Optimising nutrient and water application

Zelmari Coetzee

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AL14005

Identifying factors that influence spur productivity in almonds

Objective 1. Quantify the longer-term behaviour of fruiting spurs of Nonpareil and Carmel almond cultivars under standard management practices.

Objective 2. Investigate the effects of key environment and management factors (tree architecture, light interception, irrigation and nutrition) on spur productivity.

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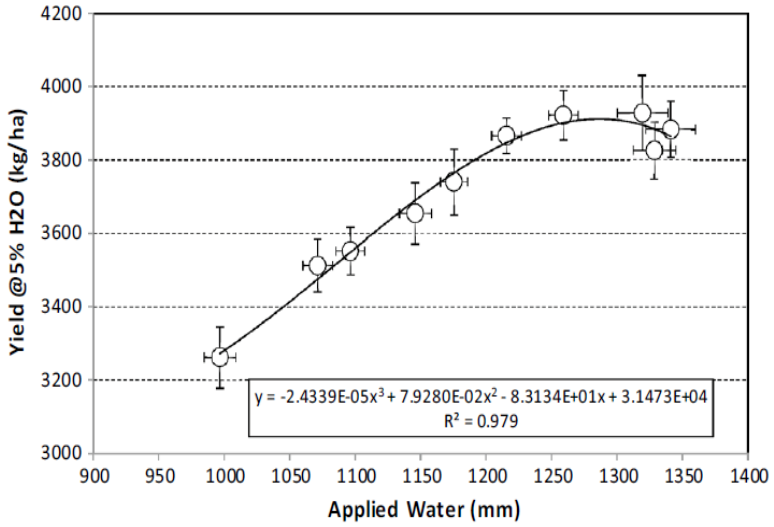
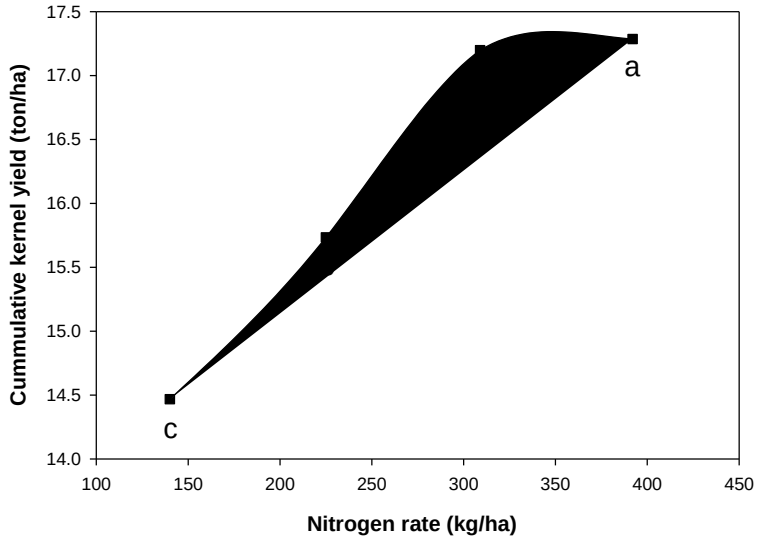
IRRIGATION



(Goldhamer and Fereres, 2017)

NITROGEN



(Muhammad et.al, 2018)

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Trial site and assessments

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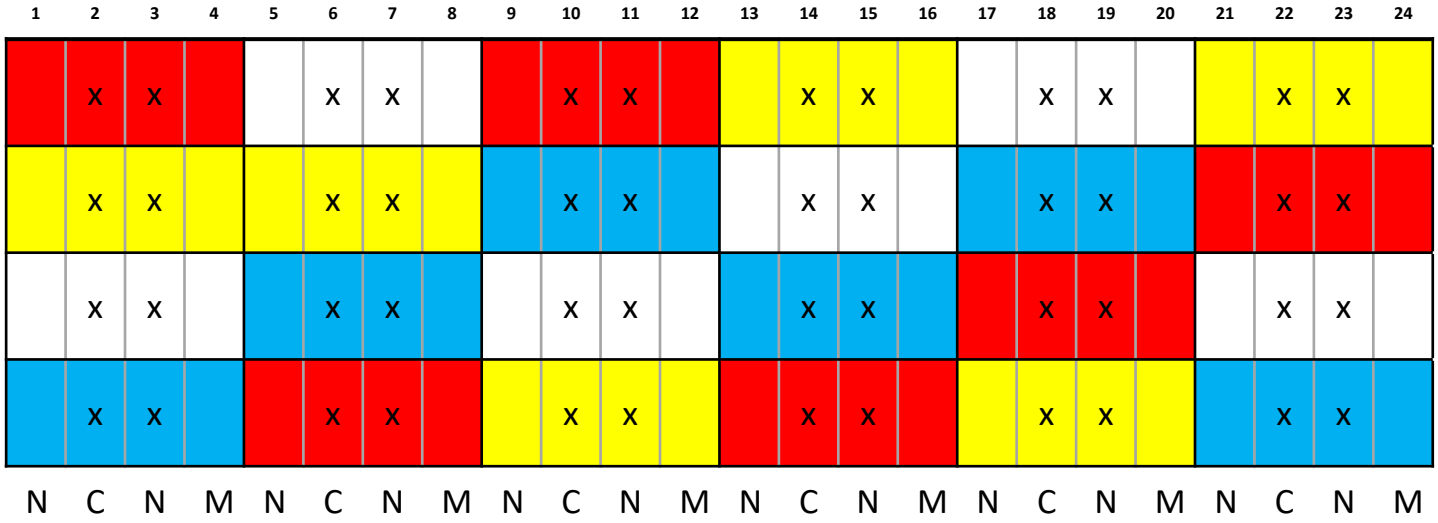
TRIAL SITE AND TREATMENTS

