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ONLINE DELIVERY

Sea Lake, Victoria

21st July 2020

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- Charcoal rot
- Ascochyta blight of chickpea
- White grain disorder
- Sclerotinia stem rot

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Broadleaf weed control in pulses – what are the options?

Greg Condon.

WeedSmart.

Useful resources

- https://weedsmart.org.au/webinars/pulse-crops-provide-extra-punch-weeds/
- https://weedsmart.org.au/what-are-the-mix-and-rotate-options-for-in-crop-herbicides/

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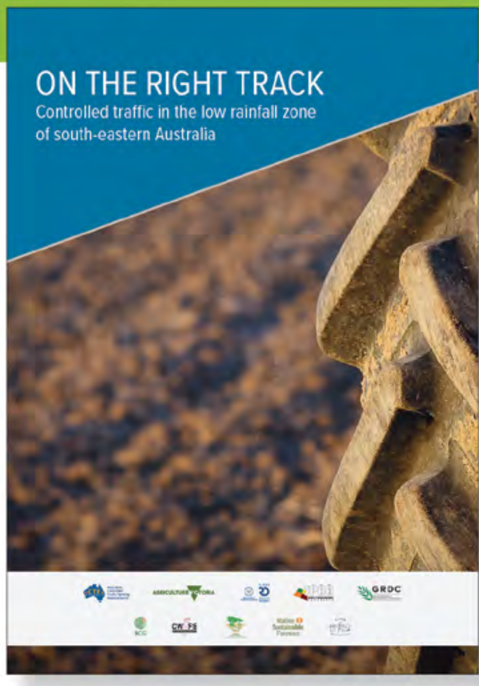

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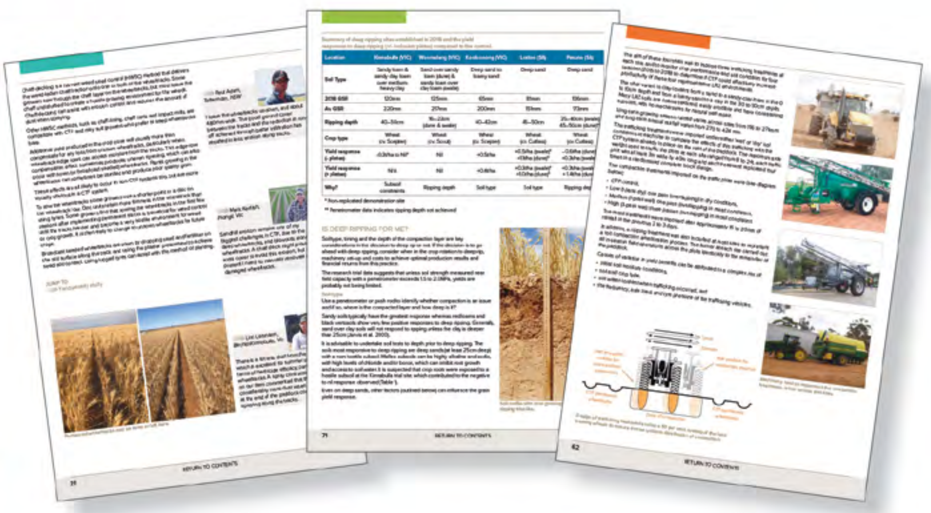

New herbicide tolerances in pulses

Garry Rosewarne.

Agriculture Victoria, Horsham, Victoria.

GRDC project codes: DAV00153, DAV00154

Keywords

- herbicide tolerance, Group B, Group C, Group I, pulses.

Take home messages

- Group B herbicide tolerant varieties are currently registered for lentils and faba beans.
- Group B tolerances for chickpea and field pea are between 2-5 years away.
- Registration for Group C and Group I tolerance in all pulses are in the pipeline.
- Timelines reflect the fact that chemical registrations add time to varietal release.

Background

Pulses have limited in-crop herbicide options. However, with the development of breeding techniques involving mutagenesis, pulse germplasm has been developed with herbicide tolerances.

Lentils have been the first pulse to have registration for the group B chemistry combination of imazamox and imazapyr. Varieties with this tolerance include PBA HeraldXT⁽ᵖ⁾, PBA HurricaneXT⁽ᵖ⁾, PBA HallmarkXT⁽ᵖ⁾ and PBA HighlandXT⁽ᵖ⁾. PBA Bendoc⁽ᵖ⁾ is the first faba bean that has similar tolerance to the same group B chemistry combination. This tolerance has also been developed in field peas and chickpeas with maximum residue limit (MRL) testing likely to commence in a few years. Tolerances to group C and group I chemistries have been passed on to all pulse breeding programs, however breeding line development and the chemical registration processes indicate potential new varieties are unlikely to be available in the marketplace for several years. The registration process is a critical component to variety release to ensure appropriate use of chemistries.

Key Question 1

What pulse varieties are available with group B herbicide tolerance?

Lentils:

- PBA HeraldXT⁽ᵖ⁾
- PBA HurricaneXT⁽ᵖ⁾
- PBA HallmarkXT⁽ᵖ⁾
- PBA HighlandXT⁽ᵖ⁾

Faba Bean:

- PBA Bendoc⁽ᵖ⁾

PBA Hurricane XT⁽ᵖ⁾ was released in 2015 and quickly dominated the market as a group B tolerant lentil with yield potential far exceeding the original tolerant line of PBA Herald XT⁽ᵖ⁾. Other releases include PBA Hallmark XT⁽ᵖ⁾ and more recently, PBA Highland XT⁽ᵖ⁾. PBA Highland XT⁽ᵖ⁾ was specifically selected for release in the Victorian Mallee and its yield approaches that of the best conventional variety, PBA Jumbo2⁽ᵖ⁾ (Table 1).

Table 1. NVT yield data showing the potential of PBA Highland XT(b) in the Mallee regions of Victoria and SA.

NVT Yield Data		VIC		SA					NSW	
Variety	Class	Mallee	Wimmera	Lower EP	Mid North	Murray Mallee	South East	Yorke P	S/E	S/W
PBA Highland XT(b)	M	110	106	94	106	117	111	109	105	108
PBA Hallmark XT(b)	M	103	106	96	105	109	104	104	109	107
PBA Hurricane XT(b)	S	100	100	100	100	100	100	100	100	100
PBA Jumbo2(b)	L	115	108	104	113	100	105	118	114	115
PBA Ace(b)	M	106	104	100	106	95	95	104	105	105
PBA Bolt(b)	M	103	98	98	98	106	103	101	94	98
PBA Flash(b)	M	105	97	103	101	92	97	105	95	99

Key Question 2

What new chemistries do the breeding programs have access to and what are the approximate timelines of when the varieties will be available?

