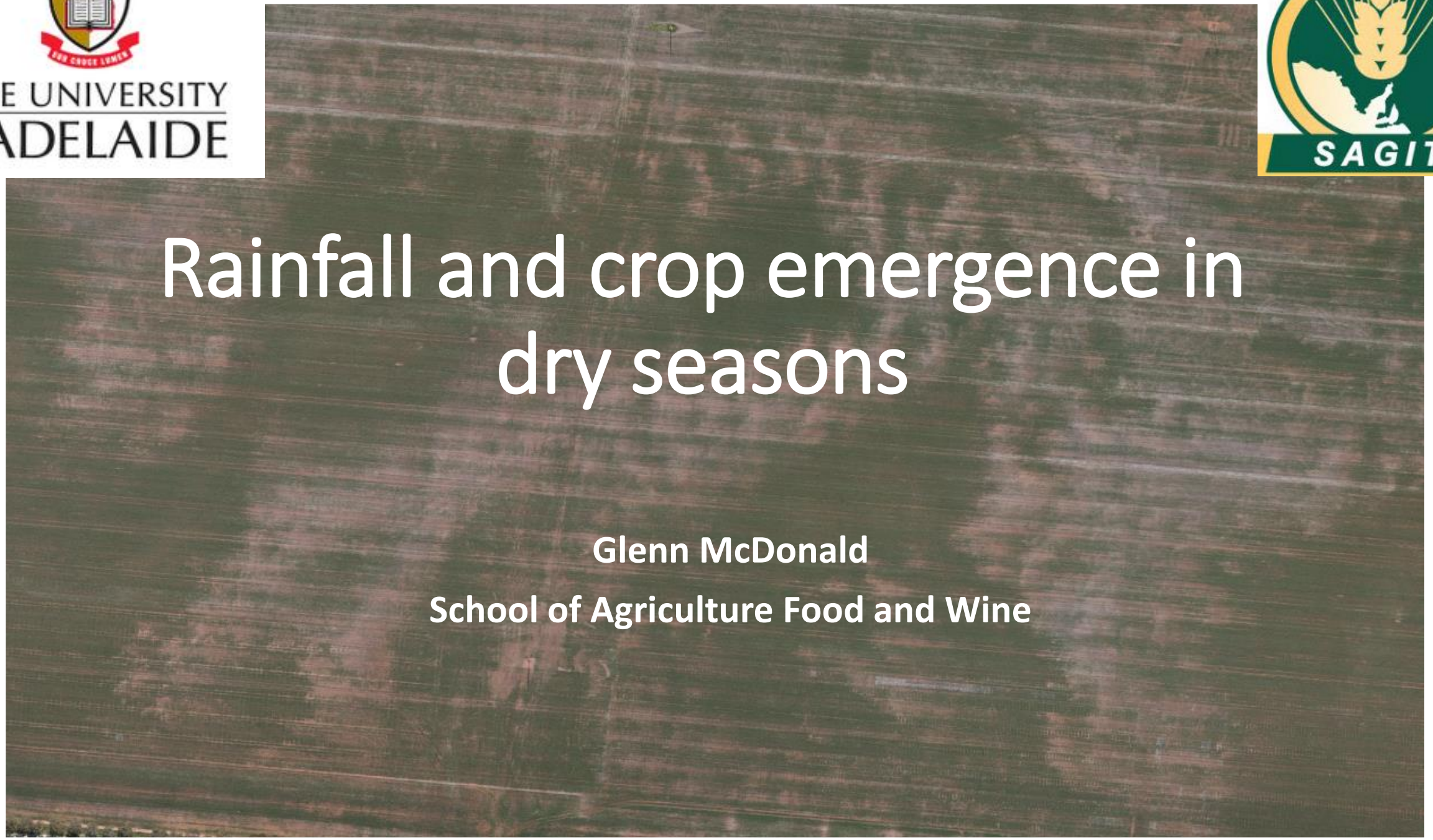


Rainfall and crop emergence in dry seasons

Glenn McDonald

School of Agriculture Food and Wine

Questions

- How much moisture is required for germination?
- How long can seed remain in soil before emergence is affected?
- How much rain is required for crop emergence?
- What is the yield penalty for low plant numbers?