Nitrogen (N)	Irrigation (W) 15 ML/ha	10.5 ML/ha
320 kg/ha	+W+N	-W+N
179 kg/ha	+W-N	-W-N



SPUR POPULATION ASSESSMENT

576 spurs per cultivar (24 per tree)

144 spurs per treatment

HARVEST

July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March

Bloom →

Budburst →

Nut growth →

Hull split →

Harvest →

Flower bud initiation →

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ECOPHYSIOLOGICAL ASSESSMENT

Environment	Physiology
• Macroclimate • Soil moisture tension • Canopy light interception (PAR) • Spur light exposure	• Spur population dynamics • Leaf traits and composition • Tree water status (SWP) • Yield • Sap flow (CSIRO) • Root analyses (CSIRO)






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Results

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IRRIGATION VOLUMES

	NONPAREIL	CARMEL
	ML/ha/season	ML/ha/season
+ W	14.5	15.5
- W	10.4	10.7

STEM WATER POTENTIAL (bar)

	+ N	- N	W main effects
NONPAREIL			
+ W	-6.4	-6.6	-6.5
- W	-9.3	-10.2	-9.7***
N main effects	-7.8	-8.4	
CARMEL			
+ W	-6.8	-6.8	-6.8
- W	-10.5	-10.6	-10.6***
N main effects	-8.6	-8.7	

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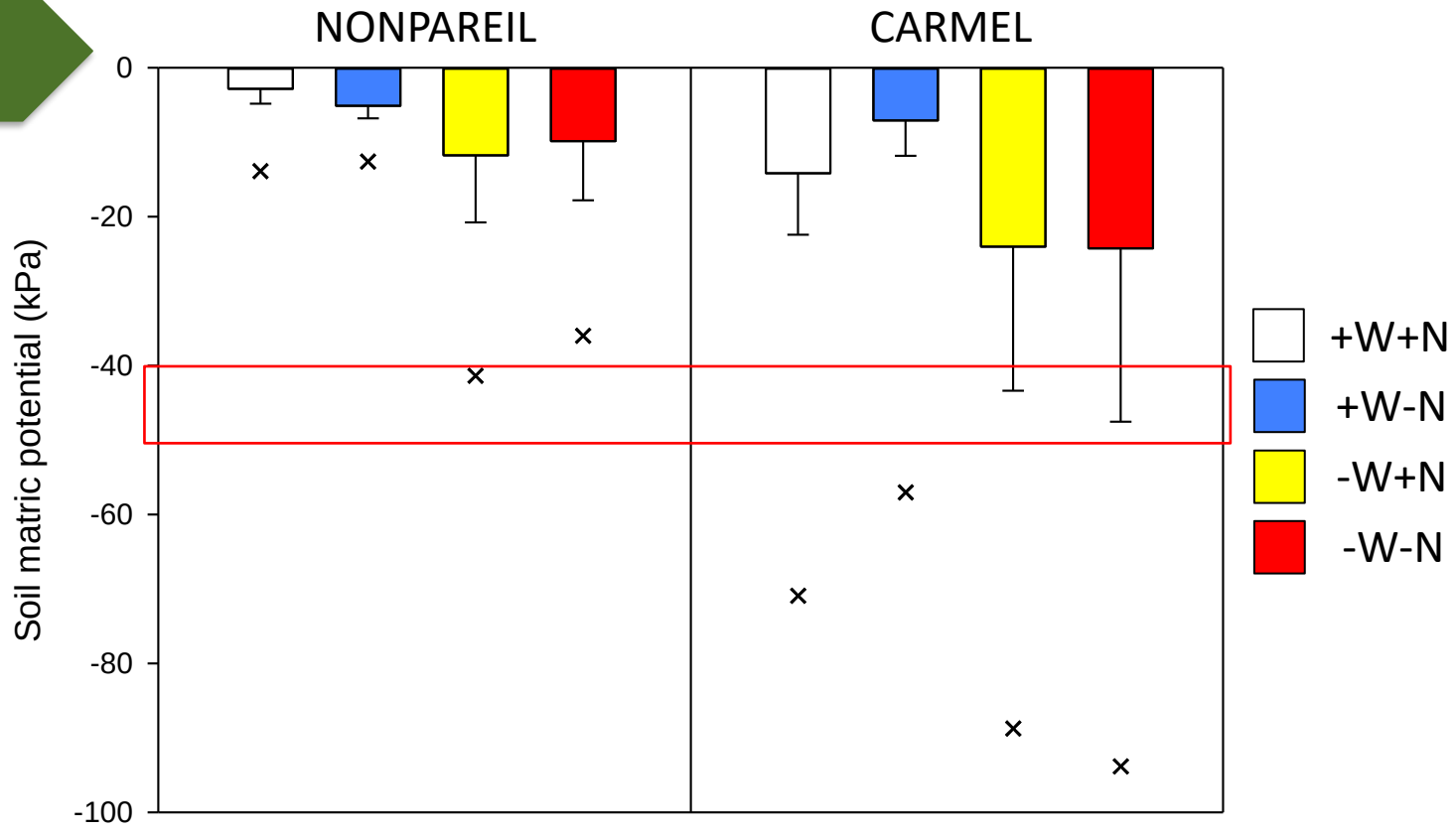
SOIL MATRIC POTENTIAL