Tolerance to group B chemistries has also been developed in chickpeas and field peas. Initial lines are undergoing seed multiplication and it is anticipated that MRL testing will commence shortly. In addition, the lentil, field pea, chickpea and faba bean breeding programs all have access to mutations conferring tolerance to group C and group I chemistries. The particular herbicides that have been targeted are Metribuzin® and Lontrel®. Metribuzin tolerance mutations affect photosystem II in plants and thereby come with an inherent yield penalty. Testing against a range of herbicides within the specific chemical groups is underway at SARDI, while the breeding programs investigate variations of potential lines in field trials and undertake crossing of the mutation lines.

Seed bulk ups are also occurring and it is anticipated that MRL testing of prescribed herbicides will commence once lines are close to commercialisation.

Acknowledgements

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LOOK AROUND YOU.

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Lifeline
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Looking for information on mental wellbeing? Information and support resources are available through:

www.ifarmwell.com.au An online toolkit specifically tailored to help growers cope with challenges, particularly things beyond their control (such as weather), and get the most out of every day.

www.blackdoginstitute.org.au The Black Dog Institute is a medical research institute that focuses on the identification, prevention and treatment of mental illness. Its website aims to lead you through the logical steps in seeking help for mood disorders, such as depression and bipolar disorder, and to provide you with information, resources and assessment tools.

www.crrmh.com.au The Centre for Rural & Remote Mental Health (CRRMH) provides leadership in rural and remote mental-health research, working closely with rural communities and partners to provide evidence-based service design, delivery and education.

Glove Box Guide to Mental Health
The *Glove Box Guide to Mental Health* includes stories, tips, and information about services to help connect rural communities and encourage conversations about mental health. Available online from CRRMH.

www.rrmh.com.au Rural & Remote Mental Health run workshops and training through its Rural Minds program, which is designed to raise mental health awareness and confidence, grow understanding and ensure information is embedded into agricultural and farming communities.

www.cores.org.au CORES™ (Community Response to Eliminating Suicide) is a community-based program that educates members of a local community on how to intervene when they encounter a person they believe may be suicidal.

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www.farmerhealth.org.au The National Centre for Farmer Health provides leadership to improve the health, wellbeing and safety of farm workers, their families and communities across Australia and serves to increase knowledge transfer between farmers, medical professionals, academics and students.

www.ruralhealth.org.au The National Rural Health Alliance produces a range of communication materials, including fact sheets and infographics, media releases and its flagship magazine *Partyline*.

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The how’s and whys for ripping deep sandy soils of the low rainfall Mallee

Michael Moodie[1], Chris Saunders[2], Mustafa Ucgul[2], and Lynne Macdonald[3].

[1]Frontier Farming Systems; [2]University of South Australia; [3]CSIRO Agriculture & Food.

GRDC project code: CSP00203

Keywords

- deep ripping, sandy soils, soil amelioration, penetration resistance, Mallee, soil constraint, organic matter, fertiliser placement, inclusion plates, machinery design, forces.

Take home messages

- Consistent first-year yield responses to deep ripping have been measured on Victorian Mallee sandy soils, with yield benefits commonly 0.5 to 1.0 t/ha in the first season following deep ripping.
- Yield responses to deep ripping have not been improved through additional inputs of fertiliser or organic matter (OM) on sandy soils in the Victorian Mallee.
- There are opportunities to optimise tine spacing, power requirements and operating costs of ripping and inclusion operations, through improving our understanding of the interaction between soil loosening, shank design and working depth.

Background

Sub-optimal productivity is commonly reported for the deep sands that make up 20 to 30% of the cropping soils in the low rainfall Mallee region of Victoria (Unkovich, 2014). There is evidence of unused soil water, despite an apparent absence of constraints commonly associated with sandy soils (such as non-wetting, soil acidity). Diagnostic studies of local constraints have pointed to low abiotic and biological fertility in the subsoil layers, and to the physical restriction of rooting depth, as the most likely constraints to production on sands in the Victorian Mallee.

There is considerable interest in strategic deep tillage with/without agronomic amendments (fertilisers, organic amendments) aimed at overcoming physical constraints and increasing nutrient supply within the soil profile. Strategic deep tillage includes ripping or deep ploughing (that is; spading, plozza, inversion) to depths of 30cm and more. To explore this further, replicated trials have been established across four sites in the Victorian Mallee; Ouyen (2017), Carwarp (2018), Kooloonong (2019) and Tempy (2019), with further sites to be established in 2020. These trials are part of the research and validation work within the GRDC project; ‘Increasing production on sandy soils in the low-medium rainfall areas of the southern region’ (CSP00203). The trials are a collaboration between Frontier Farming Systems with Mallee Sustainable Farming, CSIRO and UniSA.

Although the benefits of deep ripping in deep sandy soils have been recognised previously, there is a need to understand where ripping can most reliably lead to yield benefits, how benefits can be maximised over multiple season, and which sands are less likely to respond. There are opportunities to optimise machinery set-up and operating parameters (speed, depth, fuel consumption) and to understand how tine design influences constraints within the profile over multiple seasons. Improving this information will help inform grower decision making to better target soil amelioration practices.

Method

Yield response in the Victorian Mallee to deep ripping

Nutrient placement (Ouyen, 2017-19)

The trial had three key factors; the depth of placement (surface band at 7.5cm deep, deep band at 20cm deep and deep ripped band at 30cm deep), the nutrient source (N only or a package of N, P, K, S, Zn, Cu, and Mn) and the frequency of addition (all in 2017, or an annual approach of equivalent total input) supplying 90kg N/ha in total. All plots received an annual baseline addition of 20kg N/ha as di-ammonium phosphate (DAP) at sowing and an early top-dress application of ammonium sulphate.

Organic matter placement (Carwarp, 2018-2019)

This trial compared the impact of physical intervention alone (deep ripping, spading or a combination of the two), to physical intervention combined with incorporation or deep placement of lucerne hay (6t/ha) (Table 1). For incorporation, lucerne hay was surface spread before spading; while for direct subsoil placement the same lucerne material was pelletised and metered at a controlled rate at depth behind the rip tine. Deep ripping operations were completed with a Tilco® ridged shank at 56cm spacing and spading operations were completed with Farmax spader supplied by Groocock Soil Improvement (http://www.spaders.com.au/).

