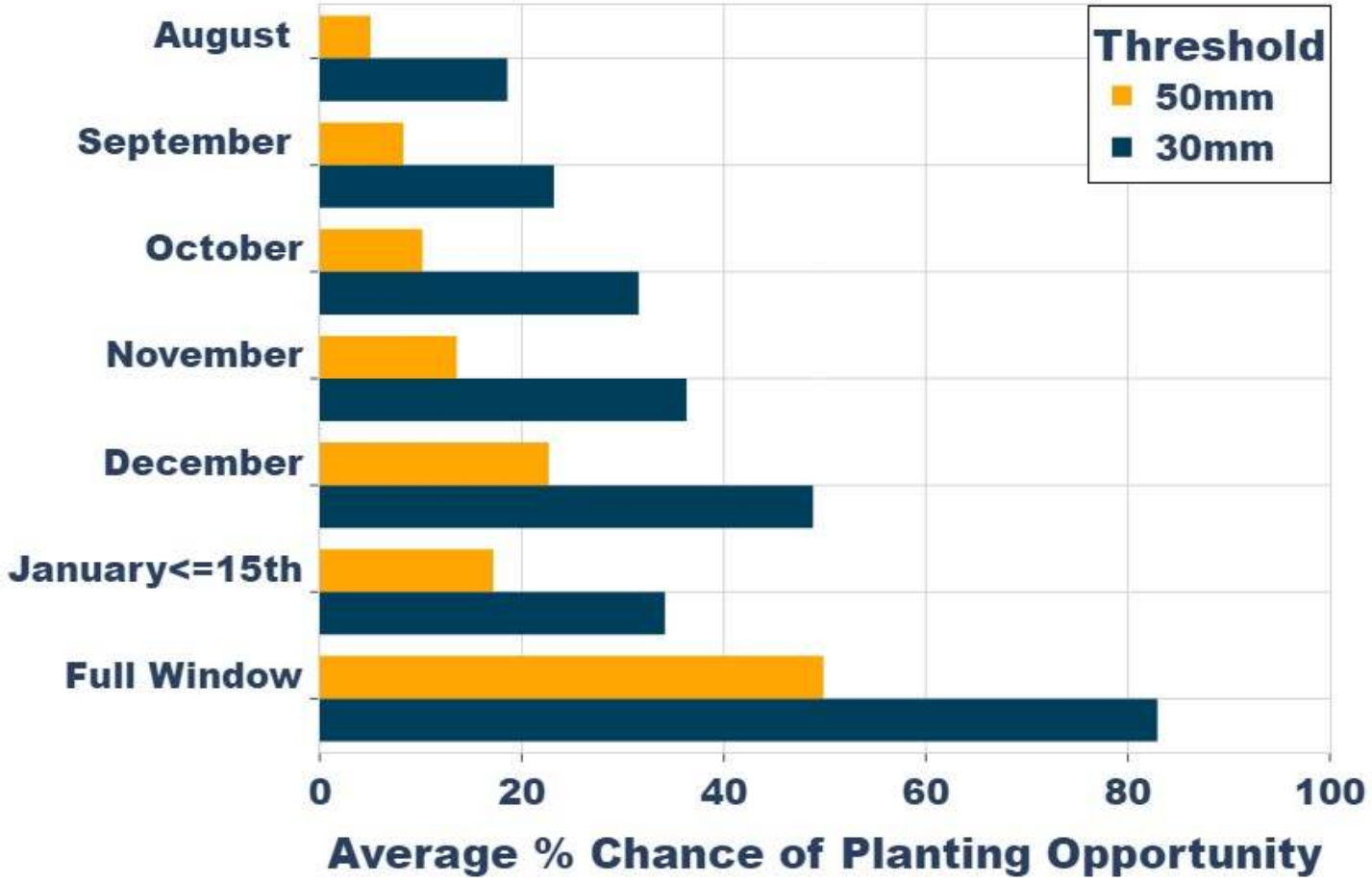
Implementation of the region in a simulation