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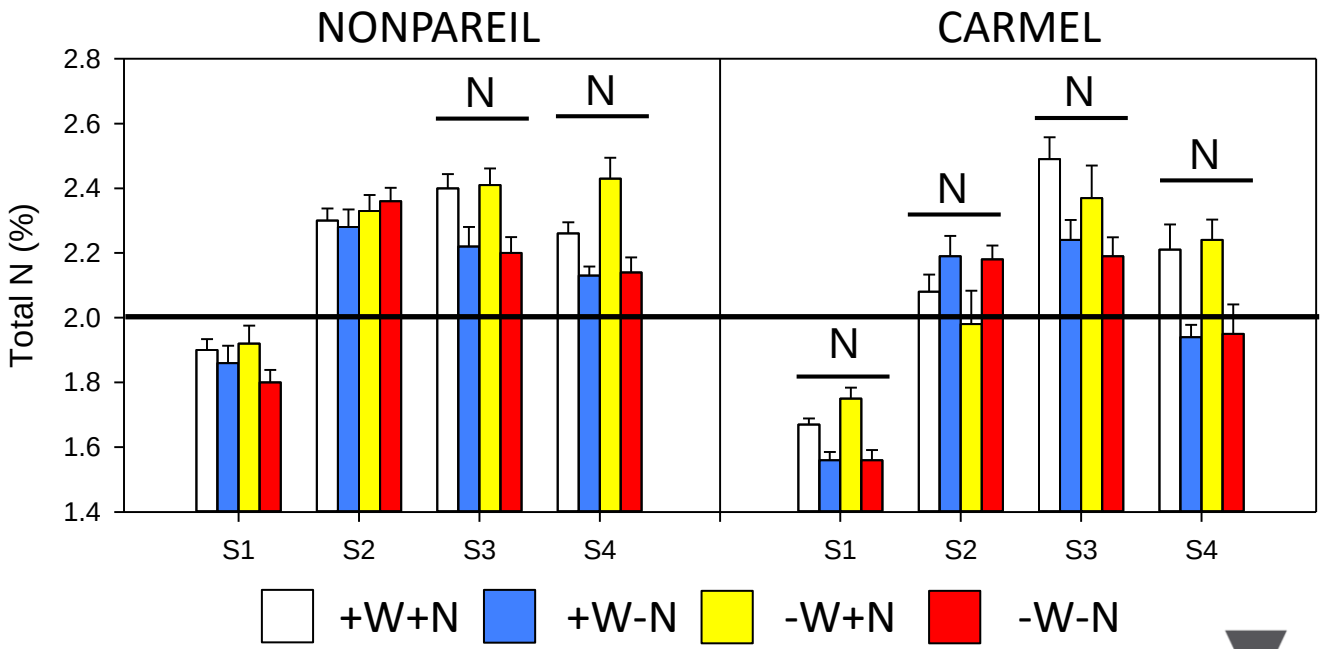
NITROGEN FERTIGATION

