Seeding systems for reliable crop establishment across Mallee soils

Trial Site Field Day, Murrayville, Tuesday 15 July 2014

The issue

MSF undertook an initial survey of 12 farmers in Murrayville region to identify what issues are perceived as limiting the success of crop establishment in Mallee soils and which aspects of district seeding systems need improvement. The survey was valuable in providing an insight into what seeding practices local farmers currently implement, what works well for them and what areas could be improved upon. The survey results showed that the greatest issue faced by most farmers was the inability to maintain a consistent and accurate seeding depth across all soil types in the paddock. As a result crop establishment is often variable with crops sown too shallow on the stony soils and too deep on the sandy soils which significantly impacts on crop emergence, especially canola. Unstable furrows filling in, residue handling limitations and poor soil/seed contact were other issues highlighted. Strong interest in seeding system solutions able to optimize the performance in stony soils and non-wetting sands – including disc and advanced tine technologies - was expressed by the majority of farmers.

The Trial

A 4 hectare demonstration trial was sown in May 2014 (6-9th) near Murrayville, showcasing eight different seeder set-up options (Table 1). The site is located in a typical Mallee paddock, comprising three soil types ranging from a heavy stony soil (swale) to a light sandy soil on the dune. Each plot was sown with a 6 row seeder on 11 inch row spacing and each plot is 205 m long and covers whole range of soils at the site (stony through to sandy). The plots were sown on a slight angle to the previous year's stubble and include 4 replications. A reference speed of 9km/h was used, reduced to 6.5km/h in stony areas, reflecting district practice.

Each seeding system is being evaluated in Clearfield wheat (Grenade, 37g/1000 grains) and canola (Pioneer 43C80, 4.1g/1000 seeds). The wheat was sown at 65 kg/ha targeting 160 plants/m^2 at 95% field establishment. The canola was sown at 2.5 kg/ha delivering 60 seeds/m^2. The wheat was treated with *Evergol Prime*^{TM} fungicide and the Canola with *Gaucho*^{TM} insecticide + *Jockey*^{TM} fungicide. Both crops were sown at the same targeted depth of 2cm, to allow a common assessment of seeding depth uniformity from the wheat plots.

Each crop had 65 kg/ha of Granulock Z 14 S (NPKS 20-13-0-7, 0.6% Zn) applied at seeding. The fertilizer was treated with *flutriafol* (*Intake*^{TM}) fungicide . A further 110 kg/ha of a 60%/40% Urea/Ammonium Sulphate blend was applied across the site on the 3rd of July.

Prior to seeding a knockdown herbicide was applied across the entire site. *Sakura*^{TM} herbicide was also applied prior to sowing on the wheat area only, however no pre emergent herbicide was applied to the canola plots. On the 3rd of July, the wheat was treated with 600 ml/ha of *Intervix*^{TM} herbicide and the Canola was sprayed with 400 ml/ha of *Intervix*^{TM}, 350 ml/ha of *Clethodim* and 75 ml/ha of *Haloxyfop*. Both wheat and canola was treated with insecticides with 250 ml each of *Alpha cypermethrin* and *dimethoate* applied during herbicide application.

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Treatments

The following seeding system treatments are included in the trial:

Treatment Number	System description	System name	Opener	Fertiliser placement	Seed boot	Furrow closing
0	District technology (Control)	Agmaster RB + narrow PW	16mm knife point (Agmaster)	Fertiliser hose bracket (profile banding)	Adjustable rubber boot	50mm wedge PW
1	Improved district technology	Agmaster + wide PW	16mm knife point (Agmaster)	Fertiliser hose bracket (profile banding)	Adjustable rubber boot	150mm wedge PW
2	Alternative chisel tyne technology 1	Agmor + wide PW	16mm knife point (Agmaster)	Fertiliser hose bracket (profile banding)	Adjustable Polyurethane Agmor UBV3	150mm wedge PW
3	Alternative chisel tyne technology 2a	RootBoot	16mm knife point (RootBoot)	Shallow center banding	Paired row attachment	110mm flat PW
4	Alternative chisel tyne technology 2b	Stealth	30mm Stealth opener	Deep center banding	Paired row attachment	110mm flat PW
5	Contour following technology 1	Triple disc system	Yetter 24 wave fluted coulter	surface banding boot on coulter	K-Hart 3612 twin discs	PW 65mm
6	Contour following technology 2	Seed Hawk	14mm knife 1st opener	Deep banding front opener	Single row 2nd opener	PW 110mm
7	Hybrid technology: tyne + twin discs	Tyne/disc combo	16mm Primary Sales knife point (PR87)	Primary Sales profile banding fertiliser boot	K-Hart 3612 twin discs	PW 65mm