→ Using over 120 years of historical weather data



Site	Soil Type	PAWC (mm)	Source
Bullarah	Vertosol	217	Loretta Serafin – 'Mallawa Heathfield'
Cryon	Grey Vertosol	198	APSoil #1017
Garah	Grey Vertosol	221	APSoil #865
Gurley	Black Vertosol	300	APSoil #877
Mungindi	Vertosol	267	Loretta Serafin – 'Mungindi Jabiru'
Rowena	Grey Vertosol	272	APSoil #126

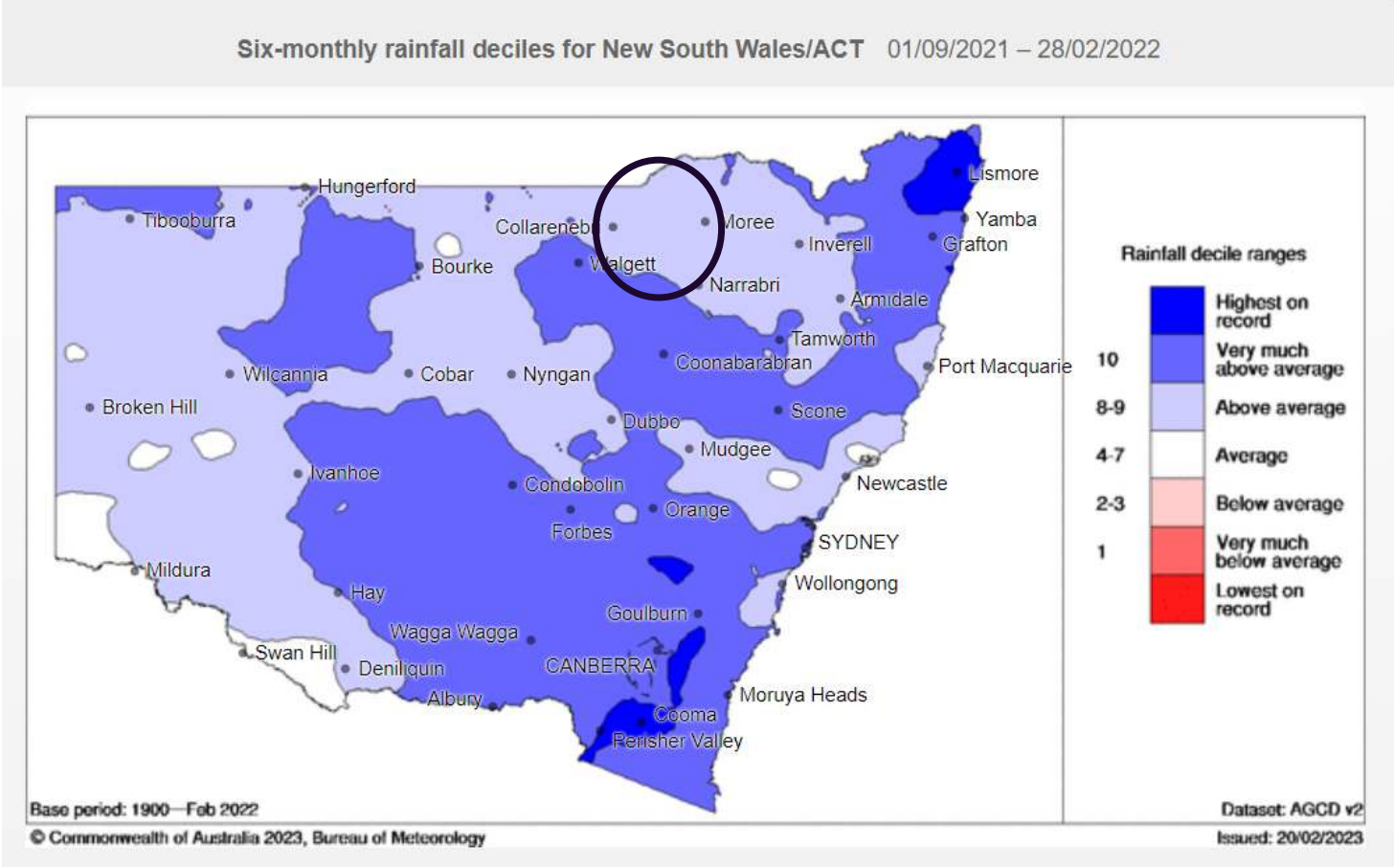
Characterising historical planting opportunities

