Charles Sturt University

Gulbali Institute
Agriculture Water Environment

The 100-Day Wheat Ideotype

Tim Green

Dr Sergio Moroni, Dr Felicity Harris, Professor Jim Pratley, Dr Daniel Mullan, Dr Greg Rebetzke

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Charles Sturt University

INTERGRAIN

NSW GOVERNMENT Department of Primary Industries

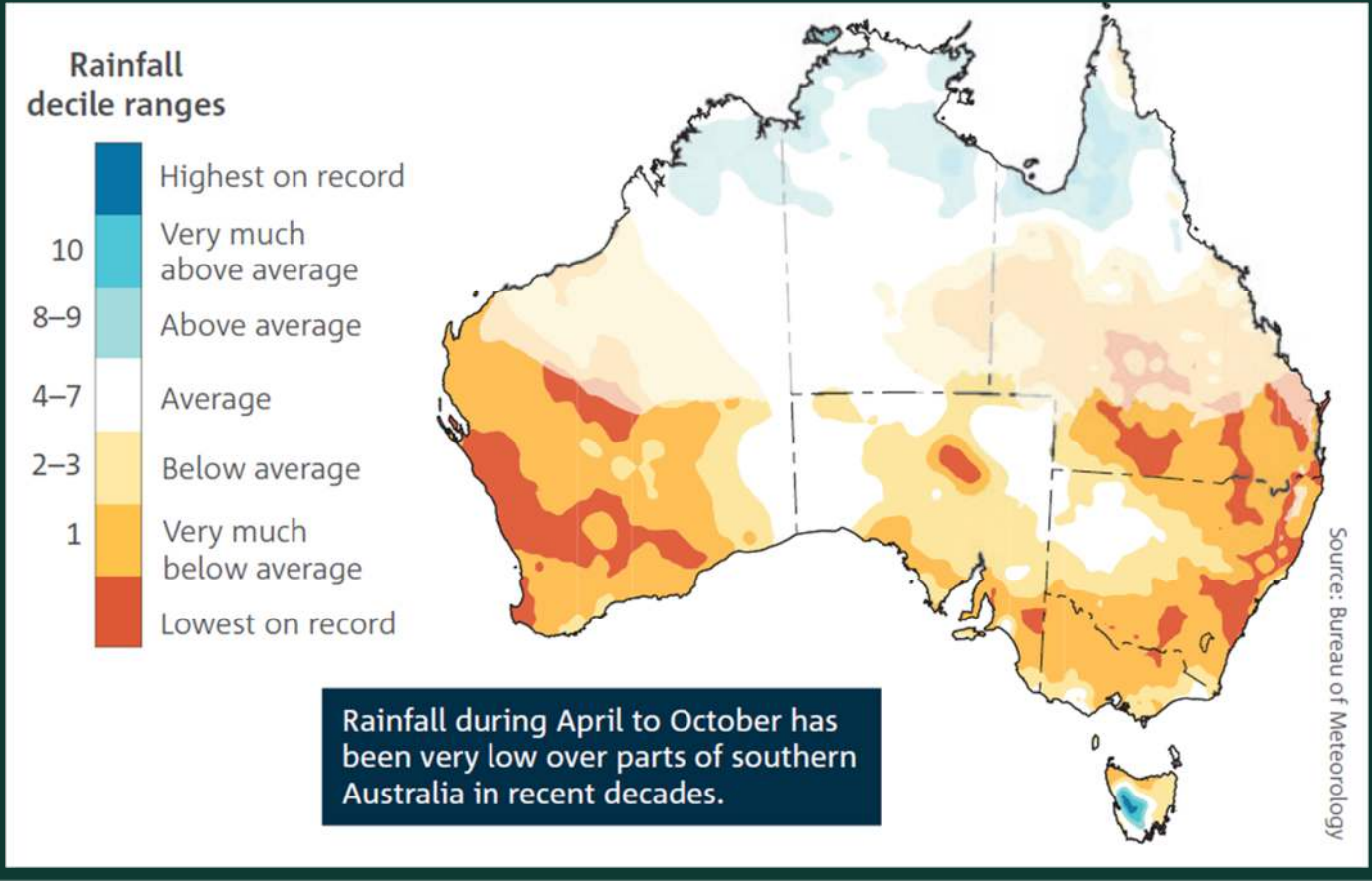
CSIRO

100 days **Sowing** to **Flowering**

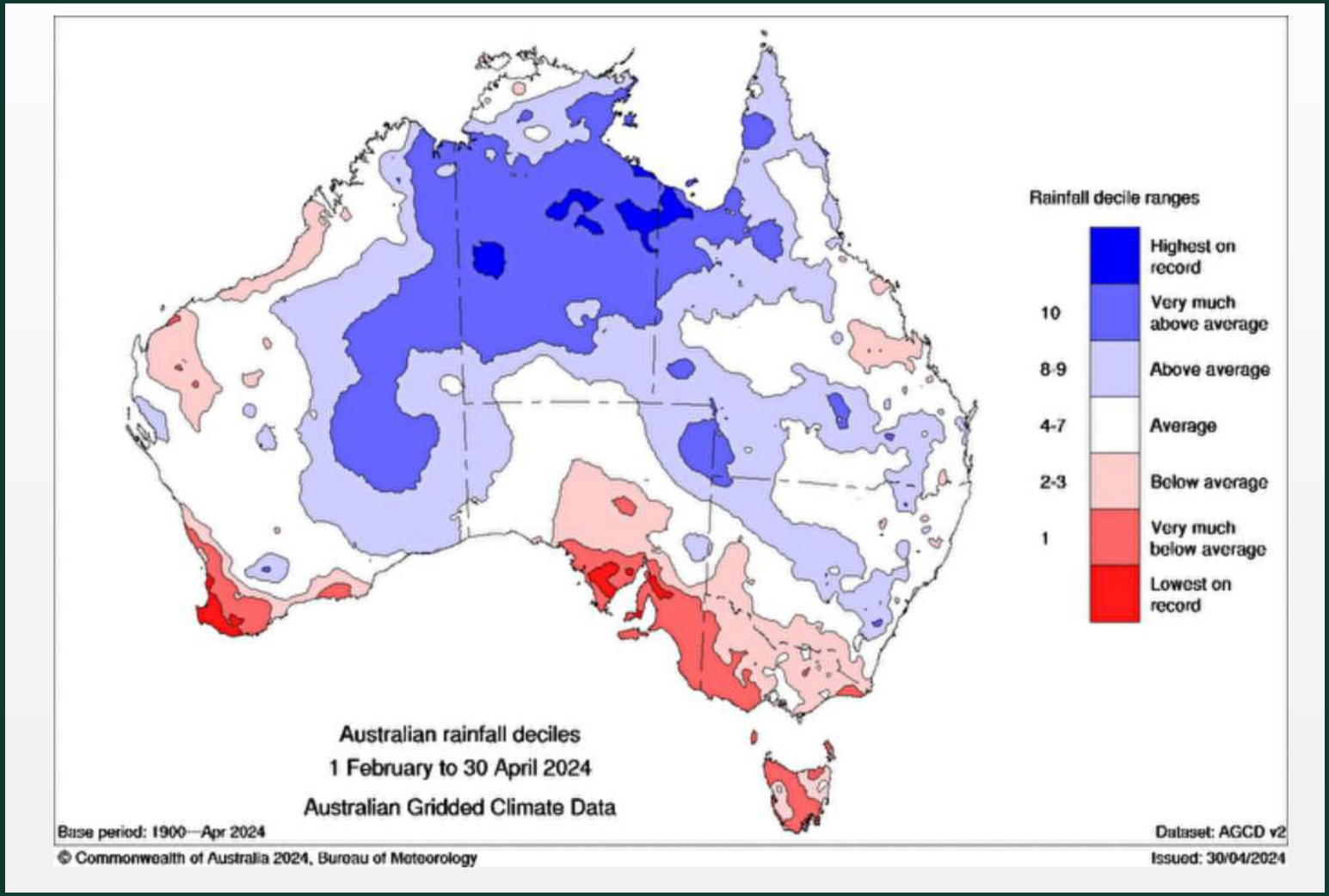
("Normally" ≈ 150d)