Note: PSA: Primary Sales Australia, PW: Press wheel

Data collection and results

The site is being intensively monitored for the impact of seeding system on crop establishment, seeding depth and crop productivity. Emergence counts on both wheat and canola plots, wheat seeding depth sampling have been conducted to date and rooting depth measurements will be taken over the duration of the season. Each 205m plot was subdivided into 12 subplots, each of 12m length, which will be individually assessed for soil characteristics (EM38, stoniness, texture) and crop response (NDVI), to help develop correlations between crop performance and soil factors. Yield data will be collected at harvest. Results of the trial will be available post-harvest and will be documented in the MSF Results Compendium.

Early results to date suggest the following:

- Good crop establishment in wheat (site average = 140 p/m^2 at 80% emergence) with few differences measured between seeding systems and a small influence of soil type with a trend for a small reduction in plant numbers in both stony soil and sand hills. (Fig. 1, Fig. 3)
- Fair crop establishment in canola (site average = 33 p/m^2 at 56% emergence) with higher losses observed across subplots (emergence varying between 35% and 84%) and larger differences between seeding systems (Fig. 2, Fig. 4). NOTE: The site has suffered significant seedling damage from insects
- Overall, a fair performance of the control system with no great differences in crop establishment highlighted between seeding systems, likely due to the wet conditions experienced following seeding (A trend of lower plant numbers is suggested for the disc and hybrid systems).
- Seeding depth data (based on emerged seedlings) varied across systems (18-35mm) despite the careful setting up at seeding. No clear interaction between canola emergence and seeding depth in this depth range. (Fig. 5)
- Seeding depth uniformity was best with disc seeding and Agmor system, and tended to be least with the higher disturbance paired row systems. (Fig. 6)

Acknowledgements

This project (Demonstrating Advanced Seeding Systems to Mallee Farmers) is supported with funding from the Australian Government. The project is also supported with funding from the Grains Research and Development Corporation (GRDC) project Maintaining Profitable Mallee Farming Systems with Retained Stubble.

More information

For more detailed information on this trial please contact Michael Moodie, M 0448 612 892, E michael@msfp.org.au or visit the MSF website www.msfp.org.au or Facebook page.

Video footage of each seeding system working was captured during sowing. You can view the footage of each seeding system at the MSF You- Tube page www.youtube.com/msfmildura.