Deep ripping with organic matter inclusion (Tempy, 2019)

The Tempy trial had five treatments (details below) to compare deep ripping only with inclusion plates and OM addition. All deep ripping treatments were implemented to a depth of 50cm with a tine spacing of 56cm. The OM used was a chicken litter compost blend, applied at 5t/ha (https://www.peatssoil.com.au), in the following treatments;

- control (undisturbed)
- deep ripping (50cm) with rigid shank (Tilco)
- deep ripping (50cm) with inclusion plate (Tilco) operating 150mm below soil surface
- deep ripping (50cm) with inclusion plate (Tilco) plus OM surface applied
- deep ripping (50cm) with OM deep placed behind the ripping shank.

Break crop response to deep ripping and organic matter (Kooloonong, 2019)

The Kooloonong trial was established for each of the break crops tested; lupin, lentil and chickpea. Each trial comprised of four treatments arranged in a factorial design;

- +/- deep ripping (50cm depth with tine spacing of 56cm)
- +/- surface OM application at 5t/ha (chicken litter compost blend https://www.peatssoil.com.au).

Optimising deep ripping operations

Complementing the agronomic field trials, University of South Australia researchers are using computer simulation and field validation to understand how different set-up and operating parameters affect the performance of deep tillage strategies. Computer simulations have highlighted that forward (driving) speed was likely to have a large impact on the burial performance of commercially available inclusion plates. A range of experimental inclusion plates were manufactured and compared to a standard commercially available plate at two operating speeds in a trial near Caliph, SA Mallee, in June 2019. The soil type was a red sand with 1.6g/cm^3 average soil bulk density from 0-400mm and 3% average moisture content over the same depth range. The validation of the surface layer burial was carried out by applying a blue layer of sand to the surface in front of the tine (Figure 1).

The forces required to pull the standard ripper tine and each of the inclusion plates was also measured. Draught forces were measured using a

Table 1. Treatments included in the organic matter (OM) placement trial at Carwarp, established 2018.

Treatment	Physical disturbance	Depth of disturbance (cm)	OM addition (6t/ha lucerne)	Depth of OM placement (cm)
Control	Nil	Nil	+/-	Surface
Spade	Rotary spade	30	+/-	Surface-30
Deep rip_30	Deep rip	30	+/-	30
Deep rip_60	Deep rip	60	+/-	60
Deep rip_30/60	Deep rip	60	+/-	30+60
Spade + deep rip_60	Rotary spade + deep rip	30+60	+/-	Surface-30 + 60

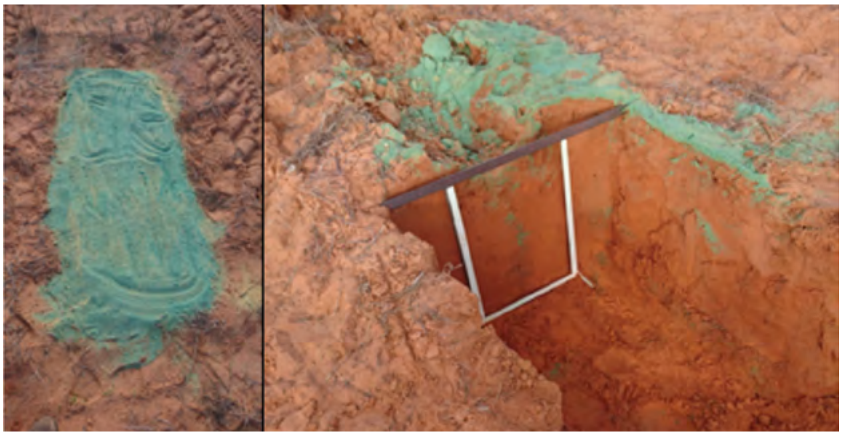


Figure 1. Blue sand applied to the surface to validate soil burial behind inclusion plates.

Figure 2. Ripper tine (left) and ripper tine with wings (right).

pull type RIMIK brand pull-meter. The pull-meter was used between two tractors (a draught tractor pulling a free-wheeling, ripper operating tractor) to avoid side and vertical loading, ensuring that the load cell measured pure tension with no side-loading.

The research also aimed to quantify the impact of shank working depth and design on soil loosening performance in the compacted sandy soils. Tines tested included with and without wings (Figure 2), and measurements included differences in relevant draught forces (RIMIK pull-meter) and in soil disturbance profiles. After ripping operations, face pits were excavated across the direction of travel to visualise and refine the loosened cross-sectional area (Figure 3). Digital image analysis was used to quantify the profile area loosened across different test treatments.

Figure 3. Excavated pit with a rope defining the boundary of the loosened soil area.

Results and discussion

Yield response in the Victorian Mallee to deep ripping

Positive yield benefits were observed across all four trial sites in the first season following deep ripping. At the Ouyen trial (2017, year 1) deep ripping (~30cm) provided a yield benefit of 0.8t/ha over the control and pre-drilling treatments (Figure 4). This result reflected a reduction in penetration resistance under the deep ripped treatments (Figure 5). Pre-drilling (20cm depth) did not reduce the sands penetration resistance, as the narrow tine and knifepoint used had a slotting effect and did not disrupt soil strength like the deep ripping implement (Agroplow deep ripping shank with a wide foot).

Following the single ripping event at Ouyen (2017), significant yield benefits were observed for two subsequent seasons, but not in the third season, providing a cumulative benefit of 1.5t/ha. Where ripping was repeat applied on an annual basis, positive yield responses were observed in all three seasons (Figure 4), with cumulative benefit over the control of 2t/ha.

In the first year of the Carwarp trial, mechanical disturbance to 30cm by rotary spading or deep ripping resulted in additional grain yield of 0.5t/ha compared to the unmodified control yield of 0.55t/ha (Figure 6). Deeper ripping to 60cm did not provide a significant yield increase over working to a depth of 30cm only. These responses were observed under very low growing season rainfall, with only 75mm of rain received post sowing. Another drought was encountered in 2019 with similar low rainfall during the growing season and very little rainfall over the summer fallow. Consequently, a negative yield effect of 0.5-0.6t/ha was observed in treatments where deep ripping was conducted to 60cm in the previous season. The mechanism of this result is not clear and is still being explored.