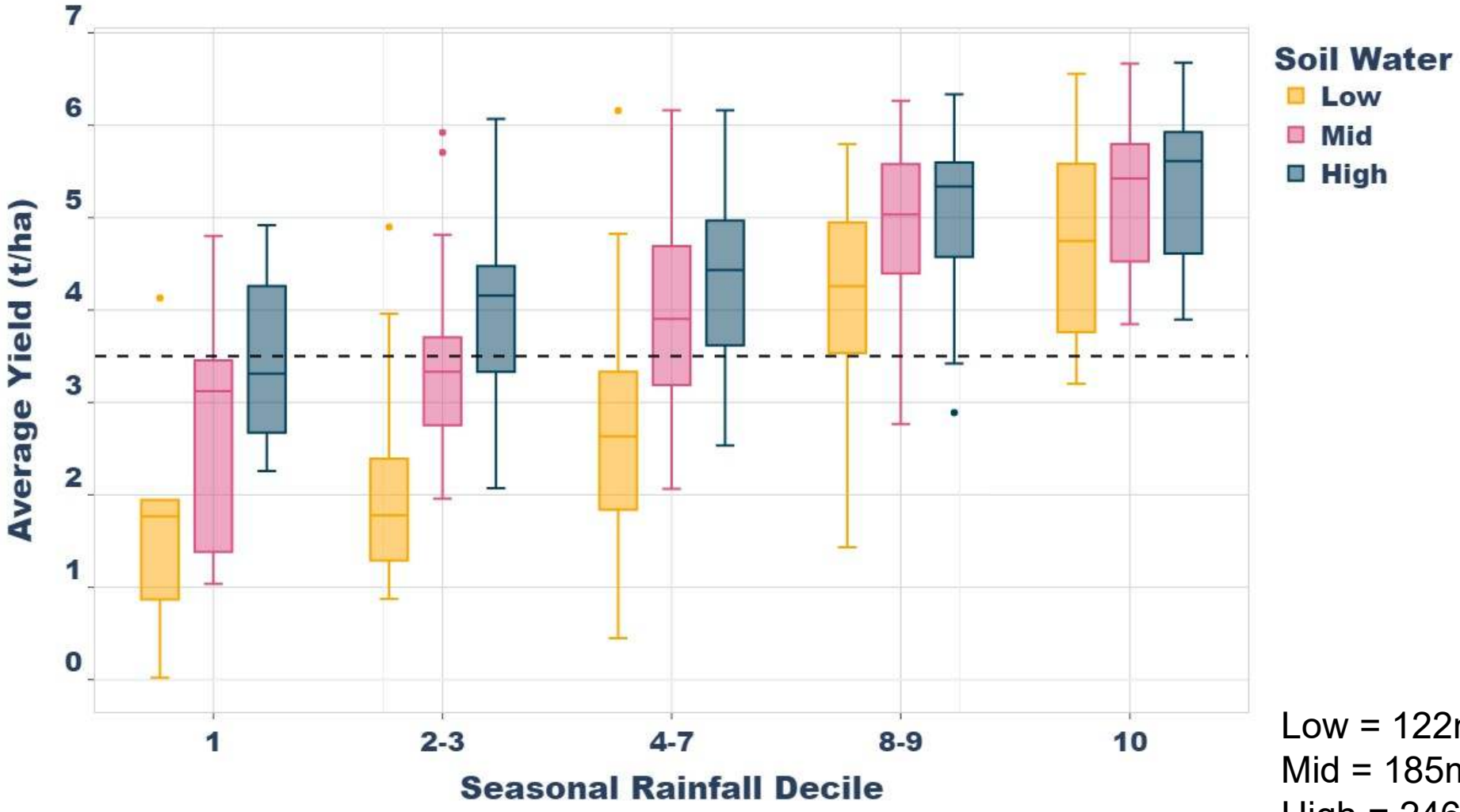


Informing criteria to plant – historical rainfall deciles

What combination of soil water x forecast = no planting?