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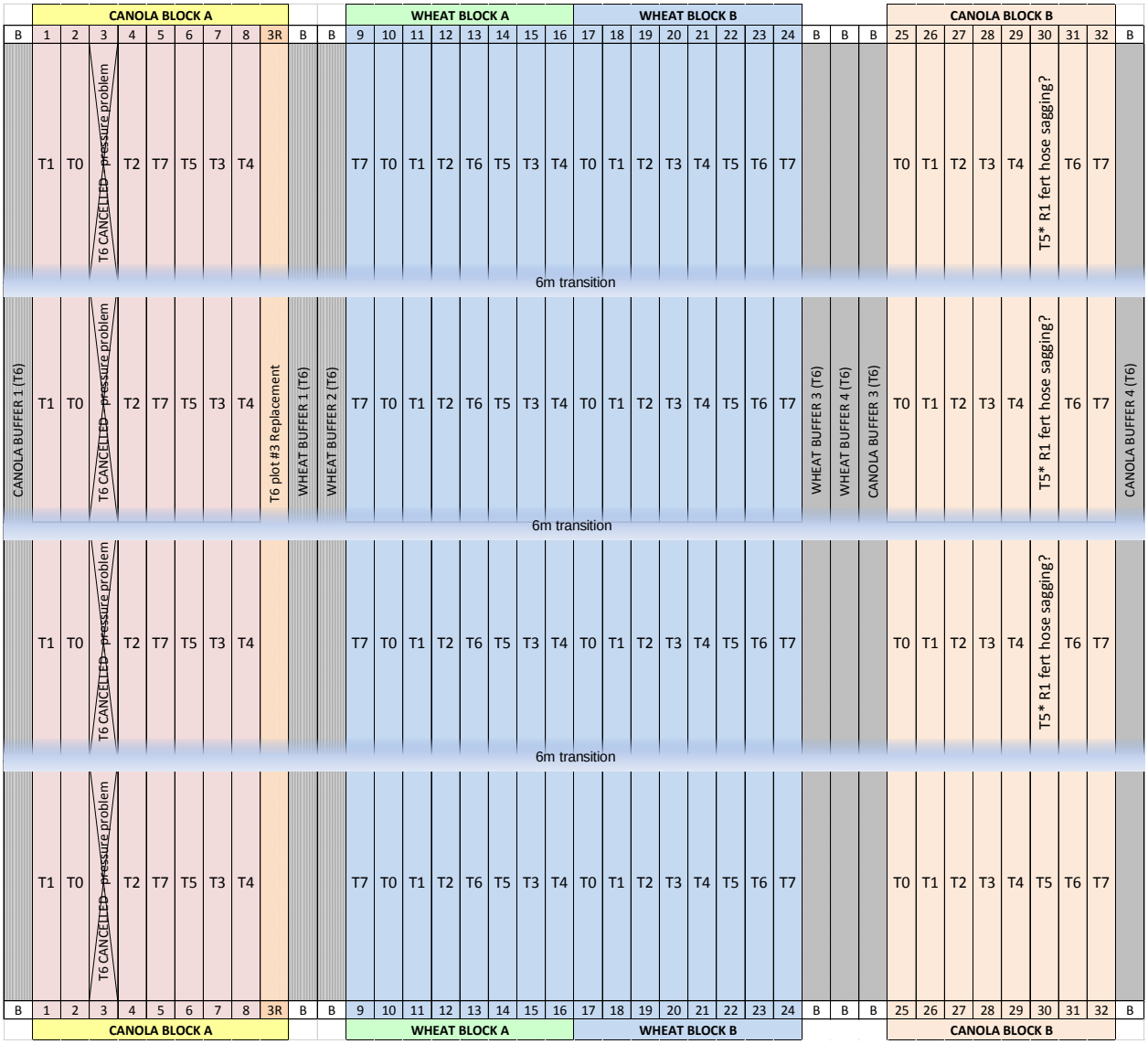