In 2019, new sites were established at Kooloonong (Figure 7) and Tempy (Figure 8) demonstrating yield gains across several crop types. Comparing grain legumes at Kooloonong, deep ripping significantly increased the yield of lupin, lentil and chickpea by 0.4, 0.4 and 1.0 t/ha respectively. At Tempy, deep ripping provided a 0.7t/ha increase in barley yield over the control, however adding inclusion plates did not provide any advantage over deep ripping with a ridged shank tine.

While deep ripping has provided clear benefits across these four trial sites, the addition of inputs such as OM or additional fertiliser is yet to show consistent and/or economic benefits. Improving inputs over and above good agronomic practice through, subsoil placement (30cm or deeper) of nitrogen or a broader nutrient package (P, K, S, Zn, Mn, Cu) did not provide a yield benefit at Ouyen. A sister trial at Ouyen, looking at the incorporation of organic inputs with rotary spading, has shown a positive response to the addition of chicken litter and compost (Moodie et al. 2019). However, this

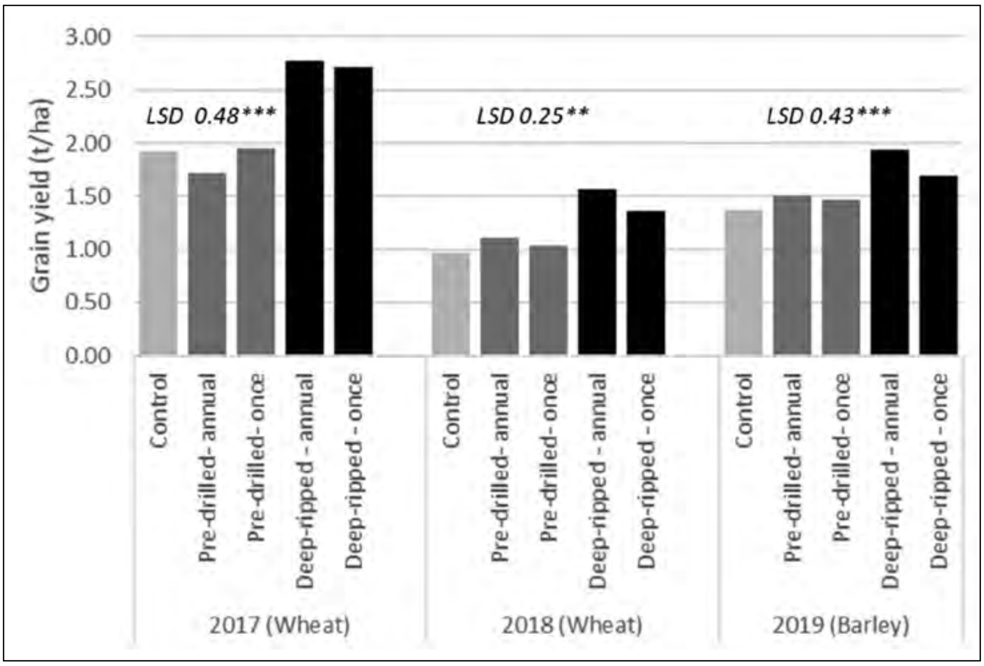


Figure 4. Grain yield (t/ha) response at Ouyen to pre-drilling or deep ripping implemented prior to sowing in (once) or in each season (annual). Only the control treatments are presented which all had equivalent rates and placement of nutrient.

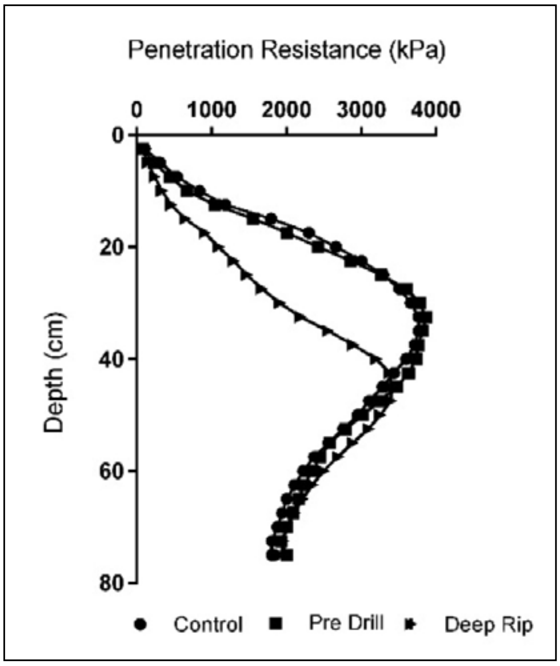


Figure 5. Penetration resistance (kPa) measured at the Ouyen site in 2017 for the control, pre-drill and deep rip treatments.

effect was unable to be replicated with similar organic inputs at the Tempy and Kooloonong sites in 2019. Lucerne hay was used as an organic source at Carwarp with no positive yield impacts observed across the first two, albeit very dry, years of the trial.

Optimising deep ripping operations

There is considerable interest in ripper modification through fitting inclusion plates to the back of the ripping shank. Inclusion plates aim to improve subsurface fertility by creating a void behind the ripping shank, which topsoil, surface residues, and surface spread amendments fall into.

Incorporation of surface material behind a standard (280mm) commercial inclusion plate is greatly affected by speed of operation, where higher speeds lead to lower burial (Figure 9). Modification of inclusion plates, such as increasing the length of the side wall (plus 150mm), can lead to improved burial at higher speed operation (such as 7km/hr), as demonstrated comparing Figures 9 and 10. Further modification to the plate (390mm high and 650mm long) improved depth and quantity of included surface layer (Figure 11).

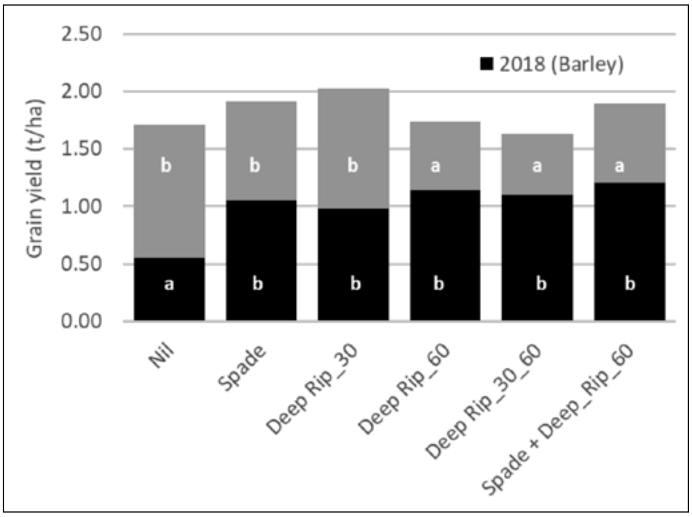


Figure 6. Grain yield (t/ha) response at the Carwarp site to deep ripping and spading treatments without organic matter (OM) addition over two seasons (2018 and 2019).

