

PAIRED-ROW SYSTEMS AND EFFECT ON WEEDS AND CROP YIELD

In 2005 Dr Jack Desbiolles led research into the effects of seedbed utilisation and seed rate on weed competition and wheat yields on a shallow grey Mallee loam near Minlaton in South Australia.

The SAGIT funded research, in collaboration with the Southern Yorke Peninsula Alkaline Soils Group, centred on investigating the impact of seedbed utilisation (SBU), which quantifies the extent of the row spacing occupied by the crop. Low SBU seeding typically makes a uniform seeding job easier to achieve but there is an increased risk for fertiliser toxicity to reduce seedling emergence, and inter-plant competition can significantly limit the yield potential in higher potential seasons.

Two wheat crop seeding rates were tested – ‘Standard’ seeding rate of 88 kg per hectare to establish 180 to 190 plants per m²; and, ‘High’ seeding rate of 125 kg per hectare to establish 250 to 260 plants per m². Three levels of seedbed utilisation (SBU) were trialled and Marloo oats was broadcast at 40 kg per hectare (105 seeds per m²) and incorporated using a prickle chain on the ‘weedy’ plots to simulate weed competition.

A knife blade plus double-shoot rubber seed boot on 25 cm row spacing gave low (15 per cent) SBU. The intermediate treatment was 45 per cent SBU using a double shoot narrow ribbon Anderson opener, also on 25 cm row spacing. Full (100 per cent) SBU was applied using a 20 cm wide share with a 20 cm reach plus Morris spreader boot set on 20 cm row spacing, effectively sowing seed across the full bed area and leaving no inter-row space.

SBU impact on weeds

While crop seeding rate had little effect initially, the 100 per cent SBU had a significant effect on early weed vigour. This treatment reduced weed biomass by 16 to 20 per cent, and reduced weed tillering by 25 to 30 per cent in the early stages of growth.

SBU also had an impact on later weed growth where greater SBU proportionally reduced weed biomass by 11 to 14 per cent (in the 45 per cent SBU system) and 29 to 32 per cent (in the 100 per cent SBU system). A 43 per cent reduction in weed growth was achieved using a high seeding rate combined with 100 per cent SBU.

Weed seed production followed similar trends, with the best results being a 38 per cent reduction in seed weight per weed plant using full SBU and the higher seeding rate. Following a 289 mm rainfall growing season, the full SBU seeding combined with

high seed rate increased wheat grain yield by 0.43 tonnes per hectare (in a weed-free environment) and 0.83 tonnes (in a weedy environment), relative to the low SBU, low seed rate control.

This research confirmed the principles of crop competition and showed that paired-row systems were a practical option to help achieve greater weed competition and higher yield potential through greater seedbed utilisation.

Different soil types

More recently, Jack conducted research on different soil types in the Murrayville district (Vic) in collaboration with Mallee Sustainable Farming Inc, and with DAFF funding, comparing paired-row systems to a commonly-used single row knife point system. In this trial, the paired-row systems gave the highest and most consistent crop establishment across a swale-dune Mallee sandy soil system, with good moisture conditions at seeding and sufficient in-crop rainfall.

The plant establishment benefits ranged from +15 per cent on the mid-slope and sand hill, to +20 per cent on the sandy stoney flats, relative to a district system control, and after a dry season finish, achieved up to 0.15 tonnes per hectare gain in wheat grain yield.

“These results correlate well with the earlier work done in Minlaton which measured crop yield and weed suppression benefits through increased seedbed utilisation,” he said. “Improving crop establishment and gaining the crop competitive advantages relies on correct seeder set-up.”

When to use paired-row systems?

- Recommended for use in marginal soil moisture conditions when seeds can be placed onto undisturbed soil moisture.
- Recommended for effective incorporation of pre-emergent herbicides (IBS) application. Crop safety is best secured using paired-row attachments closely integrated behind the opener.
- Possible use in stony soils if compatible with shallow operating depth.
- Possible use in non-wetting poor fertility soils, where seeding is at furrow tilling depth.
- Possible use under rhizoctonia pressure if coupled with best practice disease management.
- Possible use in high residue situations when coupled with good residue management strategies.



Increasing seedbed utilisation from a common 15 per cent (left) to 100 per cent (right), especially when combined with higher seed rate, effectively suppressed weed biomass and seed production while increasing crop yield.



Dr Jack Desbiolles' research favours the adoption of paired-row seeding systems as a practical way to benefit from higher seedbed utilisation. (PHOTO: Birchip Cropping Group)



