



PRODUCTIVITY & PROFITABILITY



Dual Purpose Crops - Do they add value?

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To be advantageous, DPC's need to provide one or more of the following:

- Increased total farm feed production (quantity and quality);
- Reduce supplementary feeding;
- Result in favourable shifts in the distribution of feed supply across the year;
- Increase performance of grazing animals (repro and finishing);
- Diversification of income; and/or
- Not reduce grain yield and profit from grazing the crop.
- Ultimately interested in effect on business profit and risk
- Other systems benefits



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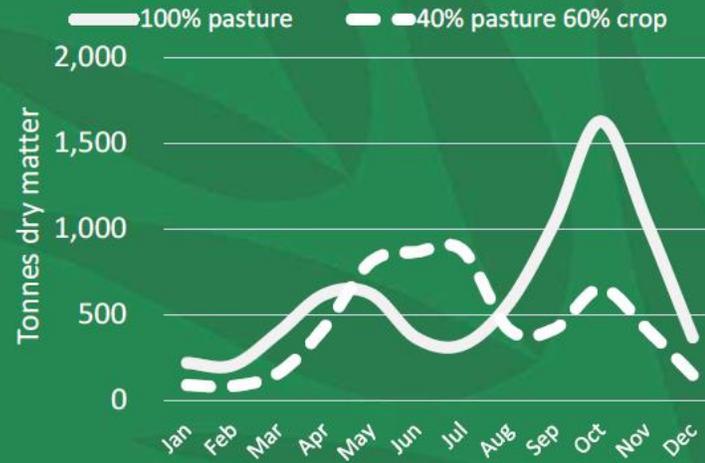


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Do crops increase total feed production?



The feed curve changes based on proportion of DP crop & pasture



Francis, GRDC Update 2024

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Impact of the inclusion of the grazing of dual-purpose wheat, dual-purpose canola or both crops on the total number of sheep grazing days per hectare (SGD/ha) gained from the total grazing system (Dove et al 2018; derived from the data of Dove et al 2015 for 2010 season)



	Total sheep grazing days achieved from system	Change compared to Phalaris-based pasture
Phalaris-based pasture only	3340	
Phalaris + wheat	5463	64%
Pasture + canola	5433	63%
Pasture + canola + wheat	6916	107%

- ~40% of the total extra SGD/ha provided by the (pasture + crop) systems (pasture spelling)
- This may be an over-estimation.

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Context is important!

- Medium/low rainfall
 - Traditional mixed-farming
 - Often DPC's are replacing a grain-only crop – grain yield often a focus
 - DPC's adding feed into the system during autumn/winter
 - Long season cultivars (winter or long-season Spring) have other benefits for the program
- ...So in this context, dual-purpose crops definitely increase total feed production!



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Do DPC's reduce supplementary feeding?

- Experiment at Ginninderra (near Canberra) (2013-2016) (McGrath et al, 2021) 
- Replicated experiment comparing systems that included d-p wheat (1/6) and canola (1/6) to a permanent pasture system
- Merino ewes producing selling lambs as yearlings.
- Two lower rainfall years, 2 different results:
 - 2013 – Systems with DPC's had lower supp feeding
 - 2015 – Systems with DPC's had higher supp feeding
 - Wheat crops sacrificially grazed
- Long-term system modelling suggests DPC's reduce supp feeding by ~60% compared with a system relying on pasture-only (Watt et al 2023)