Seeds will germinate in dry soil

Seed·after·3·weeks·in·dry·soil

Dry·seed

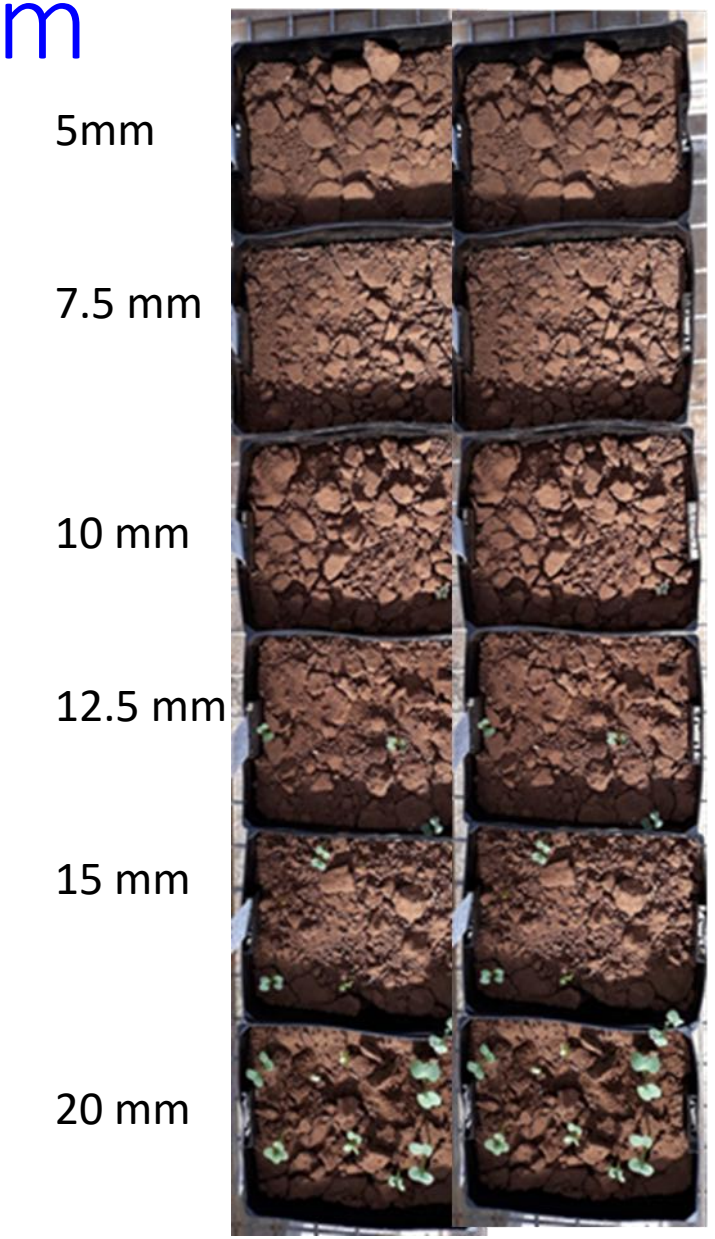
Seeds are resilient

Weeks in dry soil	Wheat	Canola
	Emerged (%)	Emerged (%)
0	73	84 ab
1	72	75 a
2	72	90 b
4	72	71 a
6	68	79 ab
	Not signif	P=0.035

Average over three soils from Hart, Bute & Giles Corner
Similar response in all soils

Canola emergence required 15-20 mm

Rainfall	Loam (Hart)		Med clay (Giles Cnr)	
	Emerged	Germinated	Emerged	Germinated
	(%)			
5 mm	0	43	0	0
7.5 mm	0	93	0	47
10 mm	3	97	3	50
12.5 mm	37	63	50	50
15 mm	67	33	90	10
20 mm	63	33	83	17