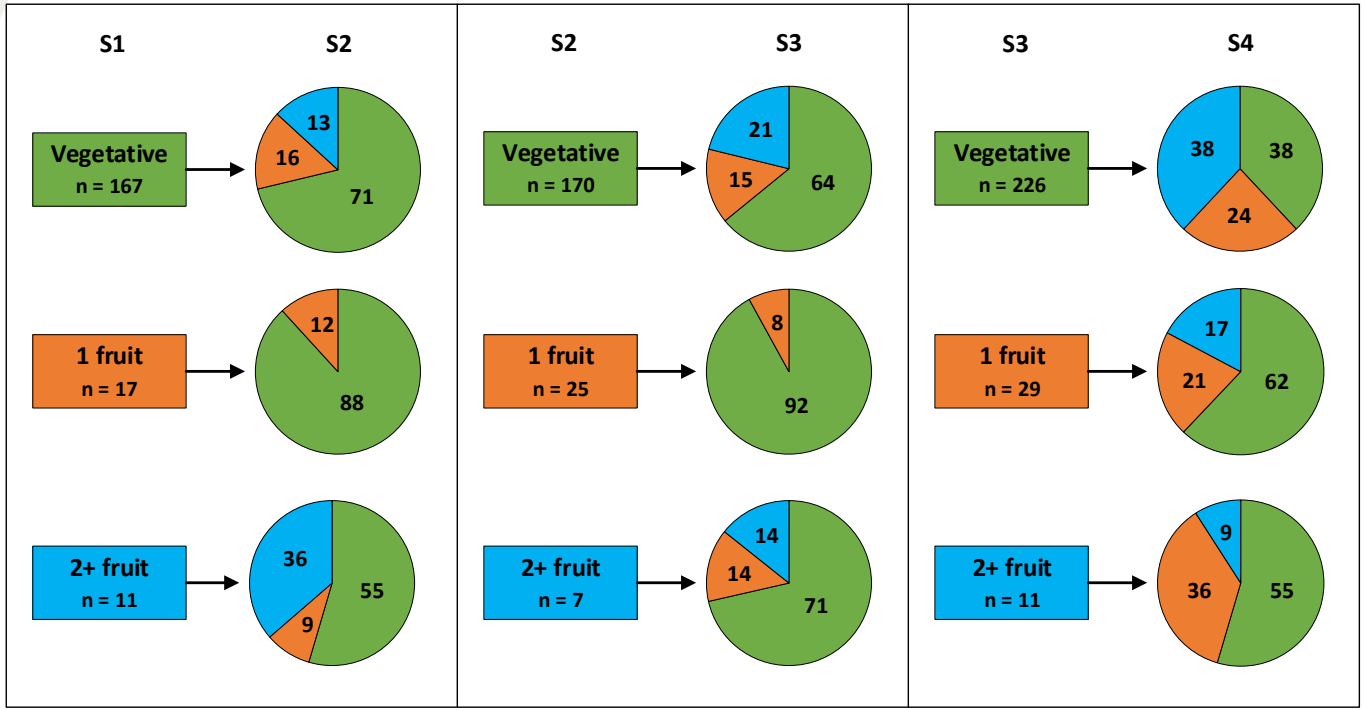
	NONPAREIL	CARMEL
	kg N/ha/season	kg N/ha/season
+ N	302	302
- N	163	163

