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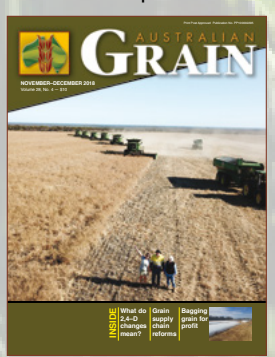
## FRONT COVER

A bird's eye view of canola harvest underway at 'Bedford Harbour' Jerdacuttup, about 170 km west of Esperance. Elisa Parisi from Italy, David Large (farm manager) and Annie Jemmeson wave the headers in. For many growers on the WA South Coast, 2018 was the first season they have seen hybrid canola varieties out-yield open-pollinated types. See page 44.
(PHOTO: Quenten Knight)



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## Southern Australia Focus

***Covering cropping systems of Southern NSW, Victoria, South Australia, Western Australia and Tasmania***



## Northern Focus

***Covering Northern NSW and Queensland***

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# Editorial... Lloyd O'Connell

WHETHER it's staging a tit-for-tat trade war with the US, creating military installations in disputed international waters or cozying up to our Pacific neighbours, China just can't seem to keep out of the headlines. But what often stays under the radar are some major developments happening within China's borders. And it's these domestic happenings which often have the most impact on the bottom line for Australian exporters.

This magazine has put forward the proposition for a number of years that international marketers need to take any grain production, consumption and inventory numbers coming out of China with a very large dose of salt. There are a number of reasons for this – not least of which is the difficulty faced by Chinese authorities in gathering accurate domestic figures. China also has very limited activity as a grain exporter and, on not much more than a whim, this centrally planned regime has the unchallenged ability to present whatever figures they want to the rest of the world.

Peter McMeekin points out in his international marketing column (page 26) how, in mid-November, marketers were thrown into some frantic revision of numbers when the China National Grain & Oils Information Centre (CNGOIC) changed, retrospectively, the production figures for corn for the past decade. With not much more than the stroke of a pen, China corn production went up nearly 300 million tonnes over the past 10 years. And in the past four years alone, domestic production apparently increased by 170 mt. And for good measure, it was decided that corn production from last season went up overnight from 216 mt to 260 mt – a jump of 20 per cent.

The end result of these internal revisions was that the USDA doubled their estimate of how much corn is on hand in storages around the world!

As Peter points out, from a global trade viewpoint, the true indicator of world ending stocks is the one that excludes China.

### Diminishing water supplies in northern China

What has flown under the international news radar is the ongoing construction of one of the world's largest engineering projects – and of course, this has happened in China. The South-North Water Diversion Scheme is an ongoing project but after spending around US$80 billion or so since 2002 – and the resettling of 300,000 plus people – most of the water now consumed in Beijing and its surrounds has travelled about 1500 kilometres by canal and pipeline from southern China.

The north is critically short of water for agricultural, industrial and domestic uses – and the situation is getting worse. A lack of good quality water could well be the biggest factor in China's agricultural future and the ability to feed its 1.4 billion people. It will also make China an even bigger importer of agricultural products.

From all at *Australian Grain*, we hope you have enjoyed some of the widespread October-November rainfall and that you and family have a very merry and safe Christmas.

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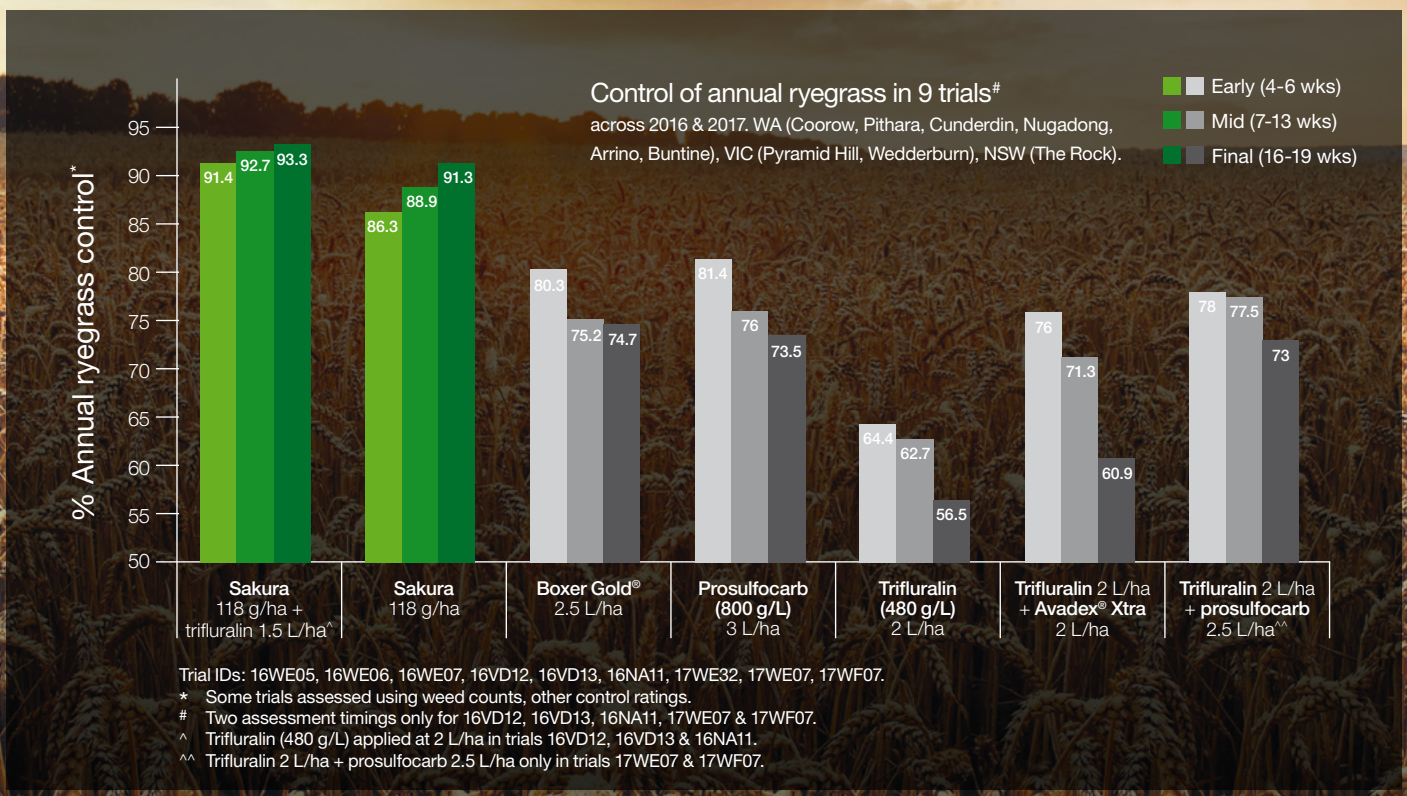
# In this issue...

# Insist on the pre-eminent pre-emergent.

## Sakura sets the standard for long-lasting residual control.




Trial IDs: 16WE05, 16WE06, 16WE07, 16VD12, 16VD13, 16NA11, 17WE32, 17WE07, 17WF07.

* Some trials assessed using weed counts, other control ratings.

\# Two assessment timings only for 16VD12, 16VD13, 16NA11, 17WE07 & 17WF07.

^ Trifluralin (480 g/L) applied at 2 L/ha in trials 16VD12, 16VD13 & 16NA11.

^^ Trifluralin 2 L/ha + prosulfocarb 2.5 L/ha only in trials 17WE07 & 17WF07.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# Genes and proteins that redirect nitrogen within plants

By Kim Kaplan, Agricultural Research Service – USDA

AGRICULTURAL Research Service (ARS–USDA) scientists have identified networks of genes and gene regulators that allow plants to direct nitrogen to different parts. This knowledge may speed breeding new plant varieties to be more effective with how they use nitrogen, according to a paper published in *Nature*.

ARS Plant, Soil and Nutrition Research Laboratory molecular biologist Doreen Ware and her team identified 23 proteins termed 'transcription factors' that play specific roles in how plants make use of nitrogen. Doreen traced these transcription factors back to the individual genes that control them and forward to the genes on which they act.

Scientists have known that plants can actively redirect nitrogen to their different parts – roots, shoots, flowers and seed heads – especially when the amount of nitrogen available in the soil is limited. But until now, they had not identified the actual genes and proteins that add up to a plant-wide nitrogen regulatory system.

**ARS molecular biologist Doreen Ware examines corn plants for their genetic information.** (PHOTO: Miriam Chua)

Nitrogen is essential for plants. It is a core component for the growth of most plant structures such as roots, stems, leaves and seed heads. Globally, producers use about 200 million tonnes of fertiliser each year to boost crop yields.

But nitrogen fertiliser is an expensive cost to farmers, and applied nitrogen not taken up by plants can leach or run-off from fields and damage waterways and enter the atmosphere as a greenhouse gas.

"What my team and our collaborators at the University of California-Davis (UC-Davis) have identified are plant gene networks that direct nitrogen to those places where the plant benefits the most when nitrogen is in limited availability," Doreen said. Doreen also is an adjunct associate professor with Cold Spring Harbor Laboratory.

## New plant breeding avenues

As the scientists tease out the details of the system, they believe it may open up new avenues for breeding plants that respond in a particular way under different environmental conditions.

"One day we may be able to precisely breed for specific plant types since a plant breeder could know exactly which genes need to be present so that a root vegetable will direct nitrogen to its roots first in times of limited availability or temperature change. Or, with crops where the important yield is in the seed head such as with wheat or oats, breeders would select plants with genes to direct nitrogen to seed heads first," Doreen added.

The researchers also identified genes and transcription factors that help regulate other aspects of plant growth that involve nitrogen such as increasing height or stunting in plants, triggering the transition to flowering and other essential processes.

If crop varieties that selectively direct nitrogen and other nutrients can be bred, it possibly could reduce the amount of nitrogen the farmers need to apply to maximise yield.

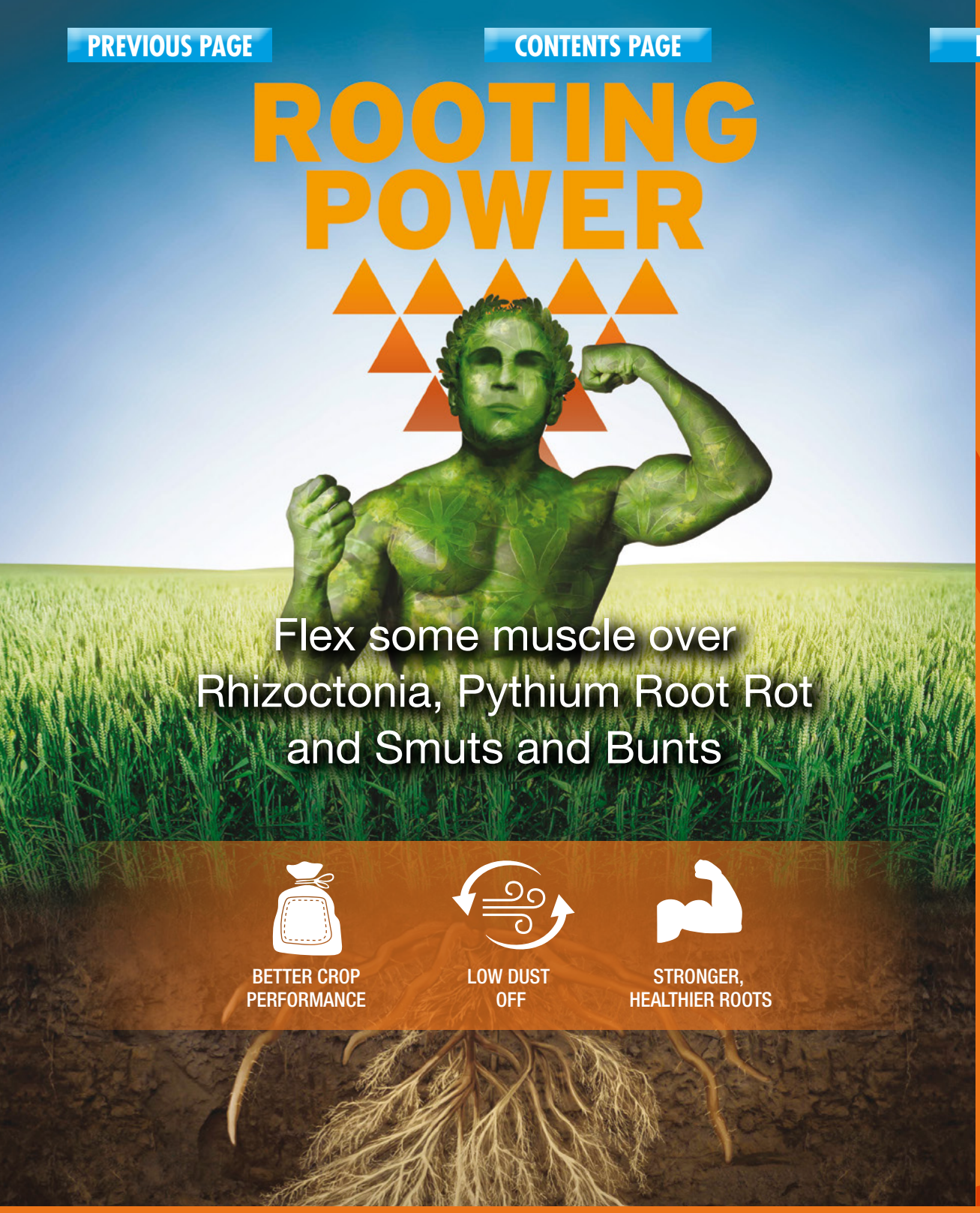
Doreen and her team used computational and molecular biological approaches to identify a set of genes and transcription factors they suspected plants might use to direct nitrogen. Then collaborators at UC-Davis tested those potential players in the field.

## Major strides

This relatively new science of computational biology is making major strides at putting crop variety development on a more scientifically precise basis. Computational biology is the science of building models that allow researchers to integrate and analyse very large, diverse sets of experimental and field measurements to describe and/or predict how an organism will react physiologically.

**The Agricultural Research Service is the US Department of Agriculture's chief scientific in-house research agency.** ■

# ROOTING POWER



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# Maintaining efficacy with larger droplets: New 2,4-D requirements

## AT A GLANCE…

- Growers and spray operators need to check if their current nozzle meets the new APVMA 2,4–D application requirements (effective October 4, 2018).
- Using Very Coarse or coarser spray qualities may require an increase in the total application volume to maintain efficacy.
- To maintain efficacy when increasing the droplet size, operators must ensure that spray coverage on the target weeds is adequate, water quality is suitable and robust product label rates are used.
- Always use robust rates according to label instructions

THE Australian Pesticides and Veterinary Medicines Authority (APVMA) recently made the decision to suspend the labels of all products containing the active ingredient 2,4–D and replace them with a permit (effective October 4, 2018). The permit requires that all products containing this active ingredient must now be applied with a Very Coarse spray quality or coarser. In sensitive areas there is also an advisory statement to use an Extremely Coarse or Ultra Coarse spray quality over summer.

This is a significant change from original label requirements for a Coarse spray quality or coarser.

Many of the nozzles used by grain growers may not be able to produce a Very Coarse spray quality or larger at practical operating pressures. Spray operators may need to change from low pressure air induction nozzles to high pressure air induction nozzles that can produce the Very Coarse (VC), Extremely Coarse (XC) or Ultra Coarse (UC) spray qualities specified by the new 2,4–D permit. See Table 1 for examples of common nozzle types and the spray qualities produced at various pressures.

## Impact of coarser spray qualities on coverage

An increase in droplet size by moving to coarser spray qualities can have a significant impact on the number of droplets generated and the potential spray coverage of target weeds, unless the total application volume (litres per hectare) is also increased (see Figure 1).

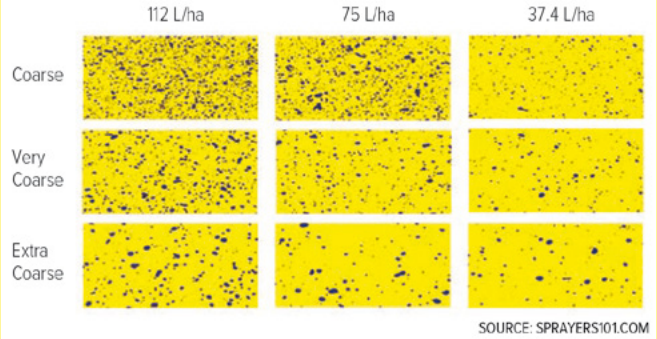
An increase in droplet size can also impact on the ability of many of the larger droplets to be retained on certain leaf surfaces, with a proportion of the larger droplets bouncing off the leaf surface or shattering into smaller droplets that may not