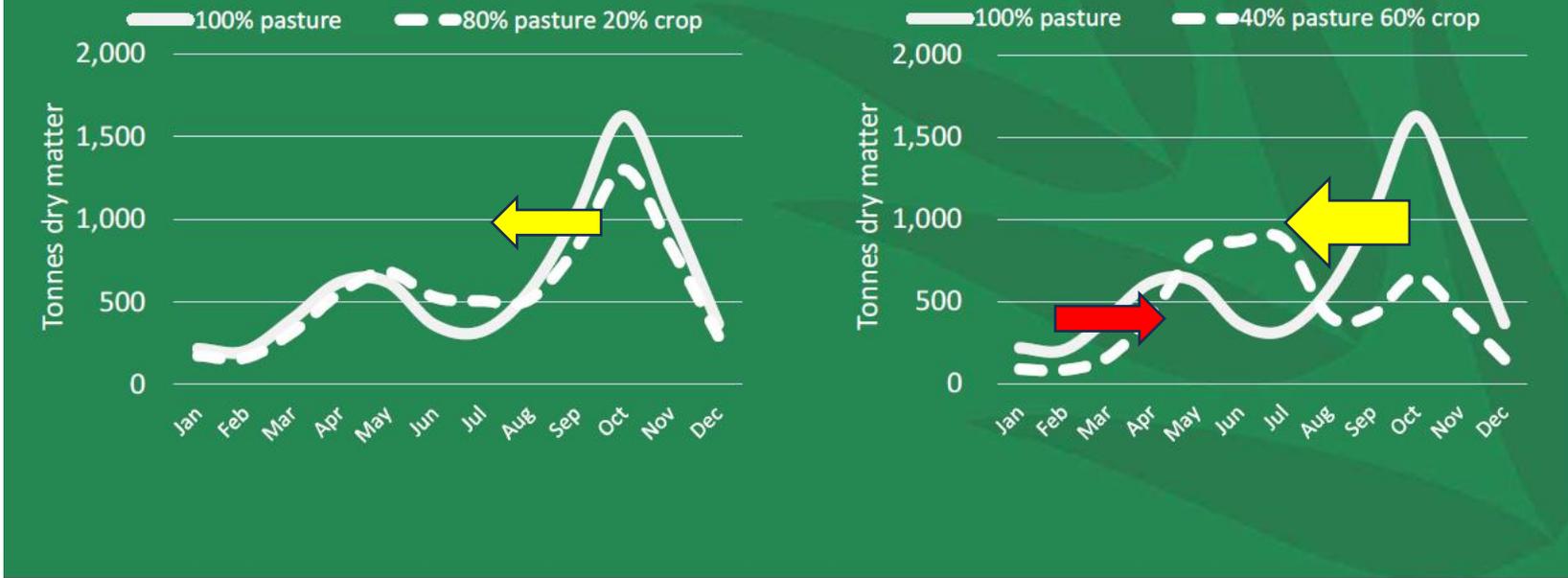


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Shift in distribution of feed supply