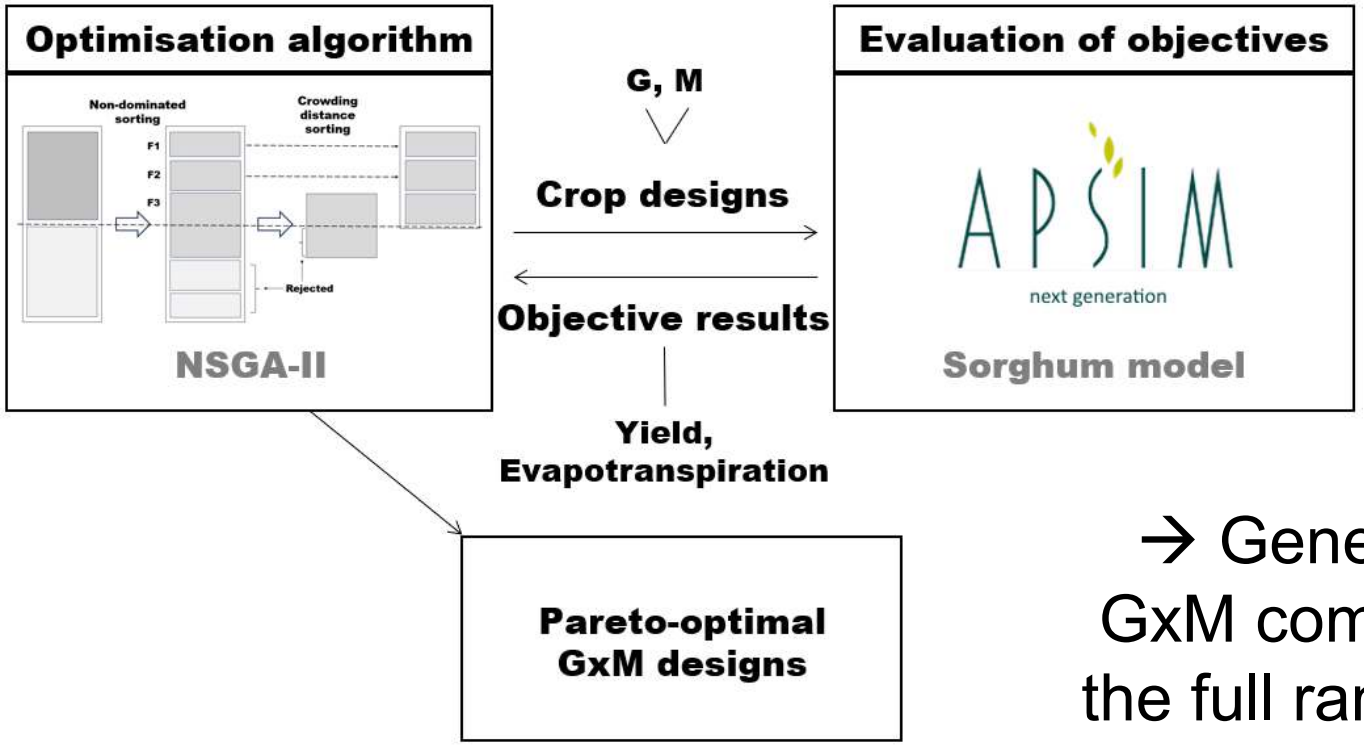
Seasonal rainfall decile determined each season 1900-2022





Low = 122mm avg.
Mid = 185mm avg.
High = 246mm avg.

Maximising production when you do plant…



Best trait x management combinations?