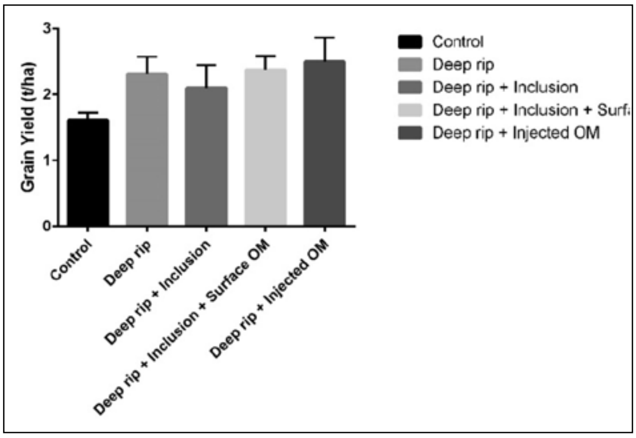


Figure 8. Grain yield of barley in response to treatments implemented at Tempy in 2019. Error bars are standard error of mean (SEM).

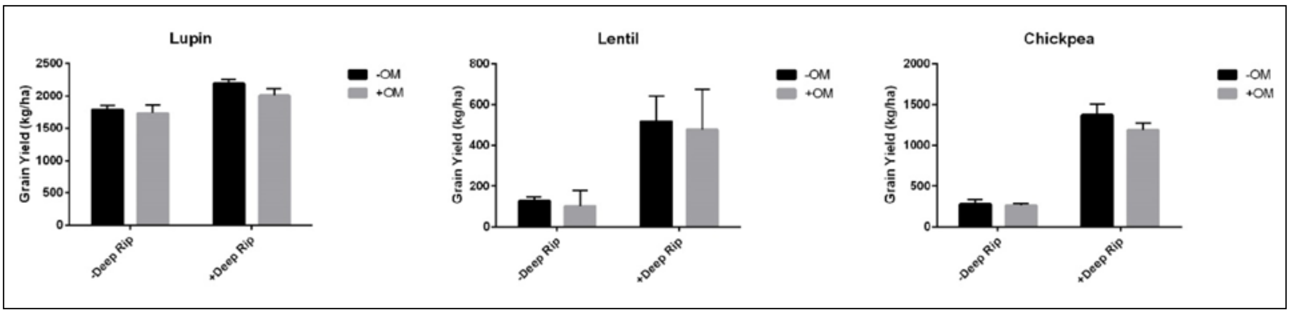


Figure 7. Grain yield of lupin, lentil and chickpea at Kooloonong in 2019 in response to deep ripping and organic matter (OM) addition. Error bars are standard error of mean (SEM).

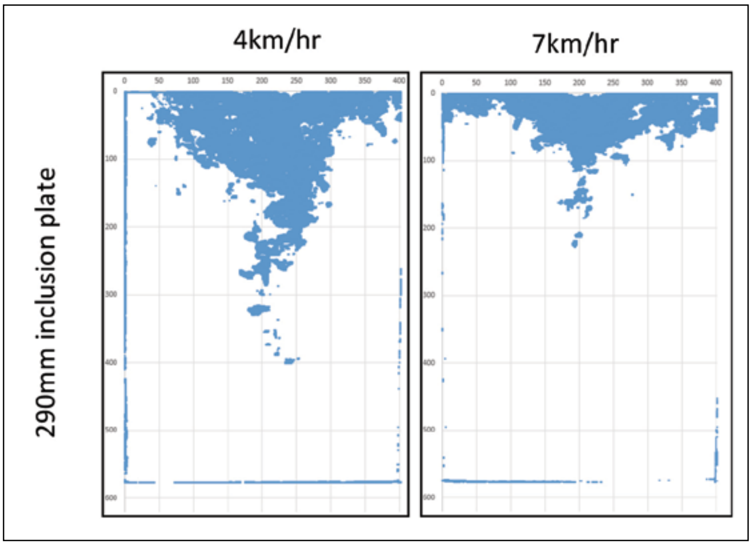


Figure 9. Topsoil inclusion using a standard 290mm high inclusion plate at 4km/h and 7km/h.

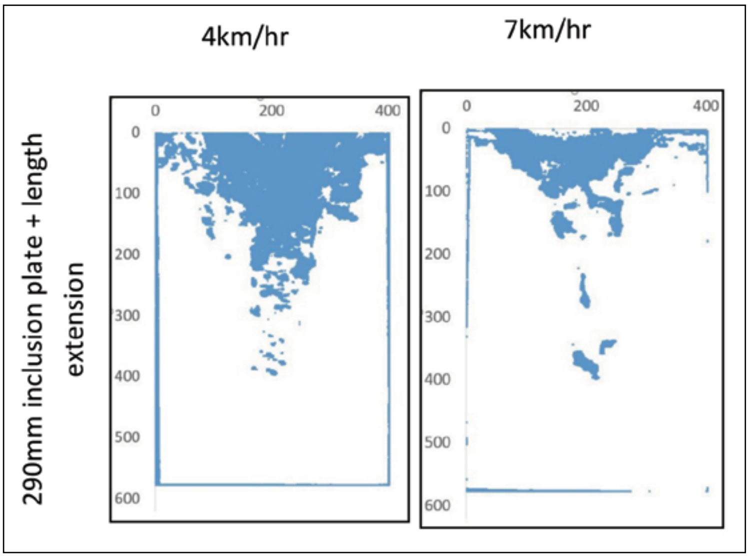


Figure 10. Topsoil inclusion using a 290mm inclusion plate with 150mm length extension at 4km/h and 7km/h.