Growing Season Rainfall

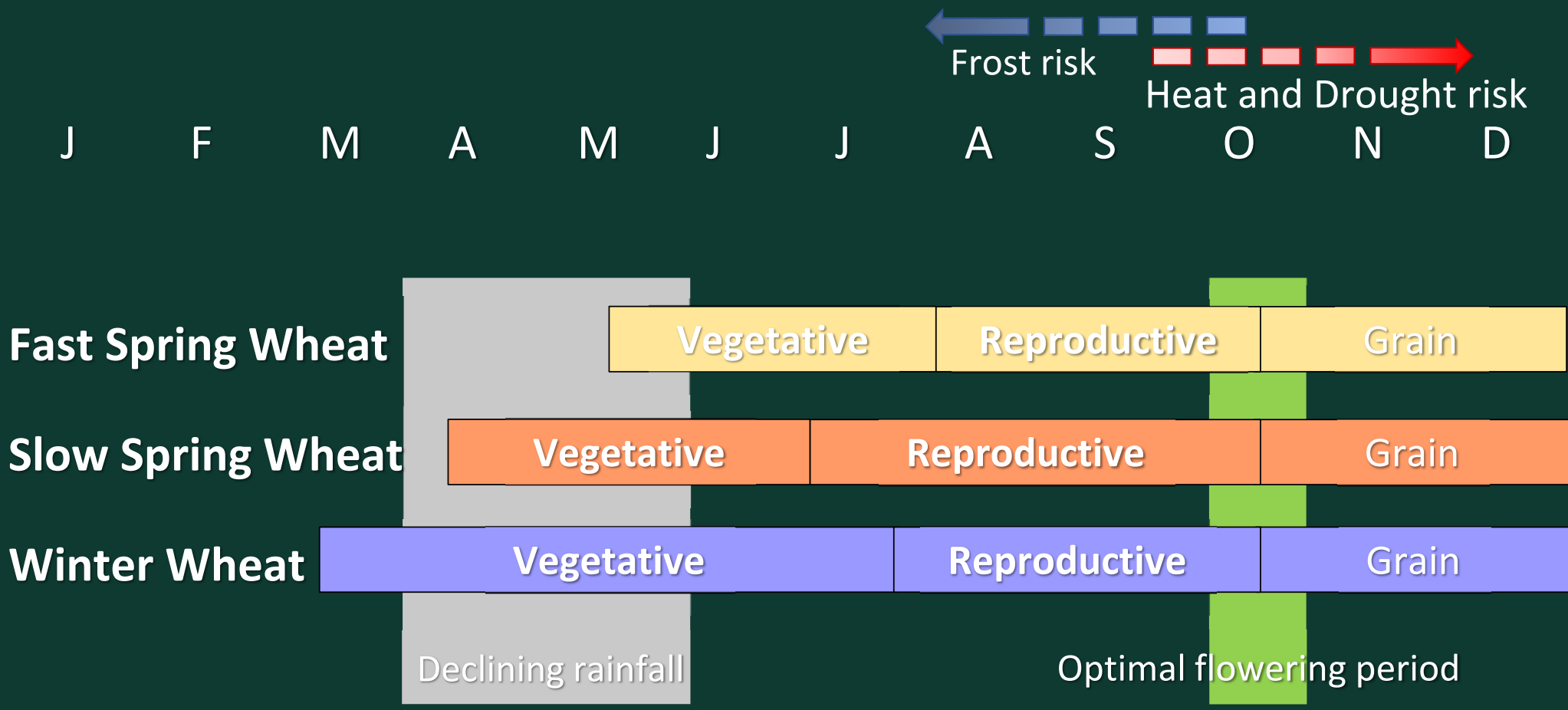
2000-2021 April to October rainfall declining vs. previous 100 years



2024 late break across the country



Current sowing options



Edit of Flohr *et al.* (2018) Field Crops Research 223, 12-25.

WA Context- what's the sowing guide say?

