# Evaluating approaches to improve furrow sowing on water repellent sands

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| **Purpose:** | To evaluate a range of seeding modifications or additions with the aim of improving crop establishment and yield on water repellent sandplain soil. |
| **Location:** | Colin McAlpine, 'Sandown', Badgingarra |
| **Soil Types:** | Pale deep sand; Sandy gravel |
| **Soil Test Results:** | pH (1:5 CaCl2) = 6.0; pH (1:5 H2O) = 6.6; EC (1:5 H2O) dS/m = 0.11; Organic carbon = 1.89%; Nitrate nitrogen (KCl) = 40 mg/kg; Ammonium nitrogen (KCl) = 5 mg/kg; Colwell K = 15 mg/kg; Phosphorus Buffer Index (PBI) = 7.7; Colwell P = 65 mg/kg; Sulphur (KCl-40) = 7.2 mg/kg. |
| **Rotation:** | Wheat 2010; Lupin 2011; Wheat 2012 |
| **Growing Season Rainfall (April- October 2012):** | 325 mm |

## BACKGROUND SUMMARY

Water repellent sandy soil lacks cohesion when dry so it tends to flow around narrow knife points at seeding and become concentrated in the sown furrow. This repellent soil concentrated in the furrow resists wetting up and hence can reduce establishment and timely germination of the crop. In these circumstances the furrow tends to remain dry while the ridges wet up. The problem would tend to be expressed more with dry or partially-dry sowing and in circumstances where the soil water repellence is more severe. The aim of this research is to investigate modifications or additions to the seeding system that improve the wetting up of the seeding furrow by either reducing the flow of water repellent soil into the furrow at seeding or improving the capacity of the furrow to wet up primarily through the use of banded wetting agents.

## TRIAL DESIGN

**Plot size:** 3 m x 300 m

**Machinery use:** Research airseederwith 12-inch row spacings

**Repetitions:** 4, randomised complete block design

**Crop and seeding details:** Mace wheat, 70 kg/ha on 17-18 May 2012

**Fertiliser rates and dates:** 25kg/ha MacroPro Trace at seeding (note: problems with airseeder prevented a higher rate being used)

## RESULTS and DISCUSSION

Early sowing (17th May) into highly variable and marginal soil moisture conditions, with dry soil over some moisture, resulted in partial crop emergence with the majority of plants emerging 3 weeks later following a >20 mm rainfall event. The wetting agent improved crop emergence over knife points alone with this subsequent germination suggesting it had remained active for the 3 week dry period. Banded wetting agents increased total establishment by an average of 36% (15 plants/m2) in the pale deep sand and by 48% (18 plants/m2) in the sandy gravel (Fig. 1). The paired-row (both rows sown) treatment increased overall crop establishment by 31% (13 plants/m2) in the deep sand and by 66% (25 plants/m2) in the sandy gravel (Fig. 1).

The sandy gravel had more soil moisture in the deeper topsoil than the deep sand at seeding and the winged points appeared to delve more of this moist soil into the seed zone improving early emergence on the sandy gravel but not the deep sand (Fig. 1).

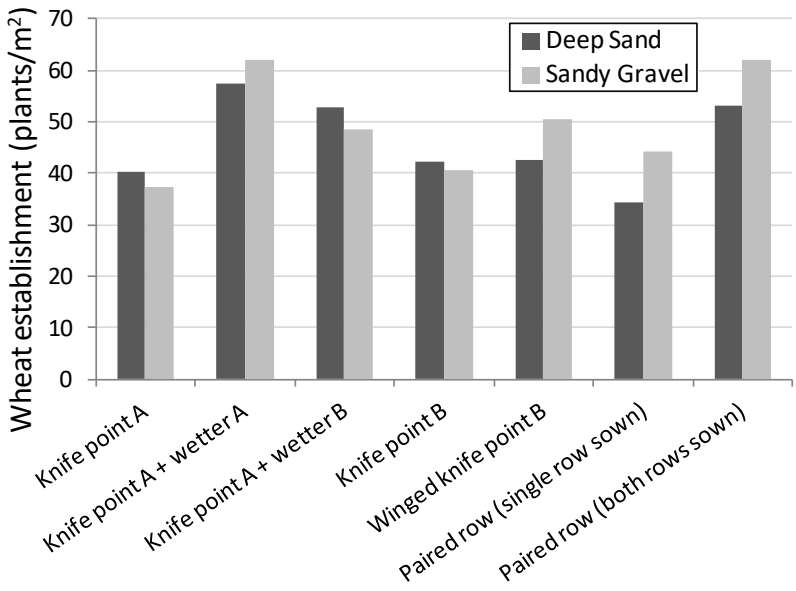


**Figure 1. Wheat establishment (plants/m$^2$) in response to different seeding point designs and banded wetting agents (wetter) used in water repellent pale deep sand and sandy gravel at Badgingarra in 2012.**

Both banded wetting agents and a paired row seeding both had significant yield increases over knife points alone (Fig. 2). On average the wetting agents increased the yield over knife points by 46% (507 kg/ha) on the pale sand and 35% (523 kg/ha) on the sandy gravel. Paired-row seeding, with both rows sown, increased yield by 88% (965 kg/ha) on the pale deep sand and 43% (650 kg/ha) on the sandy gravel. Winged points gave a 33% yield increase (500 kg/ha) on the sandy gravel but showed no yield benefit on the deep sand (Fig. 2).

On the pale deep sand there was no impact of treatment on grain protein which ranged from 12.2 to 12.5% across the treatments (data not shown). On the deep sandy gravel marginal 0.2% increases (90% confidence of a real difference) in grain protein were measured for the one of the soil wetting agents (wetter A), winged points and the Stiletto, single row sown treatments (data not shown).