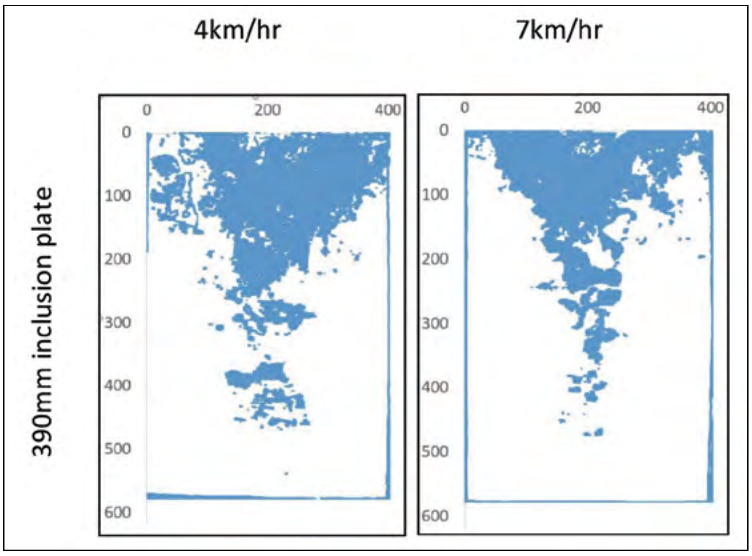


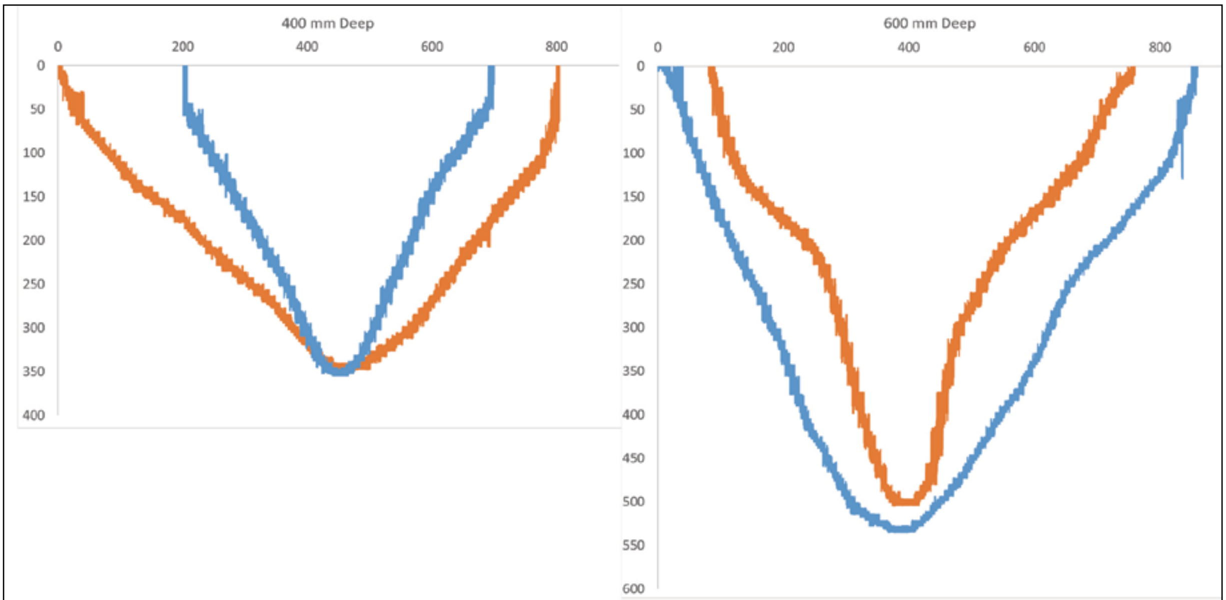
Figure 11. Topsoil inclusion using a 390mm inclusion plate with 150mm length extension at 4km/h and 7km/h.

In relation to the forces required to pull these inclusion plates, adding an inclusion plate always led to an increase in draught force to pull the ripper. Increased draught forces were in the order of 40%, but the improved burial inclusion plates only increased the draught force an additional 12% and 15% at 4km/h and 7km/h respectively. Increasing draught forces will also increase power and fuel requirements associated with the operation.

Ripping shank design and working depth will influence profile loosening impact, power requirements, and the cost of ripping. Adding an experimental wing to the ripping shank increased loosening areas by about 49% to 53% when operating depth was 400mm and 600mm respectively (Figure 12). Increasing working depth from 400 mm to 600 mm increased the area of loosened soil by about 70% (Figure 12). Considering power and cost implications, working at 600mm depth, the wing addition increased loosening by ~50%, but the draught force increased by only 24% (Figure 13). Improving our understanding of the interaction between soil loosening, shank design, and working depth will help optimise tine spacing, power requirements and operating costs.

Conclusion

The primary constraints to crop water-use in deep sandy soils of the Victorian Mallee appear to include physical barriers to root growth and nutrient supply in the subsoil layers. Acidity, strong repellence, and subsoil toxicity are not primary constraints at the focus research sites in this project. Provided there is reliable subsoil moisture, ripping to a depth beneath hard compacted layers provides a good starting place for growers aiming to improve under-performance. Deep ripping provides more consistent yield responses compared to combined approaches, looking to physically ameliorate and boost profile fertility through incorporation of high N organic amendments. Growers should consider the depth of the constraint and choose a ripper which can work into, and under, compacted and consolidated layers. Deeper ripping operations, requiring greater draught, are more costly and do not necessarily lead to higher yield benefits.



400mm ripper profiles; blue without wings, orange with wings

600mm ripper profiles; blue without wings, orange with wings

Figure 12. Comparing ripper loosened area, with and without the addition of wings.

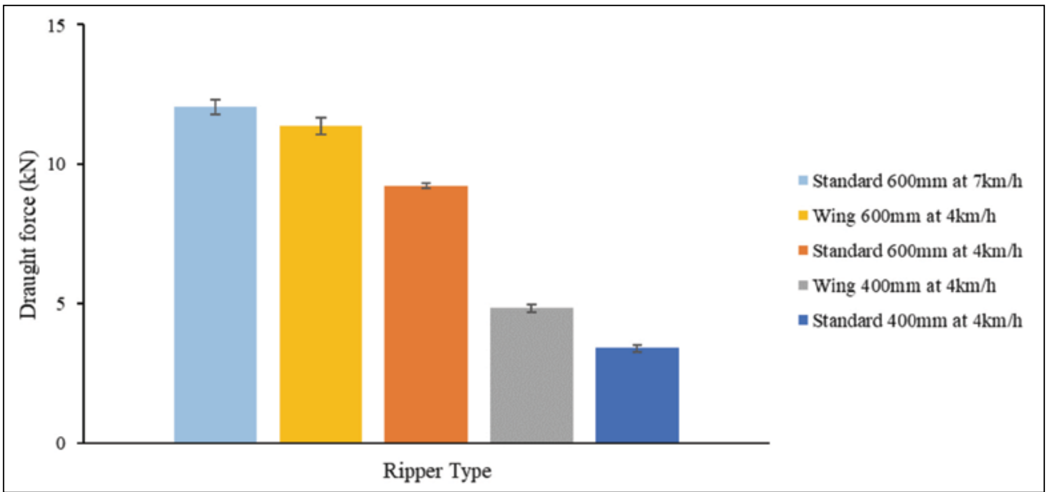


Figure 13. Draught force of ripper tines, with and without wings

Use of inclusion plates for burial of surface material have not provided consistent yield benefits above ripping alone, and significantly increase draught and operation costs. There are opportunities to optimise tine spacing, power requirements and operating costs of ripping and inclusion operations through improving our understanding of the interaction between soil loosening, shank design, and working depth.