The feed curve changes based on proportion of DP crop & pasture

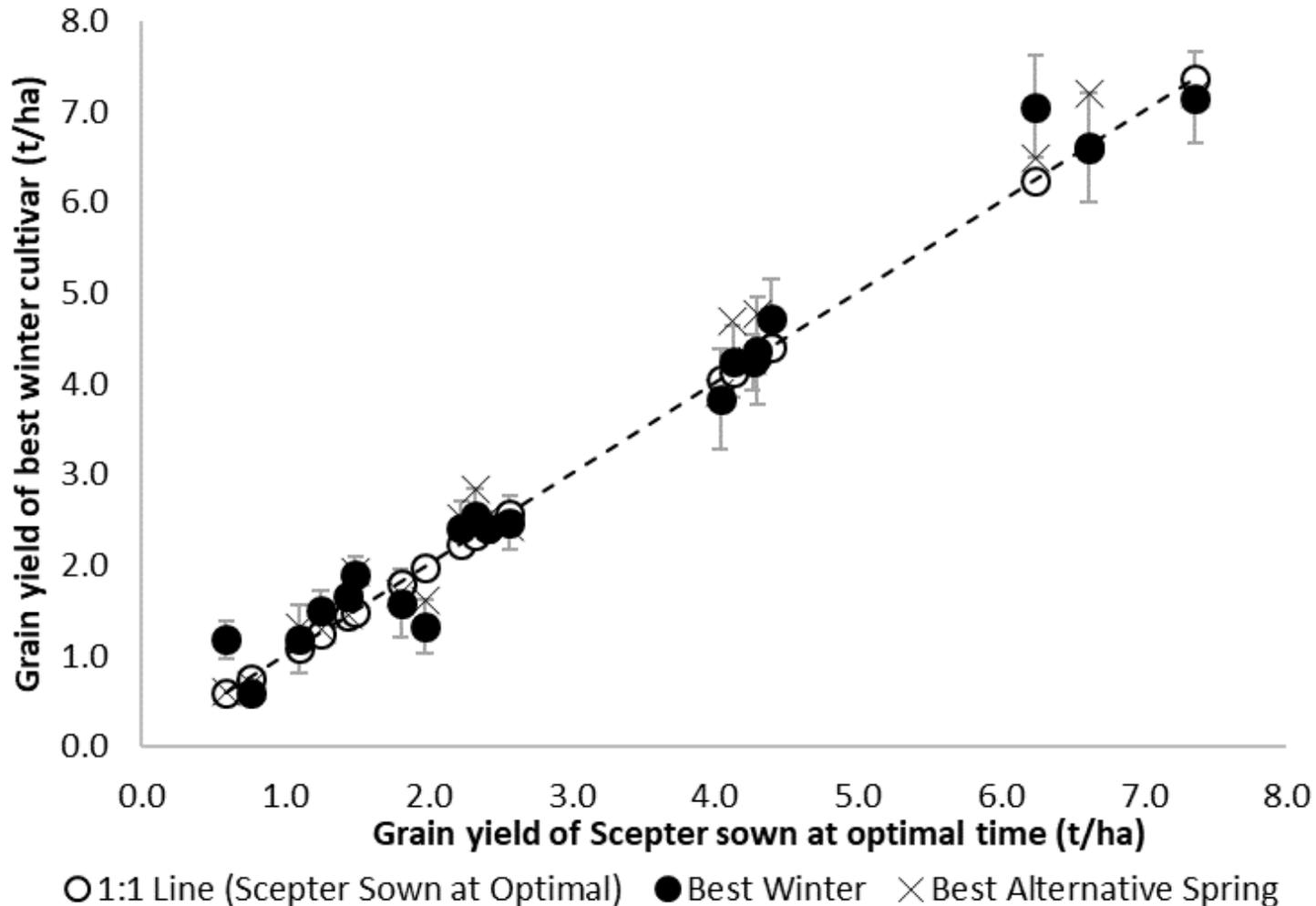


Francis, GRDC Update 2024

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BEST YIELDS OF EARLY SOWN WINTER WHEATS SIMILAR TO SCEPTER SOWN AT OPTIMAL TIME



For 20 sites SE Australia (2017/18):

- Winter = spring (14 sites)
- Winter > Spring (4 sites)
- Spring > Winter (2 sites)

Harris et al, GRDC Update 2019

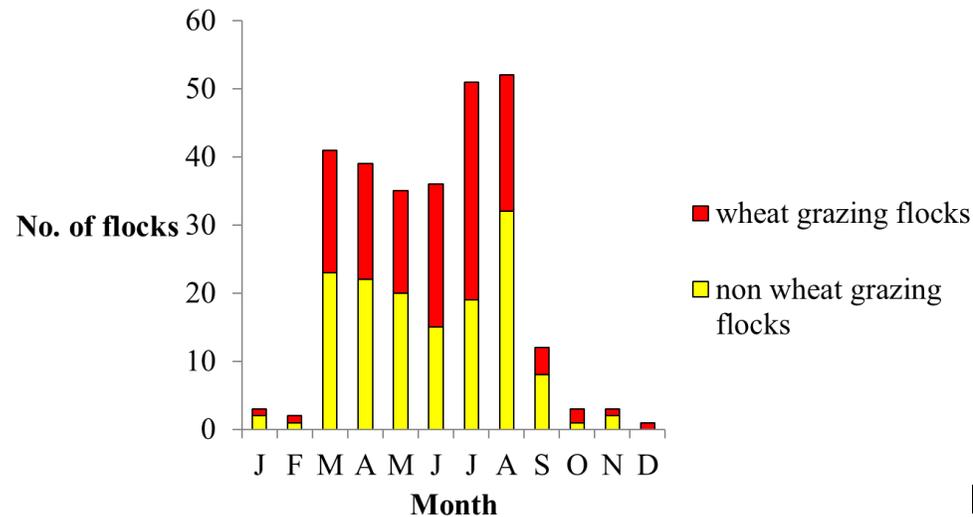
Mid-late April = highest yields; <2.5 t/ha (fast winter types); >2.5t/ha (slower winter types)

Favourable shift in feed

- Traditional approach has been that the winter feed gap is a limit to earlier lambing
- Dual-purpose crops fill this gap → make Autumn lambing more attractive (Watt et al 2023)



Lambing time in Hume LHPA (McGrath et al 2013)



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Can dual-purpose crops impact livestock performance?