**TABLE 1: Spray qualities for common nozzle types and orifice sizes**

| | | Low pressure air induction (RUN ABOVE 2-3 BAR) | | | | | | | | | | | | | | High pressure air induction (RUN ABOVE 3-4 BAR) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRAND | | Hypro | TeeJet | Lechler | Agrotop | Hypro | Hardi | Hardi | Lechler | TeeJet | Hypro | Belle-ricay | ARAG | Albuz | | TeeJet | Lechler | Albuz | ARAG | Agrotop | Agrotop | Hardi | Teejet | TeeJet | TeeJet |
| MODEL | | Guardian Air Twin | AI3070 TwinJet | IDK-120 | Airmix | Guardian Air | Minidrift DUO TwinJet | Minidrift | IDKT TwinJet | AIXR | ULD-120 | bubble-jet | CFA | CVI | | AITTJ60 TwinJet | ID | AVI | CFA-ULTRA | Turbo Drop TD | Turbo Drop TD-XL-D | Injet | AI | TTI60 TwinJet | TTI | |
| Nozzle size | BAR |  |  |  |  |  |  |  |  |  |  |  |  |  | BAR |  |  |  |  |  |  |  |  |  |  |
| 015 GREEN | 1.5 | not available in this size | VC | C | not available in this size | UC | not available in this size | C | not available in this size | VC | UC | | VC | VC | 1.5 | not available in this size | | | | | not available in this size | | | not available in this size | UC |
| | 2.0 | | C | C | XC | XC | | C | | C | XC | XC | ? | VC | 2.0 | | | | | | | | UC | | UC |
| | 3.0 | | M | C | C | C | | C | | C | VC | VC | C | VC | 3.0 | | VC | VC | VC | | | VC | XC | | UC |
| | 4.0 | | M | M | C | M | | M | | M | C | C | C | | 4.0 | | C | C | VC | C | | VC | XC | | XC |
| | 5.0 | | F | M | C | M | | M | | M | C | C | C | | 5.0 | | C | C | C | C | | VC | VC | | XC |
| | 6.0 | | F | F | M | M | | M | | M | M | C | C | | 6.0 | | C | C | C | C | | VC | VC | | XC |
| | 7.0 | | F | | | M | | | | | M | C | C | | 7.0 | | C | C | C | C | | VC | C | | VC |
| | 8.0 | | | | | | | | | | M | | M | | 8.0 | | M | C | C | C | | C | C | | |
| 02 YELLOW | 1.5 | | VC | VC | | XC | VC | VC | not available in this size | VC | UC | VC | XC | VC | 1.5 | XC | | | | | UC | | | UC | UC |
| | 2.0 | C | VC | C | C | VC | C | C | | VC | XC | C | ? | VC | 2.0 | VC | | | | | UC | | UC | UC | UC |
| | 3.0 | M | C | C | C | M | C | C | | C | C | C | C | C | 3.0 | C | VC | VC | VC | | XC | VC | XC | UC | UC |
| | 4.0 | M | M | M | M | M | C | C | | M | C | M | C | | 4.0 | C | C | C | VC | C | XC | VC | XC | VC | UC |
| | 5.0 | M | M | M | M | M | M | M | | M | M | M | C | | 5.0 | M | C | C | C | C | XC | VC | VC | VC | XC |
| | 6.0 | M | F | M | M | M | M | M | | M | M | M | C | | 6.0 | M | C | C | C | C | VC | VC | VC | VC | XC |
| | 7.0 | F | F | | | M | | | | | M | M | C | | 7.0 | M | C | C | C | C | | VC | C | C | VC |
| | 8.0 | F | | | | | | | | | M | | C | | 8.0 | | C | C | C | C | | VC | C | | |
| 025 LILAC | 1.5 | | XC | VC | | XC | VC | VC | not available in this size | XC | XC | XC | XC | VC | 1.5 | XC | | | not available in this size | | UC | | | UC | UC |
| | 2.0 | UC | VC | VC | VC | VC | VC | VC | | VC | XC | XC | ? | VC | 2.0 | VC | | | | | UC | | UC | UC | UC |
| | 3.0 | VC | C | C | C | C | C | C | | VC | C | VC | VC | C | 3.0 | C | VC | VC | | | XC | VC | XC | XC | UC |
| | 4.0 | M | M | C | C | M | C | C | | C | C | C | ? | | 4.0 | C | VC | C | | VC | XC | VC | XC | VC | UC |
| | 5.0 | M | M | M | M | M | M | M | | C | M | C | C | | 5.0 | M | VC | C | | VC | XC | VC | VC | VC | XC |
| | 6.0 | M | M | M | M | M | M | M | | M | M | C | C | | 6.0 | M | C | C | | VC | VC | VC | VC | VC | XC |
| | 7.0 | M | M | | | M | | | | | M | C | C | | 7.0 | M | C | C | | VC | | VC | C | C | XC |
| | 8.0 | M | | | | | | | | | M | | C | | 8.0 | | C | C | | VC | | VC | C | | |
| 03 BLUE | 1.5 | | XC | VC | | UC | VC | VC | C | XC | XC | XC | XC | VC | 1.5 | UC | | | | | UC | | | UC | UC |
| | 2.0 | VC | XC | VC | VC | XC | VC | VC | C | VC | XC | XC | ? | VC | 2.0 | XC | | | | | UC | | UC | UC | UC |
| | 3.0 | C | VC | C | C | VC | C | C | C | VC | C | VC | VC | C | 3.0 | VC | VC | XC | VC | | UC | VC | XC | UC | UC |
| | 4.0 | M | C | C | C | C | M | C | M | C | C | C | VC | | 4.0 | C | VC | VC | VC | VC | XC | VC | VC | XC | UC |
| | 5.0 | M | M | M | C | M | M | C | M | C | M | C | VC | | 5.0 | C | VC | C | VC | C | XC | VC | VC | XC | UC |
| | 6.0 | M | M | M | M | M | M | M | F | M | M | C | ? | | 6.0 | M | C | C | VC | C | XC | VC | VC | VC | XC |
| | 7.0 | M | M | | M | M | | | | | M | C | C | | 7.0 | M | C | C | VC | C | | VC | C | VC | XC |
| | 8.0 | M | | | | | | | | | M | | C | | 8.0 | | C | C | C | C | | VC | C | | |
| 04 RED | 1.5 | | UC | VC | | XC | VC | VC | VC | XC | UC | XC | XC | VC | 1.5 | UC | | | | | | | | UC | UC |
| | 2.0 | VC | XC | VC | VC | VC | C | VC | C | XC | UC | VC | XC | C | 2.0 | XC | | | | | | | UC | UC | UC |
| | 3.0 | C | VC | VC | C | C | C | VC | C | VC | UC | C | XC | C | 3.0 | VC | XC | XC | | | | VC | XC | UC | UC |
| | 4.0 | M | VC | C | C | M | M | C | M | VC | XC | C | ? | | 4.0 | C | VC | VC | data not available | VC | | VC | VC | XC | UC |
| | 5.0 | M | C | C | C | M | M | C | M | C | XC | C | VC | | 5.0 | C | VC | VC | | VC | | VC | VC | XC | XC |
| | 6.0 | M | C | M | M | M | M | C | M | C | VC | C | ? | | 6.0 | M | VC | VC | | VC | | VC | VC | VC | XC |
| | 7.0 | M | M | | | M | | | | | C | C | C | | 7.0 | M | C | VC | | C | | VC | C | VC | XC |
| | 8.0 | M | | | | | | | | | C | | C | | 8.0 | | C | VC | | C | | VC | C | | |

Compiled and updated by bill.gordon@ispray.com.au, mobile 0429 976 565.

**FIGURE 1: Spray coverage on water-sensitive paper at three application volumes and various spray qualities**




be recaptured when weed densities are low. Reduced retention of large droplets is often more pronounced on weeds that are hard to wet due to the types of wax structures in the cuticle of the leaf.

To compensate for the reduced number of droplets produced and for reduced retention of larger droplets an increase in the total application volume (water rate litres per hectare) is strongly recommended when moving from Coarse to Very Coarse, Extremely Coarse or Ultra Coarse spray qualities.

When increasing the total application volume (litres per hectare) it is important to ensure that the water quality is suitable, that robust label rates are used, and where appropriate additional adjuvants are used to maintain efficacy.

For many applicators it may be initially worthwhile to use water-sensitive paper to assess potential spray coverage with various total application volumes in their own paddocks (for more information see the GRDC Grow Note on spray application – module 21 on assessing spray deposits).

**With the new 2,4–D application requirements, a move to coarser spray qualities will impact on potential spray coverage of target weeds. Total application volumes will need to be increased.** (PHOTO: Brad Collis)

## How much water is required?

When using a Very Coarse (VC) or Extremely Coarse (XC) spray quality with fully translocated product –, such as those containing 2,4–D – a minimum application volume of at least 70 litres per hectare is recommended in low stubble environments (typically less than 2.5–3.0 tonnes per hectare), increasing to at least 80 litres per hectare as stubble loads increase. Good results for summer fallow weed control using 70 litres per hectare XC spray quality have been achieved by spray operators.

This total application volume is supported by recent trials assessing spray quality and total application volume for fleabane control by the Northern Grower Alliance conducted in the summer of 2017–18. Reductions in efficacy have been measured when using XC spray qualities at 50 litres per hectare (compared with Coarse), particularly when targeting hard-to-wet weeds in standing stubble.

When using an Ultra Coarse (UC) spray quality total application volume should be at least 80 litres per hectare and may need to be increased to 100 litres per hectare or more in situations where there are high weed densities or heavier stubble present.

To identify suitable nozzle sizes to achieve higher total application volumes see Table 2.

For example, from Table 2 we can determine that an operator spraying at 25 km per hour, who wants to achieve 80 litres per hectare with a 50 cm nozzle spacing would require an 03 orifice at 6 bar, or an 04 orifice at 3.5 bar

To provide applicators with a greater spray quality choice ranging from VC, XC to UC will require changing to high pressure air induction nozzles such as on 03 or 04 Teejet TTI, TeeJet TTI60 or the Agrotop TurboDrop TD-XL-D with an operating pressure in the range of 4 to 6 bar. To achieve a UC spray quality with these nozzles at a total application volume of 80 litres per hectare would require a minor reduction in speed.

Users of sprayers fitted with pulse width modulation systems

**TABLE 2: Total application volume (L/ha) at a range of spraying speeds (km/h) for common nozzle sizes based on a 50 cm nozzle spacing**

| | | | L/ha at various speeds (km/h) based on a 50cm nozzle spacing | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE | BAR | L/min/ nozzle | 8 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 015 GREEN | 1.5 | 0.42 | 63 | 50 | 46 | 42 | 39 | 36 | 34 | 32 | 30 | 28 | 27 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 19 | 18 | 17 | 17 |
| | 2.0 | 0.48 | 72 | 58 | 53 | 48 | 45 | 41 | 39 | 36 | 34 | 32 | 31 | 29 | 28 | 26 | 25 | 24 | 23 | 22 | 21 | 21 | 20 | 19 |
| | 3.0 | 0.59 | 89 | 71 | 65 | 59 | 55 | 51 | 47 | 44 | 42 | 39 | 37 | 36 | 34 | 32 | 31 | 30 | 28 | 27 | 26 | 25 | 24 | 24 |
| | 4.0 | 0.68 | 103 | 82 | 75 | 68 | 63 | 59 | 55 | 51 | 48 | 46 | 43 | 41 | 39 | 37 | 36 | 34 | 33 | 32 | 30 | 29 | 28 | 27 |
| | 5.0 | 0.76 | 115 | 92 | 83 | 76 | 71 | 65 | 61 | 57 | 54 | 51 | 48 | 46 | 44 | 42 | 40 | 38 | 37 | 35 | 34 | 33 | 32 | 31 |
| | 6.0 | 0.84 | 126 | 100 | 91 | 84 | 77 | 72 | 67 | 63 | 59 | 56 | 53 | 50 | 48 | 46 | 44 | 42 | 40 | 39 | 37 | 36 | 35 | 33 |
| | 7.0 | 0.91 | 136 | 109 | 99 | 91 | 84 | 78 | 72 | 68 | 64 | 60 | 57 | 54 | 52 | 49 | 47 | 45 | 43 | 42 | 40 | 39 | 37 | 36 |
| | 8.0 | 0.96 | 144 | 115 | 104 | 96 | 88 | 82 | 77 | 72 | 68 | 64 | 60 | 57 | 55 | 52 | 50 | 48 | 46 | 44 | 43 | 41 | 40 | 38 |
| 02 YELLOW | 1.5 | 0.56 | 84 | 67 | 61 | 56 | 52 | 48 | 45 | 42 | 39 | 37 | 35 | 33 | 32 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 |
| | 2.0 | 0.65 | 97 | 77 | 70 | 65 | 60 | 55 | 52 | 48 | 46 | 43 | 41 | 39 | 37 | 35 | 34 | 32 | 31 | 30 | 29 | 28 | 27 | 26 |
| | 3.0 | 0.79 | 119 | 95 | 86 | 79 | 73 | 68 | 63 | 59 | 56 | 53 | 50 | 47 | 45 | 43 | 41 | 40 | 38 | 36 | 35 | 34 | 33 | 32 |
| | 4.0 | 0.91 | 137 | 109 | 100 | 91 | 84 | 78 | 73 | 68 | 64 | 61 | 58 | 55 | 52 | 50 | 48 | 46 | 44 | 42 | 41 | 39 | 38 | 36 |
| | 5.0 | 1.02 | 153 | 122 | 111 | 102 | 94 | 87 | 82 | 76 | 72 | 68 | 64 | 61 | 58 | 56 | 53 | 51 | 49 | 47 | 45 | 44 | 42 | 41 |
| | 6.0 | 1.12 | 168 | 134 | 122 | 112 | 103 | 96 | 89 | 84 | 79 | 74 | 71 | 67 | 64 | 61 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 45 |
| | 7.0 | 1.21 | 181 | 145 | 132 | 121 | 111 | 103 | 96 | 90 | 85 | 80 | 76 | 72 | 69 | 66 | 63 | 60 | 58 | 56 | 54 | 52 | 50 | 48 |
| | 8.0 | 1.29 | 193 | 155 | 141 | 129 | 119 | 110 | 103 | 97 | 91 | 86 | 81 | 77 | 74 | 70 | 67 | 64 | 62 | 59 | 57 | 55 | 53 | 52 |
| 025 LILAC | 1.5 | 0.70 | 105 | 84 | 76 | 70 | 64 | 60 | 56 | 52 | 49 | 47 | 44 | 42 | 40 | 38 | 36 | 35 | 34 | 32 | 31 | 30 | 29 | 28 |
| | 2.0 | 0.81 | 121 | 97 | 88 | 81 | 74 | 69 | 64 | 60 | 57 | 54 | 51 | 48 | 46 | 44 | 42 | 40 | 39 | 37 | 36 | 35 | 33 | 32 |
| | 3.0 | 0.99 | 148 | 118 | 108 | 99 | 91 | 85 | 79 | 74 | 70 | 66 | 62 | 59 | 56 | 54 | 51 | 49 | 47 | 46 | 44 | 42 | 41 | 39 |
| | 4.0 | 1.14 | 171 | 137 | 124 | 114 | 105 | 98 | 91 | 86 | 80 | 76 | 72 | 68 | 65 | 62 | 59 | 57 | 55 | 53 | 51 | 49 | 47 | 46 |
| | 5.0 | 1.27 | 191 | 153 | 139 | 127 | 118 | 109 | 102 | 96 | 90 | 85 | 80 | 76 | 73 | 69 | 66 | 64 | 61 | 59 | 57 | 55 | 53 | 51 |
| | 6.0 | 1.40 | 209 | 168 | 152 | 140 | 129 | 120 | 112 | 105 | 99 | 93 | 88 | 84 | 80 | 76 | 73 | 70 | 67 | 64 | 62 | 60 | 58 | 56 |
| | 7.0 | 1.51 | 226 | 181 | 165 | 151 | 139 | 129 | 121 | 113 | 106 | 101 | 95 | 90 | 86 | 82 | 79 | 75 | 72 | 70 | 67 | 65 | 62 | 60 |
| | 8.0 | 1.61 | 242 | 193 | 176 | 161 | 149 | 138 | 129 | 121 | 114 | 107 | 102 | 97 | 92 | 88 | 84 | 81 | 77 | 74 | 72 | 69 | 67 | 64 |
| 03 BLUE | 1.5 | 0.84 | 126 | 100 | 91 | 84 | 77 | 72 | 67 | 63 | 59 | 56 | 53 | 50 | 48 | 46 | 44 | 42 | 40 | 39 | 37 | 36 | 35 | 33 |
| | 2.0 | 0.97 | 145 | 116 | 105 | 97 | 89 | 83 | 77 | 73 | 68 | 64 | 61 | 58 | 55 | 53 | 50 | 48 | 46 | 45 | 43 | 41 | 40 | 39 |
| | 3.0 | 1.18 | 178 | 142 | 129 | 118 | 109 | 101 | 95 | 89 | 84 | 79 | 75 | 71 | 68 | 65 | 62 | 59 | 57 | 55 | 53 | 51 | 49 | 47 |
| | 4.0 | 1.37 | 205 | 164 | 149 | 137 | 126 | 117 | 109 | 103 | 96 | 91 | 86 | 82 | 78 | 75 | 71 | 68 | 66 | 63 | 61 | 59 | 57 | 55 |
| | 5.0 | 1.53 | 229 | 183 | 167 | 153 | 141 | 131 | 122 | 115 | 108 | 102 | 97 | 92 | 87 | 83 | 80 | 76 | 73 | 71 | 68 | 66 | 63 | 61 |
| | 6.0 | 1.68 | 251 | 201 | 183 | 168 | 155 | 144 | 134 | 126 | 118 | 112 | 106 | 101 | 96 | 91 | 87 | 84 | 80 | 77 | 74 | 72 | 69 | 67 |
| | 7.0 | 1.81 | 271 | 217 | 197 | 181 | 167 | 155 | 145 | 136 | 128 | 121 | 114 | 109 | 103 | 99 | 94 | 90 | 87 | 83 | 80 | 78 | 75 | 72 |
| | 8.0 | 1.93 | 290 | 232 | 211 | 193 | 179 | 166 | 155 | 145 | 137 | 129 | 122 | 116 | 111 | 105 | 101 | 97 | 93 | 89 | 86 | 83 | 80 | 77 |
| 04 RED | 1.5 | 1.12 | 168 | 134 | 122 | 112 | 103 | 96 | 89 | 84 | 79 | 74 | 71 | 67 | 64 | 61 | 58 | 56 | 54 | 52 | 50 | 48 | 46 | 45 |
| | 2.0 | 1.29 | 193 | 155 | 141 | 129 | 119 | 110 | 103 | 97 | 91 | 86 | 81 | 77 | 74 | 70 | 67 | 64 | 62 | 59 | 57 | 55 | 53 | 52 |
| | 3.0 | 1.58 | 237 | 189 | 172 | 158 | 146 | 135 | 126 | 118 | 111 | 105 | 100 | 95 | 90 | 86 | 82 | 79 | 76 | 73 | 70 | 68 | 65 | 63 |
| | 4.0 | 1.82 | 273 | 219 | 199 | 182 | 168 | 156 | 146 | 137 | 129 | 122 | 115 | 109 | 104 | 99 | 95 | 91 | 88 | 84 | 81 | 78 | 75 | 73 |
| | 5.0 | 2.04 | 306 | 245 | 222 | 204 | 188 | 175 | 163 | 153 | 144 | 136 | 129 | 122 | 117 | 111 | 106 | 102 | 98 | 94 | 91 | 87 | 84 | 82 |
| | 6.0 | 2.23 | 335 | 268 | 244 | 223 | 206 | 191 | 179 | 167 | 158 | 149 | 141 | 134 | 128 | 122 | 117 | 112 | 107 | 103 | 99 | 96 | 92 | 89 |
| | 7.0 | 2.41 | 362 | 289 | 263 | 241 | 223 | 207 | 193 | 181 | 170 | 161 | 152 | 145 | 138 | 132 | 126 | 121 | 116 | 111 | 107 | 103 | 100 | 96 |
| | 8.0 | 2.58 | 387 | 309 | 281 | 258 | 238 | 221 | 206 | 193 | 182 | 172 | 163 | 155 | 147 | 141 | 135 | 129 | 124 | 119 | 115 | 111 | 107 | 103 |

**Portable batching plants can increase the efficiency of mixing and filling operations.**

should consult Wilger literature or the 'TipWizard' app to evaluate suitable nozzle types and operating pressures to achieve the required spray quality. Note that adjusting operating pressure will affect the 'duty cycle' (lower pressure increases duty cycle).

It is important when using larger droplets (coarser spray qualities) that the 'duty cycle' be maintained as high as possible to avoid misses, as larger droplets will not redistribute in the same way smaller droplets will.

## Mixing and filling operations

Increasing total application volumes will result in an increase in the number of mixing and filling operations required. To minimise the time out of the paddock when spraying conditions are good operators should consider where they can increase the efficiency of the mixing and filling operation.

Equipment and practices that can increase efficiency include:

- Portable batching plants and chemical trailers;
- Water tankers and increasing the number of fill points around the farm;
- Pre-treating water with water conditioners; and,
- Front fill points on sprayers to avoid folding the boom.

**For more information see the GRDC Grow Note on Spray Application, module 9, on Mixing and filling and transfer systems.**

**Source: GRDC Fact Sheet, October 2018 for whole article.** ■

## Pulse width modulation systems: Examples of nozzles that can achieve VC, XC and UC spray quality

| | |
|---|---|
| Very Coarse (VC): | Wilger DR 110-03 up to 50 psi<br>Wilger MR 110-04 at 30 psi<br>Wilger MR 110-05 at 40-50 psi<br>Wilger MR 110-06 at 60-80 psi |
| Extremely Coarse (XC): | Wilger MR 110-06 up to 50 psi<br>Wilger DR 110-04 at 40 psi<br>WIlger DR 110-05 up to 70 psi<br>Wilger DR 110-06 up to 80 psi |
| Ultra Coarse (UC): | Wilger UR 110-04 or larger at a range of pressures |

# FREQUENTLY ASKED QUESTIONS…

### Will larger droplets result in poorer control?

Without increasing the total application volume, it is likely that a reduction in efficacy will occur, unless the operator is already using around 80 litres per hectare or more.

### What spray quality do I use if I tank mix 2,4–D with another product that requires a different spray quality?

Regardless of the tank mix partner, 2,4–D must be applied according to the instructions on the permit.

### Can I use the same nozzles used for 2,4–D for other products or double knocks?

Nozzles that produce Very Coarse or larger spray qualities may also be suitable for other fully translocated products, including other Group I herbicides, glyphosate at higher application volumes and many soil-applied (pre-emergent) herbicides.

For contact herbicides application volumes would need to be increased to more than 90 litres per hectare when using Very Coarse or Extremely Coarse spray qualities. For Ultra Coarse this may need to be well above 120-130litres per hectare. Therefore, double/second knocks with paraquat should continue to use a standard Coarse spray quality when the wind direction is away from sensitive areas.

### If I am double-knocking, can I use less water in the first pass?

It is critical to maximise efficacy for every pass, even when a double knock is planned. Always use enough water to ensure good coverage in the first pass. This places less pressure on the product/s used in the second pass.

### How can I get over my country in a timely manner if I use more water and must fill the sprayer more often?

Increasing the total application volume will require more mixing and filling operations, which can eat into valuable spraying time. Having portable mixing and filling rigs, batching plants and water tankers allow the sprayer to be filled at the paddock, saving a lot of time. Modifications to the sprayer such as front fill points can also mean the sprayer does not have to be folded while filling occurs.

### Will increasing the water rate mean I will be spending more on adjuvants?

When adjuvants are added on a volume per volumes basis, increasing the total application volume will mean a corresponding increase in adjuvant volume and a small increase in the overall cost per hectare. Ensuring water quality is good and using robust label rates of product can minimise additional adjuvant requirements. Always test water of unknown quality to determine if additional water conditioners are required.