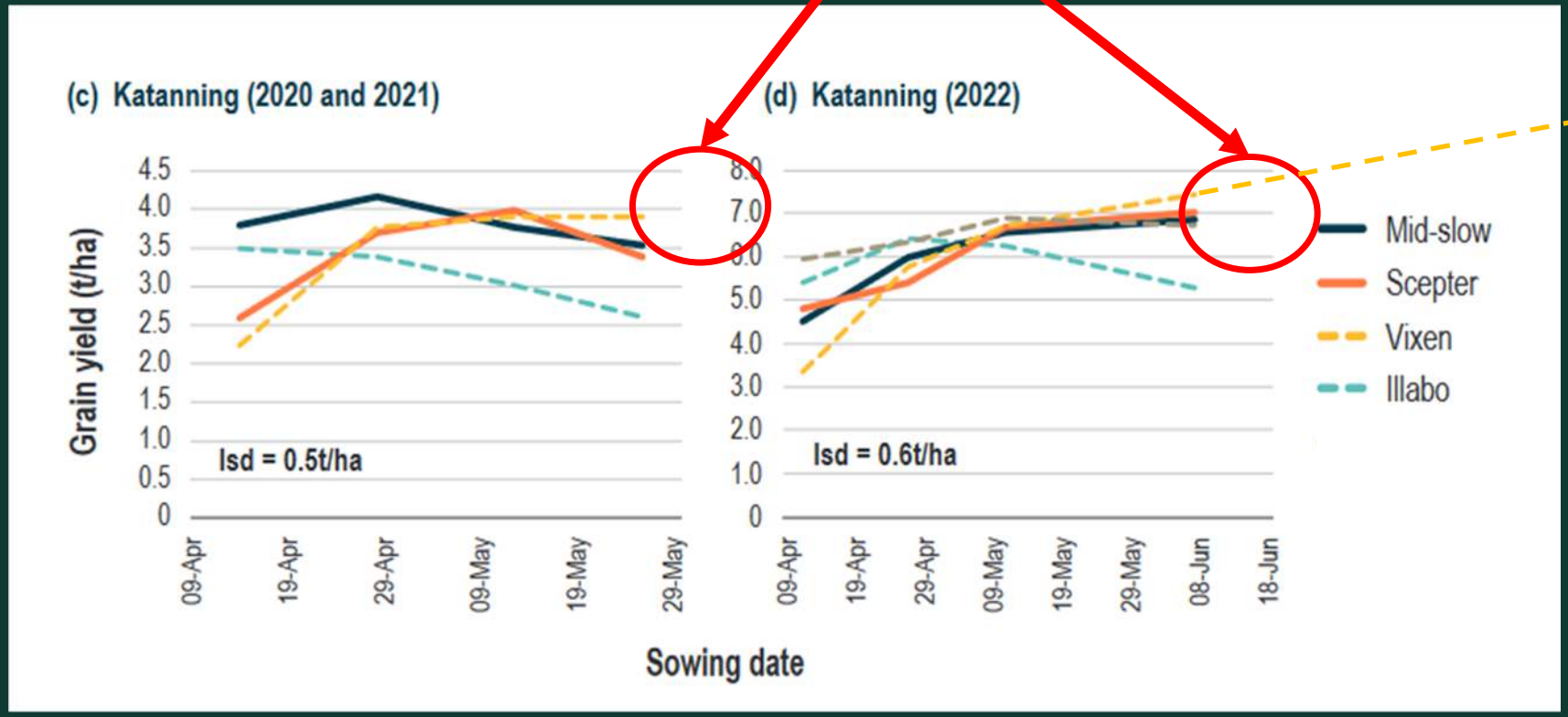
Table 12. Suggested sowing times of wheat varieties in WA (assumes low frost risk)

AGZONES 1–6	April				May				June			
	wk 1	wk 2	wk 3	wk 4	wk 1	wk 2	wk 3	wk 4	wk 1	wk 2	wk 3	wk 4
# Winter wheat (quick): Illabo, Mowhawk												
Mid-slow: Brumby, Catapult, Cutlass, Denison, Kinsei, Magenta, RockStar, Yitpi, Valiant CL Plus, Zen												
Quick-mid to mid: Calibre, Chief CL Plus, Devil, Hammer CL Plus, LRPB Havoc, Mace, Ninja, Scepter, Tomahawk CL Plus												
Quick: Emu Rock, LRPB Anvil CL Plus, LRPB Avenger, Sting, Vixen												

= earlier than ideal = optimum sowing time = later than ideal but acceptable

Suggested sowing times have been given for quick winter wheats such as Illabo or Mowhawk, however these are only applicable to southern WA where the winter types are more adapted to the longer environments (refer to Figures 3 and 4).

So why the 100-day wheat?
Well, what happens here?



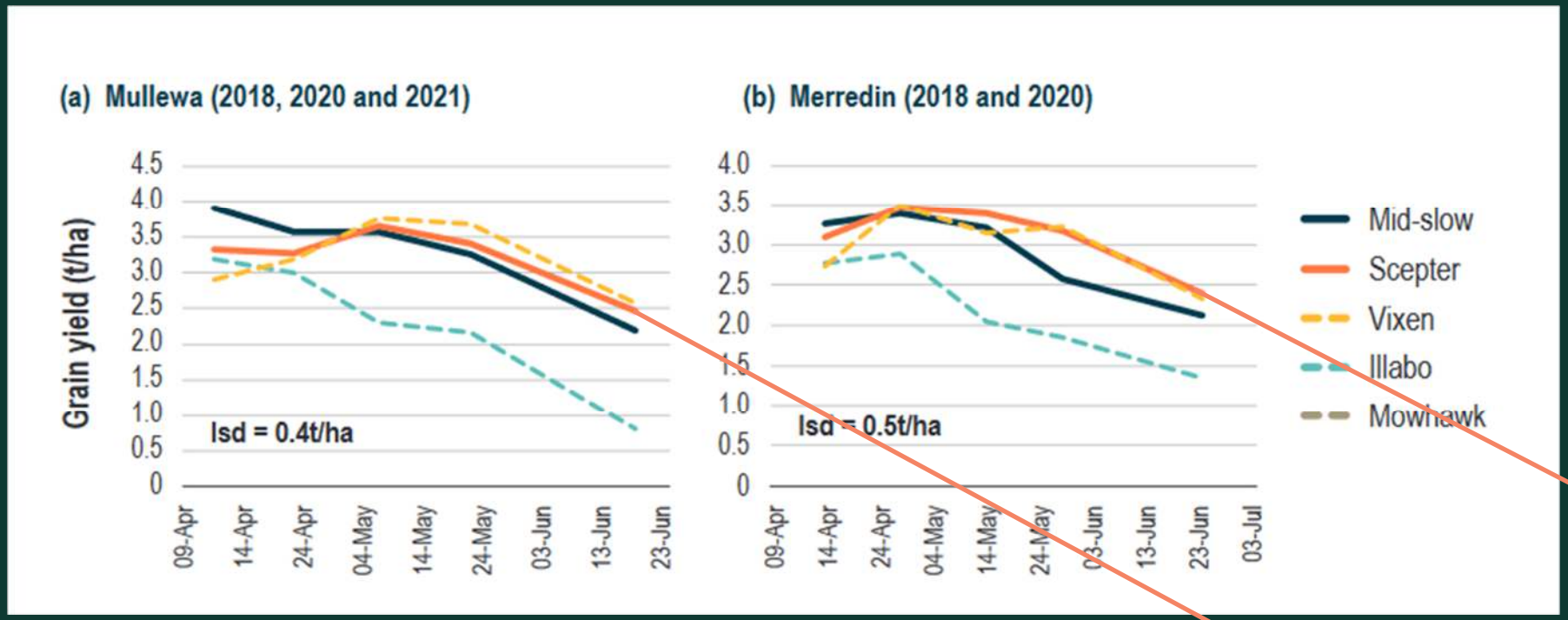
Imagine!