Acknowledgements

This research is a collaborative project between the GRDC, CSIRO, the University of South Australia, the SA state government through Primary Industries and Regions SA, Mallee Sustainable Farming Inc, AgGrow Agronomy and Trengove Consulting. The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC, the author would like to thank them for their continued support.

UniSA also acknowledge GRDC / DAFWA project (DAW00243) for supporting the computer simulations and Tilco Engineering for supplying modified inclusion plates.

Useful resources

Think strategically before ripping into sandy soils: https://grdc.com.au/news-and-media/news-and-media-releases/south/2019/4/think-strategically-before-ripping-into-sandy-soils

Advice to match design of inclusion plates to soil type for optimum effect: https://groundcover.grdc.com.au/story/6384234/keys-to-undertaking-deep-ripping-with-inclusion-plates/

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The Spray Application GrowNotes™ Manual is a comprehensive digital publication containing all the information a spray operator needs to know when it comes to using spray application technology.

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TOP 10 TIPS

FOR REDUCING SPRAY DRIFT

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01 **Choose all products in the tank mix carefully**, which includes the choice of active ingredient, the formulation type and the adjuvant used.

02 **Understand** how product uptake and translocation may impact on coverage requirements for the target. Read the label and technical literature for guidance on spray quality, buffer (no-spray) zones and wind speed requirements.

03 **Select the coarsest** spray quality that will provide an acceptable level of control. Be prepared to increase application volumes when coarser spray qualities are used, or when the delta T value approaches 10 to 12. Use water-sensitive paper and the Snapcard app to assess the impact of coarser spray qualities on coverage at the target.

04 **Always expect** that surface temperature inversions will form later in the day, as sunset approaches, and that they are likely to persist overnight and beyond sunrise on many occasions. If the spray operator cannot determine that an inversion is not present, spraying should NOT occur.

05 **Use weather forecasting** information to plan the application. BoM meteograms and forecasting websites can provide information on likely wind speed and direction for 5 to 7 days in advance of the intended day of spraying. Indications of the likely presence of a hazardous surface inversion include: variation between maximum and minimum daily temperatures are greater than 5°C, delta T values are below 2 and low overnight wind speeds (less than 11km/h).

06 **Only start spraying** after the sun has risen more than 20 degrees above the horizon and the wind speed has been above 4 to 5km/h for more than 20 to 30 minutes, with a clear direction that is away from adjacent sensitive areas.

07 **Higher booms increase drift**. Set the boom height to achieve double overlap of the spray pattern, with a 110-degree nozzle using a 50cm nozzle spacing (this is 50cm above the top of the stubble or crop canopy). Boom height and stability are critical. Use height control systems for wider booms or reduce the spraying speed to maintain boom height. An increase in boom height from 50 to 70cm above the target can increase drift fourfold.

08 **Avoid high spraying speeds**, particularly when ground cover is minimal. Spraying speeds more than 16 to 18km/h with trailing rigs and more than 20 to 22km/h with self-propelled sprayers greatly increase losses due to effects at the nozzle and the aerodynamics of the machine.

09 **Be prepared** to leave unsprayed buffers when the label requires, or when the wind direction is towards sensitive areas. Always refer to the spray drift restraints on the product label.

10 **Continually monitor** the conditions at the site of application. Where wind direction is a concern move operations to another paddock. Always stop spraying if the weather conditions become unfavourable.
Always record the date, start and finish times, wind direction and speed, temperature and relative humidity, product(s) and rate(s), nozzle details and spray system pressure for every tank load. Plus any additional record keeping requirements according to the label.

THE 2017-2020 GRDC SOUTHERN REGIONAL PANEL

JANUARY 2020

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CHAIR - JOHN BENNETT

Based at Lawloit, between Nhill and Kaniva in Victoria's West Wimmera, John, his wife Allison and family run a mixed farming operation across diverse soil types. The farming system is 70 to 80 percent cropping, with cereals, oilseeds, legumes and hay grown. John believes in the science-based research, new technologies and opportunities that the GRDC delivers to graingrowers. He wants to see RD&E investments promote resilient and sustainable farming systems that deliver more profit to growers and ultimately make agriculture an exciting career path for young people.

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Mike is a researcher with the University of Adelaide, based at the Waite campus in South Australia. He specialises in soil fertility and crop nutrition, contaminants in fertilisers, wastes, soils and crops. Mike manages the Fertiliser Technology Research Centre at the University of Adelaide and has a wide network of contacts and collaborators nationally and internationally in the fertiliser industry and in soil fertility research.

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Jon has worked in agriculture for the past three decades, both in the UK and in Australia. In 2004 he moved to Geelong, Victoria, and managed Grainsearch, a grower-funded company evaluating European wheat and barley varieties for the high rainfall zone.
In 2007, his consultancy managed the commercial contract trials for Southern Farming Systems (SFS).
In 2010 he became Chief Executive of SFS, which has five branches covering southern Victoria and Tasmania. In 2012, Jon became a member of the GRDC's HRZ Regional Cropping Solutions Network.

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Fiona has been farming with her husband Craig for 21 years at Mulwala in the Southern Riverina. They are broadacre, dryland grain producers and also operate a sheep enterprise. Fiona has a background in applied science and education and is currently serving as a committee member of Riverine Plains Inc, an independent farming systems group. She is passionate about improving the profile and profitability of Australian grain growers.