LEAF NITROGEN CONCENTRATION

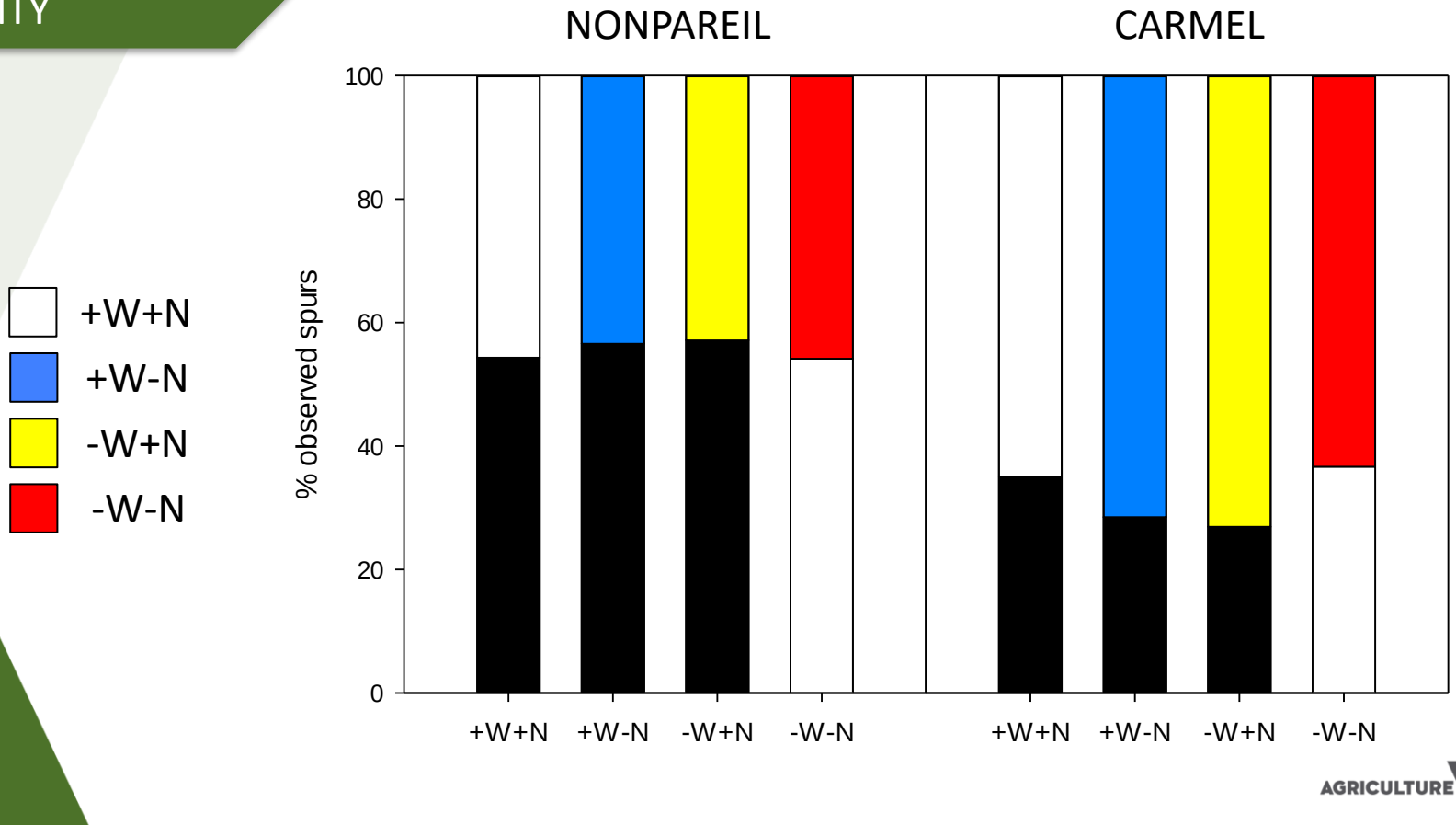


SPUR DYNAMICS
FERTILITY

Inter-seasonal dynamics of Nonpareil spurs



SPUR DYNAMICS VITALITY