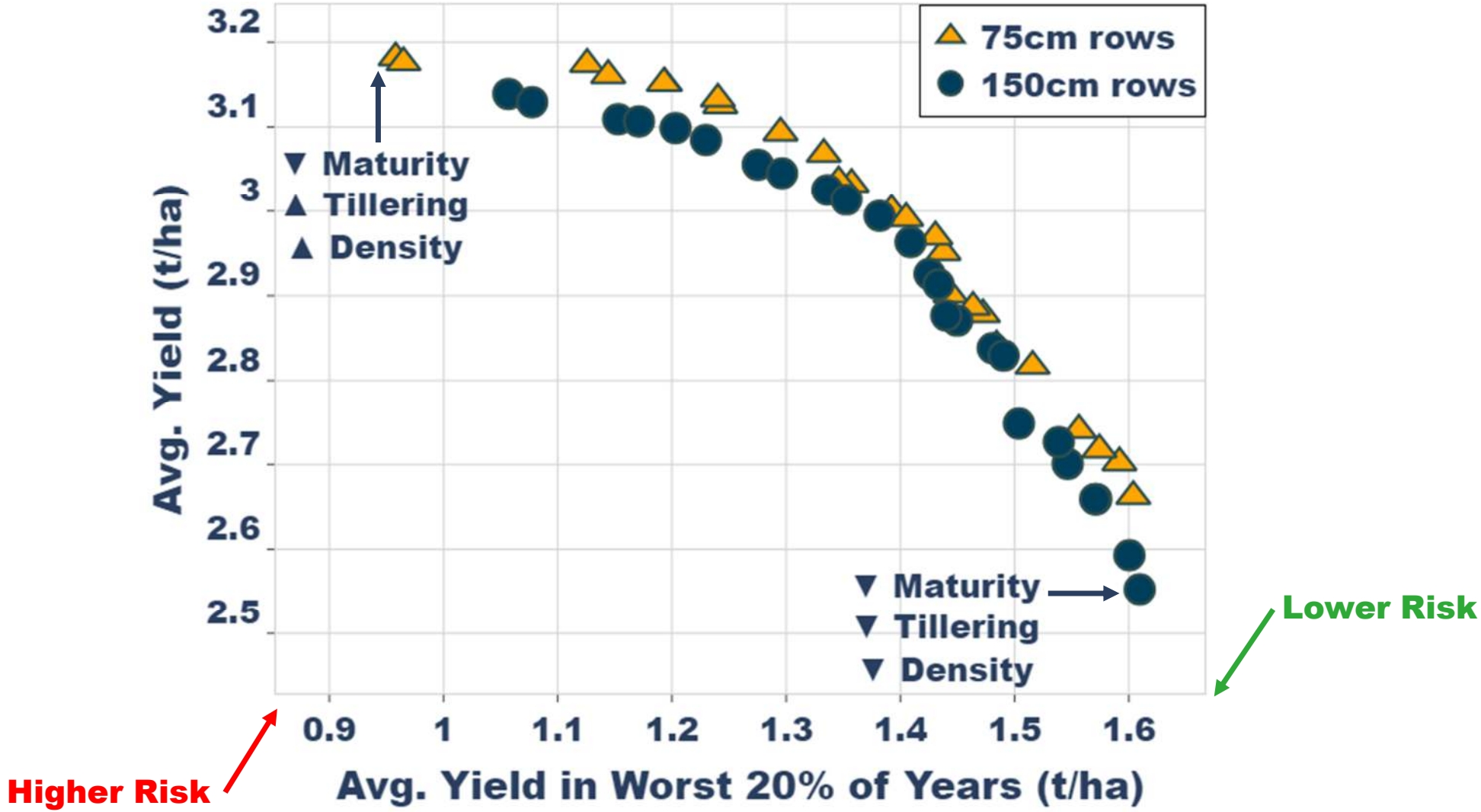
→ Generates a set of optimal GxM combinations representing the full range of criteria trade-offs