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Lou is a farmer based at Lameroo in the Southern Mallee of South Australia. Along with her parents and partner, she runs a mixed farming enterprise including export oaten hay, wheat, barley a variety of legumes and a self-replacing Merino flock. After graduating Lou spent 3 years as a sales agronomist where she gained valuable on-farm experience about the retail industry and then returned to her home town of Lameroo. She started her own consultancy business three years ago and is passionate about upskilling women working on farms.

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Richard along with wife Lee-Anne, son Will and staff, grow wheat, canola, lentils and faba beans on some challenging soil types at Warooka on South Australia's Yorke Peninsula. They also operate a self-replacing Murray Grey cattle herd and Merino sheep flock. Sharing knowledge and strategies with the next generation is important to Richard whose passion for agriculture has extended beyond the farm to include involvement in the Agricultural Bureau of SA, Advisory Board of Agriculture SA, Agribusiness Council of Australia SA, the YP Alkaline Soils Group and grain marketing groups.

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Michael runs a collaborative family farming enterprise at Nile in the Northern Midlands of Tasmania (with property also in northern NSW) having transitioned the business from a dryland grazing enterprise to an intensive mixed farming enterprise. He has a broad range of experience from resource management, strategic planning and risk profiling to human resource management and operational logistics, and has served as a member of the the High Rainfall Zone Regional Cropping Solutions Network for the past seven years.

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KATE WILSON

Kate is a partner in a large grain producing operation in Victoria's Southern Mallee region. Kate and husband Grant are fourth generation farmers producing wheat, canola, lentils, lupins and field peas. Kate has been an agronomic consultant for more than 20 years, servicing clients throughout the Mallee and northern Wimmera. Having witnessed and implemented much change in farming practices over the past two decades, Kate is passionate about RD&E to bring about positive practice change to growers.

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Andrew is a forth generation grain grower and is currently the Managing Director and Shareholder of Lilliput AG and a Director and Shareholder of the affiliated Baker Seed Co - a family owned farming and seed cleaning business. He manages the family farm in the Rutherglen area, a 2,500 ha mixed cropping enterprise and also runs 2000 cross bred ewes. Lilliput AG consists of wheat, canola, lupin, faba bean, triticale and oats and clover for seed, along with hay cropping operations. Andrew has been a member of GRDC's Medium Rainfall Zone Regional Cropping Solutions Network and has a passion for rural communities, sustainable and profitable agriculture and small business resilience.

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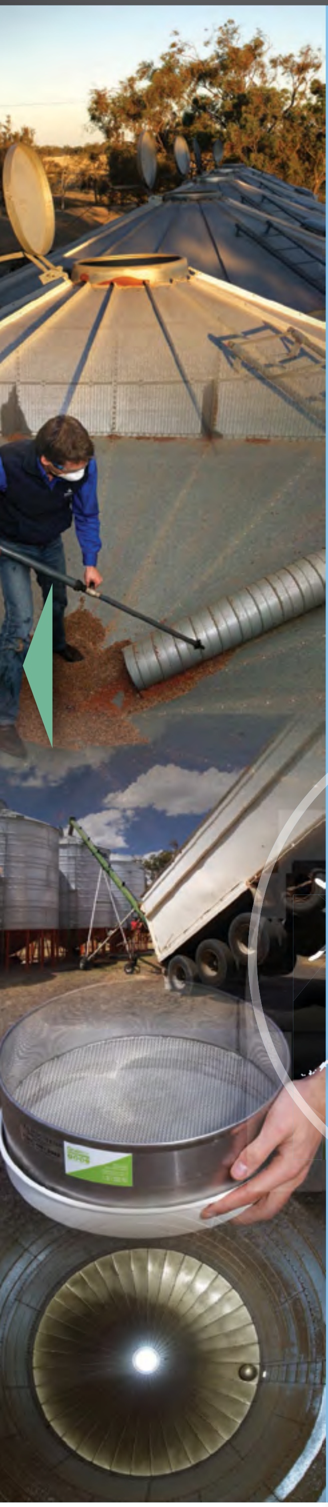

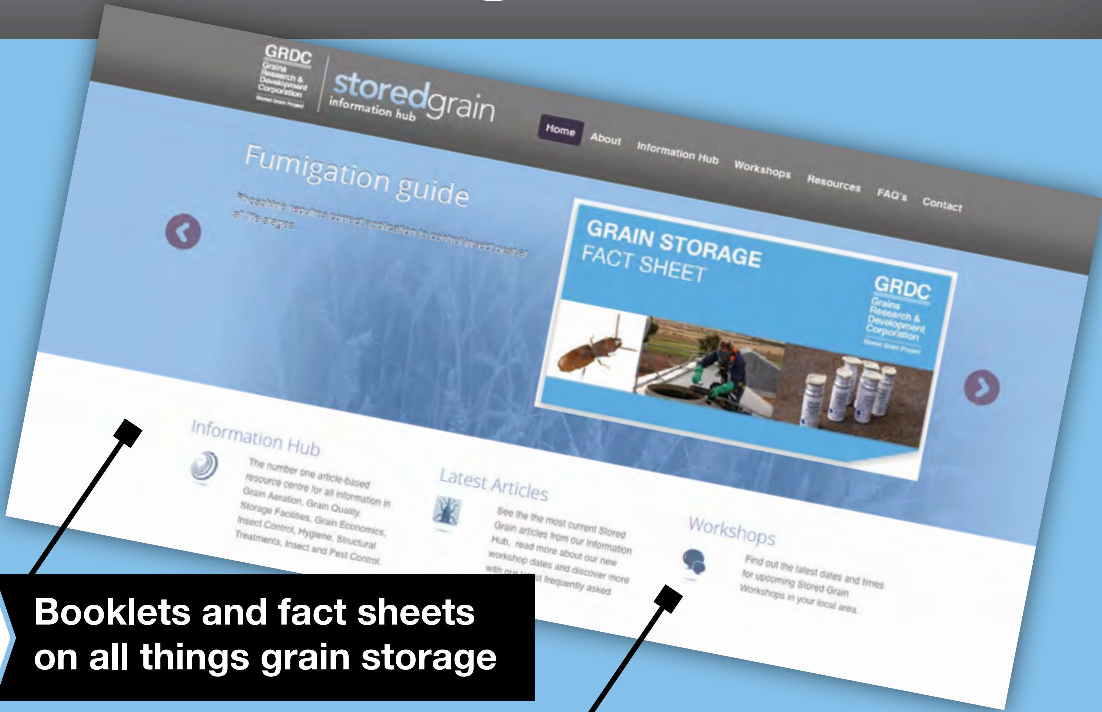

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