More **Time** = More **Options**

- Changing climate risk mitigation
- DK Weed control
- Large sowing operations (deep rip)
- Lower inputs (urea $$$)
- Double cropping

Summit Ag, X, Jul 5, 2023

What actually happens…

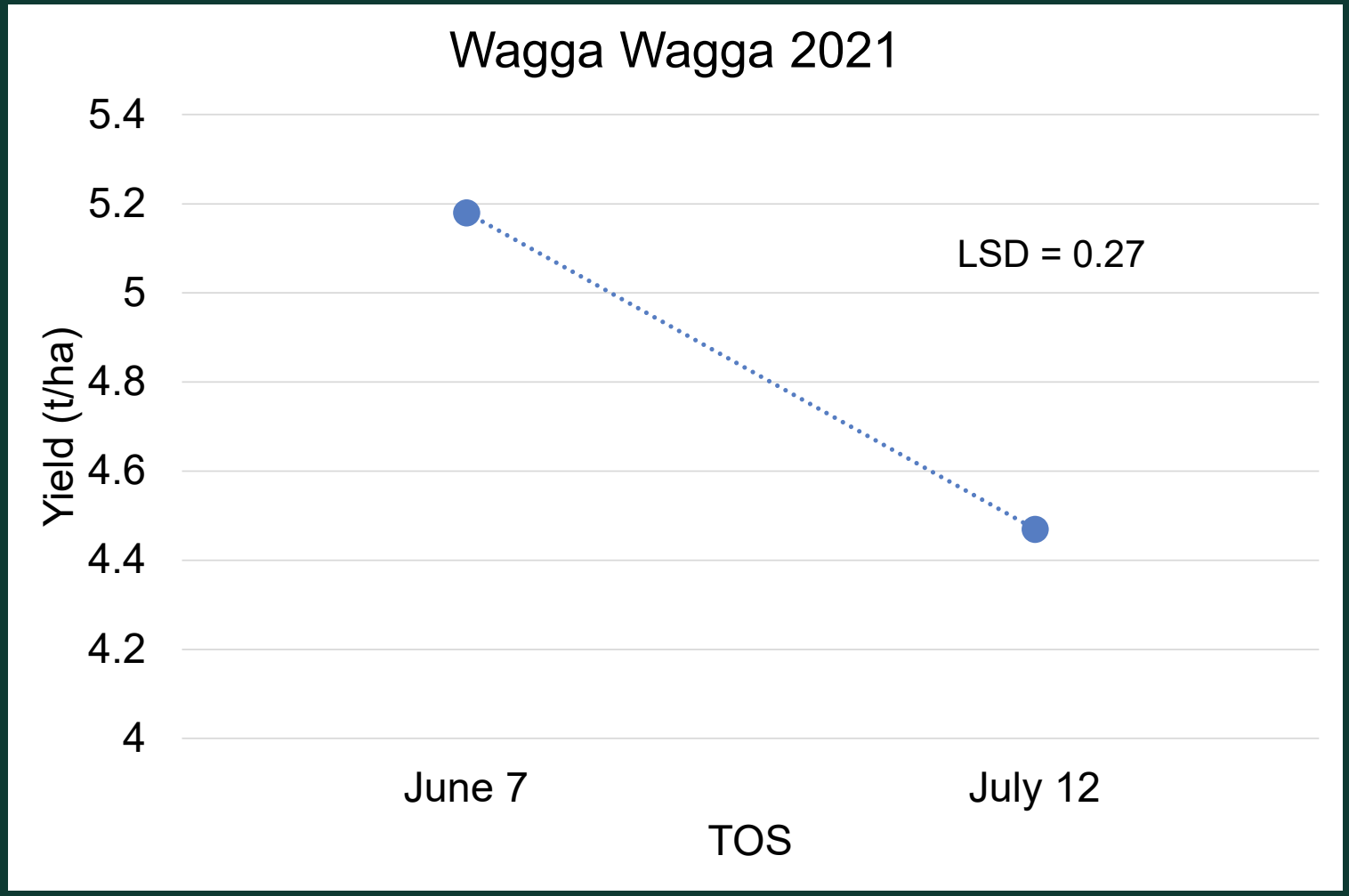


What are the ideal physiological and developmental drivers of 100-day wheats, in winter sown Australian conditions?