Soil type influences the moisture required for emergence

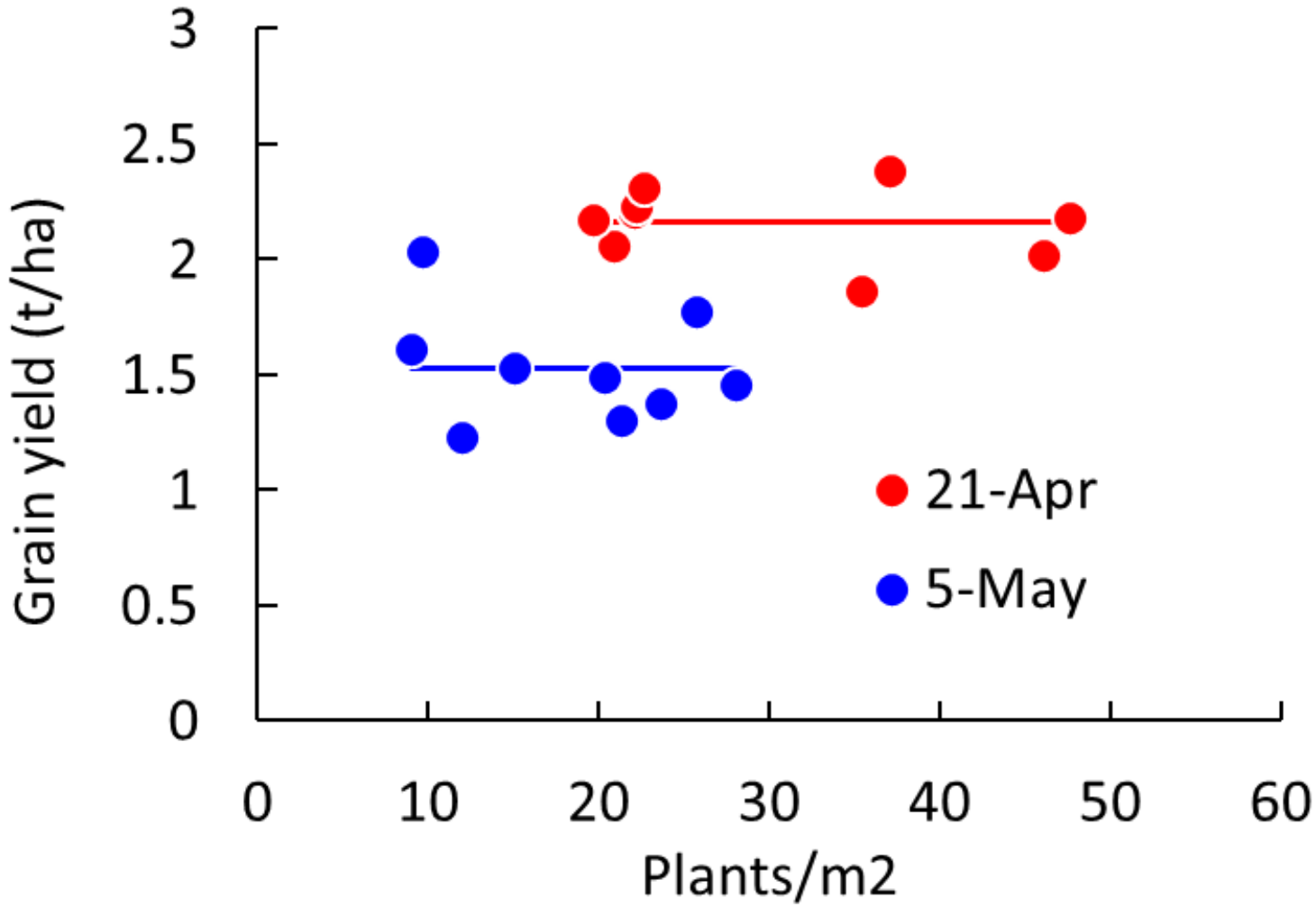
Rainfall	Loam (Hart)	Med clay (Giles Cnr)	Loam (Minnipa)	Sandy loam (Lock)	Sand (Darke Peak)
	Emergence %				
5 mm	0	0	0	0	15
7.5 mm	0	0	0	20	68
10 mm	3	3	0	60	95
12.5 mm	37	50			
15 mm	67	90	95	70	88
20 mm	63	83	85	100	100

Hart 2023 and 2024: timing of rainfall and emergence

Year	Sowing date	Rainfall (mm)			Emergence	
		1 week before sowing	3 weeks after sowing	Sowing to emergence	Days to emergence	%
2023	21 April	26	8	0	6	63
	5 May	6	6	4	20	43
2024	18 April	0	0.4	19*	54	85