# Practical implications of 2,4–D changes: It's all about the drift

THE action by the APMVA concerning 2,4–D (see previous article) was taken in response to widespread damage over several years to sensitive crops, such as grapes, horticultural crops, summer pulses and cotton. The APMVA permit will stay in place until the finalisation of the 2,4–D review. Public consultation on the review is expected to start later this year.

Under the permit there are changes to the 'directions for use' for 2,4–D including: changes to application technique, spray quality, timing and the observance of mandatory no-spray buffer zones, as well as increased requirements for detailed record keeping.

Industry spray specialist Bill Gordon, who has done extensive work on best practice application, has helped develop the latest GRDC guide to 2,4–D use, for those working in the paddock.

Bill said it was important to understand the new changes were primarily targeted at drift mitigation and did not restrict any other aspects of the current approved use patterns as detailed in the new permit (replacing the original product labels).

But he said the key changes for using 2,4–D under the permit include:

- Applicators must now use at least a Very Coarse (VC) spray quality;
- When using a boom sprayer, boom heights must be 0.5 metres (or lower) above the target canopy; and,
- Downwind buffers now apply (typically less than 50 metres, subject to rate and product being applied) between application sites, downwind sensitive crops and environmentally sensitive aquatic areas.

Bill said the new permit also included an advisory statement for 2,4–D use in cereals, fallow and pasture from October 1 to April 15. These statements advise operators to use an Extremely Coarse (XC) or Ultra Coarse (UC) spray quality and to take steps to mitigate the risk of spray drift such as adopting increased water rates and slower application speeds.


**The GRDC has developed a drift reduction guide for spray operators explaining how new restrictions to the use of 2,4–D will impact on-farm applications.** (PHOTO: GRDC)

## Additional record keeping

"Additional record keeping is also required under these changes, so operators now need to update spray records, with greater detail, within 24 hours of application and to keep these records for a minimum of two years," he said.

"The permit also includes clearer instructions to help identify temperature inversions to reduce off-target spray risk.

"I would advise operators to watch for weather changes and stop spraying immediately if a surface temperature inversion develops or conditions become unsuitable for any other reason."

## New nozzles needed

Bill said the changes would mean many spray operators would have to buy additional sets of nozzles to meet the new requirements for VC, XC or UC spray quality.

"In practical terms, many low-pressure air induction nozzles, such as the Teejet AIXR or Hardi Minidrift, are not able to produce VC, XC or UC droplets at useful pressures in the nozzle sizes most commonly used, which range from 02 (yellow), 025 (lilac) and 03 (blue)," he said.

"Therefore, many spray operators will need to change to high pressure air induction nozzles, such as the Hardi Injet, Teejet TTI or TTI-60, or the Agrotop TD-XL-D.

"Operators are encouraged to contact their suppliers well before starting spray activities to secure the supply of their nozzle requirements.

"These nozzles should be operated at pressures above 4 bar (ideally 5–6 bar), so their use may require increasing application volumes."

## Pulse Width Modulation Systems

If spray operators are using Pulse Width Modulation Systems, Bill said there were several options to ensure they were meeting the new permit requirements.

"Very coarse spray qualities can be achieved on Pulse Width Modulation systems using Wilger MR-04 or SR-06 nozzles at pressures below 2.4 Bar. Other nozzle sizes may be appropriate if using the Wilger DR nozzle types," he said.

"To obtain XC or coarser spray qualities, operators should check with their suppliers on the availability of newer nozzle models that are suitable for this purpose."

## Application volumes

Bill said operators would also need to consider adjusting application volumes when using coarser spray qualities.

"When increasing the droplet size, it is important to consider increasing the total application volume to maintain coverage and efficacy," he said. "In low stubble environments a minimum of 70 litres per hectare has be shown to provide acceptable efficacy when using XC spray qualities. In heavier stubbles this may need to be increased to 80 litres per hectare or more."

Bill said there were additional state and territory restrictions which spray operators and growers must adhere to which may include restricted areas and times of use. Operators are advised to check with their relevant state authority for details.

**More information is available from the new GRDC Fact Sheet 'Maintaining efficacy with larger drops' at *https://bit.ly/2IT3lND*. For more information about best practice spray application go to *https://grdc.com.au/spray-drift*** ■

# Plant enzyme discovery could help produce frost-resistant crops

RESEARCHERS from The University of Western Australia have found that an enzyme in plants – ATP Synthase – plays a critical role in how plants respond to the cold.

The discovery, published in *New Phytologist*, could be used to produce frost-resistant crops, which would save the agricultural industry millions of dollars every year.

The researchers say the new finding could lessen or prevent the impact of significant weather events, such as record low temperatures in the WA wheatbelt this year, which wiped out a million tonnes of wheat.

Dr Nic Taylor from UWA's School of Molecular Sciences and the ARC Centre of Excellence in Plant Energy Biology (PEB) said that as the climate changes it is becoming increasingly important to understand how plants respond to temperature.

"In our study we observed plants in near-freezing conditions and saw there was a decrease in the production of ATP – a plant cell's main energy currency – which led to reduced growth," Nic said.

"Based on a number of international studies it was previously thought that other components of energy production were more sensitive than this enzyme, but we were surprised to identify ATP Synthase as the culprit."

The finding has led to new revelations about plant responses to temperature.

Dr Sandra Kerbler, from UWA and PEB said the benefits of understanding a crucial enzyme for energy production being so sensitive to cold was of great use to the agricultural industry and to the future of producing frost-resistant crops.

"The research has changed previous thoughts of how plants cope with temperature stress and has highlighted new angles for investigation," Sandra said.

"A better understanding of how a plant's energy production is altered in response to changing temperatures could inform how we breed plants that are more adaptive to climate change."

**More information: Nic Taylor (UWA School of Molecular Sciences) 08 6488 1107.** ■

**The newly discovered role ATP Synthase plays will help breeders develop more frost resistant crops.**

# Long-term view can pay off when making frost decisions

DIFFERENT management options are available for frost-damaged crops – apart from cutting them for hay – which can help growers maximise the future potential of affected paddocks, according to agronomist Garren Knell of ConsultAg (WA).

"I encourage growers to carefully assess paddocks and take a long-term view when considering management options for frosted crops, so that they can maximise future returns from affected areas," said Garren.

Over a number of years Garren has conducted frost research, development and extension (RD&E) in collaboration with the Grains Research and Development Corporation (GRDC).

His advice follows frosts that affected a wide area of WA's central, eastern and southern cropping areas in the 2018 season. Dry conditions compounded the effects of the frosts, making it difficult for crops to recover or compensate.

**ConsultAg agronomist Garren Knell says in many cases the best management decision for a frosted crop is to go ahead and harvest it.**

"If crops have been badly frosted, they still need to be managed, whether this involves taking the crop through to harvest; baling crops for hay; spraying out weedy paddocks to prevent weed seed set; swathing crops for straw; grazing them with livestock; or burning or slashing them," Garren said.

"A number of the growers who decide to cut frosted crops for hay are often oaten hay producers who are already equipped with hay machinery, infrastructure and marketing connections.

"It may be advisable for most growers to wait a couple of weeks after the frost – so that they have time to properly assess the full extent of frost damage and make informed decisions.

"It can be frustrating during this period when you are waiting to be able to make an accurate assessment, but rushed decisions can be costly and most options and strategies to deal with frost can be implemented later."

## Deal with the 'knowns'

"There is not a perfect solution for dealing with frost – just remember to deal with 'knowns' and to be pro-active in quantifying the loss and dealing with issues that arise."

Garren said that in many cases the best option would be to harvest the crop.

"At current wheat prices, a paddock only needs to yield about 150 kilograms per hectare of grain to cover the operational cost of the harvester," he said.

Garren said another option was to assess the market for straw and, if this was an appropriate option, crops could be swathed a few weeks after the frost and then baled.

"A benefit of cutting crops for straw, and some other management options – as opposed to cutting them for hay – is that a quick decision does not need to be made," he said.

"Decisions on cutting crops for hay need to be made relatively soon after a frost to preserve the nutritional benefits of the crop."

Garren said weedy paddocks that had been severely frosted could be sprayed out to prevent weeds from setting seed, and these sprayed crops would require further management through burning or slashing.

"Spraying out and grazing with livestock may also be a good option, especially where there is a high weed burden," he said

Garren said frost damage in crops this season had become quite visible one week after the frost. In reasonably short periods such as that he encouraged growers to collect about 50 heads – from multiple areas of a paddock – and assess the amount of grain contained in them, to help inform decisions.

**More information:**

- **Frost Identification Guide, produced by DPIRD with co-investment from GRDC, available at *https://grdc.com.au/CerealFrostIDGuide***
- **Frost – Frequently Asked Questions, a DPIRD publication produced in collaboration with GRDC at *https://grdc.com.au/frost-faq***
- **GRDC Managing Frost Risk Tips and Tactics at *https://grdc.com.au/ManagingFrostRisk***
- **Information on frost management can be found via the GRDC's suite of GrowNotes publications available at *https://grdc.com.au/grownotes***
- **The GRDC YouTube frost playlist which includes segments about the emotional cost of frost and managing the effects of frost *https://www.grdc.com.au/GRDC-Video-NationalFrostInitiativePlaylist***

**Frost resources are also available on the DPIRD website at *https://www.agric.wa.gov.au/frost/frost-tools-and-support* and *https://www.agric.wa.gov.au/frost/management-options-frosted-crop***

**Contact Garren Knell, ConsultAg: gk@consultag.com.au** ■

*Winter crops that fail due to drought, frost, poor pod set or low grain yield potential can be cut as silage or hay. With correct management, a failed grain crop can be salvaged as quality forage.*

# Making the most of a failed winter crop

FAILED crops can be cut for hay or silage to cover some costs of growing the crop and in some instances can be profitable, but markets can be volatile. Crop hay and silage can be of very good quality if managed correctly.

Crops cut for hay can be at risk of weather damage due to longer curing times. Crops cut for silage have less curing time (24 to 48 hours), reducing exposure to possible weather damage.

Silage is cut at an earlier growth stage, making it of higher quality than hay, but is less cost-effective to transport long distances.

## Markets for hay and silage

In droughts, fodder can be in high demand. Growers should have a market for hay before cutting their crop, unless the forage is intended for their own stock. Most hay is sold on nutritional specifications. If sold on contracts, growers need to thoroughly understand hay contracts in terms of agreed quality.

The main consideration for hay buyers is cost per megajoule of digestible energy (MJ). Some hay produced from failed crops can be of excellent quality but there can be variability and testing is important before feeding to livestock.

***"A failed canola crop may be salvaged as hay or silage, but good management is essential to produce a quality product."***

## AT A GLANCE...

- Hay and silage can be made from failed crops as an alternative income source and is sometimes a profitable venture.
- The quality of canola and cereal hay and silage can vary enormously; quality testing is suggested before feeding to livestock.
- Before cutting, chemical withholding periods must have expired.
- Hay cut at late flowering and conditioned provides a reasonable balance between yield and feed quality.
- Markets for hay can be unstable.
- Hay and silage can be fed to all types of ruminant livestock as long as precautions are taken when introduced to their diet.
- Salvaging calculators can assist growers with failed crops.

## To cut or not?

The decision to cut a crop must be made early and will be a compromise between yield and quality.

To determine if a crop should be cut, harvested or left standing in the paddock, it is first necessary to estimate grain and hay or silage yields.

An informed decision can be made by estimating commodity prices, costs of harvesting versus hay or silage-making and understanding the market.

Decision support software is available to help with these calculations (*https://www.dpi.nsw.gov.au/ agriculture/broadacre-crops/crop-salvage-calculator*).

Raking and baling losses are highest in very dry hay: Working at night after dew reduces losses in such crops. A greater proportion of biomass is lost in baling crops with less than two tonnes per hectare of dry matter (Figure 2). The quality is also lower as the leaves and pods are lost first.

Before cutting a failed crop for hay or silage, the withholding period (WHP) and approval for use on forage crops must be checked on the labels of all chemicals used on the crop.

## ESTIMATING HAY YIELD

To estimate hay yield the following method can be applied.

**STEP 1:** Cut one metre of crop row from five representative sites across the paddock. Cut at the same height the crop will be mowed.

Area cut in square metres = number of rows sampled (five) x row spacing in metres.

**STEP 2:** Record the fresh weight in kilograms.

**STEP 3:** To calculate dry matter percentage cut the sample into pieces roughly a centimetre long, to aid drying. Weigh a subsample of 100 to 500 grams and dry.

To dry in a microwave oven, refer to the 'Guide to dry matter testing of silage' listed under Useful resources. Dry matter percentage = dry weight ÷ subsample fresh weight x 100.

**STEP 4:** The hay yield can now be calculated. But about 20 per cent of hay can be lost in baling (Figure 1). Hay is typically 12 to 15 per cent moisture.

Assuming 15 per cent moisture and 20 per cent baling loss:

Hay yield in tonnes per hectare = dry matter percentage (step 3) x fresh weight (step 2) x 1.15 x 0.8 x 0.1 ÷ area cut (step 1).

**NOTE:** The 1.15 assumes 15 per cent moisture; replace with 1.12 for 12 per cent moisture. The constant 0.8 assumes 20 per cent baling loss. This is 100 minus the percentage baling loss, divided by 100. For example, if you expect 30 per cent loss, replace 0.8 with 0.7. The 0.1 converts the yield into tonnes per hectare.

### Example

Five lots of one-metre samples are taken with a row spacing of 25 centimetres (0.25 metres).

The fresh weight was 3.26 kilograms.

The area sampled is: 5 X 0.25 metre rows = 1.25 square metres.

A 400-gram subsample is dried in a microwave and weighs 44 grams. The dry matter percentage is: 44 grams ÷ 400 grams x 100 = 11 per cent.

The yield of hay at 15 per cent moisture and 20 per cent baling loss is: (11 per cent dry matter x 3.26 kilograms x 0.115 x 0.8) ÷ 1.25 square metres = 2.64 tonnes per hectare.

All WHPs must have expired before cutting. Growers also need to ensure the crop has not been sprayed with a chemical product that carries a label warning or prohibitive statement that treated crops are not to be grazed or fed to livestock.

Failing to comply with a WHP can lead to unacceptable chemical residues in products such as milk, meat and eggs.

Producers can check any chemical listed on the vendor declarations to assess their residue risk exposure.

**FIGURE 1: Whole plant yield and quality of 2006 drought-affected crops**

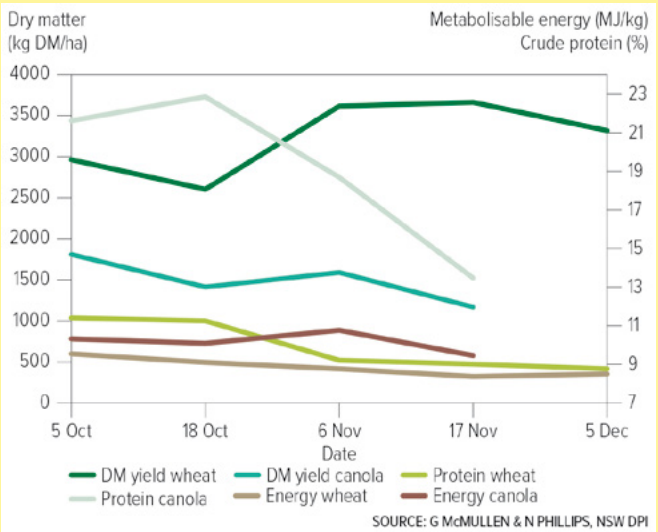
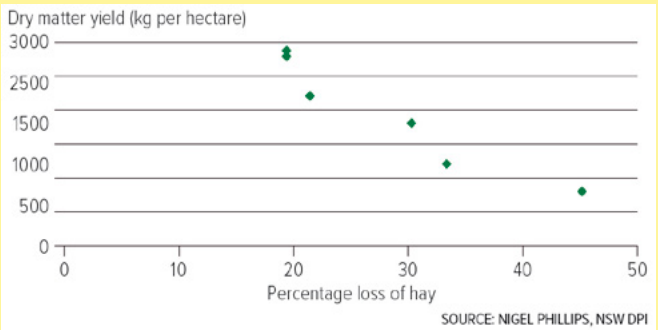



**FIGURE 2: A higher proportion of canola hay is lost during raking and baling in crops with less dry matter**




**Left to right: mid-flowering, late flowering and mid pod-fill. As per cereal crops, cutting canola at the later flowering stage is important for the production of quality forage.**
**(PHOTOS: Felicity Pritchard, Pace, and Chris Smith, Longerenong College)**

# Optimising yield and quality

## Crop nutrition

The nutrition of the crop will affect the hay and silage quality. Adequate nitrogen will lead to higher protein levels than deficient crops. But stressed crops with high soil nitrogen levels are at higher risk of causing nitrate poisoning in livestock if precautions are not taken.

## When to cut crops for hay or silage?

Late flowering generally represents the peak dry matter yield for canola crops (Figure 1). Yields for cereals may increase after flowering as grain fill commences, but only if conditions for growth persist. Quality largely declines for most species after flowering. The shorter curing time of silage may allow crops to be cut earlier with a reduced risk of weather damage compared with hay.

## Height of cutting

Canola hay has a thicker stem than many other hay crops, which may affect the palatability. Cutting the crop higher – for example, at 15 to 20 cm rather than 5 cm – improves its quality, as there will be less thick stems. But hay yields will be reduced.

## Conditioning

Conditioning of hay improves its quality in three ways.

- Curing time is reduced as conditioning cracks the stem, allowing moisture to escape more rapidly.
- Reducing the period from cutting to baling means less dry matter is lost, particularly the high-quality leaves and pods.
- Cracking of canola stems makes them more palatable and easily chewed by livestock.

**Hay and silage should be introduced to livestock slowly, replacing part of the ration.** (PHOTO: Felicity Pritchard)

## Handling

Drought-affected crops are often high in sugar and water-soluble carbohydrates, which can increase curing times and may increase the risk of haystack fires. Like all hays, getting moisture down is important for quality and to avoid fire risks. When making silage, it may be desirable to bale and transport the canola to the storage site before wrapping to avoid damage to the plastic wrap. Wrap canola silage with at least four layers of 'netwrap' for less chance of puncture. Monitor the wrap for signs of deterioration.

**Hay cut at late flowering and conditioned provides a reasonable balance between yield and feed quality.**
**(PHOTO: Felicity Pritchard)**

## Buying and using hay

The quality of hay depends on a range of factors, so undertaking a feed test will provide an accurate analysis to help determine feed rations. Drought-affected crops can also be tested for nitrate to avoid nitrate poisoning.

Silage generally produces better-quality feed than hay. The feed quality of canola hay and silage is generally adequate in maintenance rations for sheep and cattle in drought years.

### Safely feeding hay and silage

Hay or silage can be fed to all types of ruminant livestock, provided necessary precautions are taken when introducing these feeds to the diet. Animals generally find canola hay and silage palatable and waste very little, but can take one or two days to become accustomed to the taste. Feeding hay and silage is safer than grazing a standing crop because animals will selectively graze plant parts with a potentially higher concentration of nitrates. Hay and silage have caused very few problems – especially considering the large quantities of canola hay and silage consumed over recent years. But farmers must exercise care at all times to minimise risks to stock health.

### Managing animal health issues

Most potential health issues can be overcome by using the following guidelines to introduce a new feed into the animals' diet.

- Test the nitrate level in hay or silage. The level at which nitrate causes toxicity in ruminants depends on several factors. Generally, hay or silage with less than 5000 parts per million (ppm) nitrate on a dry matter basis is safe – 5000 to 10,000 ppm is potentially toxic when provided as the only feed. Forage above 10,000 ppm nitrate is considered dangerous but can often be fed safely if diluted with other feedstuffs and supplemented with energy. Stock can sometimes gradually adapt to feed with raised nitrate levels.
- Never offer large amounts of hay or silage to hungry stock. Introduce it slowly by replacing part of the diet and increase the proportion of hay over several days.
- Introduce the feed to only a few animals, as described above, monitoring them closely for several days before introducing the canola hay or silage to the other animals.
- Never feed livestock 'silage' before complete fermentation as it can lead to nitrate poisoning.
- Condition canola hay aggressively to remove any sharp stalk ends.
- Livestock will consume hay with thicker stems more readily if it is chopped. The length of the fibre can affect the digestibility of hay for ruminants. Feed mixer wagons that chop the straw into consistent lengths are considered to improve the nutrient availability to the animal through better presentation and consistency in the ration.