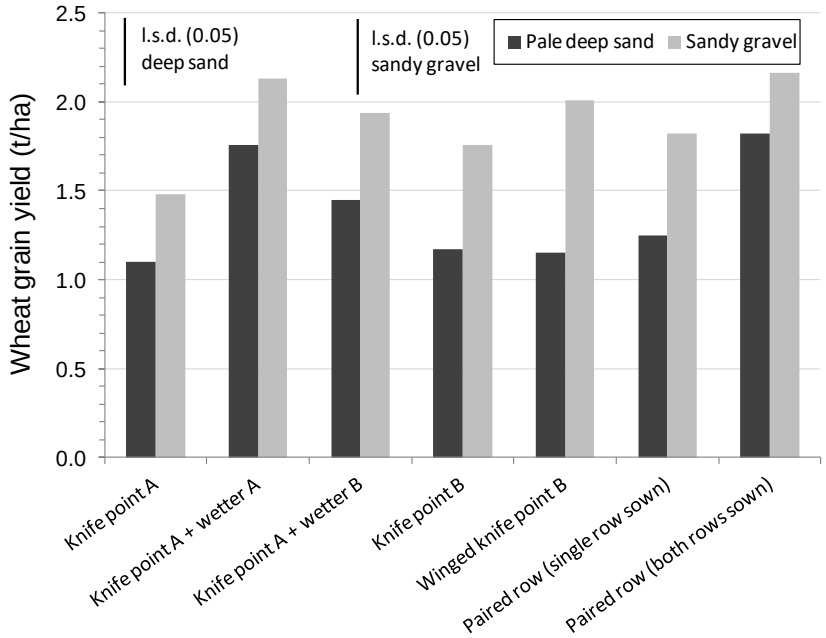


**Figure 2. Impact of seeding systems on wheat yield grown in water repellent pale deep sand and sandy gravel at Badgingarra in 2012.**

On the sandy gravel soil the knife point control had screenings of 3% and the used of banded wetting agent and winged paired-row seeding decreased this to 2.5% (Fig. 3) with smaller but still significant declines in screenings for these treatments on the deep sand.

Grass weed ratings indicated that the banded wetting agent treatments had less weed numbers than the knife point control on both soil types while the paired row (both rows sown) treatment had less on the deep sand soil (data not shown). Weed seed counts indicated that all treatments had large reductions in ryegrass seed set on the sandy gravel soil but only the banded wetting agents reduced brome grass seed set on the sandy gravel. There was no effect of treatment on grass weed seed set on the pale deep sand (data not shown).

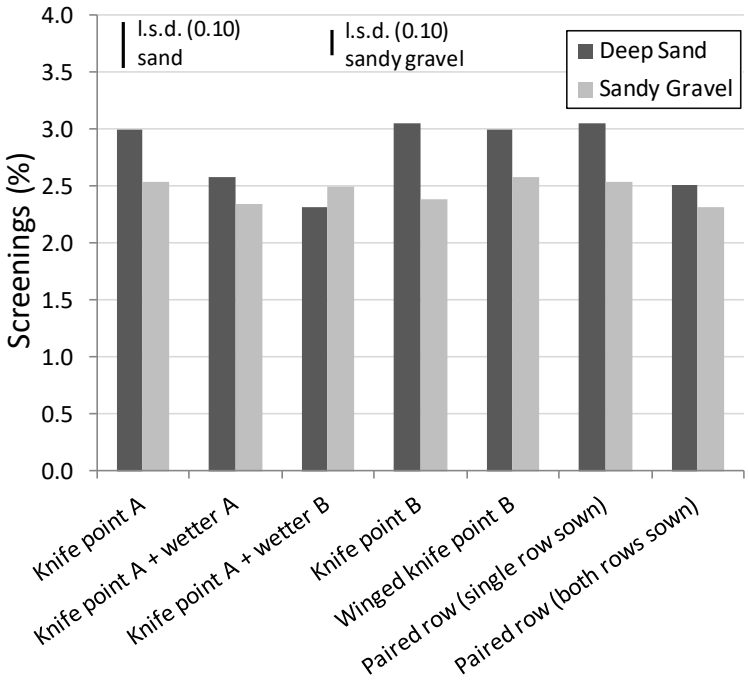


**Figure 3. Impact of seeding systems on screenings (%) for wheat grown in water repellent pale deep sand and sandy gravel at Badgingarra in 2012.**

## CONCLUSION

- This and other research demonstrates that it is possible to improve crop establishment and productivity on water repellent soils using modified furrow sowing techniques.
- Banded wetting agents are helpful with early dry or partially dry sowing before opening rains but show less benefit later in the sowing program when there has already been rain and the soil has started to wet up more (see Banded wetting agent paper WMG 2012 research annual). In very erodible conditions with high wind erosion risk the use of this strategy may be safer than the options with winged points or boots due to less soil disturbance and release of root anchorage for existing plant cover. Optimal wetting agents for WMG areas still need identification.
- Winged points and winged-paired row systems perform better than knife points under certain soil conditions but the benefits are variable and in some sowing conditions may provide little benefit. Further research is required. Winged points look most attractive when shallow moist soil can be ‘delved’ to the seed zone to provide early establishment (as in the winged knife point on the gravelly sand with shallow moisture).
- Simple approaches like sowing next to or at a shallow angle across the previous year’s crop row and broadcast spreading a portion of the seed in front of the seeding tynes are relatively simple approaches that can provide establishment benefits.

**PEER REVIEW:** P. Blackwell

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