- High quality feed → potential high growth rates
 - Mineral supplements (Mg, Na) can increase growth rates (0-50% in sheep, 0-27% in cattle)
 - ...but consider what livestock are available in your system at that time of year
- Evidence of positive effect on ewe weights
 - increase sale weight of cull ewes?
 - Increase reproductive performance?
 - Remember to provide Na, Mg, Ca to late pregnant and lambing ewes grazing wheat
- Wool: GFW's were on average 13% higher over the 4 years when crop grazing was prioritised (no effect on fibre diameter) (McGrath et al 2021)

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Diversify income

Replace some area of permanent pasture → income from grain

Receipts, expenses and farm business profit (AU\$/farmlet ha) over 2013–16 in the Canberra systems experiment

	Pasture only	Incl. dual-purpose crops
4 yr Total Livestock Receipts	\$2069	\$2146
4 yr Total Wool Receipts	\$941	\$941
4 yr Total Grain & hay receipts	-	\$1676
4 yr Total cash receipts*	\$3010	\$4762
4yr Total cash expenses*	\$1525	\$2449
Mean annual farm business “profit”*	\$265	\$472

Asterisk “*” indicates where values are significantly different (P<0.05)

(McGrath et al 2021)



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Grain income was always important contributor...

- 2013 = low rainfall
 - higher receipts (grain and hay); lower supp feeding
- 2014, 2016 = high rainfall
 - higher receipts (grain and hay); net income from livestock similar
- 2015
 - Lower grain income (wheat crop failed) and higher supp feeding, but compensated by canola receipts and higher wool income.



Example: diversifying income by taking on agistment cattle

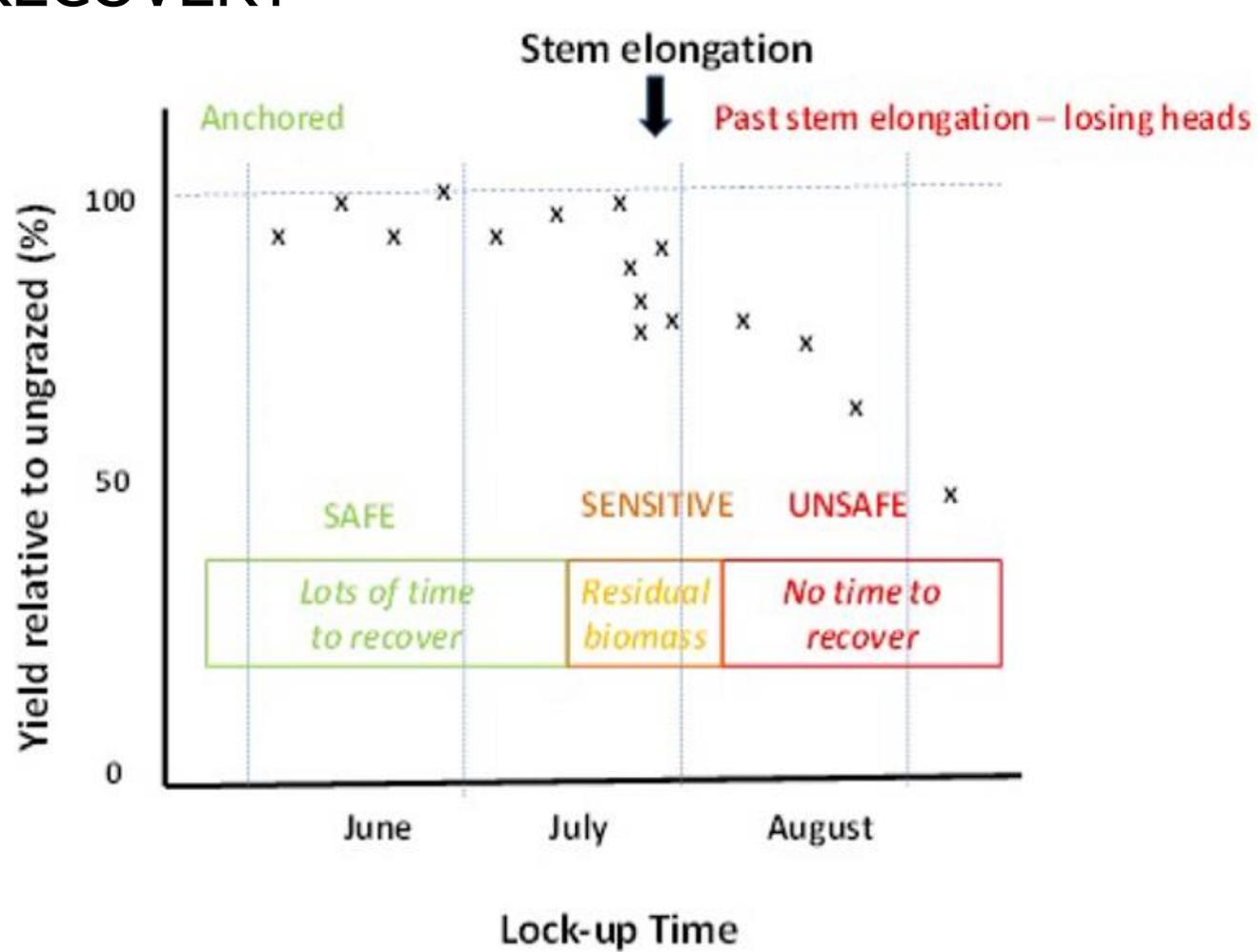
- Data from 2022, 250 steers grazing crops May-August
- Weighed before grazing canola in May (LW = 294 kg)
 - Weighed 1/7/22 – growth rate on canola 1.06 kg/h/d
 - Weighed post-grazing wheat – growth rate 1.46 kg/h/d
 - Calculation based on weight gain agistment rate (\$2.50/kg LWG, no other costs)