### Milk and meat quality

No reports have occurred of tainted milk from cows or tainted meat of lot-fed lambs fed canola hay or silage. This is possibly due to low levels of glucosinolates in canola.

## Vendor declarations

Livestock producers should request vendor declarations from forage suppliers to ensure chemicals are used appropriately and the stockfeed is suitable for stock consumption.

Vendor declarations include:

- 'Commodity vendor declarations', used for primary feeds such as grain. Available from the Meat and Livestock Australia website; and,
- 'Fodder vendor declarations', used for hay and silage. Available from the Australian Fodder Industry Association website.

## Rotational impacts of hay cutting

### Nutrient export from a hay crop

Nutrient export in hay and silage crops can be very high and needs to be considered when planning the following crop. A soil test in autumn is essential in paddocks where crops were cut for hay or silage the previous season. Growers need to ensure potassium and sulfur levels are adequate.

### Weeds

Hay production is beneficial in reducing the weed seed bank and useful for managing herbicide-resistant weeds. But movement of hay poses a risk of weeds spreading into new areas. Hay buyers should:

- Aim to source local hay;
- Ask for written certification on any potential weed content;
- Feed stock in a confined area;
- Record details of purchased hay;
- Monitor feeding areas for up to two years for unfamiliar plants; and,
- Purchase silage cut early in the season, which will reduce the chance of introducing new weeds.

Hay trucks should be cleaned in a designated area after deliveries.

## Recording of decisions and review

Similar events may occur in the future so record all crop measurements, yields, costs, feed quality and livestock outcomes as a future resource. Review this information at a later stage to determine what additional information could have ben sourced to improve the decisions made.

**Source: GRDC Hay and Silage Fact Sheet, September 2018.**
**Content prepared and edited by Coretext.** ■

WEED smart
every weed every seed
every farm every year

## ASK AN EXPERT –

# HOW CAN I GET THE MOST BANG FROM CROP-TOPPING CANOLA?

**With Greg Condon, Grassroots Agronomy and Australian Herbicide Resistance Initiative**

IN an environment of increasing herbicide resistance, getting back in the driver's seat with weed control relies on stacking tactics and not leaving all the heavy lifting to just one or two strategies.

Greg Condon, Grassroots Agronomy and Australian Herbicide Resistance Initiative (AHRI) southern extension agronomist, works with growers to develop and implement combinations of control measures that complement each other to drive down weed seed set.

"One of the combinations we are advocating is crop-topping plus harvest weed seed control," he says. "Canola is a good candidate for this package, particularly to drive down annual ryegrass numbers."

"Being able to apply the registered glyphosate products early in the crop senescence in canola gives growers a better opportunity to interrupt weed seed set. Following the herbicide with a non-herbicide tactic like harvest weed seed control helps protect the herbicide chemistry by taking another swipe at weed seed that may have evaded the crop-topping tactic."

Greg says the over-the-top option is generally a more practical option than applying the registered glyphosate products under the cutterbar if the crop is windrowed.

"Knowing the glyphosate resistance status of weeds in a

**Greg Condon, Grassroots Agronomy and Australian Herbicide Resistance Initiative (AHRI) southern extension agronomist, advocates crop-topping plus harvest weed seed control as an effective way to drive down annual ryegrass and wild radish numbers in canola.**

paddock is really important," says Greg. "If the weeds present have resistance to glyphosate then crop-topping is ineffective and should not be used."

On some farms canola may be grown as often as every second year, putting heavy pressure on the crop-topping tactic. Under these circumstances, adding harvest weed seed control and maximising crop competition is absolutely essential.

## What herbicides are registered for late season weed control in canola?

**Short answer:** Diquat and three specific glyphosate formulations.

**Longer answer:** Products registered for application prior to direct heading or before/under the windrow are Weedmaster DST, Pintobi Attack and Roundup Ultra Max. Weedmaster DST and Pintobi Attack both have a withholding period of five days. Diquat is also registered for use in canola (WHP 4 days).

The glyphosate products registered for canola can be applied to mature standing crops with a minimum of 20 per cent seed colour change to dark brown or black. Higher end label rates are recommended when crops or weeds are dense. Glyphosate must not be applied to crops intended for seed. Refer to the label prior to use and follow the instructions.

Glyphosate must not be applied to standing crops and again at windrowing.

## What other benefits do I get from crop-topping in canola?

**Short answer:** A head start on summer weed control.

**Longer answer:** Crop-topping with high water rates gives good coverage and can penetrate dense crops to kill small, germinating weeds (such as sowthistle) as well as reducing weed seed set in mature weeds (such as annual ryegrass and wild radish). This essentially provides the first summer weed control application and should reduce the use of glyphosate over summer.

## What if I suspect glyphosate resistance is present?

**Short answer:** Reduce glyphosate use across the cropping program and look for ways to protect this chemistry by driving down weed numbers.

**Longer answer:** Collect weed seed samples and have them tested for herbicide resistance. Knowing what still works is just as important as confirming your suspicions. If immature weeds are present they can be collected and sent for a QuickTest that will give you an opportunity to take action within the season.

Research by Dr Peter Boutsalis and others has confirmed that late season applications of glyphosate on glyphosate-resistant annual ryegrass provides no control and is essentially a waste of money. This research showed that 80 per cent of the seed on glyphosate resistant annual ryegrass remains viable after crop-topping.

Two take home messages from this research are:

- Treating younger plants at lower temperatures can improve glyphosate efficacy on resistant biotypes; and,
- Crop-topping with glyphosate is not effective on glyphosate resistant ryegrass.

## Which harvest weed seed control method is the best crop-topping partner?

**Short answer:** All harvest weed seed control (HWSC) methods provide very similar results – the key is to do everything you can to get the weed seeds into the front of the header.

**Longer answer:** Harvesting low and setting up your harvester to maximise weed seed capture are very important. Canola is a good crop for implementing HWSC because harvesting low does not add significantly to the amount of material that must be processed through the header. Many growers are also using canola chaff captured through HWSC tactics such as chaff carts, chaff lining or chaff decks as a high quality feed source for sheep when grazed. ■

## HOW TO ASK A WEEDSMART QUESTION

Ask your questions about crop-topping canola on the WeedSmart Innovations Facebook page WeedSmartAU, Twitter @WeedSmartAU or the WeedSmart website *https://weedsmart.org.au/category/ask-an-expert/*

'WeedSmart' is an industry-led initiative that aims to enhance on-farm practices and promote the long term, sustainable use of herbicides in Australian agriculture.

**Before crop-topping canola it pays to understand the herbicide resistance profile of the weeds present. Crop-topping glyphosate resistant annual ryegrass is not effective as 80 per cent of the weed seed remains viable after crop-topping.**

# The same – but different?

By Ian M. Johnston

**Hard though it may be to believe, but there are some homo sapiens who fall into the hapless and ill-informed category of being non-tractor people! (Yes, quite extraordinary)! If asked about the embryonic development of automobiles and tractors, and provided they had sufficient cerebral capacity to comprehend the question, they would probably respond by asserting that all automobiles and tractors followed along identical evolutionary paths. But of course we intellectually superior tractor people know that in many instances that answer would be incorrect.**

## The very first tractor not even European!

One need only to reflect upon such idiosyncratic technological early tractor marvels such as Lanz Bulldog, Hart Parr, Rumely Oil Pull, H.S.C.S., Fitch, Jelbart and of course John Deere, none of which had any correlation with motor cars of their era.

Further, and with no intention of offending my Germanic friends, the very first agricultural tractor powered by an internal combustion engine was not German, nor was it British, indeed not even a product of any European country, it was a Yank! (And Donald Trump had never even been thought of!)

The tractor in question, manufactured in 1892, was a contraption designed by John Froelich. It was powered by an absurdly massive 36 litre single cylinder petrol fuelled engine, which produced an equally absurd miniscule 16 horse power. But, the point is, Froelich beat the Europeans with their tractors by more than a decade.

Certainly, tractor and car engines matured into multi-cylinder units, but even here there were significant differences. Tractor engines were designed to run on low grade fuels and had the added advantage of being able to produce consistent high torque figures over sustained, often gruelling conditions. The emphasis on car engines was to produce smooth horsepower accompanied by high revolutions, but which usually resulted in a regrettably high fuel consumption.

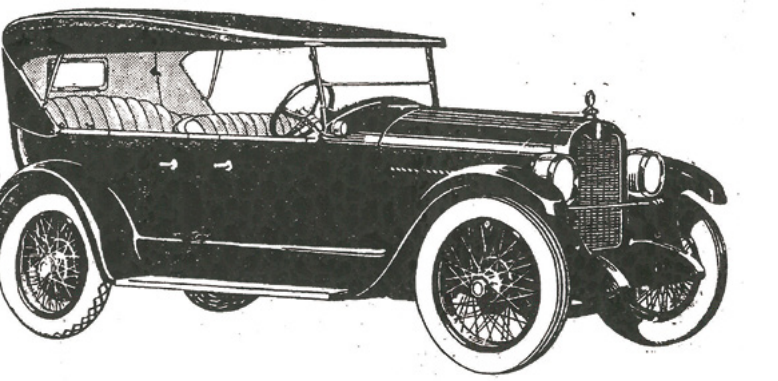
By the mid 1920s, many tractor engines featured overhead valves, while motor cars, apart from a few exotics including Bugatti and Bentley, remained in the majority with side valves through until the late 1940s. By contrast, in 1919 the Minneapolis Steel and Machinery Company equipped their Twin City 12-20 tractors with twin cam four cylinder engines featuring 16 valves.

The majority of tractor manufacturers soon discovered the advantages of unit construction, thus doing away with a chassis. Engines were bolted directly to transmissions and final drives, thus providing a much greater degree of rigidity and strength. With few exceptions, (outstandingly the French Citroen and American Cord) car designers persisted with chassis construction until after World War 2.

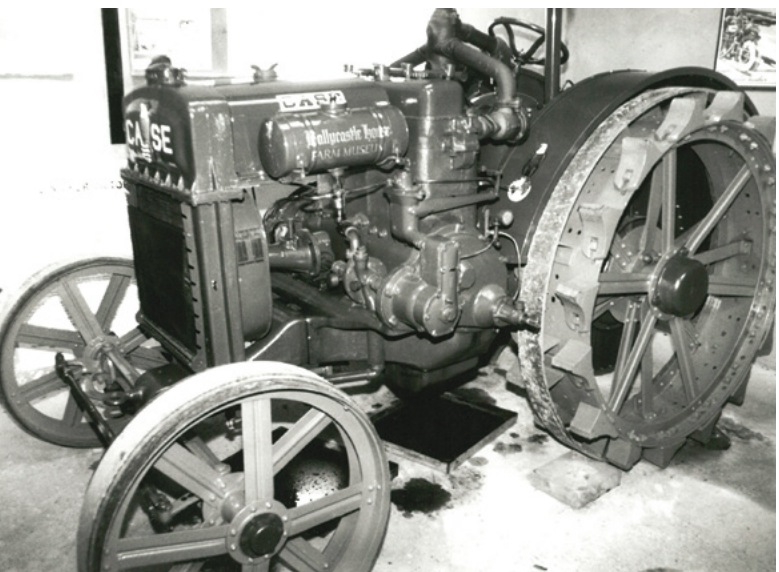
But, as the 20th Century progressed, there were a handful of manufacturers who courageously introduced a range of both cars and tractors into the highly competitive market place. A few of these are considered hereunder.

## J. I. Case

The J.I. Case Threshing Machine Co of Racine, Wisconsin, in 1910 purchased the Price Motor Company, also of Racine. The following year, three specially constructed Case race cars competed in the inaugural Indianapolis 500 mile circuit race and won the first three poll positions. A range of luxury Case cars followed and remained in production until 1927.



**An early Case Model X powered by a 31.5 hp Continental Red Seal 5.3 litre six cylinder side valve petrol engine. It featured a four bearing drilled crankshaft assuring an adequate supply of oil to the bearings. Electrical components included Delco lighting and starting equipment. Note the absence of front wheel brakes.** (IMJ archives)



**The Case 15-27 tractor had no correlation with the Case car, apart from the name of the parent company. This was one of a family of cross engined Case tractors and featured an overhead four cylinder engine and unit construction. The example pictured has been restored by R. Deering of Newtonards, Northern Ireland.** (Photo IMJ)

## Hanomag

Hanomag Maschinbaw AG, of Hanover, (now Komatsu Hanomag) originated in 1835 and rapidly became one of Germany's largest heavy engineering firms involved in the production of steam engines, locomotives, trucks, military vehicles, plus cars and tractors.

Its venture into cars commenced with the diminutive 2/10 Kommisbrot in 1925. (Translated, 'Kommisbrot' means 'army loaf' on account of the vehicle's squat contours). The water cooled engine was a 499 cc 10 hp single cylinder. Despite its

**The Hanomag Kommisbrot had a width of only 1180 mm and a length of 1920 mm The rear located single cylinder 499 cc engine was capable of propelling the vehicle of speeds up to 85 km per hour. This was probably the first genuine German 'Peoples Car'.** (IMJ archives)

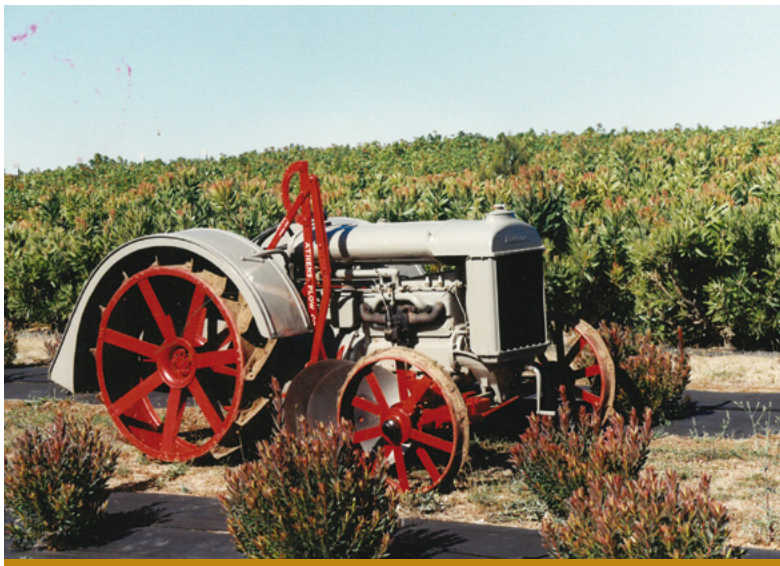
**Pictured is a brilliant example of a Hanomag K50 38-50 crawler, restored by Hanomag enthusiast Peter Desch. Introduced in the early 1930s, such was the success of this well engineered tractor that, following a pause during the war years, it remained in production, with only minor modifications, until 1951. The 8870 cc four cylinder diesel power plant was of Hanomag's own design and produced an easy 50 b.hp at a leisurely 1300 rpm. The drawbar pull was rated at an impressive figure of 7200 lbs at 1.9 mph.** (Photo IMJ)

diminutive size, the 2/10 performed surprisingly well and excelled in negotiating steep Alpine passes. It also raced with success and competed in numerous long distance rallies.

## Ford/Fordson

The name of Henry Ford needs no introduction. His immortal Model T was manufactured between 1908 and 1927. Altogether a staggering 16,500,000 were produced during its 19 year life span. At peak production, 2,000,000 units were rolling off the assembly line each year, which equates to one every 10 seconds!

**While the majority of Model T Fords were equipped with 4 seater hard top or soft top bodies, there were other variations, the most sporty of which were the Speedsters. Pictured is a 1912 Model T Speedster owned and restored by the author in 1982. Apart from the upholstery and tyres, all other components were original – including the acetylene lamps and brass radiator. The vehicle now languishes in a museum for posterity.** (Photo M. Daw)



**Pictured is a Fordson Model F (the 'F' being the initial of the designer Eugene Farkas) restored by Mal Brinkman of Western Victoria. Attached to the tractor is a central side mounted Athens disk plough, which was ideal for orchard or vineyard cultivation. The 20 hp side valve engine was coupled to a flywheel magneto, which provided the spark to the ignition. Air to the Holly carburettor was filtered through a water bath cleaner. Lubrication to the crankshaft and big end bearings was by a splash system operated by a fluted disk attached to the flywheel.** (Photo IMJ)

Despite this, the cars were comparatively flimsy – yet immensely durable.

The side valve engine produced 22.5 hp, but was so robust that thousands were converted to high performance race car engines. A new owner would initially have found the odd-ball two speed epicyclic transmission a degree confusing, but importantly – it worked and proved trouble free.

Henry Ford employed a team of technicians, under the guidance of a Bulgarian engineer named Eugene Farkas, for the purpose of designing a tractor that would be affordable to battling farmers. A clear indication he succeeded is evidenced by the fact that immediately upon its release in 1917, it became the world's top selling tractor. By the mid 1920s, the Fordson Model F accounted for around three quarters of the total world tractor production.

## Caldwell Vale

The Caldwell Vale Motor and Tractor Company of Auburn, NSW, is credited with two major technological breakthroughs.

In 1913 the firm released the world's first four wheel drive, four wheel steer touring car, which created rave reviews when demonstrated to newspaper journalists as it easily negotiated the Cronulla sand hills. Indeed the Australian press Christened the vehicle "Advance Australia".

Earlier, back in 1910 Caldwell Vale had produced a giant 80 hp tractor, which was undoubtedly the world's most advanced tractor! No other tractor of the era could boast four wheel drive coupled to four wheel steer.


**Pictured is a rare historic photo of a four wheel drive, four wheel steer Caldwell Vale negotiating the Cronulla sand hills in 1913. The power unit was a six cylinder 30 hp engine of the firm's own make. The drive train was also designed 'in house', although no specific details are now available.**

**The 1910 Caldwell Vale tractor featured a 680 cubic inch 80 hp overhead valve four cylinder engine with a 6.5 inch bore and stroke. The four driving and steering wheels obtained their power via a fully enclosed three speed gearbox. The big tractors were used not only for agricultural work, but also for hauling trains of loaded wagons to and from outback grazing properties.**

## Conclusion

The foregoing offers a glimpse into the design heterogeneity of early tractors and cars. Today the situation of course remains the same. Even a non-tractor individual could not fail to appreciate the difference between a Holden Commodore and a John Deere 9RX. Although – perhaps, maybe? ■

## IAN'S MYSTERY TRACTOR QUIZ

**Question:** The picture shows the view over the bonnet of which tractor?

**Clue:** It is not a Fergy nor is it a Caterpillar.

**Degree of difficulty:** Easy to any old tractorman.

**Answer:** See page 48.

NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

# Research into new wheat genes for dry conditions

WHEAT growers who have struggled this season with dry conditions across vast tracts of Queensland and New South Wales during the winter cropping season, will be heartened to know research is underway to develop new genetics for wheat varieties that make better use of precious – and increasingly variable – rainfall.

Long-term research investments by the GRDC in partnership with the CSIRO are investigating the development of genes that increase the length of the coleoptile, a protective sheath enclosing the shoot tip and first leaves of wheat.

Seed which germinate with long coleoptiles can be sown deeper in the soil to make use of residual moisture left over from summer rains. This means plants with long coleoptiles are potentially better suited to capturing yield benefits associated with early sowing than plants with shorter coleoptiles.

CSIRO wheat geneticist Greg Rebetzke leads this research and said his team was committed to delivering traits and germplasm for improving crop variety's water use efficiency, as well as weed-competitiveness.

## High yielding, more robust

The research team has a close working relationship with commercial plant breeders to understand the benefits of one trait over another and how to integrate new genetics into the development of higher-yielding, more robust cereals.

"Drought commonly limits productivity of Australian wheat crops. This research is about delivering 'more crop per drop' so grain growers can get maximum benefit from rainfall, as well as contributing to the breeding of new wheat lines that are more weed-competitive," Greg said.

"This year after what was a relatively limited winter crop planting many growers in Queensland and NSW experienced very dry conditions, which made it difficult for crop seeds to access the moisture located deep in the soil.

"Given the increasingly variable rainfall, technologies and crop varieties that make better use of rainfall will be critical for Australian farming systems."

As part of this research investment CSIRO researchers have identified new, alternative dwarfing genes that could potentially reduce crop stature without reducing coleoptile length and early growth, as well as genes that actively promote coleoptile length.