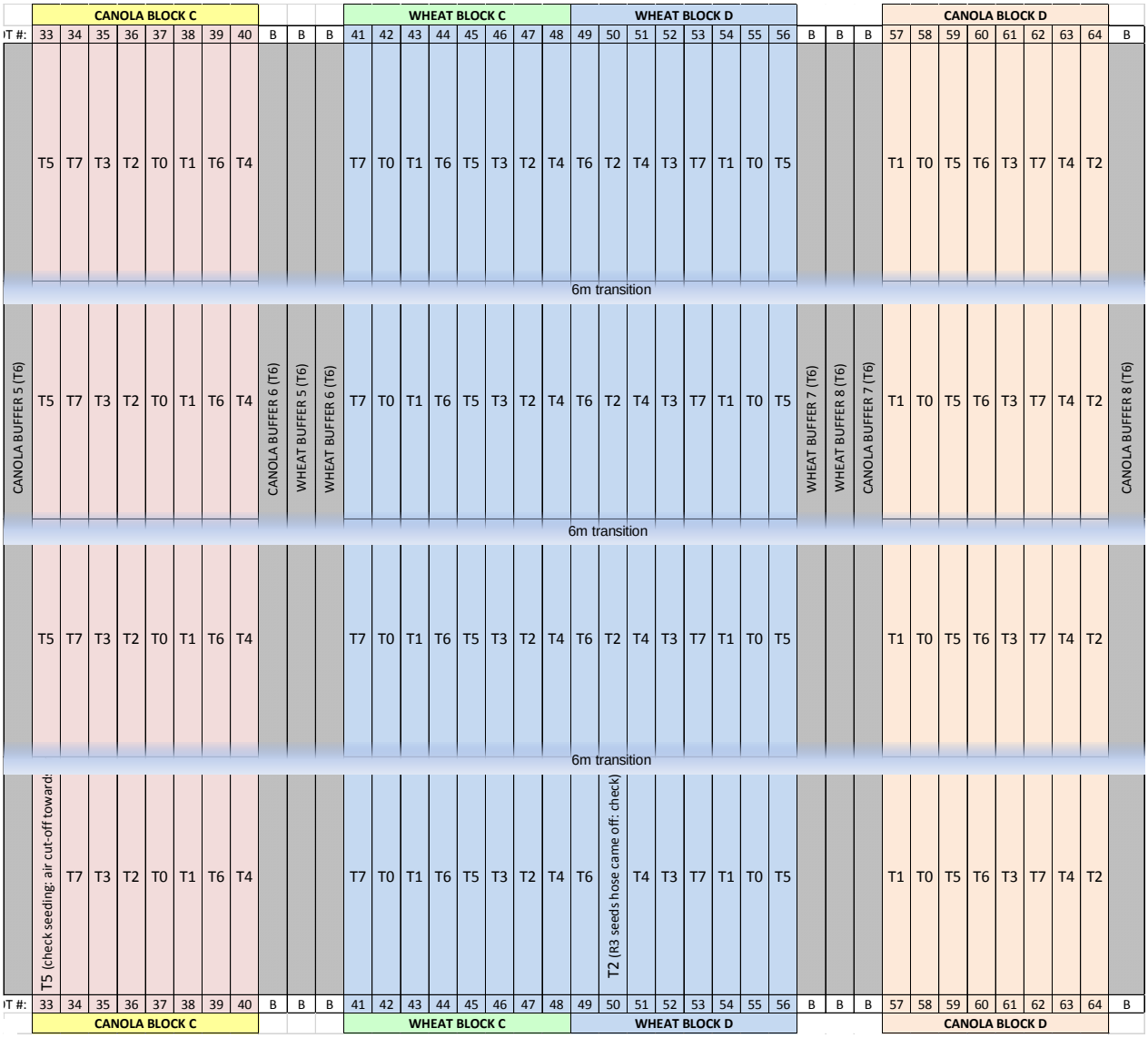
West Block