	\$GM/DSE.day	\$GM/ha*
Canola (53 days)	\$0.29	\$384
Wheat (35 days)	\$0.26	\$227

*Based on assumed stocking rate of 25 DSE/ha. Actual stocking rate unknown



IMPACT OF GRAZING ON GRAIN RECOVERY



Source: Sprague et al GRDC Updates 2015

Increase returns and reduce risk (e.g. Watt et al 2023)

- Allowed an increase in stocking density;
 - increased average gross margin;
 - without increasing risk in poorer seasons;
-
- Risk: Returns in lowest 20% of years (i.e. poorest seasons):
 - Autumn lambing with dual-purpose crops AUD\$386/ha
 - Spring-lambing system with dual-purpose crops AUD\$315/ha
 - Pasture-only systems on average ~AUD\$183/ha (often negative at Goulburn)



Don't forget the systems benefits, e.g.

- Spread sowing window
 - Perhaps also allowing better management of main season crops
- Winter clean of pastures
- Weed control as part of pasture renovation



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DPC's have the potential to be beneficial to a livestock producer:

- Increased total farm feed production (quantity and quality);
- Reduce supplementary feeding;
- Result in favourable shifts in the distribution of feed supply across the year;
- Increase performance of grazing animals (repro and finishing);
- Diversification of income; and/or
- Not reduce grain yield and profit from grazing the crop.
- Higher business profit and reduce risk
- Other systems benefits



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...but need to be willing and able to manage the added complexity, e.g.

Crop

- Paddock preparation
- Cultivars
- Sowing time
- Weed management (chemical application, WHPs)

Livestock

- Manage to optimise grazing and yields
- Animal health
- Trading





New Project – long term systems trials

- Long term systems trials are commencing at Wagga Wagga and Dookie – Comparison of different mixed-farming systems for long-term resilience and profitability. Funding from the Federal Governments Future Drought Fund.
- Partners include Southern NSW Innovation Hub, Vic/Tas Innovation Hubs, Charles Sturt University, University of Melbourne, Tasmanian Institute of Agriculture and Farming Systems Groups in southern NSW, Victoria and Tasmania.



Australian Government
Department of Agriculture,
Fisheries and Forestry



Future
Drought
Fund



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Key Reference list

- Dove (2018) System impacts of introducing crop grazing into pasture-based systems: the McClymont Memorial Lecture *Animal Production Science* 58 445-451
- Francis (2022) Practicalities and economics of integrating dual purpose crops into the whole of farming operation in the medium rainfall zone. GRDC Update
- McGrath, Behrendt, Friend and Moore (2021). Utilising dual-purpose crops effectively to increase profit and manage risk in meat production systems. *Animal Production Science* 61(11) 1049-1061
- Nicholson, Fischke and Barrett-Lennard (2016) Grazing Cropped Land. GRDC 2016
- Watt, Bell, Hermann and Hunt (2023) Integrating dual-purpose crops mitigates feedbase risk and facilitates improved lamb production systems across environments: a whole-farm modelling analysis. *Animal Production Science* 63(8), 782-801.