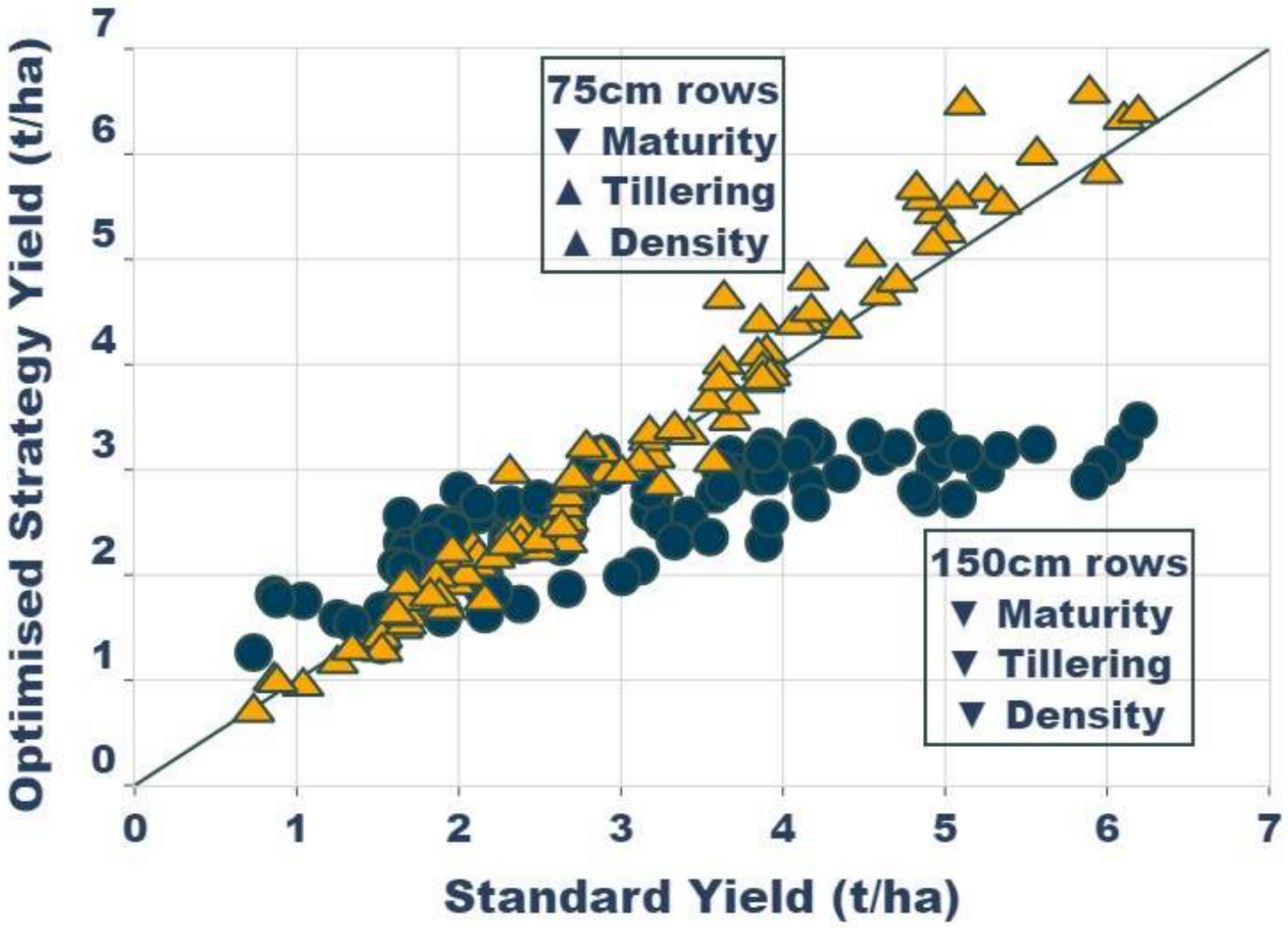
Optimisation and simulation specifications

Design Variables		Criteria
Maturity (End Juv to FI)	130 – 190 DD	Average yield (t/ha)
Tillering	-2 – 2 fertile tillers	Average yield in lowest 20% years (t/ha) – "Risk"
Planting density	3-10 /m2	

Site	Soil Type	PAWC (mm)	Source
Garah	Grey Vertosol	221	APSoil #865
	Black Vertosol	117	APSoil #234

Evaluating 75cm vs 150cm wide rows


75cm rows
150cm rows
Maturity
Tillering
Density
Maturity
Tillering
Density
Avg. Yield (t/ha)
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
Avg. Yield in Worst 20% of Years (t/ha)
Lower Risk
Higher Risk


Optimised Strategy Yield (t/ha)
Standard Yield (t/ha)
0
1
2
3
4
5
6
7
75cm rows
▼ Maturity
▲ Tillering
▲ Density
150cm rows
▼ Maturity
▼ Tillering
▼ Density

Evaluation of NW NSW region – take home messages

- Planting opportunities are not too limiting, but require flexibility from growers
- Criteria to plant are likely too conservative – understanding the level of starting soil water will be very valuable here
- Potential in area is good, need to understand limiting factors on-farm – fertiliser
- Both varietal traits and management practices can be optimised to balance productivity and risk – it is possible to improve performance at all yield levels!

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Trevor Philp

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