* 16 mm in 2 weeks before emergence

Low crop establishment does not always result in low yields

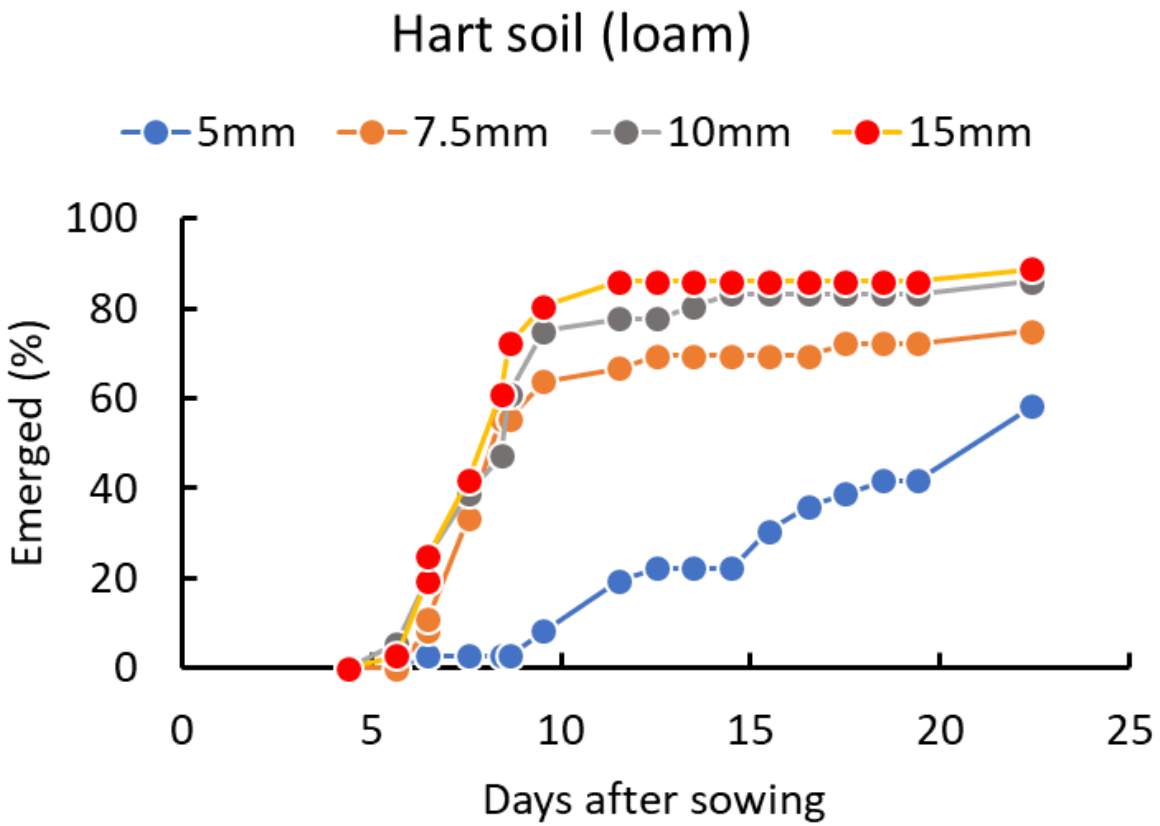


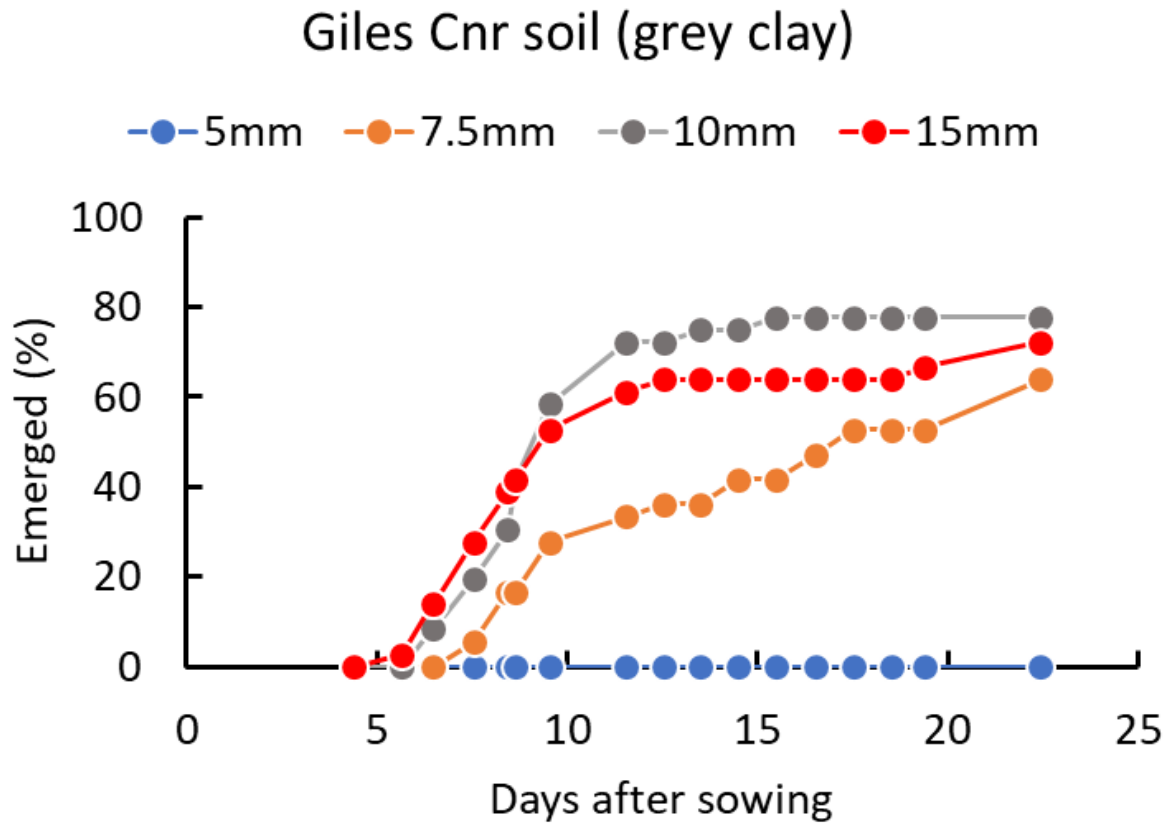
Time of emergence has a bigger effect on yield than plant density of depth of sowing

Key points

- Seeds will start germinating shortly after sowing
- Seeds are resilient – emergence may not be affected by long periods in dry soil
- Rainfall required for emergence varies with soil type:
  - 10-15 mm (sand), ~20 mm (loams), 20-30 mm (clays)
- Low crop establishment does not necessarily mean low yields but depends on the capacity of the crop to compensate for low plant density