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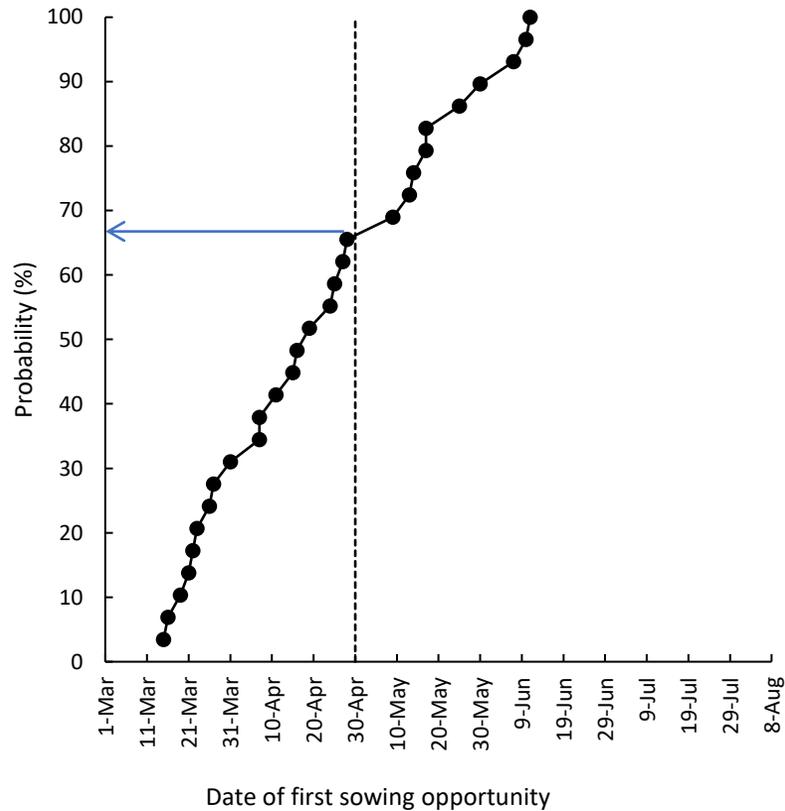
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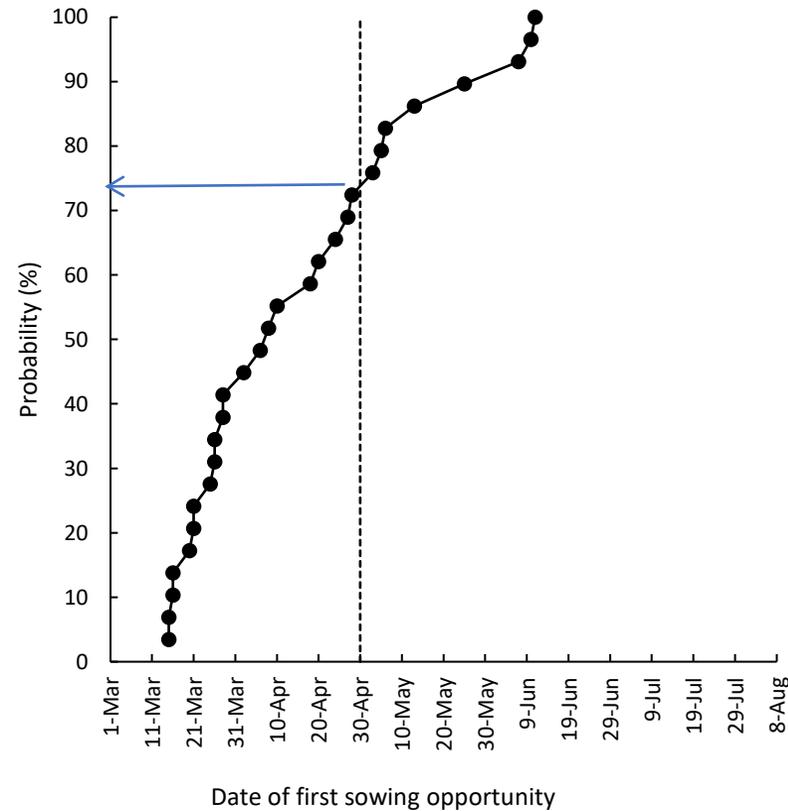
HOW OFTEN CAN YOU SOW EARLY?