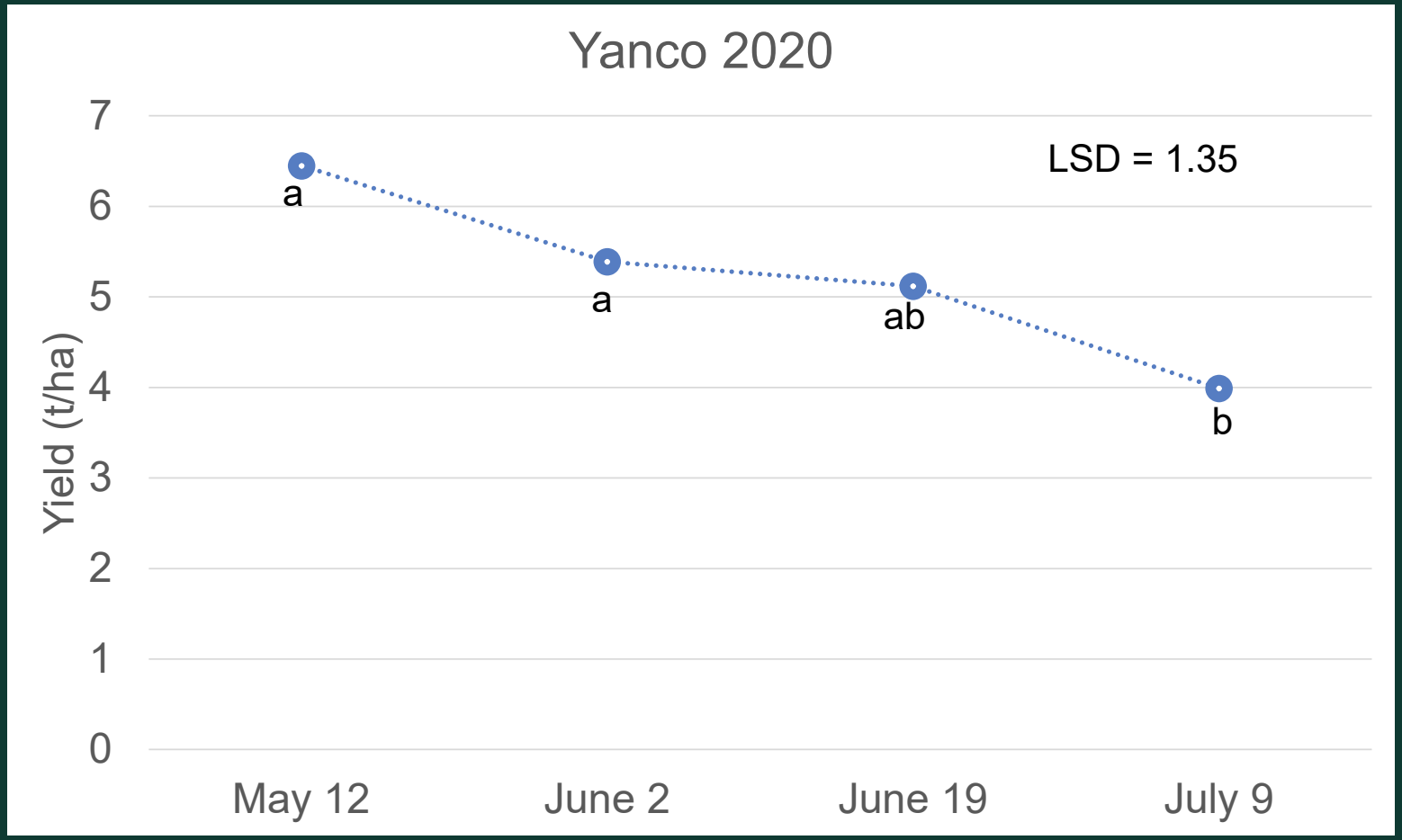
Wagga Field Experiments

- 96 high early vigour pre-breeding wheats
- Sown June 7 and July 12 2021, June 28 in 2022
- Fast flowering and high early vigour expected to contribute positively to yield

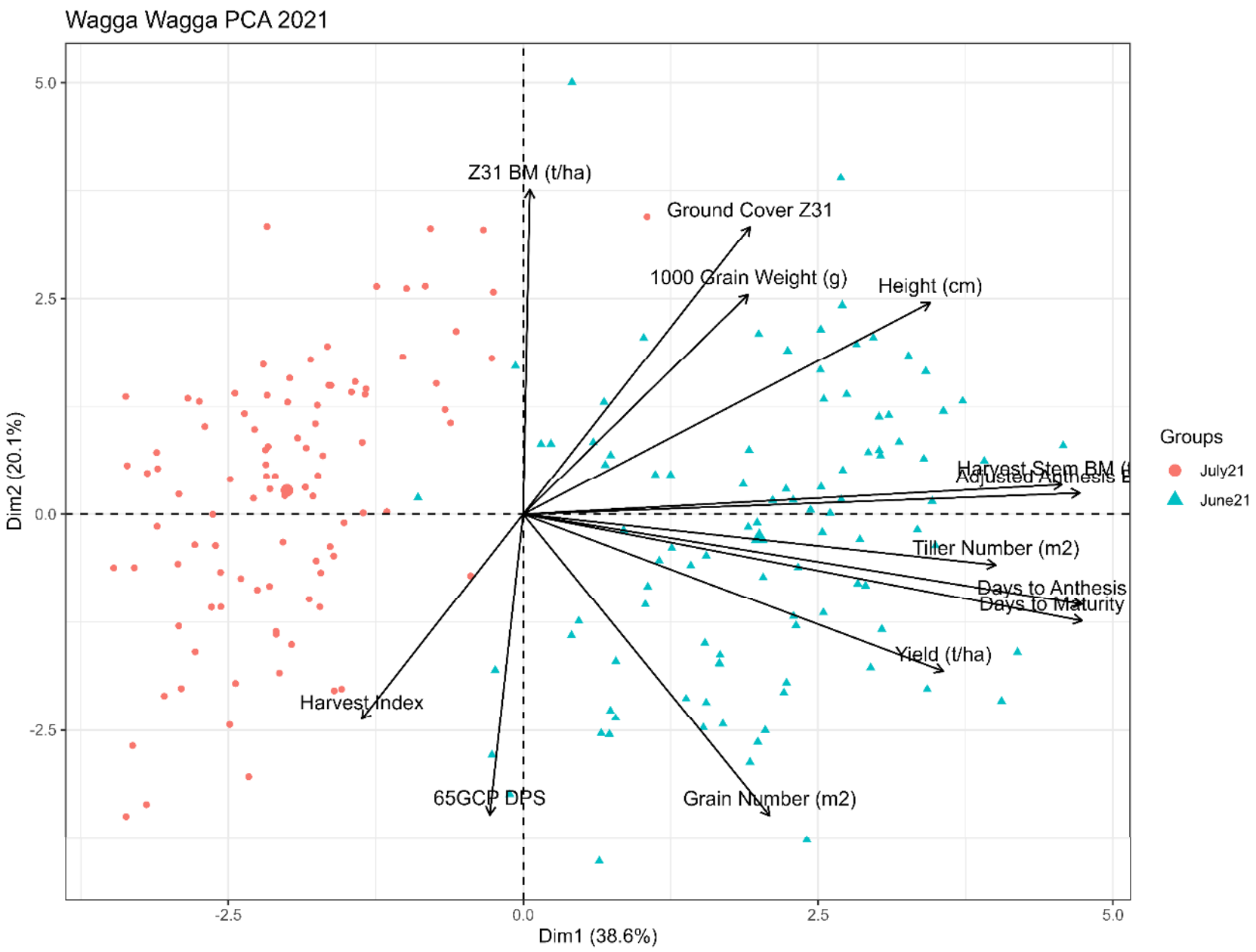
As expected, yield dropped with later sowing