CANOLA BLOCK A
WHEAT BLOCK A
WHEAT BLOCK B
CANOLA BLOCK B
B 1 2 3 4 5 6 7 8 3R B B 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 B B B 25 26 27 28 29 30 31 32 B
T1 T0 T6 CANCELLED - pressure problem T2 T7 T5 T3 T4
T7 T0 T1 T2 T6 T5 T3 T4 T0 T1 T2 T3 T4 T5 T6 T7
T0 T1 T2 T3 T4 T5* R1 fert hose sagging? T6 T7
6m transition
CANOLA BUFFER 1 (T6)
T6 plot #3 Replacement
WHEAT BUFFER 1 (T6)
WHEAT BUFFER 2 (T6)
WHEAT BUFFER 3 (T6)
WHEAT BUFFER 4 (T6)
CANOLA BUFFER 3 (T6)
CANOLA BUFFER 4 (T6)



East Block

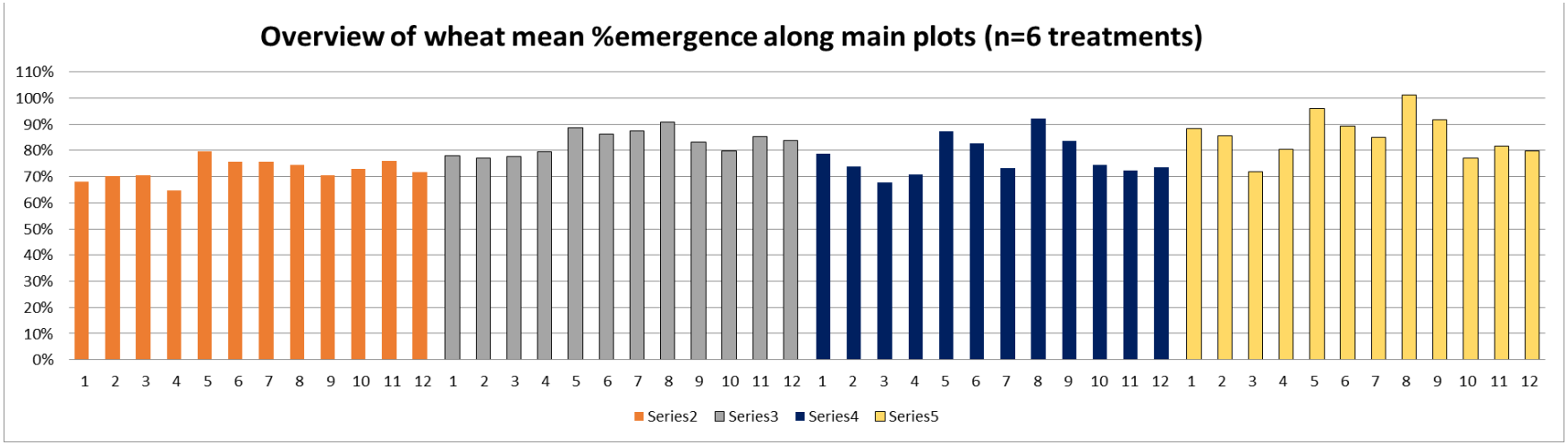


Fig. 1: Wheat crop establishment profile along subplots (stones start at subplots 1 and progress through to flats and sand hills up to subplot 12) – mean site establishment: 140 plants/m^2 (range: 113 to 177 p/m^2)