Effect of soil moisture on emergence affected by soil type



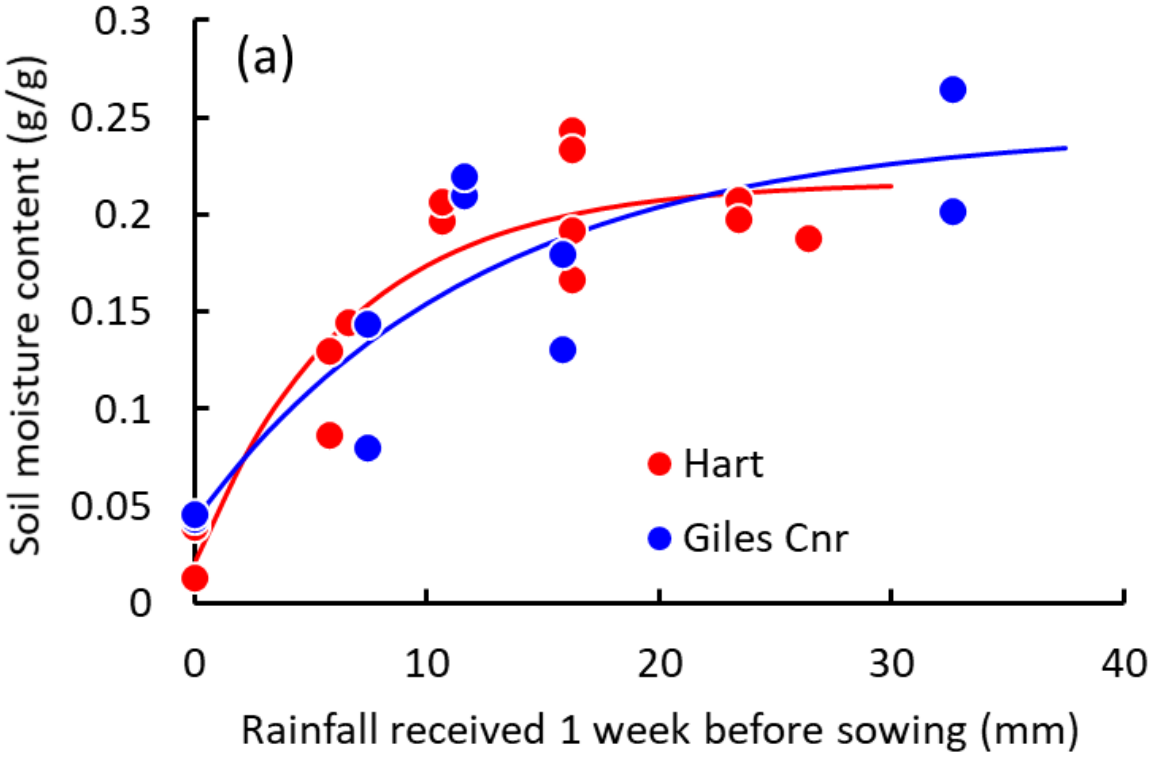


Estimates of rainfall required to wet top 10 cm from air dry soil

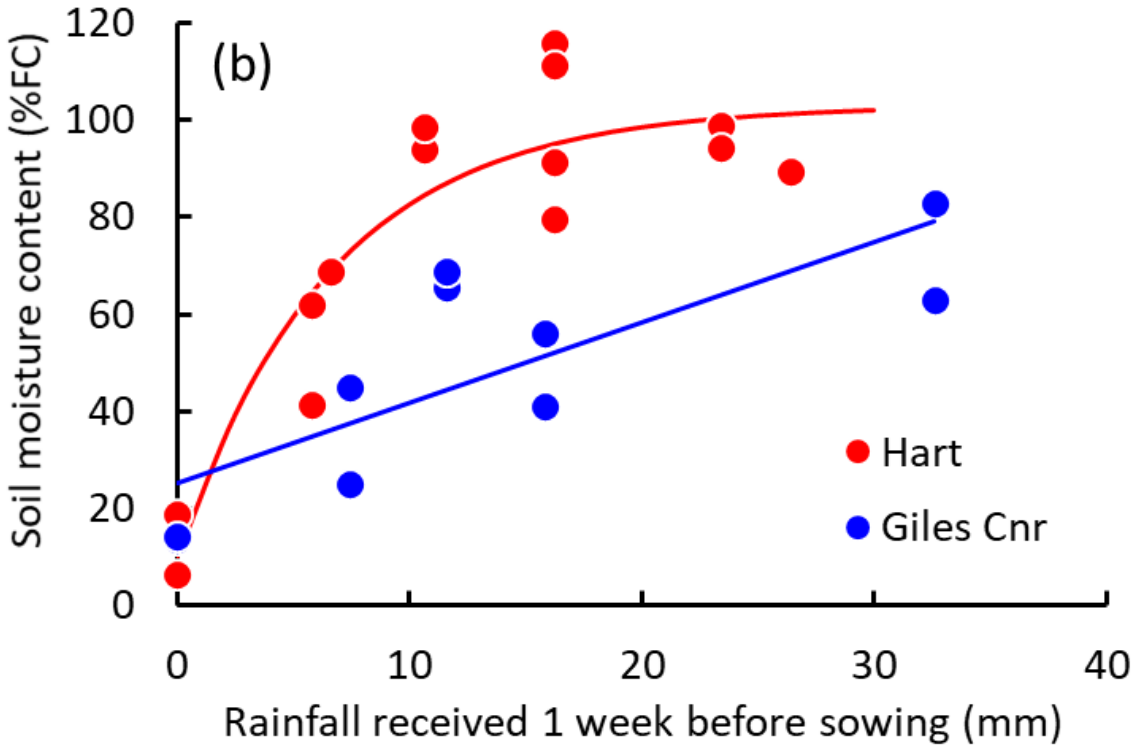
	Amount of rainfall required to bring soil from air dry to:	
	Crop lower limit	Drained upper limit
Sand	2 mm	10 mm
Sandy - Loam	3 mm	14 mm
Loam	4 mm	20 mm
Clay loam - light clay	6 mm	21 mm
Medium – heavy clay	10 mm	32 mm