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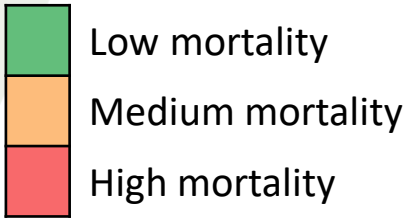
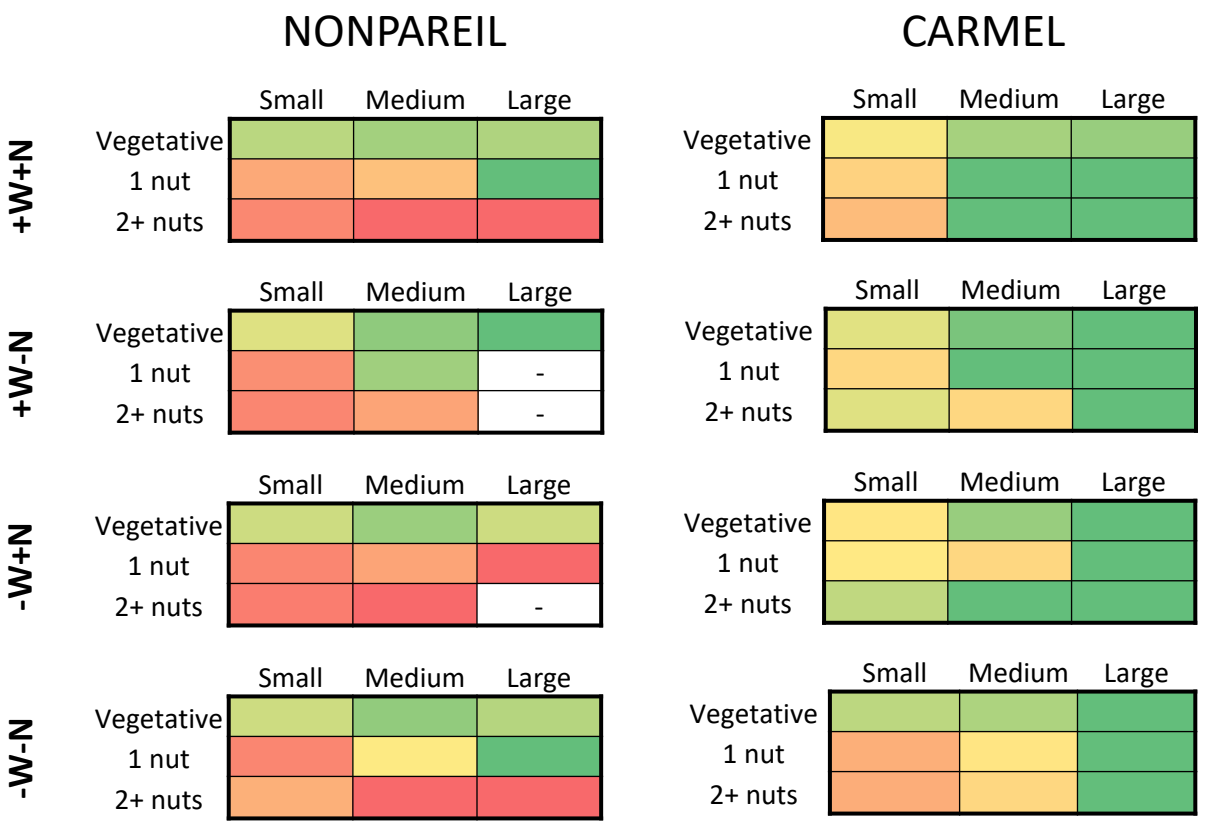
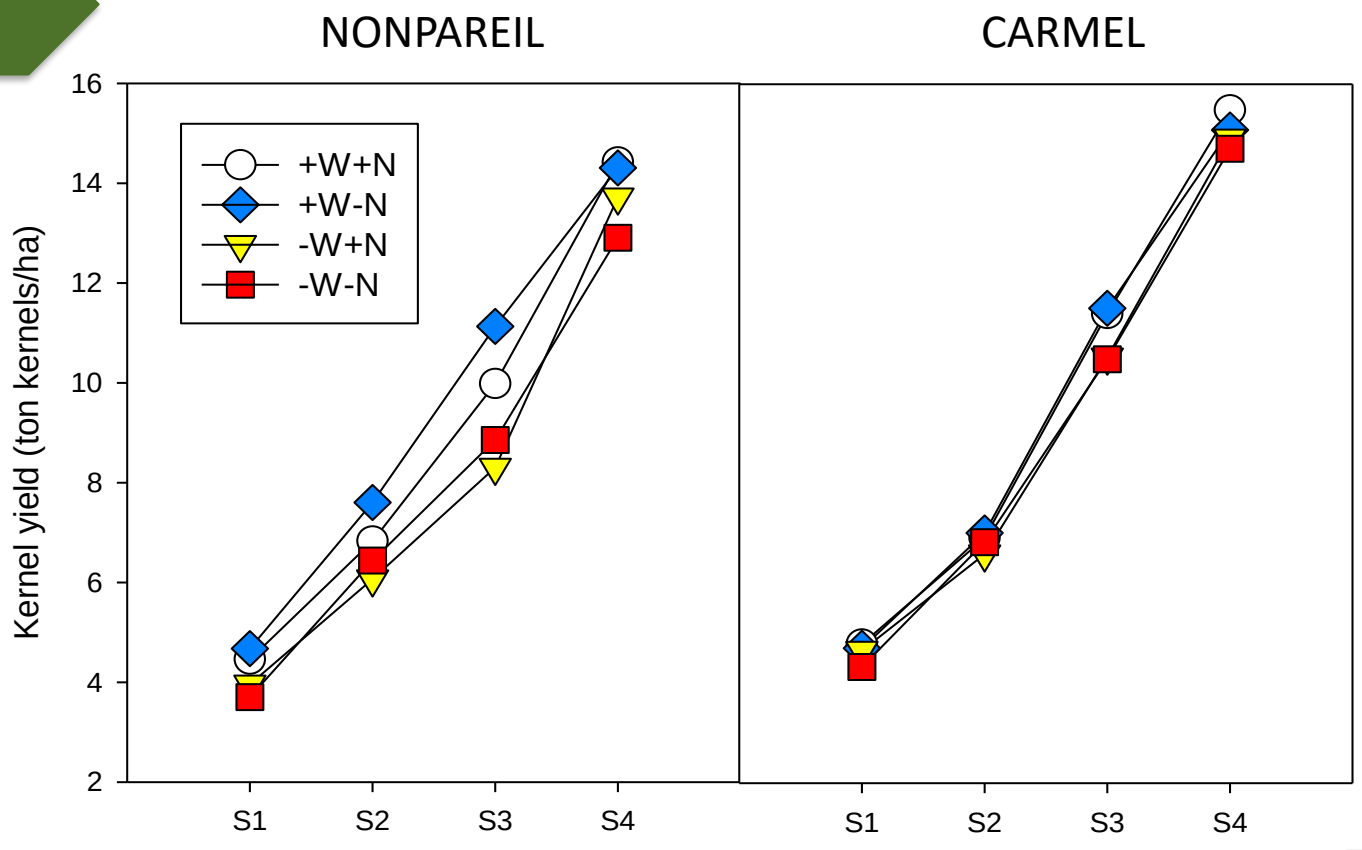
SPUR DYNAMICS VITALITY