Sowing opportunity = 7 day cumulative rainfall > 7 day cumulative potential evaporation (PET) (Unkonvich, 2010)

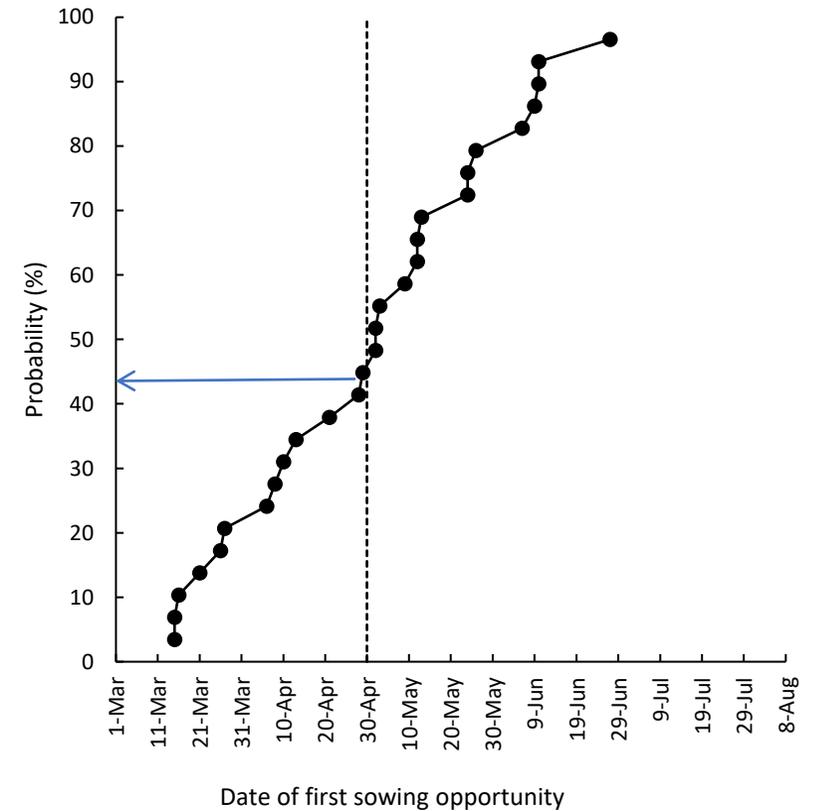
Wagga Wagga (1990-2018)



Wallendbeen (1990-2018)



Condobolin (1990-2018)



When to commence grazing?

- safe once the crops have grown secondary roots and are well anchored
 - usually the three leaf stage for cereals
 - six to eight leaf stage for canola (Nicholson et al. 2016).
- Starting biomass
 - Often studies have used a threshold > 1 or 1.5 t/ha
 - Dual-purpose wheat grazing studies in Wagga Wagga, NSW, commenced grazing in mid to late June, with levels as low as 0.6 – 1.1 t DM/ha (McGrath et al. 2015).



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Financial analysis of Ginnindera Experiment (2013-2016)

- Replicated experiment comparing systems that included d-p wheat (1/6) and canola (1/6) to a permanent pasture system
- Merino ewes producing selling lambs as yearlings
- Financial analysis used average farmgate prices over the 4 years:
 - Yearling sheep AU\$2.61/kg liveweight;
 - Wool (GFW) \$10.31/kg; for
 - wheat \$255/t \$470/t for
 - Canola \$470/t
 - N \$1.22/kg
 - P \$3.29/kg
 - Contractor prices



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High rainfall zone – benefits of DPC's (Watt et al 2023)



- Minimal difference in livestock production metrics (e.g. lamb production) due to supplementation
 - amount of supplement fed becomes an important metric.
 - supplement required to meet livestock demand was reduced by ~60% compared with a system relying on pasture-only.
- Makes autumn lambing more attractive
 - DPC's = less severe feed gap in winter
- Differences most apparent at high stocking densities (autumn lambing)
 - DPC's may not be as valuable if you don't already have high pasture utilisation
- Ewes generally in better condition (particularly Autumn lambing)
 - Impact on repro and sale value of cull ewes