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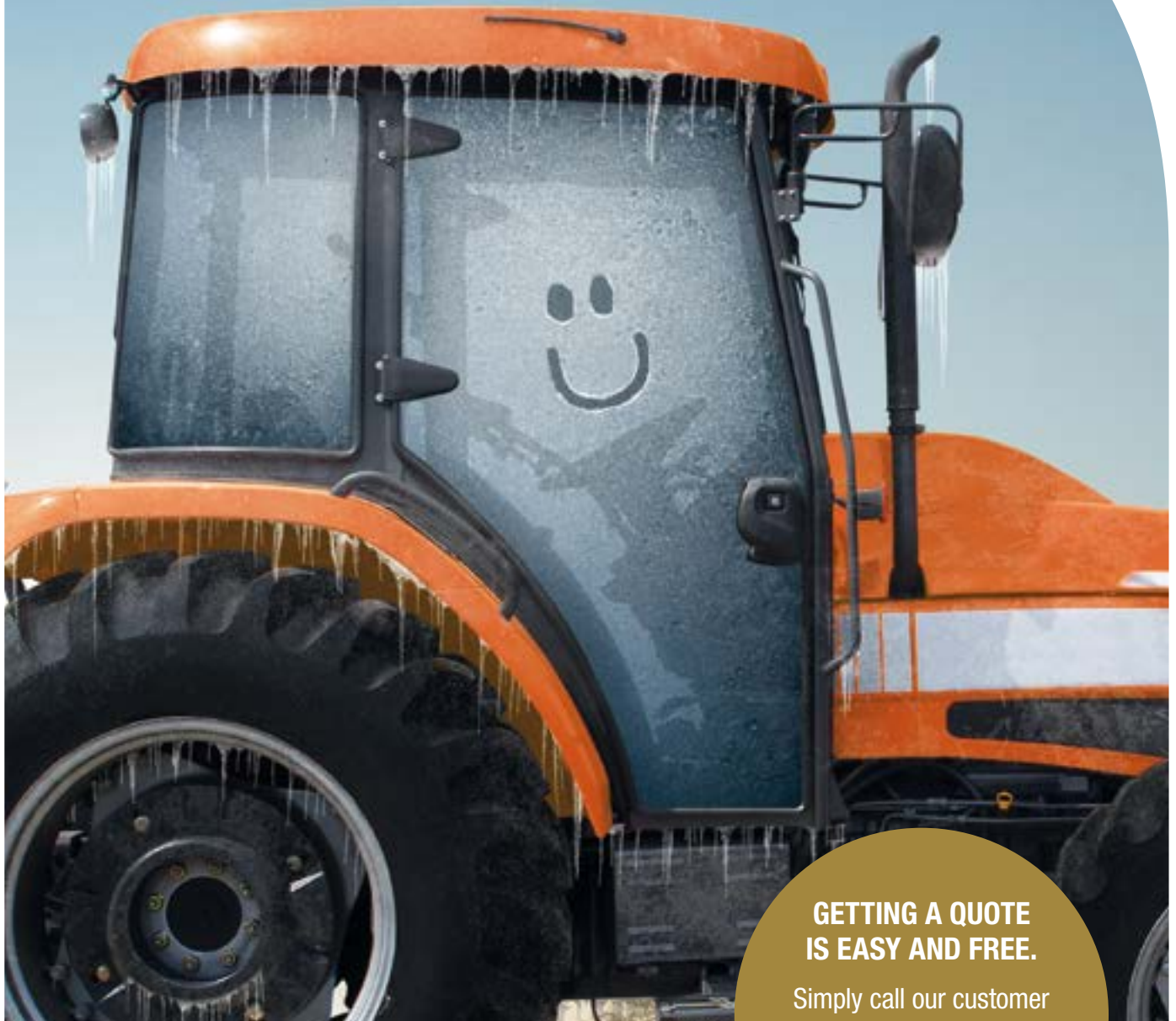
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Experts say it's important for industry to recognise the key FHB risk factors and implement preventative agronomic strategies where possible, particularly if the cropping program includes cereal crops and maize within the rotation. (PHOTO: GRDC)

Yield and economic losses result from sterility of the flowers and grain that is shrivelled, lightweight, low quality and prone to containing toxins such as deoxynivalenol.

Steven recommended that growers:

- Avoid durum crops in areas with known high prevalence of FHB;
- Avoid sowing durum into or adjacent to paddocks that contained maize the previous year;
- Plant the least susceptible varieties available (although this can be difficult with durum);
- Reduce FHB inoculum levels by rotating with non-grass crops, such as sunflowers, cotton, soybeans, mungbeans, chickpeas, faba beans, canola and field peas;
- Vary sowing times and varieties to minimise the risk of the entire crop flowering when weather is favourable for infection; and,
- Use clean seed – if contaminated seed must be used, seek further advice.

In-crop treatment a last resort option

Grain infected with FHB is usually white and, if prolonged wet conditions occurred during grain fill, infected grains will take on a pink appearance. But it should be noted that if any white or pink grains are evident, then the levels of Fusarium infection can be significantly higher than what may be indicated by visual inspection.

Steven said in-crop fungicide treatments should be considered as a 'last resort' management option with the only chemical

registered for use in FHB control in cereals, Prosaro, requiring a well-timed and well-executed application strategy to be effective.

"Research has shown that spraying durum wheat at flowering (GS61) was more effective and had more yield benefit than spraying seven days before flowering," Steven said.

"The anthers (flowers) are the primary infection site for *F. graminearum*, so spraying before flowering provides reduced protection of these plant structures.

"Overseas research has demonstrated the importance of spray coverage in FHB control, with twin nozzles (forward and backward facing) angled to cover both sides of a wheat head and high volumes of water (100 litres per hectare or more) being critical to efficacy.

"Globally, wherever corn has been grown in rotation with cereals (especially durum), add successive rainy days during flowering and more often than not they've ended up with significant FHB issues."

Look out for Gibberella cob rot

Maize growers are also being encouraged to factor Gibberella cob rot into their decisions around hybrid selection, rotations and stubble management given that the disease is caused by *Gibberella zeae* – the asexual state of *F. graminearum* and the same fungus that causes FHB in cereals. The Gibberella cob rot fungus survives from season to season on infected maize residue.

"So that has implications for maize hybrid selection as well as management of maize stubble within the farming system," Steven said. ■