Rainfall and seedbed moisture

Rainfall and soil moisture content

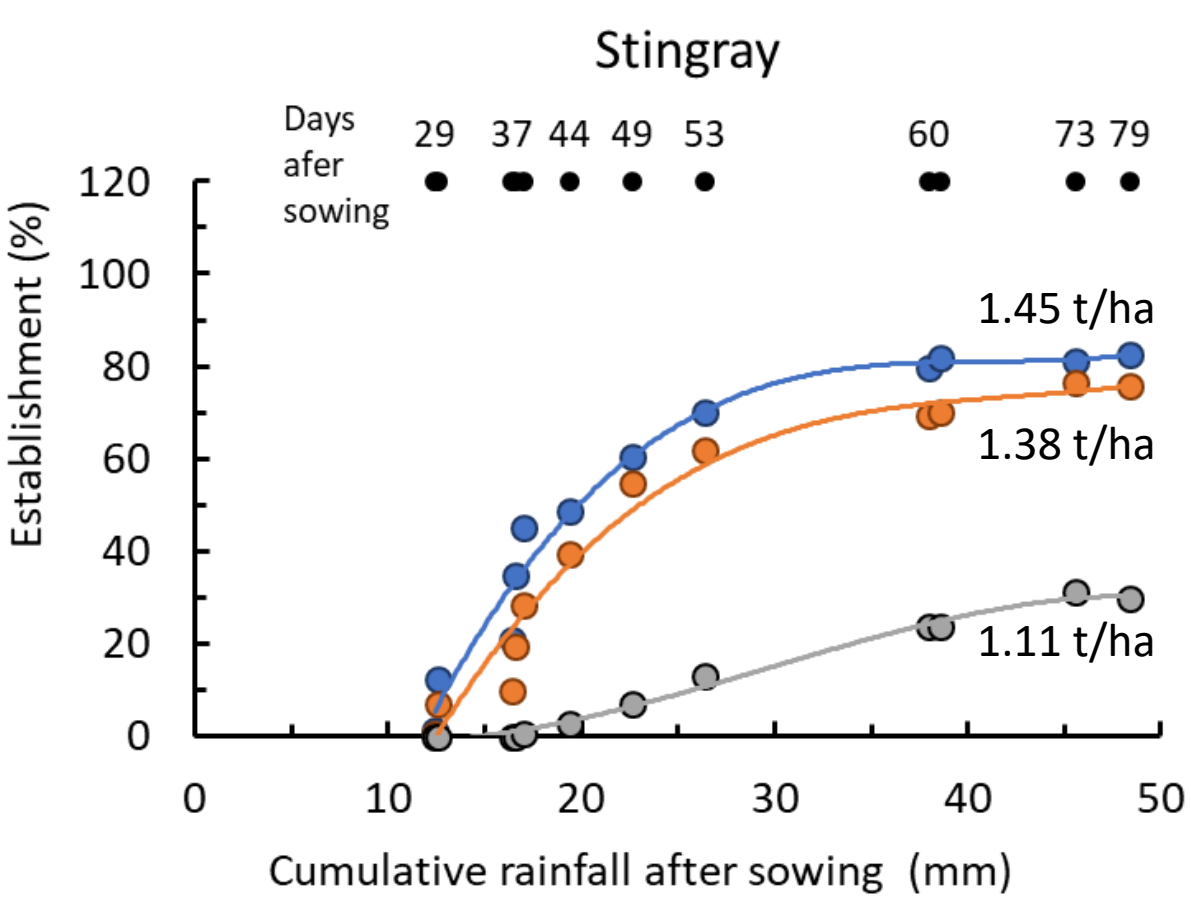


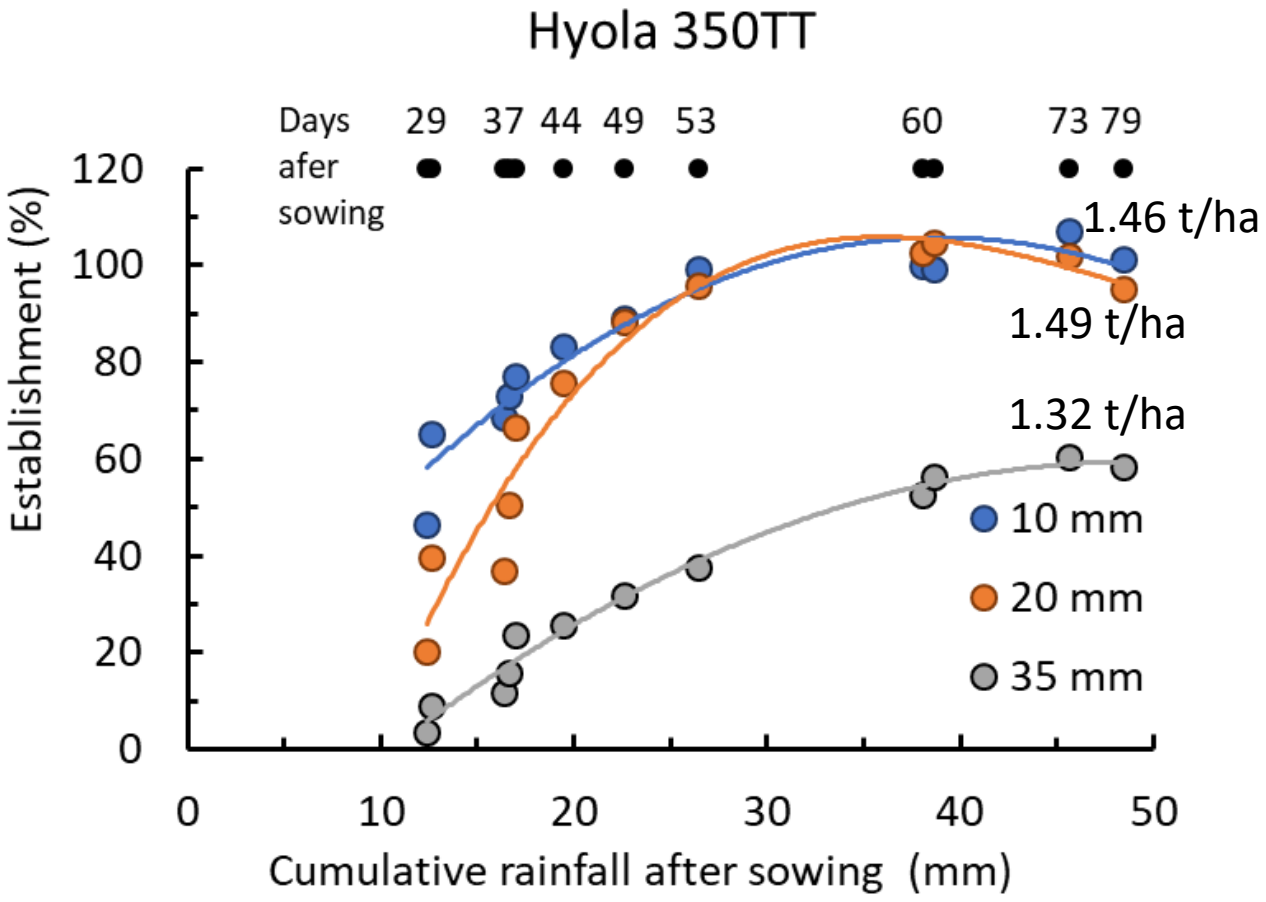
Rainfall and available water