YIELD CUMMULATIVE



OFFICIAL

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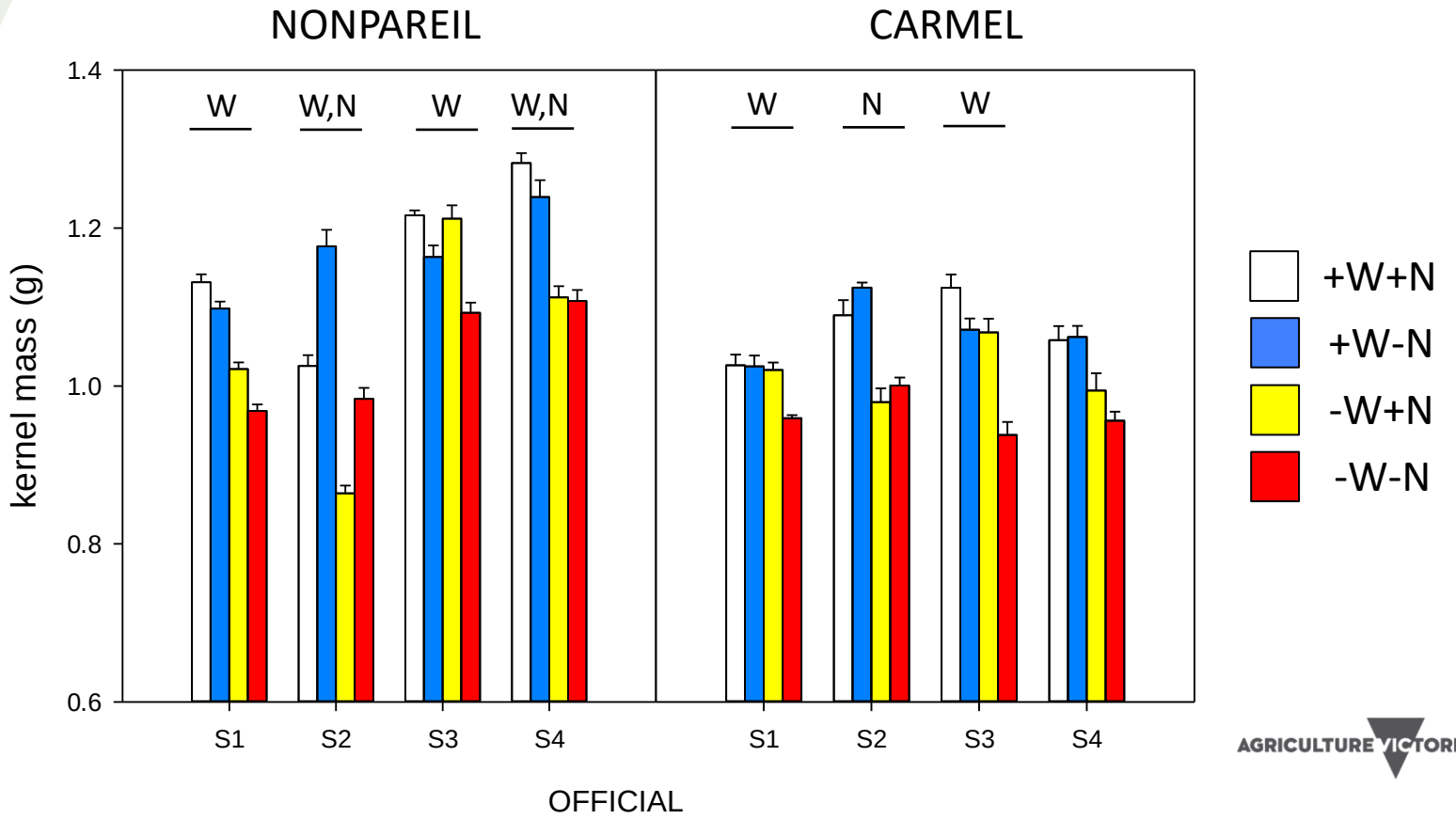
YIELD
KERNEL MASS