The dwarfing genes are associated with reduced lodging when grown under conditions of higher nitrogen fertilisation.

**CSIRO wheat geneticist Greg Rebetzke is committed to delivering traits and germplasm for improving wheat's water use efficiency, as well as weed-competitiveness.**

These new parental germplasm shows considerable promise in breeding wheats with improved water-use efficiency, weed-competitiveness, and larger root systems/greater nitrogen uptake.

Plants with the desired combination of genes have now been passed on to wheat breeders to validate in their own programs, and then in the development of new long coleoptile varieties.

"Australian wheat breeders now have new genes that can produce a wheat plant the same height as varieties such as Mace or Yitpi , but that have a longer coleoptile of up to 12.5 cm in length that can access water stored deeper in the subsoil," Greg said.

Wheat lines incorporating these genes have undergone field testing at the GRDC's Managed Environment Facilities throughout Australia and at the Central West Farming Systems' Condobolin Agriculture Research and Advisory Station in NSW.

"We hope to learn more about these genes and be able to identify and release new wheat lines with the capacity to be sown as deep as 10 cm – or even 12.5 cm deep – if these new genetics are combined with improved technologies around planting equipment," Greg said.

Currently, wheat cannot be sown unless there is sufficient moisture within the top five to eight centimetres of the soil profile, or poor rates of emergence are a possibility. This caveat often causes growers to delay sowing past the optimal date, resulting in yield penalties.

"The new establishment trait is designed to allow growers to chase soil moisture deeper in the soil profile without compromising the ability of the wheat crop to establish strongly," Greg said.

"We also know that small increases in soil temperatures especially with earlier sowing can reduce coleoptile length. Together with some older seed treatment known to effect on coleoptile length, seedling establishment is one of the most risky periods for growers setting up their crops."

The coupling of new genetics and improved phenotyping has also allowed the development of weed-competitive wheat germplasm to be used as parents in the development of new varieties.

## Work with commercial breeders

"The close engagement with commercial breeders throughout the extensive breeding effort is beginning to deliver large numbers of lines with their first yield assessments made during this season (2018)," Greg said.

"When coupled with appropriate agronomy, harvest weed-seed collection technologies and new chemistries, the potential for competitive wheats to control weeds and reduce costs to growers is in the making."

GRDC Grower Relations Manager North Richard Holzknecht said investment into cereal breeding for a changing climate was critical for grain growers.

"The challenges of this season in Queensland and NSW have just served to reinforce the importance and potential value on-farm of wheat varieties that make better use of rainfall and stored soil moisture," he said.

"The potential development of wheat varieties that can be sown deeper into the soil to maximise use of soil moisture could become a game changer for growers, particularly with what seems to be increasingly variable weather patterns.

"Given the herbicide resistance issues becoming increasingly prevalent in Australia, breeding wheat that is more weed-competitive will also be an invaluable tool in growers' management strategies."

**For more information about the GRDC and CSIRO wheat pre-breeding programs go to *https://bit.ly/2J2sepY*** ■

# Long fallow disorder risk after months of dry weather

IT may sound like fridge magnet philosophy, but the oft-used quote 'if you don't plan, you plan to fail' is timeless advice for northern region grain growers as they weigh up their summer crop options each season.

Waiting on a planting rain to plant summer crops is part and parcel of grain production in the northern region. GRDC Crop Protection Officer North Vicki Green said as part of the waiting game, growers and their advisers were accustomed to weighing up critical elements like varietal selection, soil moisture levels and plant-back timeframes.

But she said after months of dry weather this year – which had severely limited winter planting across the region – they should also evaluate the potential risk of issues such as long fallow disorder.

"Growers should be aware when planting their first crop after the drought that beneficial fungi known as arbuscular mycorrhizal fungi (AMF, previously known as vesicular arbuscular mycorrhizal or VAM fungi), that occur naturally in the soil, can be depleted. These fungi help crops access nutrients and grow," Vicki said.

"A low level or lack of AMF shows up as 'long fallow disorder' and is often found in paddocks that have been fallow for at least eight to 12 months, where AMF may have died out due to the lack of living host plants.

"The fact this season has been so dry we haven't even had weed growth. This has compounded the potential issue, as most weeds are also known to host AMF.

"When long fallow disorder is present crops fail to thrive even with adequate moisture. Essentially, when AMF levels have dropped, it is difficult for the crop to access nutrients, such as phosphorus (P) and zinc (Zn)."

Vicki said long fallow disorder could cause yield losses of up to 80 per cent in chickpea, maize, mungbean and linseed; 60 per cent losses in sorghum and soybean; and about 30 per cent in wheat and barley.

## Improved understanding

The GRDC, together with the Queensland Department of Agriculture and Fisheries (DAF), have invested in research to improve the understanding of long fallow disorder's impact on specific crops, as well as what action growers can take to reduce the risk.

DAF soil microbiologist Nikki Seymour said new PreDicta B tests had been developed to determine the levels of two main AMF groups, plus provisional disease risk categories within paddocks, and these tests could be useful for identifying at-risk paddocks.

"I recommend growers consider testing this season, which could allow them to alter rotations to a crop less dependent on AMF and/or attempt to ameliorate paddocks with addition nutritional inputs," Nikki said.

"But research has found that even excessive rates of P cannot overcome the effects of very low AMF levels for some crops."

She said different crop species and varieties had different levels of dependency on AMF and P and Zn levels in the paddock also influenced whether crop growth was affected by low AMF levels.

"Non-host crops such as winter crops canola and lupins, do not contribute to building up AMF levels, therefore they are not as beneficial as say wheat or sorghum in the rotation for a future AMF dependent crop," Nikki said.

She said due to this variation in the amount of inoculum that different crops produced, cropping history and length of fallow were very important for estimating if AMF inoculum levels in soil were high or low.

"Predicting the AMF status of a particular paddock is not straightforward, nor is estimating the optimum P and/or Zn fertiliser requirements of crops that you suspect will be low in AMF," said Nikki.

"There is still much we do not know about how AMF survival is influenced by soil temperatures and moisture levels both in-crop and during the fallow periods. Soil disturbance can reduce AMF and therefore minimising tillage is more conducive to optimising AMF levels."

## Strategies to minimise AMF impact

She said if growers suspected low AMF, they could use management strategies to minimise the impact, such as:

- Growing crops with lower AMF dependency, such as sorghum won't suffer as much yield loss, as for example mungbeans and maize, providing P and Zn are well supplied in soil or fertiliser, but will still increase the AMF inoculum for following crops;
- Avoiding non-AMF crops, as they will not increase AMF inoculum status;
- Applying high rates of P and Zn fertilisers if growing a crop of high AMF dependency for reasons such as good prices; and,
- Adopting zero or reduced-tillage practices during fallow periods, as this is less harmful to AMF than frequent tillage.

**DAF soil microbiologist Nikki Seymour recommends growers consider using a new PreDicta B DNA test for determining AMF levels within paddocks, which could be useful for identifying paddocks at risk of long fallow disorder.** (PHOTO: DAF)

**For more information about long fallow disorder and arbuscular mycorrhizal fungi (AMF) go to *https://bit.ly/2O6Nktd or https://bit.ly/2yeOlix and https://bit.ly/2zSBRoi*** ■

# Sorghum Farming Has Gone Viral!

It's been a few years since we have seen a solid start to a summer season across the northern grain belt. These good conditions often cause a rapid build-up of *Helicoverpa armigera* numbers, and flowering sorghum will be one of the most attractive crops this December leading up to Christmas.

Vivus® Max (*Helicoverpa* NPV) is established as the proven standard for *Helicoverpa* management in sorghum. The real value of NPV lies in its ability to replicate in the field, giving increasingly better control over time, allowing the virus to control caterpillars during flowering and right-through to harvest.

AgBiTech

## Go early...

With this understanding of the biology of NPV, many consultants and farmers know that the best way to use Vivus Max in sorghum is to apply it during early flowering. With chemistry, the old approach was wait and target as many larvae as possible with one spray, which caused damage along the way, disrupted beneficials, and risked the need for a clean-up spray for late tillers or pressure. Using NPV early sets-up the natural virus cycle and eliminates the risk of significant losses from *Helicoverpa* damage with a single, cost-effective application.

## ... keep costs low ...

For farmers with ground rigs, Vivus Max can be effectively applied in bands to keep costs low. For

Don't hang around, use Vivus Max early.

An early Vivus Max spray paying off.

aerial application, AgBiTech has registered a low water volume recommendation (with Optimol®) to reduce application costs. Early use of Vivus Max is also compatible with other approaches, such as lower application rates (Vivus Max is registered at 75 to 150 mL per hectare in sorghum) and double swathing, to help further reduce the cost of managing *Helicoverpa* in sorghum.

Using a low cost Vivus Max strategy and based on $300 per tonne sorghum prices, *Helicoverpa* thresholds are generally below 0.35 larvae per sorghum head.

## ... to minimise risk and maximise profitability!

These recommendations are all geared toward encouraging the early application of Vivus Max. Experience has shown that large acreages of flowering sorghum early in the new year can cause significant challenges for farmers and operators being able to apply Vivus Max on-time, especially if there is some rain about. Taking the low-cost, pre-emptive approach avoids delayed sprays, and reduces tillering for maximum earliness, meaning more grain is delivered into the early market and moisture is conserved for the next crop.

**For further information, contact AgBiTech:**
**Ph. 1800 242 519 Web: www.agbitech.com Twitter: @agbitech**
**® Vivus and Optimol are trademarks of AgBiTech Pty Ltd.**
**Always read the product label before use.**

## *Give early worms the bird, and profit this summer!*

ViVUS MAX
Advanced *Helicoverpa* Biocontrol

Optimol®
Biological Insecticide Optimiser

**Spined predatory bug eating a Heli dying from NPV... easy pickings.**
**INSET: Prevent damage all the way to harvest.**

# Keep FTR control front of mind

GROWERS across Queensland and New South Wales are being encouraged to monitor paddocks for feathertop Rhodes grass (FTR) (*Chloris virgata*) with early intervention a potential game-changer for on-farm weed populations later in the season.

While FTR is predominantly a summer weed, the first cohort of emergence can occur during the winter crop phase and taking preventative action as part of a wider year-round integrated management strategy is critical to achieving long term control.

There are some key considerations for growers when developing an effective management strategy including:

- No single weed management application will provide complete control. Use a variety of tactics – both chemical and non-chemical.
- Aim to stop seed-set and run down the weed seedbank.
- Choose competitive cultivars and use increased planting densities to improve crop competition.
- FTR can be tolerant to glyphosate, especially after early tillering.
- Determine treatment type according to the density and distribution across paddocks. Use spot treatment or hand rouging for scattered or occasional FTR infestations.
- Target small, non-moisture-stressed and actively growing plants.
- Spray small FTR seedlings immediately after rain.
- Incorporate the double-knock tactic by using glyphosate or a Group A herbicide [please note permit conditions *https://portal.apvma.gov.au/permits*] followed by paraquat.
- Adopt good herbicide application techniques to maximise coverage. This means using full label rates and appropriate nozzles, boom heights, water volumes and speed for the intended spray job.
- Group A herbicides have a high risk of developing resistance so only use them as part of a carefully considered integrated weed management (IWM) plan. If Group A resistance develops, all in-crop grass management options are lost.
- Closely monitor the results of all management applications and spot treat survivors as soon as possible.

**A year-round integrated management strategy is critical for achieving long term control of FTR.** (PHOTO: Michael Widderick)

**Control of FTR is proving a challenge for growers with increasing reports of glyphosate resistance meaning growers need an integrated management program.** (PHOTO: Michael Widderick)

- When using residual herbicides, apply prior to the FTR germinating. Efficacy is maximised when applied to a clean soil surface as crop stubble residue can prevent chemical from reaching germinating weeds.
- Consider using strategic tillage to control existing plants, ensure the depth and type of tillage is sufficient to uproot the grass without transplanting it.
- If using tillage for seed burial, aim for burial of seed below 5 cm to prevent seed from germinating.
- Manage outbreaks along roadsides, fence lines and around sheds as these will be a continuing seed source for paddocks.

## Know FTR to beat it

Previously a weed of roadside verges and fence lines, FTR has become a major weed of broadacre cropping systems across Queensland and NSW over the past 20 years with the transition to zero and minimum tillage.

FTR is a tufted annual grass growing up to one metre tall. It prefers lighter textured soils but will survive in heavier clays.

It has a distinctive seed head of between seven and 19 feathery spikes and is quick to mature. FTR can produce seed heads within four weeks following emergence if conditions are suitable.

Research has shown FTR is often one of the first weeds to establish on bare ground and can germinate on as little as 10 mm of rain with emergence as soon as two days later.

FTR prefers to germinate at temperatures of between 20°C and 30°C but can germinate at much lower temperatures. The majority of germinations occur from seed in the top two centimetres of soil.

The majority of seeds lose viability after seven to 12 months which means that although FTR is a difficult weed to manage, effective control can be achieved within one or two seasons if growers are able to limit seed production.

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BAYER

FTR has become a major weed of broadacre cropping systems in Queensland and NSW.

## Planning a herbicide program

Chemical control of FTR is proving a challenge for growers with confirmed cases of glyphosate resistant populations from Central Queensland to South Australia.

Alternative knockdown options for controlling FTR in fallow are limited, although some of the Group A herbicides such as propaquizafop – Shogun or haloxyfop – Verdict under the Permit PER12941 *https://portal.apvma.gov.au/permits* have shown to be effective.

But industry experts are cautioning against the over-reliance on Group A herbicides, warning that they are among some of the quickest modes of action to select for resistance. Registered use of Group A herbicides in fallow are limited. But for propaquizafop and haloxyfop application in fallow must be followed by paraquat within seven to14 days of the first application, as part of a double knock strategy. A double knock strategy is also recommended when using glyphosate due to FTR resistance.

Growers are encouraged to check the APVMA website *https://portal.apvma.gov.au/pubcris* to ensure that their product of choice is registered for use on FTR or a permit is in place to support use.

Queensland Department of Agriculture and Fisheries (DAF) principal research scientist Michael Widderick urged growers to be strategic when planning a herbicide control program for FTR and incorporate the double knock tactic in conjunction with a range of non-chemical practices.

"The double knock tactic relies on two herbicide applications, using herbicides from different modes of action, to increase efficacy of control and stop weed seed set," Michael said.

"As with most herbicide-based weed control tactics, the double knock works best on young, actively growing weeds."

Residual herbicides can also be considered in a herbicide control program, although it's important to understand the product and potential plant-back restrictions prior to use.

Efficacy can vary between products but generally the residual herbicides work best if there is minimal plant residue on the soil surface.

Refer to the label for each residual herbicide to understand their requirement for incorporation by rainfall or machinery into moisture to activate.

## What other control options are available?

To successfully manage FTR in the future, growers must adopt a range of integrated management practices designed to run down the weed seedbank and stop seed set.

If seed set is prevented for one to two seasons, growers will see a rapid decline in the seedbank according to Michael.

Management practices to consider as part of an IWM strategy include:

- Use of knockdown and residual herbicides.
- Spot spraying/WeedSeeker/rouging, particularly for escapes and survivors. This is an effective practice when the seedbank is low.
- Strategic tillage – effective when used in conjunction with residual herbicides.
- Target small weeds using an effective double knock spray tactic.
- Burning – can be effective in reducing seed numbers but won't destroy all seed. It can also assist in the removal of dead plant material prior to residual herbicide application and/or tillage.
- Crop rotation and competitiveness – the range of available residual and knockdown herbicide options can be broadened if broad leaf crops are grown in rotation with cereals. Narrow rows and uniform plant populations can be used to increase crop competitiveness and suppress weeds.

**More information Dr Michael Widderick, DAF, Toowoomba, 07 4529 1325, michael.widderick@daf.qld.gov.au**

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# Cropping difficult soils plumbs new depths

By Brad Collis – *Ground Cover*

IN recent years, soil compaction and its remedy – deep ripping – has been a hot topic on many farms across the Australian grainbelt. Western Australia in particular has been the home of a lot of deep ripping research as well as on-farm commercial application of the practice. More and more growers are reporting significant production improvements from deep ripping resulting from crop roots being able to reach deeper into the soil profile.

The ripping, down to 550 mm, is allowing crops to overcome severe growth constraints caused by soil being packed harder and harder by increasingly heavier machinery. Compounding this is a cluster of other constraints that often come together – non-wetting soils, and subsoil acidity and sodicity.

The prize for roots able to breach these barriers is the precious reserve of soil moisture half a metre to a metre down.

In a drying environment where more moisture equals more grain and profit, plant root access to this deeper moisture is vital.

Department of Primary Industries and Regional Development, WA (DPIRD) soil scientist Bindi Isbister says soil compaction has become top-of-mind for an increasing number of growers because it has been moving deeper down the profile beyond the depth of standard deep rippers owing to the increasing weight of today's machinery.

This compaction has been restricting access to deeper moisture, and consequently is a significant constraint on yields.

## Compaction rule of thumb

As a general rule of thumb Bindi says a 10-tonne axle weight causes compaction down to 300 mm. Most new large machinery,

**Steel 'inclusion' plates fitted to a ripper before the start of the 2016 season on Yuna (WA) grower Brady Green's property.** (PHOTO: Brad Collis)

such as headers, tractors, aircarts, chaser bins, and even spray booms, exceed this weight.

A modern header can weigh 30 tonnes when loaded, causing compaction down to 400 to 600 mm.

The issue has led to considerable experimentation in recent years and a lot of growers are either importing massive deep-ripping implements from overseas or buying locally engineered deep rippers.

Prior to retirement (DAFWA) soil scientist Dr Paul Blackwell built a research ripper able to work down to 600 mm to evaluate new ripping methods in GRDC-funded trials.

Bindi says some form of renovation such as deep ripping has long been required in WA soils – it is just that compaction has worsened at the same time as a drying climate has made it even more crucial for crop roots to reach deep moisture.

She says the region's sandy soils generally have less than 35 per cent clay and so have little capacity to naturally swell and crack to remove compaction. Shallow compaction down to 200 to 300 mm can be removed by standard deep ripping or other soil renovation methods such as mouldboard ploughing or spading. These practices also help alleviate water-repellent soils and subsoil acidity (by incorporating lime).

## Topsoil slotting or inclusion

Now, the emphasis is on ripping much deeper and supplementing the actual ripping with 'topsoil slotting'. This involves fitting steel 'inclusion' plates behind a ripper's tynes to immediately direct the loosened topsoil into the furrow. This has the effect of burying topsoil and surface ameliorants such as lime, gypsum or organic matter. This means soil ameliorants, nutrients and soft topsoil can be mixed together at depth and in moist conditions.

This not only improves soil structure at depth, but also sets up conditions such as a soft channel for plant roots, which are much more conducive to higher yields.

## Trial evidence

In WA trials during 2015, deep ripping to 550 mm combined with topsoil slotting produced yield increases of 1 to 1.7 tonnes per hectare at four different sites. The return on investment ranged from $6 to $16 per dollar invested.

Three years after treatment a positive yield response of 15 to 29 per cent to deep ripping and topsoil slotting was recorded at these trials.

**Soil scientist Bindi Isbister says soil compaction has become top-of-mind for an increasing number of growers.**

With the increasing number of growers taking a serious look at deep ripping, Bindi is keen to capitalise on the interest by urging growers to plan their approach to ripping in conjunction with implementing controlled-traffic farming (CTF).

She says CTF will minimise re-compaction and therefore increase the return on investment of expensive soil-amelioration techniques.

"Up to 80 per cent of compaction damage occurs in the first pass, so adopting CTF is the best way to minimise re-compaction and maximise the longevity of soil renovation treatments," she says.

"Increasing the longevity will improve the economics of treatment. For example, assuming a treatment cost of $60 per hectare for deep ripping to 550 mm and a yield increase of 500 kg per hectare, the difference in benefit between the treatment remaining effective for three years and seven years is $4.70 and $10.80, respectively, for every dollar spent."

Bindi explains that the basic principle of CTF is reducing the percentage of the paddock wheeled in any given season so that traffic is confined to set wheel tracks, leaving uncompacted beds for plants to grow in and to more easily access moisture and nutrients.

"It is not uncommon for farming operations in the WA wheatbelt to cover 40 to 60 per cent of the paddock with wheels in a single season. The target 'wheeling' for a CTF system is about 11 to 15 per cent.