Based on field data in 2023 and 2024

Sowing depth and responses to rainfall



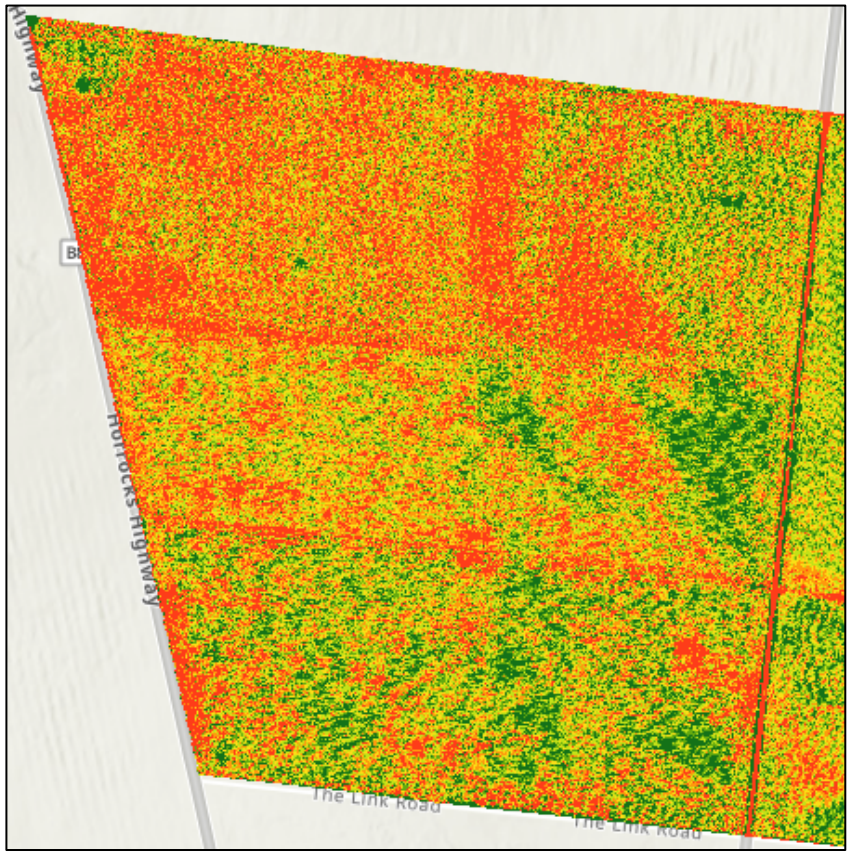


Sown: 19 April
Sowing density: 50 seeds/m^2
Sowing depths at establishment: 21 mm, 23 mm, 35 mm