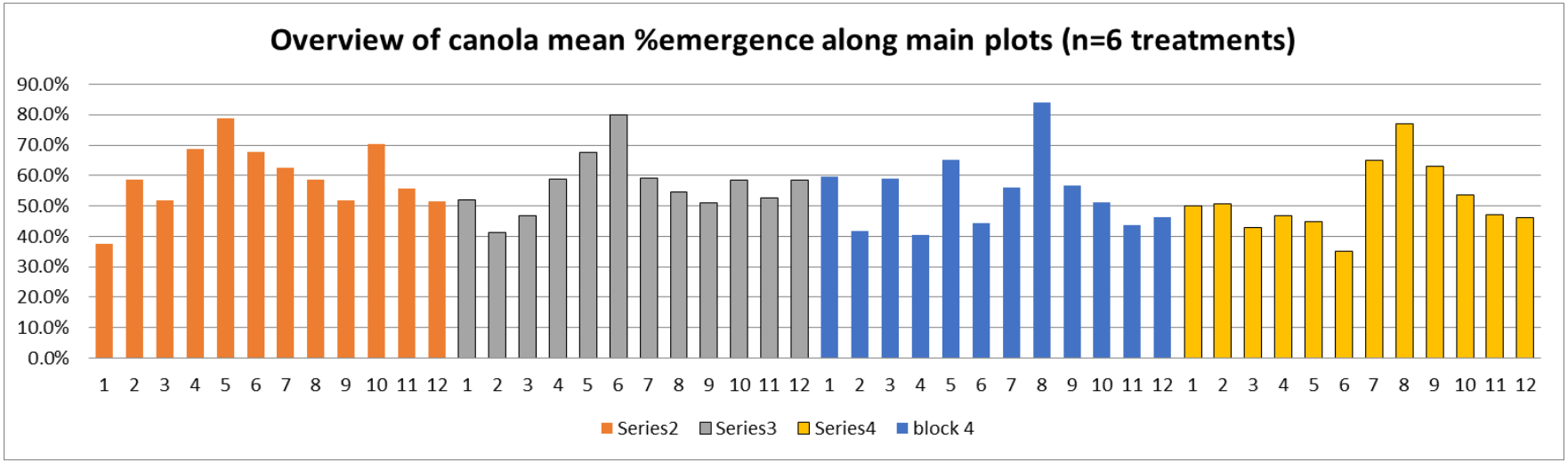


Fig. 2: Canola crop establishment profile along subplots (stones start at subplots 1 and progress through to flats and sand hills up to subplot 12) - mean site establishment: 33 plants/m^2 (range: 20 to 50 p/m^2)

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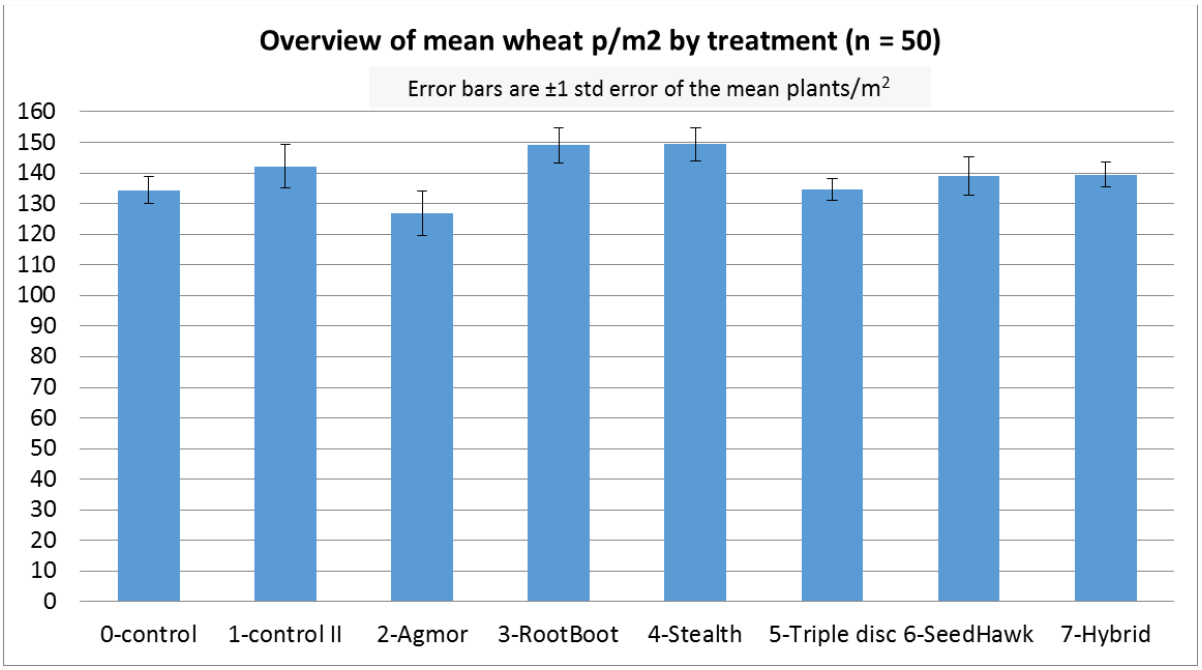