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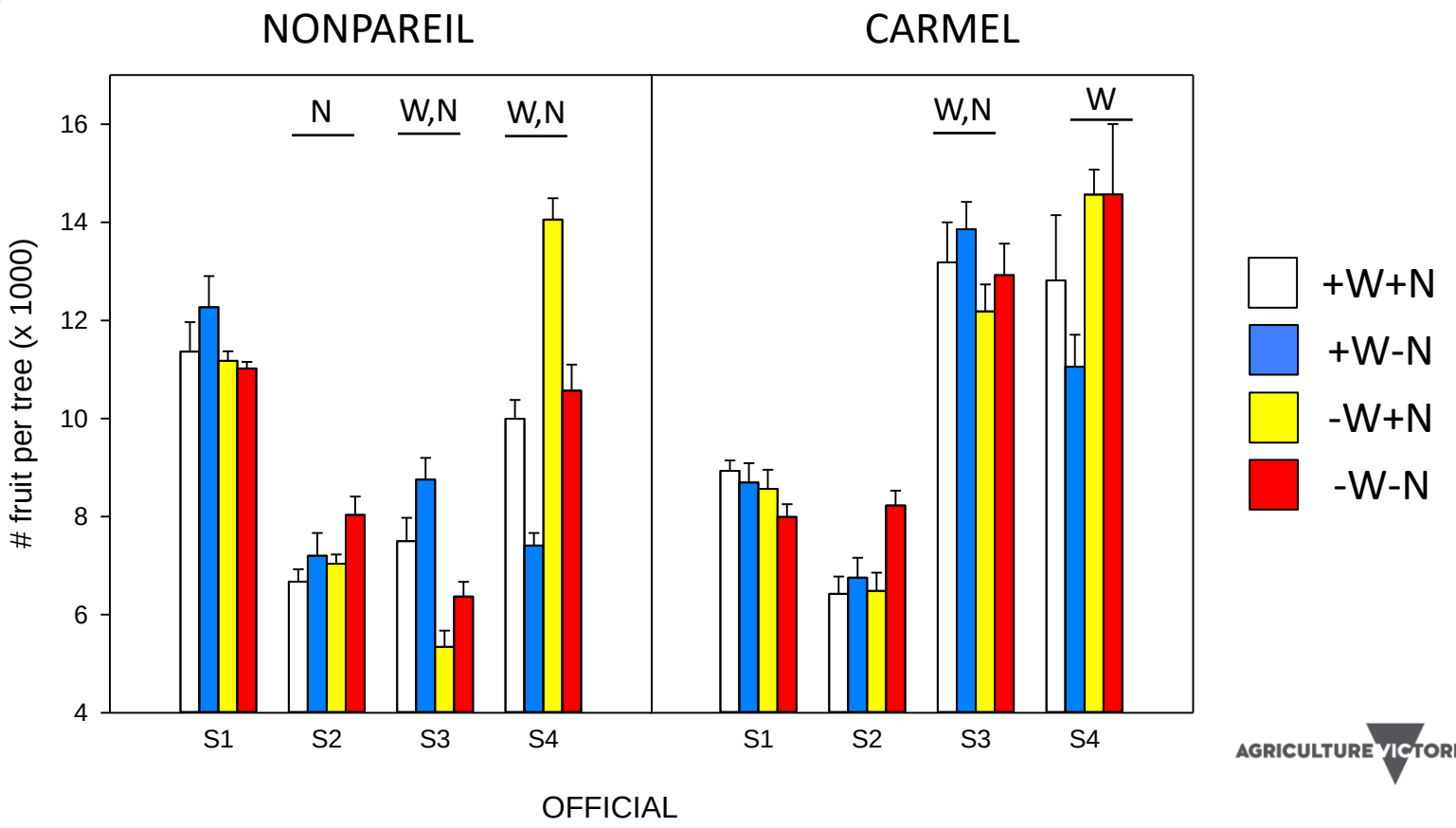
YIELD
FRUIT PER TREE



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WATER USE EFFICIENCY

kg kernels per kL of water applied

	NONPAREIL	CARMEL
+W+N	0.26 b	0.26 b
+W-N	0.25 b	0.24 b
-W+N	0.32 a	0.34 a
-W-N	0.31 a	0.34 a

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ORGANOLEPTIC

randomised triangle tasting

→ 316 consumers

	Treatment compared			
Opposing treatment	**+W+N**	**+W-N**	**-W+N**	**-W-N**
+W+N		25	34	39
+W-N	30		43	27
-W+N	18	31		37
-W-N	26	35	35	

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KEY OUTCOMES

- Cultivars need to be managed separately
- Reducing N did not significantly affect yield
- Reducing water did not have a negative effect on yield or tree functioning

Kernel yield = number of kernels x kernel mass

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Acknowledgements

CMV farms – Lindsay Point

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AVR Irymple staff

Hort Innovation

Australian and Victorian Government

Mildura SmartFarm field day

Wednesday, 23 August 2023

10:00 am to 1:00 pm

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