"We also recommend deeper ripping be conducted under a CTF system due to the very soft soil conditions after ripping. For CTF you would remove or lift the ripper tynes in line with the planned wheel tracks, leaving a solid track for the seeding, sprayer and harvest machinery to follow."

She also points out that removing the tynes on wheel tracks can reduce the horsepower output and save 15 per cent of the total paddock cost of ripping.

Bindi recommends using a shallow leading-tyne configuration or ripping in two 'bites' to reduce the horsepower requirement and achieve more even break out (less large clods): "A heavy hydraulic crumbler roller is also useful to firm, level and crush clods to create a more even seedbed."

## Tips for implementing CTF

In terms of implementing CTF Bindi emphasises that there is no 'one size fits all' approach because of the significant variation in machinery sizes. But she offers the following tips:

- Decide on imperial or metric. Forty feet is not 12 metres, but 12.2 m. A small difference, but enough to make it hard to match Australian and imported machinery. Choosing to work in one or the other helps keep it simple.
- Then choose an operating width. Machinery matching in multiples of 12 m or 40 feet is the most common. The ideal machine to work from when deciding the width is the header as it is the heaviest machine, the hardest to modify and can have the widest wheelbase. A compromised system of a 40-foot header, 60-foot seeder and 120-foot sprayer is becoming increasingly common in WA.
- When you measure bars and sprayers remember to add one row or nozzle spacing.
- Check the header cutting-bar width. Often machinery is sold at a certain width but it may cut more or less.
- When thinking through the best option, consider what system you might like to have in five to 10 years' time.

Bindi says the best way to decide what width will suit your system is to map out your machinery widths and tracks either using graph paper or the 'CTFcalculator' developed by DPIRD and GRDC.

**Source: GRDC *Ground Cover*. Contact bindi.isbister@dpird.wa.gov.au** ■

# Topsoil inclusion works best in controlled traffic farming systems

By Paul Blackwell[1], Ed Barrett-Lennard[2], Chris Bechard[3], Wayne Parker[4] and Stuart Faulkner[5]

TOPSOIL inclusion – by whatever means are appropriate and safe – has already proved its worth in the short term in managing difficult soils. In Western Australian research we have seen topsoil inclusion help to stabilise heavier sands that self-compact, thereby assisting the downward movement of many soil ameliorants, improving the fertility of poor sands, providing underground topsoil for dry seasons and stabilising dispersive clays.

Then having invested valuable time and money in doing the inclusion, with the hope of reaping benefits for as many seasons and circumstances as possible, it is financially sensible to protect that investment and employ a Controlled Traffic Farming (CTF) system that is compatible with your farm's finances and circumstances.

Inclusion of the organic matter from good topsoil can also have a profitable effect on Gimlet soils. Gimlet soils occur in much of WA's eastern wheatbelt. This article is about two paddocks with Gimlet soils near the town of Beacon, around 300 km northeast of Perth.

## What is a Gimlet soil?

Gimlet is a soil type which is:

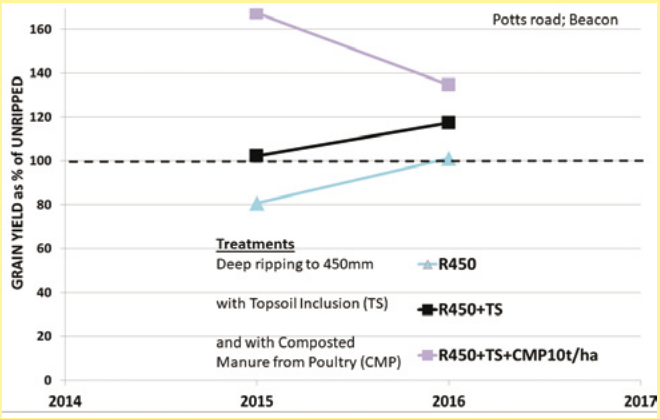
- Dominated by salts which rise to the surface in dry times of the year and get flushed deeper by fresher water in wetter times. Grain and pasture yields from them follow the same pattern – poor in dry years and good in wetter years. Salts – either chloride or bicarbonate based – restrict water uptake by competing with roots for fresh water with their osmotic potential (saltiness); and are,
- Often restricted in their flushing capacity by surface seals created by slaking and collapse of bicarbonate dominated soil. This precludes the use of gypsum – which is of great benefit in stabilising dispersive soil – because gypsum itself is a salt and it adds to the osmotic potential pulling fresh water away from roots.

So Gimlets need assistance to flush salts downward by breaking up tight surface layers and simultaneously stabilising them from slaking.

## Trials on two soil types

In the deeper ripping and CTF DAFWA projects we ran during 2013–16 we were invited to test deep ripping, gypsum, lime and organic amendment on Gimlet and York Gum soils at Beacon, with Wheatbelt NRM support and hosted by the Faulkner family.

**FIGURE 1: Deep ripping and topsoil inclusion benefits on saline Gimlet clay soil**




We took the project deep ripper there in March 2015 and set up two trials, one on each soil type on Potts road with the help of Ty Henning, the Faulkner family's consultant. On the Gimlet soil type we spread gypsum at five tonnes per hectare or pelletised composted chicken manure (Composted Manure from Poultry (CMP); Organic 2000 from Carrabooda) at 10 tonnes per hectare before ripping and the York Gum soil had gypsum or limesand spread before ripping.

The ripping was done in the direction of seeding, within the unwheeled zones of the CTF system and in four ways on each soil type – none, ripping to 300 mm, ripping to 450 mm and ripping to 450 mm with topsoil inclusion.

The wheat yield responses in 2015 at the York Gum soil site were very modest. It was a very strong pan to break and probably had geomorphological origins from long periods of wetting and drying of transient lakes that form in those climates and soils.

In contrast, the wheat yield responses on the Gimlet soil were much greater; up to 170 per cent increase, compared to no treatment, using the manure with topsoil inclusion, but a 20 per cent decrease using deep ripping alone to 450 mm. Topsoil inclusion alone (no manure or gypsum) restored the grain yield of the deeper ripping (see Figure 1) and ripping to 300 mm alone provided no benefit.

The manure tended to boost all treatment yields, but gypsum had the opposite effect – yields were poor and screenings very high for that season, five to seven per cent, reflecting the effect of increased osmotic pressure of the gypsum as a salt.

**Topsoil falling down between the topsoil inclusion plates into the subsoil while deep ripping.**

Both sites were resown to wheat in 2016 and the residual grain yield responses at the Gimlet site were very interesting.

Benefits from the manure with topsoil inclusion had declined, now only 135 per cent of no treatment, and the deeper ripping alone had recovered to be the same as no treatment.

But the deeper ripping with topsoil inclusion had now increased to almost 20 per cent of the yield with no treatment. These responses was at no extra cost except maintaining the CTF system in the same direction and with the same equipment, so no compromise of the original investment by compaction from heavier wheels or tracks.

The next season, 2017, was a shocker. The sites were sown to canola, but the growth was so poor it was decided to spray out the crop for best conservation of soil moisture and better control of weeds.

## Better biomass/grazing value

But the section of the Gimlet site using deep ripping treatments alone was saved for measurement of grazing value, as the Faulkners run Merinos. The biomass responses in the flowering canola showed a consistent trend of being greater using topsoil inclusion (with 450 mm ripping) than no treatment and the benefits were greater in the poor 2017 season in the saltier parts of the site that needed more flushing by natural rain; more than double the biomass in the saltier plots.

Additionally the biomass was checked for grazing value and none of the treatments compromised the grazing value of the canola in that season.

So, in summary, a Gimlet near Beacon, able to grow very good medic, gave a very profitable response to deeper ripping with topsoil inclusion for grain by the second season and a very profitable looking benefit to grazing in a very dry year.

All the seasons had some periods of good flushing rains (about 100 mm) to wash the salts further to depth where the organic matter from the topsoil had stabilised the surface from slaking. Considerable detailed soil and infiltration measurements in 2015 confirmed these processes. The buried topsoil allowed more infiltration, that allowed a greater exploration by crop roots for scarce moisture due to the flushing effect of the better rainfall infiltration; this led to improved yield and biomass compared to deep ripping with no topsoil inclusion, and eventually better than the original condition.

Unfortunately there is never enough time or money to investigate all seasons or all examples of these types of soil, but it is an encouragement for other growers with Gimlet soil to test the idea of topsoil inclusion for themselves in a mixed farming system employing CTF.

## To sum up

We would like the readers of this article to be encouraged that there does seem to be a quite easy means of improving profitability from the challenging Gimlet soils of Western Australia's eastern wheatbelt.

The depth of topsoil inclusion that was effective was only about 200 mm – enough to stabilise the slaking surface soil and break up some of the worst compaction.

**Our sincere thanks to the Faulkner family for their patient hosting of this work and the Wheatbelt NRM and GRDC for funding it.**

**Authors: 1. By Paul Blackwell (ex DAFWA); 2. Ed Barrett-Lennard (Murdoch); 3. Chris Bechard (NuFab); 4. Wayne Parker (DPIRD); and, 5. Stuart Faulkner (Beacon).**

■

# Are pre-ems and crop competition the wine and cheese for canola?

By Kirrily Condon

*Wine and cheese. Strawberries and cream. Crop competition and pre-emergent herbicides.*

*OK... so the last one doesn't quite have the same ring about it but they really do go together nicely. Combining a competitive canola variety with pre-emergent herbicides has proven to be an effective strategy for reducing annual ryegrass seed set. Considering limited post-emergent options and increasing levels of ryegrass resistance to clethodim, the 'crop competition + pre-emergent' combo is a strategy which deserves serious attention.*

TRIALS by University of Adelaide researchers Sam Kleeman, Gurjeet Gill and Chris Preston, together with the Hart Field-Site Group and Southern Farming Systems, showed that with effective pre-emergent herbicides, a competitive hybrid canola variety can reduce ryegrass seed set by 50 per cent compared with a less competitive open-pollinated (OP) variety.

That's impressive. But should we tar all OP varieties with the same brush? The research team repeated the trial using a more competitive OP variety and found crop competition to be similar to the hybrid variety. Research by Dr Deirdre Lemerle has shown varieties can vary significantly in their competitive ability, but hybrids were found to be generally more competitive than OP varieties.

Regardless of hybrid or OP, it's definitely worth assessing competitive ability when choosing varieties – together with an effective pre-emergent herbicide strategy, it just might make a great combo.

## The trials – 2016

Clethodim for annual ryegrass control has been a major feature of canola production systems, but the level of resistance to clethodim is increasing rapidly. In 2016, the University of Adelaide research team set up a trial at Roseworthy, South Australia, to look at the effects of crop competition and pre-emergent herbicide strategies on managing ryegrass in canola.

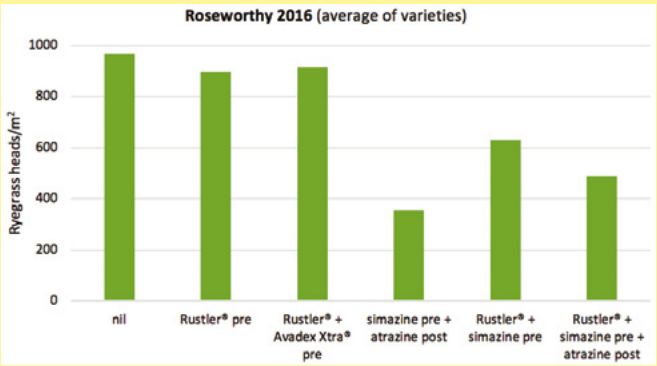
The trial compared two triazine tolerant canola varieties, a hybrid (Hyola 559TT) and an open-pollinated (ATR-Stingray), sown on May 14 at 35 plants per square metre (rates adjusted for seed size). Each variety was subjected to six pre-emergent herbicide strategies (Table 1).

**TABLE 1: Pre-emergent herbicide treatments at Roseworthy, 2016**

| Hyola 559TT vs ATR-Stingray |
|---|
| Nil |
| Rustler 1 L/ha pre |
| Rustler 1 L/ha + Avadex Xtra 2 L/ha pre |
| Simazine 1.1 kg/ha pre + atrazine 1.1 kg/ha post |
| Rustler 1 L/ha + simazine 1.1 kg/ha pre |
| Rustler 1 L/ha + simazine 1.1 kg/ha pre + atrazine 1.1 kg/ha post |

Although pre-emergent herbicides reduced ryegrass numbers early in the season, under high ryegrass pressure and with no follow-up control, the density of ryegrass heads later in the season was similar to the untreated ones. Where atrazine was applied post-emergent (under ideal moisture conditions), ryegrass control improved significantly, with about 50 per cent fewer ryegrass heads than the untreated.

**FIGURE 1: Ryegrass head density by herbicide treatment**




Chris Preston.

**FIGURE 2: Ryegrass head density by herbicide treatment**

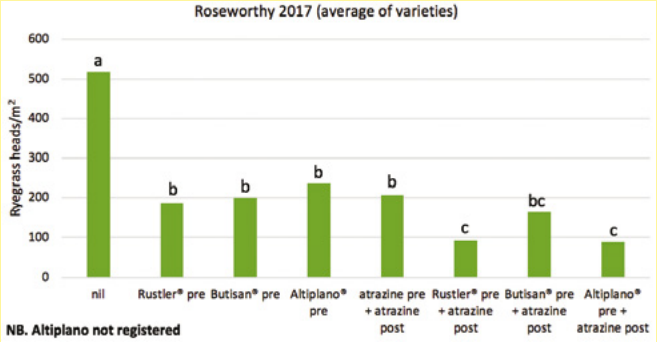
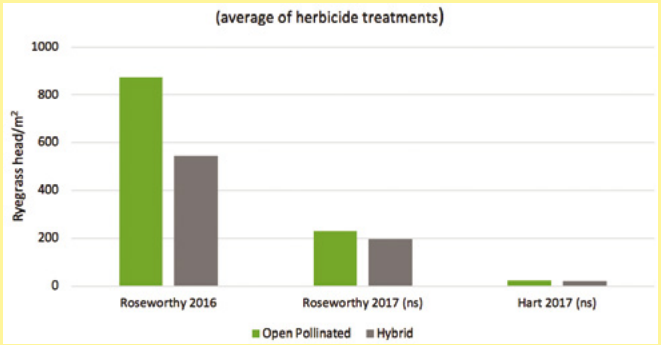



**FIGURE 3: Ryegrass head density by variety**




The hybrid variety Hyola 559TT had a significant effect on ryegrass control with an average of 40 per cent fewer ryegrass heads than the open-pollinated ATR-Stingray (Figure 3). Seed set per ryegrass plant was approximately two-fold higher in ATR-Stingray.

Across all herbicide treatments, the average yield of Hyola 559TT was double that of ATR-Stingray and appeared to better maintain grain yield in the presence of weeds. When comparing the relationship between ryegrass density and grain yield, ATR-Stingray yields declined more sharply at low to moderate ryegrass densities than Hyola 559TT.



## The trials – 2017

Fast forward to 2017 and similar trials were repeated at Roseworthy and Hart. This time the OP variety ATR-Stingray was replaced with ATR-Bonito, and some robust pre-emergent herbicides were included.

**TABLE 2: Pre-emergent herbicide treatments at Roseworthy and Hart, 2017**

| Hyola 559TT vs ATR-Bonito |
|---|
| Nil |
| Rustler 1 L/ha pre |
| Butisan 1.5 L/ha pre |
| Altiplano 3 kg/ha pre (not registered) |
| Atrazine 1.1 kg/ha pre + atrazine 1.1 kg/ha post |
| Rustler 1 L/ha pre + atrazine 1.1 kg/ha post |
| Butisan 1.5 L/ha pre + atrazine 1.1 kg/ha post |
| Altiplano 3 kg/ha pre (not registered) + atrazine 1.1 kg/ha post |

At the low-pressure Hart site, atrazine applied pre-and post-emergent was the most effective treatment at reducing ryegrass head density (by 95 per cent). Where weed pressure was much higher at Roseworthy, the more robust treatment of Rustler + atrazine was more effective, reducing ryegrass heads by around 80 per cent (Figure 2).

In contrast to the 2016 trial, there was no significant impact of variety on ryegrass density at either site (Figure 3). ATR-Bonito showed comparable early vigour and growth to Hyola 559TT throughout the season. Yields were similar at Roseworthy, but Bonito out-yielded Hyola 559TT at Hart, favoured by the shorter season.

## To sum up

Row spacing has taken centre stage in recent years in the efforts to increase crop competition, but these trials have reinforced the impact competitive varieties can have on weed numbers. Crop competition + robust pre-emergent herbicides may just be the new 'canola combo'. Follow it up with the 'crop top + harvest weed seed control' combo and ryegrass won't stand a chance.

**Further information:**

**Weed control and its impact on yield (Preston et al 2017)**
**Managing clethodim resistant ryegrass in canola with crop competition and pre-emergent herbicides (Kleeman et al 2017)**
**Managing clethodim resistant ryegrass in canola with crop competition and pre-emergent herbicides (Kleeman et al 2016)**
**Lemerle et al (2014). Competitive ability of Australian canola (*Brassica napus*) genotypes for weed management. Crop & Past. Sci. 65: 1300-1310.** ■

# Fast lupin harvest can cut grain losses and optimise quality

## AT A GLANCE...

- Optimal lupin harvest timing is at crop maturity and when grain moisture levels reach 14 per cent
- Delaying harvest increases risks of pod drop, seed shedding, plant lodging, pod shattering and physical damage to seed
- This can lead to yield losses of five to 20 per cent if harvest is delayed by up to six weeks.

GROWERS are advised to harvest lupin crops as soon as they ripen to avoid grain losses from seed shedding and pod drop. Seed shedding, pod drop, shattering of mature grain and potential for reduced seed germination (if there is rainfall after the crop matures) are key issues to be considered. Harvesting the crop when it is ripe can help to reduce the risks of yield losses and lower grain quality stemming from these problems.

Trials carried out in WA's northern grainbelt in 2017, with Grains Research and Development Corporation (GRDC) investment, found delaying harvest by two weeks after crop maturity lowered average lupin yields by six per cent.

If the gap stretched out to six weeks after crop maturity, average yields were 15 per cent less than the crops harvested at maturity.

Department of Primary Industries and Regional Development (DPIRD) research officer Martin Harries led this research and said the extent of yield loss if harvest was delayed was similar for all six lupin varieties tested, including the latest-released lines.

He said the trials were an important part of the GRDC-DPIRD Tactical break crop agronomy project and aimed to provide more data about the performance of older and new lupin varieties at harvest.

"Many WA growers are adding lupin back into their rotations and, to help with decision making, we need to generate more information about the effects of delaying harvest on yield losses and potential grain damage, especially if there is rainfall after the crop has matured," he said.

"The best harvesting window for lupin is typically within three weeks of crop maturity and as soon as grain moisture content reaches 14 per cent, which is the maximum allowable moisture level to meet CBH Group receival standards.

"Delaying harvest can cause seed and pods to drop and/or lead to brittle grain that is susceptible to cracking and splitting."

### Harvest time and lupin variety lupin trial

DPIRD trials at Eradu, near Geraldton, last year investigated six lupin varieties and three harvest times, ranging from crop maturity to six weeks after maturity, to assess the amount of seed and/or whole pods that shed – or fell – from the plants.

Overall, average yields of the newer varieties across all harvest times were up to 0.5 tonne per hectare (26 per cent) higher than the 2.5 tonnes per hectare average yield across all varieties and harvest times.

A two-week delay in harvest after crop maturity resulted in an average 0.04 tonnes per hectare (six per cent) yield loss across all varieties. Delaying harvest by six weeks after the crop ripened caused a more significant drop of 0.3 tonne per hectare (15 per cent) in average yields.

Martin said seed shedding or pod drop in the crop was minimal before harvest, with most yield loss occurring during the lupin harvest operation.

"All varieties had average yield losses between 12 and 15 per cent if harvest was delayed after the crop ripened, compared to if they had been harvested at maturity," he said.

"One of the older varieties had 290 kg per hectare of seed on the ground six weeks after maturity, compared to 360 kg per hectare for a new line.

"This means growers should keep in mind that they face losing more grain by delaying the harvest of higher-yielding varieties."

### Rain and ripe lupin seed

Martin said delaying harvest after crop maturity also risked lowering lupin grain quality if rainfall occurred.