Fig. 3: Wheat mean crop establishment by seeding system

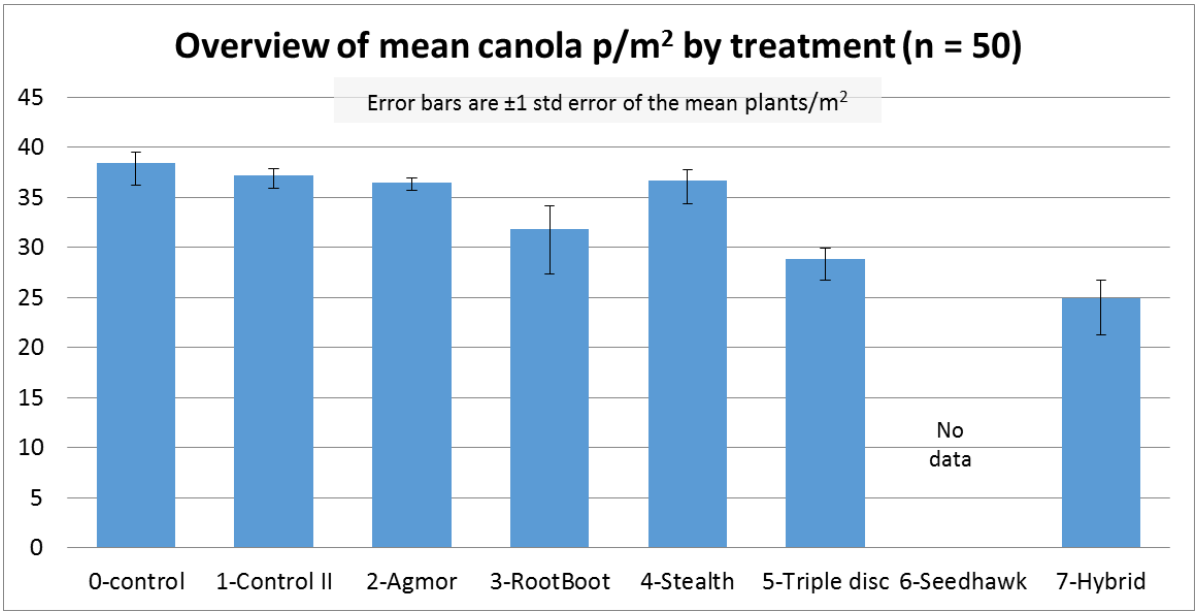

Fig. 4: Canola mean crop establishment by seeding system

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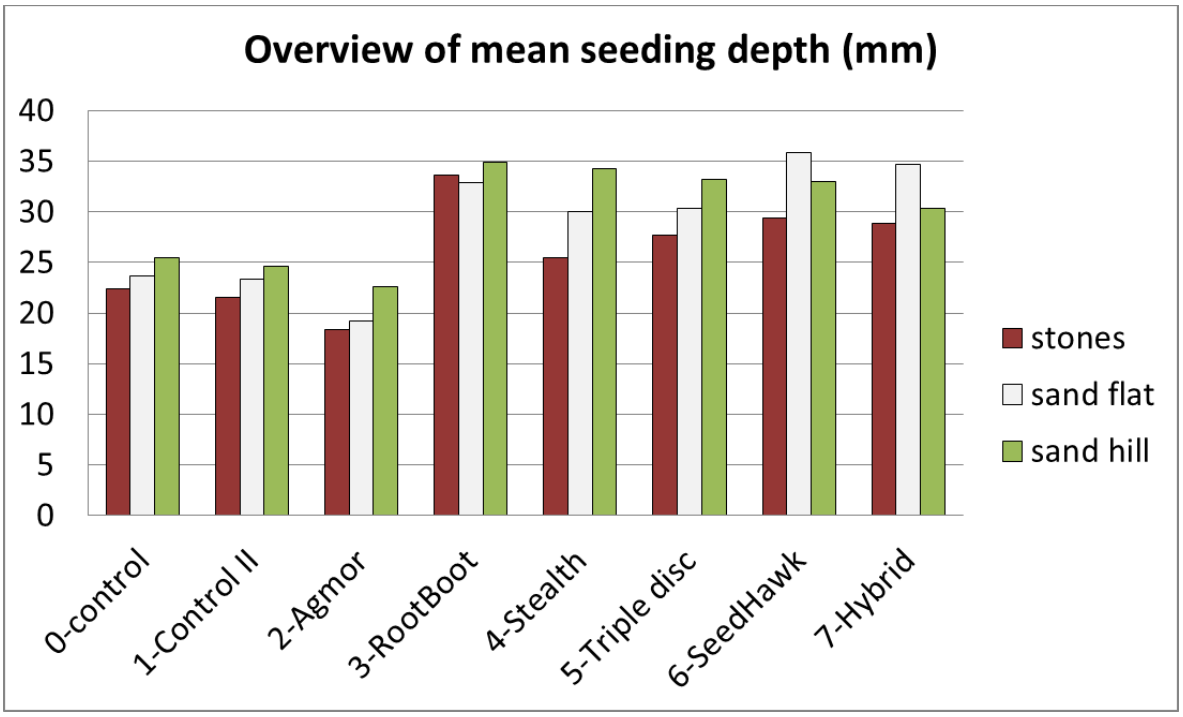