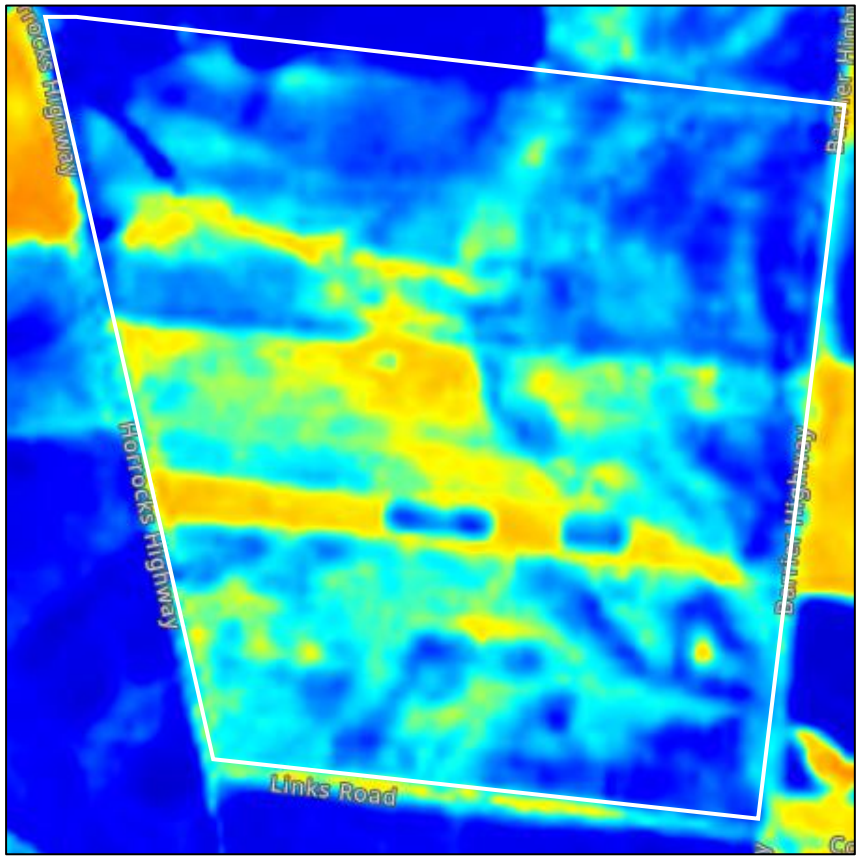
Effects of soil type- Giles Corner 2024

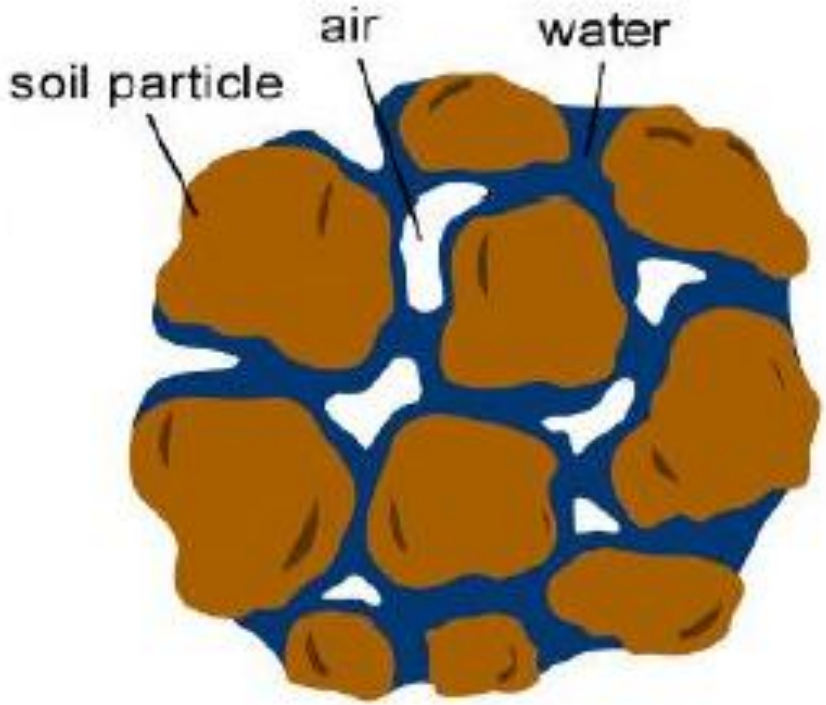
30 July 2024

NDVI 30 July 2024



Moisture index 20 Oct 2024





Sand, Silt, and Clay