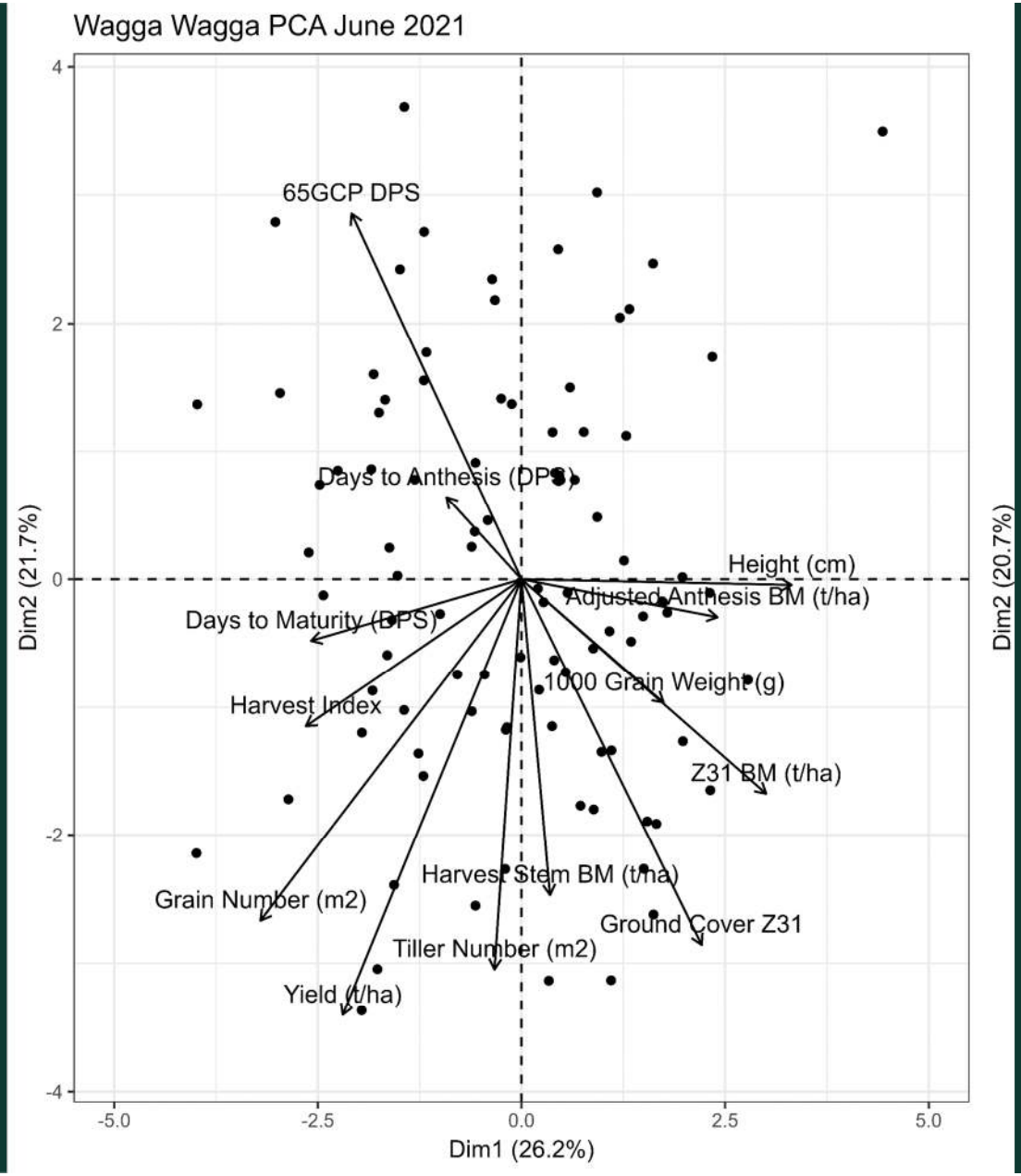


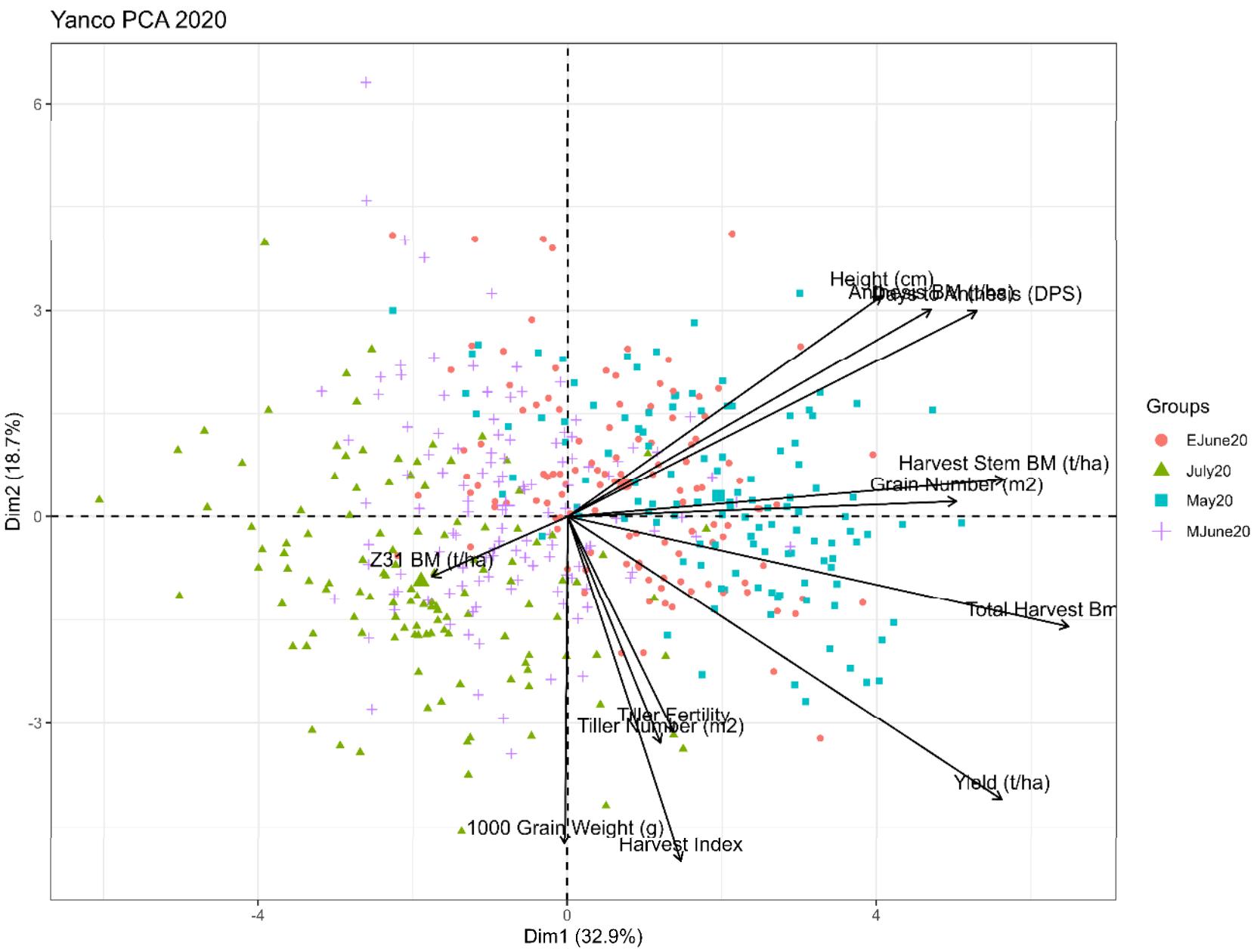
Also occurred at Yanco across a broader range of dates, can we combat this?