"Rain received after the crop ripens can cause the seed to wet up, which stimulates the germination processes until the seed dries again," he said.

"This is known to exhaust the seed energy reserves and can create problems with germination rates if retaining seed for next year's crop."

Other work by DPIRD, involving field and laboratory trials and conducted as part of the same GRDC investment project, exposed lupin crops to simulated rainfall using overhead irrigation and subjected lupin pods to moisture and drying cycles.

These found the equivalent of just six mm of rainfall after crop maturity could reduce seed germination rates by 5–10 per cent.

"Where there were two wetting and drying cycles in the laboratory, seed germination rates were 10–20 per cent lower than seeds not exposed to moisture and with three wetting and drying cycles, germination levels were 35–45 per cent lower," Martin said.

"There was minimal difference between the response of different varieties to moisture and the key message is that, regardless of variety, it is advisable to harvest lupin crops as soon as possible after maturity to minimise grain losses and optimise quality." ■

**DPIRD research officer Martin Harries in a lupin glasshouse trial comparing new and older varieties.** (PHOTO: DPIRD)

# There's a new sheriff in town

WHEAT growers have a new weapon in the fight against grasses and broadleaf weeds in-crop with the recent release of the highest-yielding APW Clearfield Plus variety, Sheriff CL Plus, by InterGrain.

Extensive company and National Variety Trials (NVT) (trialled as IGW6155) have shown Sheriff CL Plus consistently delivers similar yields to Mace and will be an alternative for varieties such as Elmore CL Plus, Grenade CL Plus, Kord CL Plus and Chief CL Plus.

InterGrain wheat breeder Dr Daniel Mullan says trials have highlighted the variety's excellent yield stability across multiple environments and it is the only mid-late maturing Clearfield Plus wheat currently available. These are key advantages compared to other Clearfield Plus wheats and it is available in South Australia and Victoria for planting in 2019.

"Sheriff CL Plus is an exciting new addition to our Clearfield Plus wheat portfolio. It is a very high yielding wheat, combined with a flexible weed control system and an APW classification in Victoria and South Australia," Dan says.

"The Clearfield Plus wheat production system has many benefits for wheat growers. It provides another post-emergent grass and broadleaf weed control option with use of the Intervix herbicide, protecting crop yields by eliminating weed competition and reducing weed seed banks for following crops.

"It is especially valuable where brome and barley grass are an issue or are an increasing problem for growers to control."

Daniel says aside from its high yields and Clearfield Plus advantage, Sheriff CL Plus offers a range of agronomic and grain quality advantages.

"It is a mid-late maturing variety, which is a valuable asset for taking advantage of early sowing opportunities and is the only Clearfield Plus wheat available in this maturity," he says.

"Sheriff CL Plus is ideally suited to planting from late April to early May and has a distinct maturity difference to Chief CL Plus in South Australian and Victorian conditions.

"This new variety takes an average five days longer to flower than Chief CL Plus and means it can be sown about a week earlier, offering growers in these states an alternative wheat option to help spread flowering windows".

## Disease resistance

Sheriff CL Plus was bred by InterGrain with a purpose to not only deliver stable yield but good yellow leaf spot resistance (it is rated moderately resistant to moderately susceptible – MRMS).

"Our Clearfield Plus breeding program actively targets the delivery of useful disease resistance packages in combination with high and stable yield," Dan says.

"It is worth noting Sheriff CL Plus is rated moderately susceptible to CCN, so growers will need to manage this issue in their rotation, potentially using CCN resistant crops such as Spartacus CL within their system."

Sheriff CL Plus has a moderate plant height and demonstrates good physical grain quality characteristics, including good grain size and hectolitre weight.

Sheriff CL Plus is available for planting in 2019 and it is recommended interested growers place seed orders as soon as possible with local Seedclub members and/or resellers.

**For more information about Sheriff CL Plus, refer to:**
***http://www.intergrain.com/Wheat.aspx***

**InterGrain Marketing Manager: Ashleigh Brooks – abrooks@intergrain.com** ■

**Sheriff Clearfield Plus breeder Dan Mullan.**

# Export demand surfaces as harvest ramps up

By Peter McMeekin, Grain Brokers Australia

AS harvest of the drought ravaged winter crop gains momentum here in Australia, the European farmer is also very busy, juggling their summer crop harvest program with the seeding of their winter cereals, oilseeds and pulses.

The European summer was warmer and significantly drier than normal, and these unseasonal weather conditions have continued into the autumn. Whilst this is the ideal scenario for the summer crop harvest, it is seriously hindering the planting and emergence of the winter crops in affected areas.

Coming into November, the driest regions stretched from northern France, through Belgium, northern Germany and into the drought declared areas of eastern Poland and northern Czech Republic. Further south, most of the Balkan countries, especially Romania, were also extremely dry. In early November the seeding program was lagging behind the five-year average in all of these regions.

The rapeseed (canola) crop has been the most affected, decreasing the area sown and compromising emergence. The optimal sowing window is August through to mid-September in most of Europe and good early development before the winter sets in is critical for good yields.

Some farmers were lucky enough to sow into moisture, some have sown dry, but others have simply abandoned their rapeseed program in favour of more attractively priced cereals, primarily wheat. Forecasts suggest that the European Union (EU) rapeseed area could be down as much as eight per cent compared to last season.

## EU cereal area forecast to be down

The area planted to wheat is forecast to be more than last year due to the higher price relative to alternatives. Add the swing from rapeseed and the program is significant. Substantial rainfall is still required in many regions to ensure that the potential area is actually planted.

The risk here is that temperatures start to drop, and it becomes very difficult to get into fields before the winter sets in, leaving some European countries well short of their intended crop area. It is far too early (date of report, November 1) to be ringing any alarm bells but the potential impact on European production, global cereal supply and international grain prices is weighty.

In Ukraine, planting of the winter wheat and winter barley crops progressed smoothly, with both around 95 per cent complete by early November. Their corn harvest is estimated at a

**The European Union winter crop yields in 2018 were drought affected but due to relatively attractive prices the area planted to wheat in the EU this coming season is expected to increase.**

record 31.5 million tonne (mt) crop – up almost 30 per cent on last year.

There have been reports of renewed interest from the Chinese for Ukraine corn for the first quarter of 2019. China corn demand remains a mystery. They have auctioned more than 100 mt of reserve corn into their domestic markets this year. One would think that may spur some buying activity but the September imports of just 40,000 tonnes were the lowest since November 2016.

Ukraine has reportedly exported 12.1 mt of grain since the beginning of July. This is 0.5 mt lower than at the same point last season and is made up of 7.1 mt of wheat, 2.5 mt of barley and 2.3 mt of corn.

Ukraine expects their final grain harvest total for the season will be 64 mt, compared to 61.3 mt in 2017. This would be second only to 2016 when the total grain harvest was 66 mt.

Russia surprised the market by increasing their total 2018 grain production forecast to 109 mt. Favourable weather in Siberia led to a better than expected wheat harvest in the east of the country. The higher production number leaves 38 to 39 mt of total grains available for export this season.

The trade interpreted this as another sign that the risk of export wheat restrictions was easing. But Russian exports are running 34 per cent ahead of the same time last year and domestic consumers have been asking the government to assure wheat supply. Internal Russian wheat values continue to strengthen which suggests up-country supplies are tightening.

### Australian shipping

Making news here in Australia in early November was the 420,000 tonnes added to the shipping stem in Western Australia. This is the largest weekly increase since May this year but quite small relative to a more normal season.

Some cargos may be destined for the east coast but some are undoubtedly going international. This confirms that Australian exporters are seeing demand at current FOB values and are competitive against Black Sea offers.


**A tough 2018 season will see our lowest export wheat and barley program for many years.**

Whilst the lower Aussie dollar will certainly assist, inelastic Asian demand and the expected slowdown in Black Sea offers should ensure that Australia continues to pick up the required demand for an export wheat and barley program that will be the lowest in many years and could easily be under 8 mt and 3 mt respectively. ■

## CHINESE PUZZLES

The highlight of the November USDA WASDE report was the dramatic change to corn stocks in China. A day before the report was released the China National Grain & Oils Information Centre (CNGOIC) revised the country's corn production data for the previous decade. The overhaul was a result of last year's agricultural census, the first in China for 10 years. It highlights the amount of land in the northeast of China that has been brought into agricultural production in recent years and was not previously registered with the government for such purposes.

CNGOIC added a whopping 294 million tonnes (mt) to their corn production numbers over the decade – more than 170 mt of that in the past four seasons. Last season's production was adjusted from the previously reported 215.9 mt to 259 mt – an increase of 20 per cent. This was bought about by an increase in planted area from 35.5 million hectares to 42.4 million hectares.

There was obviously some frantic activity in the USDA building after the China update was released. In the end, the USDA adopted the revised China production numbers (for now). The USDA increased China's 2018-19 ending stocks by 149 mt to 207.5 mt. And this is after China has auctioned more than 100 mt for their strategic corn reserves this year.

As a consequence, world ending stocks increased by 148.16 mt to 307.51 mt. That is almost double the October estimate. How does that happen? Only in China, I guess!

Obviously, domestic consumption in China has also been underestimated, or so the USDA believes, as the increase in ending stocks only account for about half of the aforementioned production adjustment since 2009.

### True indicator excludes China

But from a global trade viewpoint, the true indicator of world ending stocks is the one that excludes China and that remained relatively unchanged at 100 mt. That is despite the larger than expected decrease in estimated US corn yields from 11.34 tonnes per hectare to 11.22 tonnes per hectare.

The USDA also revised China's wheat production estimates following the data adjustment from the government. The 2018-19 projections were raised 4.5 mt to 132.5 mt and ending stocks for the same season were forecast to be 143.6 mt – 7.5 mt higher due to increased supplies in prior years.

WADSE decreased the Australia wheat crop forecast by 1 mt to 17.5 mt. The export number was reduced by 1.5 mt to 11.5 mt. No surprise to see that both these numbers are still well above local consensus.

They fudged the books a little by increasing 2018-19 carry in stocks to 5.7 mt so that the carryout number could remain stable at around 3 mt.

# Grain supply chain reforms needed to remain competitive

AUSTRALIA needs to continue to reform its export grain supply chains to remain competitive in an increasingly challenging global grain market, according to a new report from the Australian Export Grains Innovation Centre (AEGIC).

AEGIC Chief Economist Professor Ross Kingwell.

The report, *Australia's Grain Supply Chains: Costs, Risks and Opportunities,* found that despite major investments to improve efficiency in Australian supply chains since 2014, costs to users have only slightly decreased or remained stable.

AEGIC Chief Economist Professor Ross Kingwell said the costs of Australia's supply chains and grain production were high in comparison to most competitors (except Canada, where costs were higher due to long transport distances).

"Supply chain costs are consistently 30–35 per cent of the total cost of grain production in Australia and this percentage is similar across competitor countries," he said.

"Even so, these competitors – such as Ukraine, Russia and Argentina – are benefiting from lower labour costs and increased economies of scale due to large production increases.

"In Australia, overall supply chain costs have either fallen slightly or stayed steady. It is important to note there are differences between Australian states (Figure 1).

"Decreases in the costs of some components of supply chains, for example freight, have been offset by increases in the cost of others, such as ports. The creation of new port facilities has created more flexibility for exporters."

Prof Kingwell said action should be taken to ensure Australian grain stays competitive.

"Australian grain needs to remain attractive to international buyers, therefore it needs to remain affordable and be fit for

**FIGURE 1: Comparison of Australian wheat supply costs**

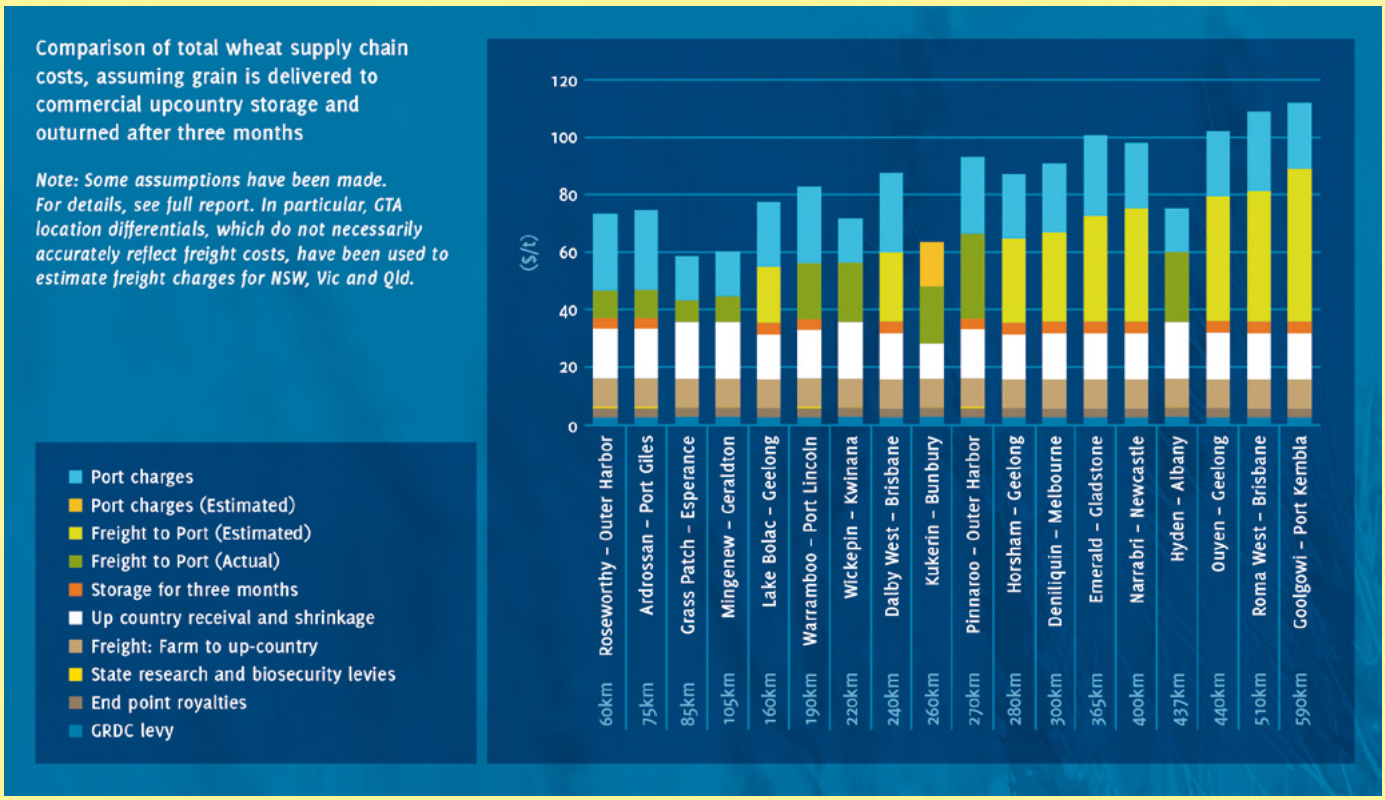


**TABLE 1: Estimated supply chain costs ($/t) in Australia and other wheat export competitors, 2013–17**

| Costs ($/t) | 2013 | 2014 | | 2015-16 | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|---|
| | Australia | Canada | Australia | Ukraine | Russia | Australia | Argentina | Australia |
| Cartage farm-site | 8.9 (12%)[a] | 10.7 (10%) | 8.9 (11%) | 4.3 (8%) | 3.5 (6%) | 7.8 (9%) | 2.9 (5%) | 7.8 (11%) |
| Upcountry handling | 11.9 (16%) | 15.2 (14%) | 14.4 (17%) | 7.7 (14%) | 9.2 (16%) | 18.4 (22%) | 13.2 (21%) | 10.4 (15%) |
| Storage | 6.8 (9%) | 17.7 (16%) | 8.9 (11%) | 2.9 (5%) | 5.1 (9%) | 9.0 (11%) | 1.4 (2%) | 5.0 (7%) |
| Transport upcountry to port | 21.6 (29%) | 46.8 (44%) | 27.8 (33%) | 13.3 (23%) | 15.5 (28%) | 26.7 (32%) | 29.5 (47%) | 23.6 (33%) |
| Port charges | 21.2 (29%) | 13.9 (13%) | 21 (25%) | 23.8 (42%) | 22.4 (40%) | 19.9 (24%) | 15.5 (25%) | 21.7 (30%) |
| Levies and check-offs | 2.9 (4%) | 3.0 (3%) | 2.8 (3%) | 4.9 (9%) | 0.10 (<1%) | 2.8 (3%) | nd | 2.8 (4%) |
| Total supply chain cost | 73.3 | 107.3 | 83.8 | 56.9 | 55.8 | 84.6 | 62.5 | 71.3 |
| Production cost | nd | 139.1 | 157.1 | 133.0 | 121.1 | 148.3 | 140.0 | 148.8 |
| Supply chain proportion | nd | 0.44 | 0.35 | 0.30 | 0.32 | 0.36 | 0.31 | 0.32 |

a Figures in brackets are the cost item as a proportion of the total supply chain cost.
nd — no data
Source: AEGIC and GRDC

purpose with the characteristics required or desired by end-users," he said.

"Australia's grain industry will increasingly need to concentrate on exporting to premium-paying nearby markets and delivering high quality wheat with characteristics not easily or cheaply replicated by competitors."

The challenge from low-cost producers such as Ukraine, Russia and Argentina is unlikely to dissipate, according to Prof Kingwell.

"Significant investments are underway in these countries that will further challenge the competitiveness of the Australian industry," he said.

"AEGIC's report identifies important areas of reform that are likely to produce enduring benefits for Australia's grain supply chains."

## Key findings

### Costs stable

The real costs to users of most export grain supply chains have remained stable or slightly decreased since 2014.

### Costlier than most

Australia's grain supply chain costs are higher than its competitors, except for Canada (Table 1). Transport and port charges are generally the biggest supply chain costs.

### Regulation

Regulation of grain exports has reduced flexibility and imposed additional costs.

### Code of conduct

Moving to a voluntary code of conduct may provide Australian supply chains with the flexibility to meet future challenges from low-cost wheat exporters such as the Black Sea and Argentina.

### Long-term freight planning

Coordinated long-term planning for high-capacity freight corridors to avoid conflict with urban development will be an important ongoing requirement.

### Location

Grain production at low-yielding locations distant from port are likely to become increasingly expensive relative to high yielding locations near to port.

### Farm storage

Increased farm storage capacity, particularly in eastern Australia, is changing the demand for upcountry commercial storage of grain.

### Grain quality

As grain storage options and pathways to markets increase, the Australian industry needs to consider how to best ensure stewardship obligations for grain quality are understood, accepted and maintained.

### Containerised exports

About 10 per cent of Australia's export wheat is in containers, with about half exported from Victoria.

### Excess port capacity

There is a surplus of capacity at some eastern Australian ports.

### Eastern states complexity

Compared with WA and SA, grain transport in NSW, Victoria and Queensland is complex. Infrastructure planning and supply chain investment on the east coast is challenging.

### Business transparency

Greater transparency in business performance reporting will build trust in the main companies providing supply chain services.

### Costs can be reduced

Reducing Australia's supply chain costs is feasible through coordinated infrastructure investments and emerging innovations.

### Costs need to be reduced

Low-cost grain suppliers, such as the Black Sea and Argentina, are undertaking major investments in their supply chains and it is essential Australia acts to reduce its supply chain costs to face this challenge.

## Recommendations

These recommendations identify important areas of reform that are likely to produce enduring benefits.

### Ensure least-cost grain paths are developed and maintained

**First:** Better coordinate road regulation, planning and investment in roads to facilitate effective planning and investment by grain supply chain owners and operators.

**Second:** Vigilance needs to be maintained over least-cost grain pathways to prevent encroachment of incompatible urban development leading to future conflict and contest over land use.

The cost of failure over this issue, at all levels of government, could be high in real terms for growers and users of the supply chains.

## Align wheat breeding, classification, assessment and handling to support the export of Australian wheat to differentiated, premium markets

Wheat exports from Australia and domestic marketing of wheat are likely to involve greater segregation, especially as on-farm storage increases. It is vital that all stakeholders (breeders, varietal classifiers and grain handlers) have incentives that align to deliver the types of Australian wheat most preferred in differentiated, premium markets.