Fig. 5: Mean seeding depth across seeding system and soil type

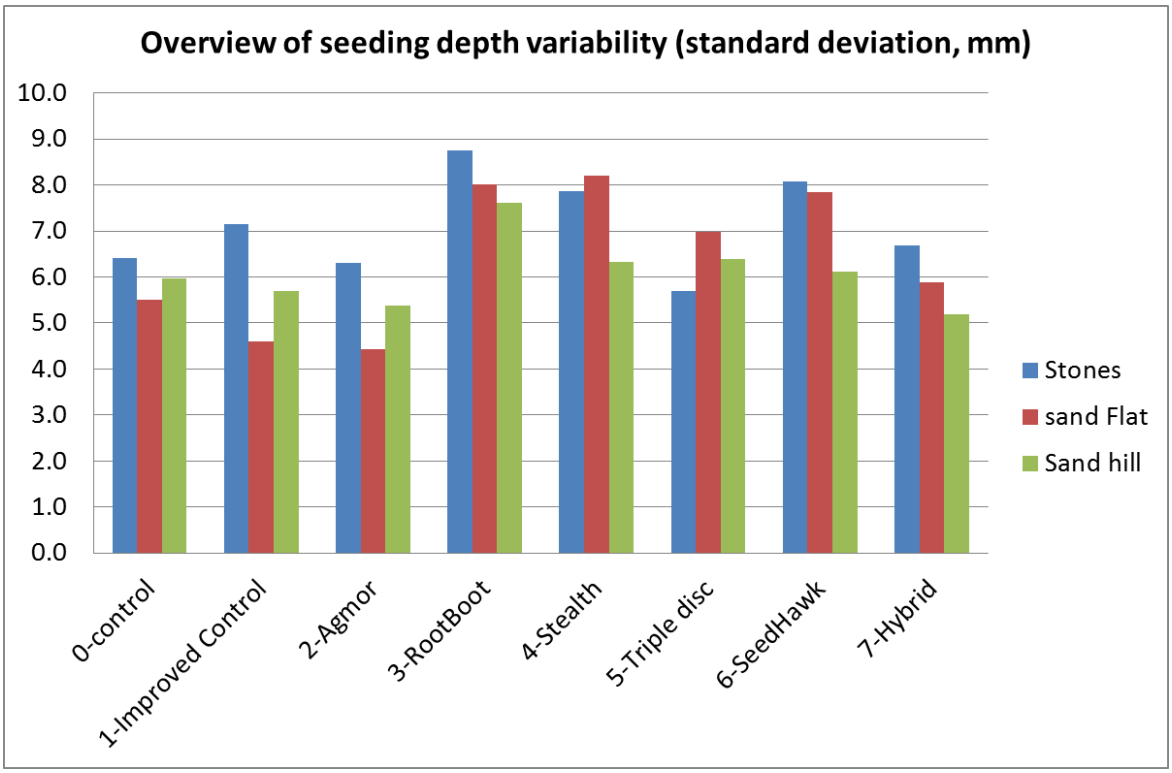

Fig. 6: Uniformity of seeding depth across seeding system and soil type

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