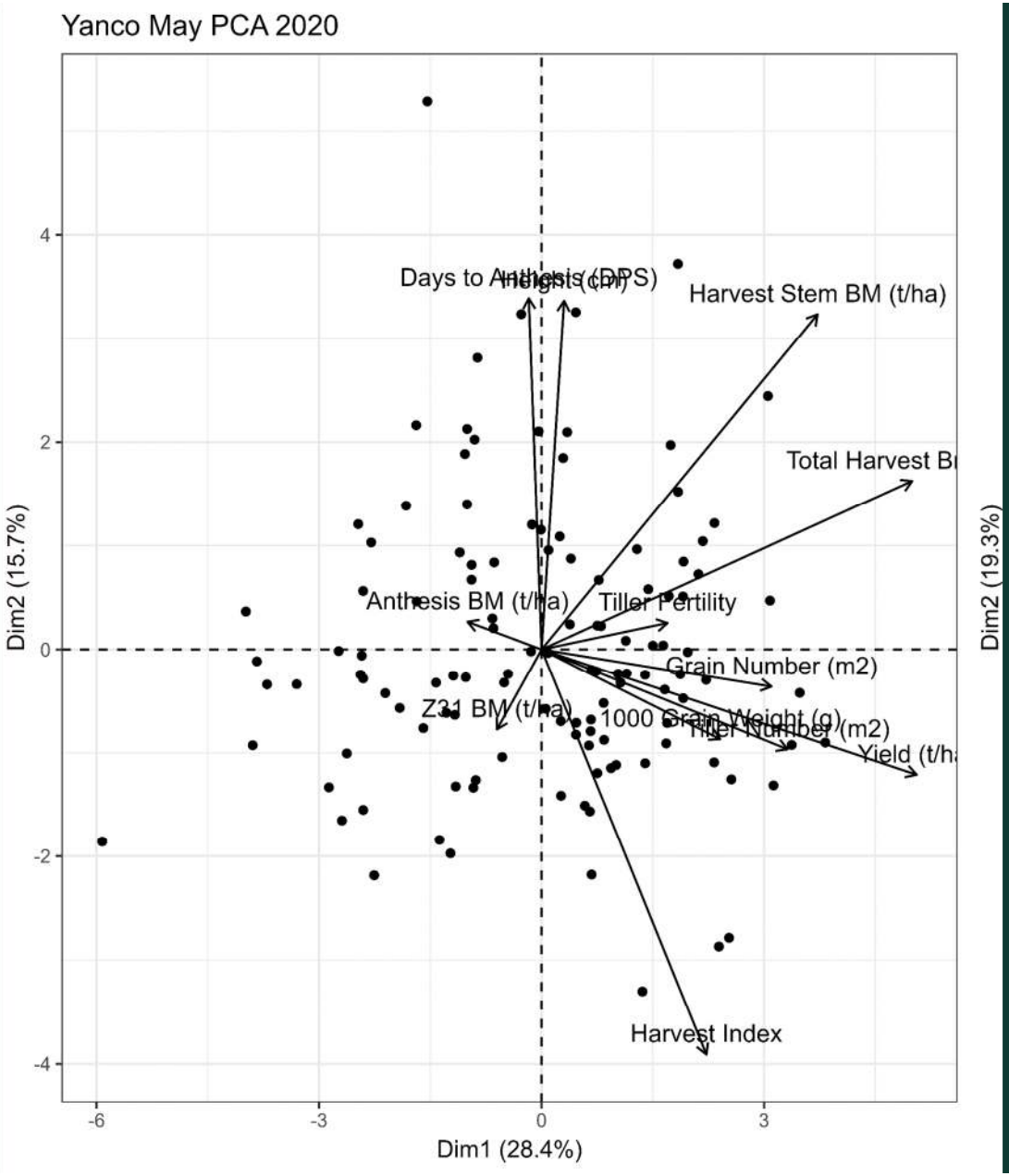


Principal component analysis again reinforces earlier sowing

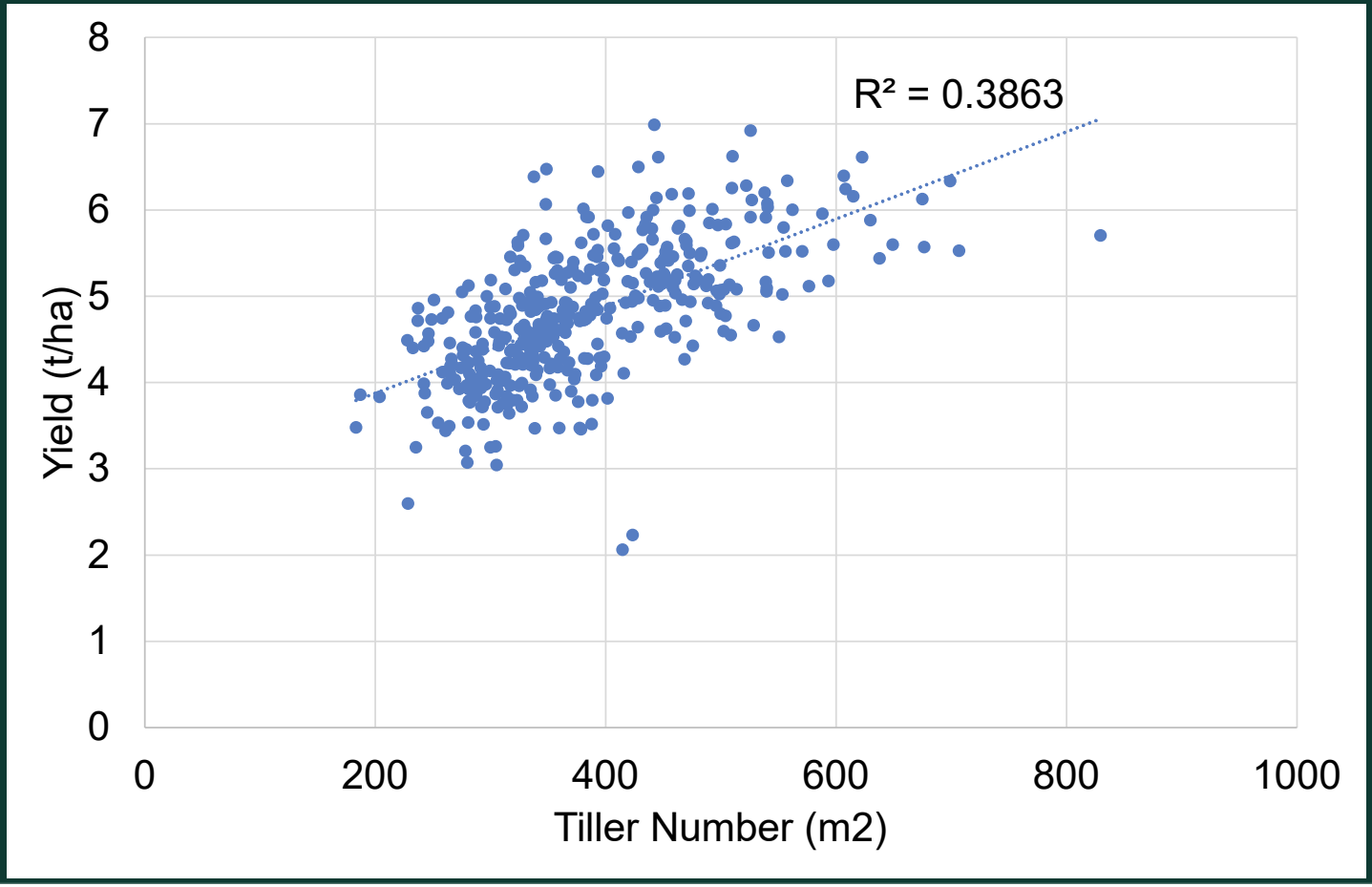



Wagga Wagga PCA June 2021
65GCP DPS
Days to Anthesis (DPS)
Height (cm)
Adjusted Anthesis BM (t/ha)
Days to Maturity (DPS)
1000 Grain Weight (g)
Harvest Index
Z31 BM (t/ha)
Harvest Stem BM (t/ha)
Grain Number (m2)
Ground Cover Z31
Tiller Number (m2)
Yield (t/ha)
Dim2 (21.7%)
Dim1 (26.2%)
4
2
0
-2
-4
-5.0
-2.5
0.0
2.5
5.0
Dim2 (20.7%)

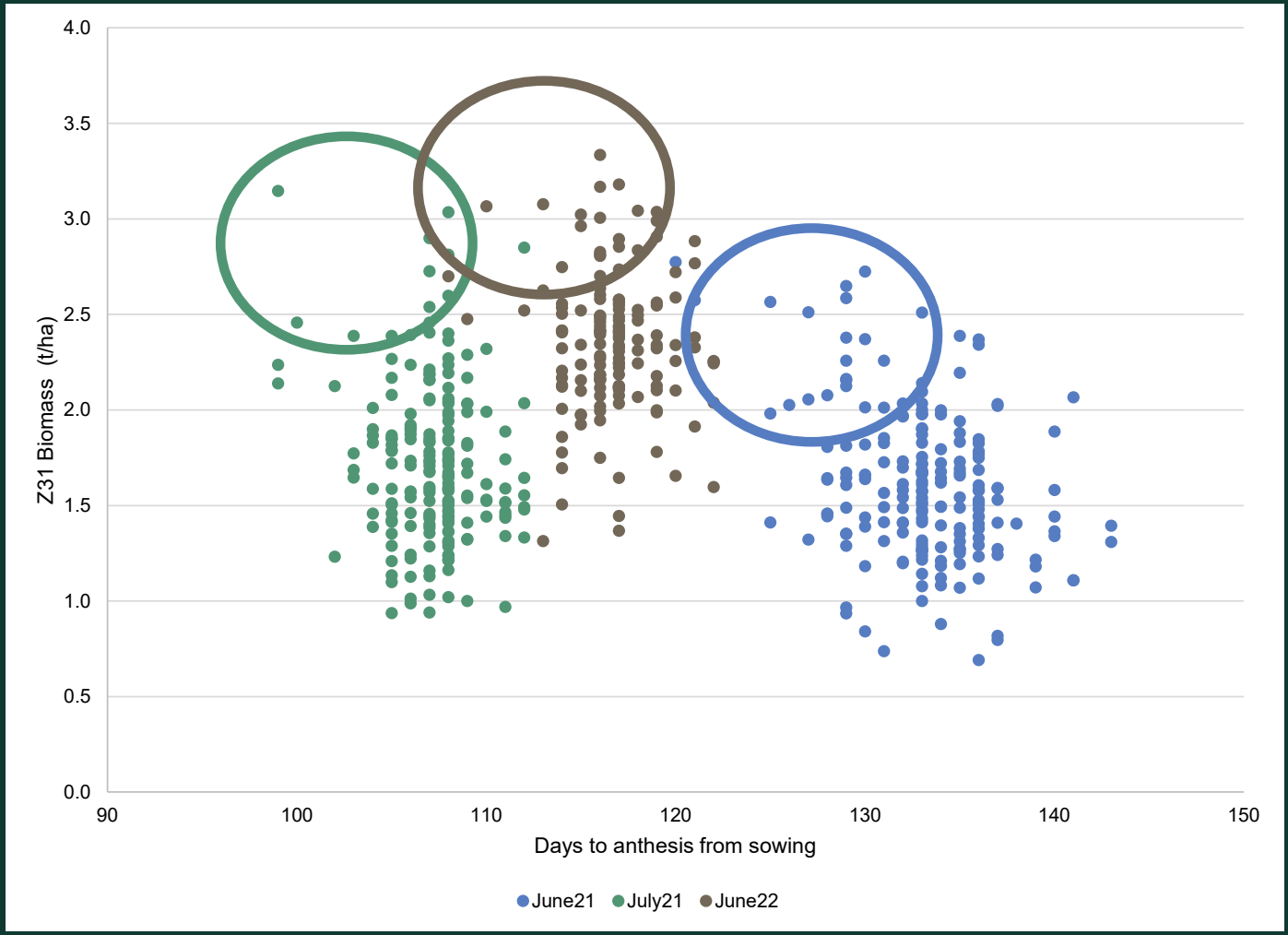

Yanco PCA 2020
Dim2 (18.7%)
Dim1 (32.9%)
6
3
0
-3
-4
0
4
Height (cm)
Days to Anthesis (DPS)
Harvest Stem BM (t/ha)
Grain Number (m2)
Z31 BM (t/ha)
Total Harvest Bm
Tiller Fertility
Tiller Number (m2)
Yield (t/ha)
1000 Grain Weight (g)
Harvest Index
Groups
EJune20
July20
May20
MJune20


Yanco May PCA 2020
Days to Anthesis (DPS)
Harvest Stem BM (t/ha)
Total Harvest Bi
Anthesis BM (t/ha)
Tiller Fertility
Grain Number (m2)
Z31 BM (t/ha)
1000 Grain Weight (g)
Yield (t/ha
Harvest Index
Dim2 (15.7%)
Dim1 (28.4%)
4
2
0
-2
-4
-6
-3
0
3

Tiller number correlates well to yield in later sowings



Genotypes to target for late sown breeding



Drivers of late sown success

- GxExM: Wagga experiments were performed in wet, mild years
- GN and HI are always key
- Build them through high early vigour pre anthesis, especially fast ground cover and productive tiller number
- (see 145. Systems Resilience; Greg Rebetzke, Wed 11am, for more on breeding these traits in)
- Fast flowering also essential

The 100 Day Wheat Ideotype

Acknowledgements

CSU AGRTP
GRDC Research Scholarship: UCS2105-002RSX

@TGreen_001
tigreen@csu.edu.au

Dr Sergio Moroni (CSU)
Dr Felicity Harris (CSU/NSW DPI)
Prof. Jim Pratley (CSU)
Dr Daniel Mullan (InterGrain)
Dr Greg Rebetzke (CSIRO)