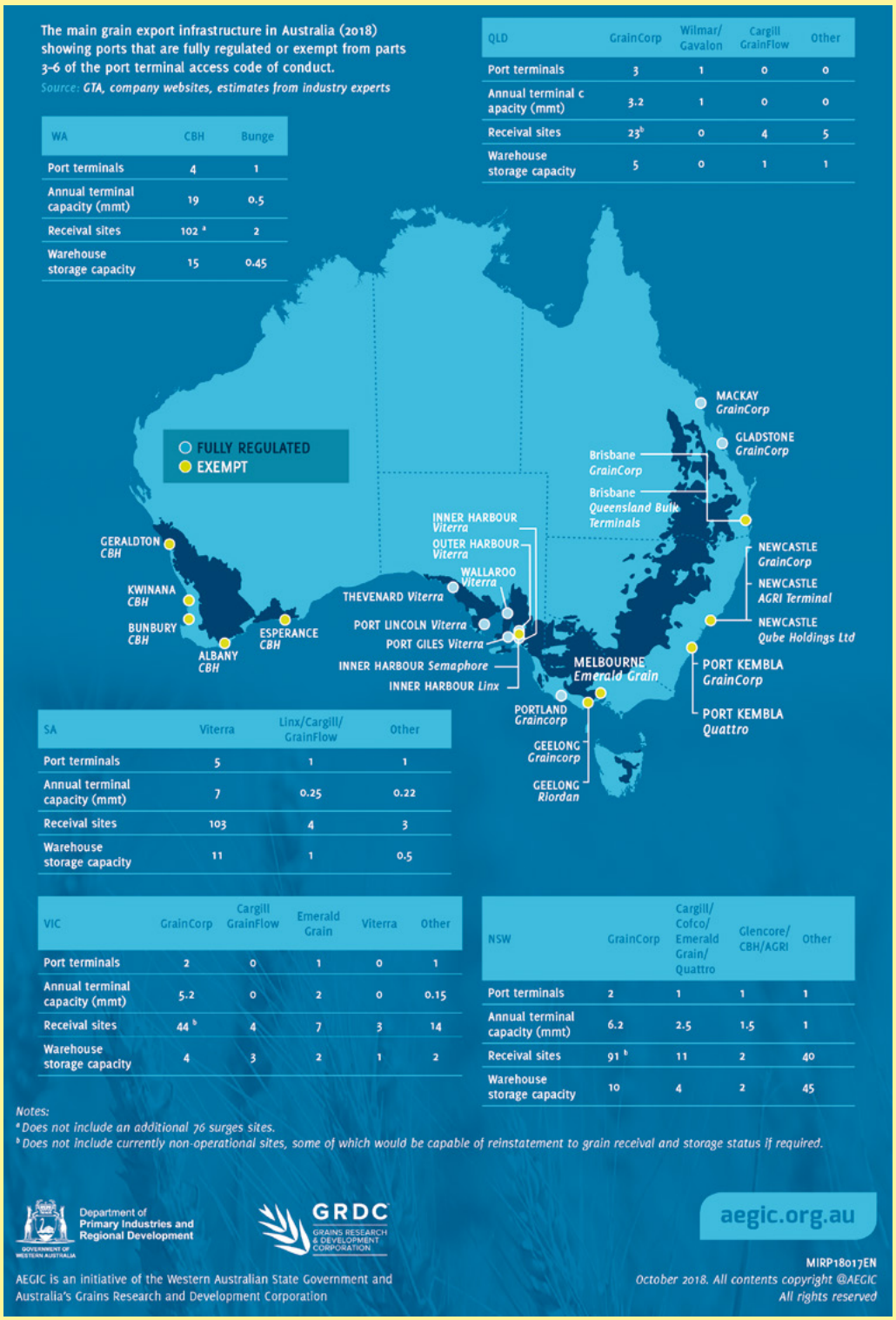
## Ensure there are sufficient incentives for R&D investment to improve the cost-efficiency of supply chains

Technological improvements that lead to productivity improvements and reduced supply chain costs will increase the competitiveness of Australian supply chains. Whether existing providers of supply chain services have sufficient incentives to commit funds to R&D that may yield valuable outcomes, requires further examination.

## Supply chain owners should consider making the basis of component charges clearer, to increase confidence in supply chains and improve perceptions of fairness

Greater transparency regarding the basis of component charges – including infrastructure use and efficiencies – could become a point of competitive advantage and a pathway to lessened regulation and associated costs. Information can be provided to an independent third party to maintain commercial sensitivity. ■

**FIGURE 2: Australian grain export infrastructure**




| WA | CBH | Bunge |
|---|---|---|
| Port terminals | 4 | 1 |
| Annual terminal capacity (mmt) | 19 | 0.5 |
| Receival sites | 102 [a] | 2 |
| Warehouse storage capacity | 15 | 0.45 |

| QLD | GrainCorp | Wilmar/ Gavalon | Cargill GrainFlow | Other |
|---|---|---|---|---|
| Port terminals | 3 | 1 | 0 | 0 |
| Annual terminal c apacity (mmt) | 3.2 | 1 | 0 | 0 |
| Receival sites | 23[b] | 0 | 4 | 5 |
| Warehouse storage capacity | 5 | 0 | 1 | 1 |

| SA | Viterra | Linx/Cargill/ GrainFlow | Other |
|---|---|---|---|
| Port terminals | 5 | 1 | 1 |
| Annual terminal capacity (mmt) | 7 | 0.25 | 0.22 |
| Receival sites | 103 | 4 | 3 |
| Warehouse storage capacity | 11 | 1 | 0.5 |

| VIC | GrainCorp | Cargill GrainFlow | Emerald Grain | Viterra | Other |
|---|---|---|---|---|---|
| Port terminals | 2 | 0 | 1 | 0 | 1 |
| Annual terminal capacity (mmt) | 5.2 | 0 | 2 | 0 | 0.15 |
| Receival sites | 44 [b] | 4 | 7 | 3 | 14 |
| Warehouse storage capacity | 4 | 3 | 2 | 1 | 2 |

| NSW | GrainCorp | Cargill/ Cofco/ Emerald Grain/ Quattro | Glencore/ CBH/AGRI | Other |
|---|---|---|---|---|
| Port terminals | 2 | 1 | 1 | 1 |
| Annual terminal capacity (mmt) | 6.2 | 2.5 | 1.5 | 1 |
| Receival sites | 91 [b] | 11 | 2 | 40 |
| Warehouse storage capacity | 10 | 4 | 2 | 45 |

# Bagging grain no impediment to quality

## AT A GLANCE…

- Use of on-farm grain bags at harvest is gaining popularity to help manage logistics.
- Research shows grain can maintain acceptable moisture levels during summer storage in grain bags.
- Seed germination rates of 99–100 per cent after summer grain bag storage were recorded in GRDC trials.

AN increasing trend by growers to use grain bags after harvest has led to new research into the impacts of this type of on-site storage on cereal seed quality. Results to date from the South East Premium Wheat Growers Association's (SEPWA) *Bagging Grain Profits* project are giving this tactic a tick of approval, with minimal evidence of adverse impacts on grain quality or seed germination rates after planting the following year.

The group conducted trials of grain bags across the Esperance region during the 2017–18 harvest, as part of a suite of Grains Research and Development Corporation (GRDC) investments into local issues that have been identified by grain growers as impacting on their profitability.

SEPWA's research will be repeated during this year's harvest period and include monitoring grain quality factors such as seed moisture, protein levels, temperature, colour and germination, and assessing any market liability risks.

**Research with GRDC investment being carried out by SEPWA is finding grain can be stored in these types of grain bags at harvest with limited risks of quality damage or poor germination in retained seed for the following year.** (PHOTO: SEPWA)

SEPWA project officer Aidan Sinnott said results from last summer indicated daytime maximum temperatures – including quite big fluctuations from low-20°C levels up to the mid-40°C range – did not have a big effect on temperatures inside the grain bags.

He said across the trial sites, and after about 40 days of storage in the bags, barley and wheat grain moisture was maintained at industry acceptable levels of about 13–14 per cent and grain quality was not adversely impacted by this type of storage in the summer conditions.

Aidan said at one location, wheat did heat up more than barley when monitored in grain bags for 38 days at an average daytime temperature of about 20°C, but not to a level that impacted on its key quality parameters.

Part of the *Bagging Grain Profits* project was to assess the germination rates of cereal seed retained in grain bags after sowing in 2018.

Across all trial sites, germination rates were 99–100 per cent for this seed, some of which was stored in grain bags for up to 74 days.

"Overall, there was very little effect on seed germination percentages for wheat and barley stored in grain bags in the conditions experienced in the 2017–18 harvest and summer period," Aidan said.

"During the coming harvest, we plan to extend the storage period of grain in bags and add other crop types to our evaluation.

"At the end of the two-year GRDC-SEPWA project, we hope to have developed comprehensive tips for using grain bags and best-practice guidelines for industry stakeholders down the supply chain, including how to manage any potential grain quality risks."

Aidan said the use of grain bags for on-site storage was now a recognised management tactic, providing logistical advantages for growers in allowing them to fast-track harvest operations, manage grain moisture and quality and capture freight cost advantages.

"SEPWA advocates early harvest in the South Coast region to optimise grain quality and crop value," he said.

"Grain bags enable management of moisture and quality parameters prior to grain leaving the farm, or can be used for storing retained seed for subsequent planting.

"Use of these bags also offers opportunities for growers to access grain quality upgrades and extend the truck freight period to further reduce peak harvest grain freight costs."

GRDC grower relations manager – West, Lizzie von Perger, said the SEPWA-led *Bagging Grain Profits* project was the direct result of this issue being raised as a challenge by growers.

"It is vitally important that GRDC responds to emerging issues, such as optimising results from the use of innovative grain storage tactics, in a timely manner," she said.

**The GRDC has a comprehensive Stored Grain information hub at *http://storedgrain.com.au* and a GrowNotes Grain Storage resource at *https://grdc.com.au/grain-storage-grownotes* that include the latest advice about using grain bags at harvest.** ■

# The best plant density for weed control in chickpea

By Gulshan Mahajan and Bhagirath S. Chauhan, QAAFI[1]

## AT A GLANCE...

- Weeds cause a great yield loss in chickpea due to the slow-growing nature of the crop.
- To take advantage of residual soil moisture and rainfall and to reduce weed seed bank and weed contamination during harvest, weed control in chickpea is essential.
- Pre-emergence application of pendimethalin (Stomp Xtra) at 2.5 L per hectare and isoxaflutole (Balance) 100 g per hectare provided superior control of weeds in chickpea planted at 30 plants per metre and resulted in 78 and 115 per cent increase in yield, respectively, as compared with the untreated control.
- Seed yield of chickpea improved when planted at 60 plants per metre due to superior weed control. The effectiveness of isoxaflutole improved at higher planting density. There was 10 per cent more yield at 60 plants per metre compared with 30 plants per metre.

CHICKPEA is an economically and nutritionally important crop. The crop fixes atmospheric nitrogen in the soil making it an important rotation crop in Australian agriculture. In addition to nitrogen fixing, chickpea also provides a disease break for the next cereal crop.

Around 400,000 hectares of chickpeas are grown each year in Australia with average yields of around 1.15 tonnes per hectare. It is an important and valuable export crop.

But the crop suffers huge yield losses due to weed infestations. Weed management in chickpea is very crucial, as the crop is slow growing. Limited leaf area development at early stages in chickpea allows luxuriant growth of weeds in the paddock and increases the weed seed bank. Yield losses can reach more than 80 per cent without timely weed control.

Broadleaf weeds (common sowthistle, turnip weed, wild turnip, etc) and herbicide-resistant grasses (wild oat and annual ryegrass) are the major problematic weeds in chickpea. Even moderate weed infestation of these weeds in chickpea may cause a high yield loss and interfere with harvesting operations.

### Early weed control is essential

Weed control with pre-emergent herbicides for providing early weed control is essential for achieving high yields of chickpea.

Herbicides options are very limited in chickpea as few herbicides are labelled. Pre-emergent herbicides are more useful as the crop is slow growing.

The effectiveness of pre-emergent herbicides varies with soil moisture in the paddock. Sometimes high moisture conditions in the paddock may cause herbicidal injury to the emerging crop and too little soil moisture may result in reduced herbicide efficacy.

The impact of weeds on chickpea yield loss can be improved by adopting effective integrated weed control tactics. Faster canopy development increases the crop competitive ability with weeds. The way, a crop establishes fast and develops a vigorous canopy, intercepts maximum solar radiation and shades the ground and inter-row area, will create competition in favour of the crop.

### Increased plant density

The use of high seeding rates or increased plant density is one of the integrated weed management tactics for faster canopy development. But yield increases with increasing seeding rates only up to certain levels as inter- and intra-competition plays a great role in influencing the seed yield.

Sometimes, the use of more than the optimum seed rate/plant density may also increase disease infestation.

Contrary to this, adverse conditions in the paddock – such as less residual moisture or excessive rainfall immediately after sowing – may also exist in the production environment.

In these situations, a high seeding rate is advantageous as it creates competition in favour of the crop due to good establishment.

This study examined the tactic of using a high planting density for the effectiveness of pre-emergence herbicides in chickpea.


**Early canopy closure by high planting density (left side) in chickpea.**

**TABLE 1: Effect of chickpea planting density and herbicide treatments on weed density**

| Treatments | Weed density (number per metre) |
|---|---|
| **Chickpea density** | |
| 30 plants per metre | 29.0 |
| 60 plants per metre | 20.0 |
| LSD | 7.0 |
| **Herbicide treatments** | |
| Control (Untreated) | 53.0 |
| Pendimethalin (450 g/L) 2.5 L/ha | 15.0 |
| Isoxaflutole (750g/L) 100 g/ha) | 7.0 |
| LSD | 6.0 |

## How the research was done

A trial was conducted in 2017 at the Gatton research farm of the University of Queensland to evaluate the effect of a high planting density in chickpea on the effectiveness of pre-emergence herbicides.

The experiment was conducted in a split plot design with two planting densities (30 and 60 plants per metre) in the main plot and three weed control treatments [untreated control, pendimethalin (Stomp Xtra) 2.5 L per hectare, and isoxaflutole (Balance) 100 g per hectare)] in the sub-plot with three replicates.

The herbicides were sprayed immediately after sowing using a $CO_2$ pressurised backpack sprayer equipped with flat-fan nozzles (AIXR 11002 TeeJet air induction flat-spray nozzles), Water used for the spray was at a volume of 100 L per hectare.

The crop was planted with respective planting densities on June 26, 2017, using the genotype Seamer. The crop was planted at a row spacing of 35 cm with a tractor mounted planter and harvested on November 3, 2017. Weed density and biomass data were taken at crop maturity.

## What we found

The paddock was infested with the following weeds: Common lambsquarters, common sowthistle, turnip weed, wild turnip, deadnettle, and marshmallow.

Averaged over weed control treatments, weed density was lower in the plots sown at 60 plants per metre as compared with 30 plants per metre (Table 1).

Averaged over crop density treatments, weed density with the pre-emergence application of pendimethalin and isoxaflutole was reduced by 72 and 87 per cent, respectively, as compared with the control plots (Table 1).

The high planting density (60 plants per metre) reduced weed biomass in the control and pendimethalin-treated plots as compared with the low-density treatment (30 plant per metre).

In the (untreated) control plot, the 60 plants per metre density reduced weed biomass by 52 per cent as compared with the 30 plants per metre density – probably due to faster canopy development (Figure 1).

In the high-density plots (60 plants per metre), pre-emergence application of pendimethalin and isoxaflutole reduced weed biomass by 92 and 97 per cent, respectively, as compared with the untreated plots. At the low planting density (30 plants per metre), these values were 81 and 98 per cent, respectively.

Planting density did not influence weed biomass in the plots treated with isoxaflutole. Isoxaflutole provided superior weed control compared with pendimethalin.

The crop planted at the high density resulted in greater yield in the untreated and isoxaflutole-treated plots compared with the plots planted at low density (Figure 2). In both planting density treatments, isoxaflutole had a greater yield than pendimethalin due to better weed control.

At 30 plants per metre, pendimethalin and isoxaflutole resulted in an increase in seed yield by 78 and 115 per cent as compared with the untreated plots.

At 60 plants per metre, pendimethalin and isoxaflutole resulted in an increase in seed yield by 24 and 56 per cent as compared to the untreated plots.

## To sum up

This trial suggests that the high planting density (60 plants per metre) improved the crop yield by reducing weed infestation and biomass. A pre-emergence application of isoxaflutole provided superior control over weeds particularly when chickpea was planted at the low seeding rate.

Isoxaflutole also resulted in greater yield than pendimethalin due to better weed control and the yield advantage was greater when planted at 60 plants per metre as compared with 30 plants per metre.

Our results demonstrated that high or optimising seeding rates in chickpea could be combined with herbicide use as a part of integrated weed management tactics to improve weed control in chickpea.

**1. Gulshan Mahajan and Bhagirath S. Chauhan are researchers at The Centre for Crop Science, Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Gatton.** ■

**FIGURE 1: Effect of herbicide treatments on weed biomass in chickpea**

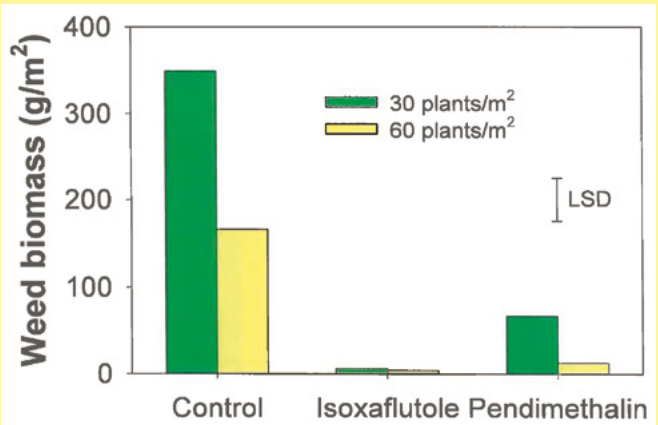
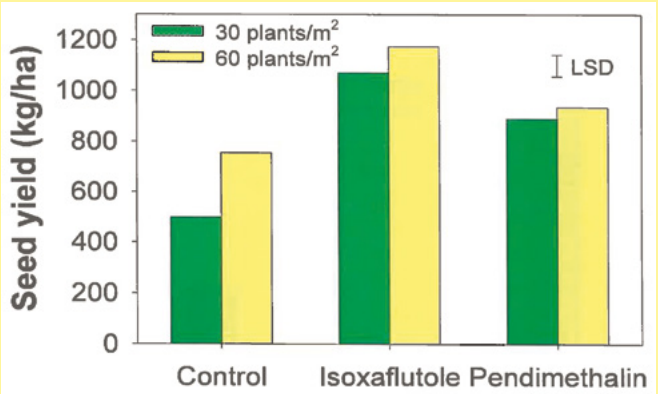



**FIGURE 2: Effect of herbicide treatment on seed yield of chickpea**



# Metabolic trifluralin resistance

By Peter Newman

JUST when we think we know who the Prime Minister is in Australia you blink your eyes and we have a new one! At the time of writing, Scott Morrison is Prime Minister but this could change by the time you receive this. Just when we thought we understood the mechanism of trifluralin resistance we blink and find another. Earlier in the year, we reported on research by AHRI PhD student Jinyi Chen confirming that a target site mutation that confers resistance to trifluralin.

Now Jinyi has confirmed that metabolic resistance to trifluralin is also possible. She studied three trifluralin resistant populations of ryegrass and found that one population had both target site and metabolic resistance mechanisms, sometimes in the same individual plant. The other two populations had metabolic resistance only.

The resistant populations could take up and translocate trifluralin just like susceptible ryegrass, but once the trifluralin was in the plant it was metabolised quickly. The exact metabolic resistance mechanism is still to be confirmed, and P450 enzymes are the prime suspect. This will be the subject of ongoing research.

There is never a single Australian Prime Minister for a full term these days and there is never a single resistance mechanism.

**FIGURE 1: Phosphor images showing the translocation pattern of [$^{14}$C]-trifluralin in (left) three susceptible *L. rigidum* populations (S1, S2, and S3) and (right) three resistant populations (R1, R2 and R3)**


Roots of seedlings were immersed in [$^{14}$C]-trifluralin solution for 48 hours prior to washing, oven drying and imaging.

AHRI PhD Student Jinyi Chen.

Metabolic resistance to herbicides appears to be an ongoing theme amongst resistant Australian weeds. Our recent AHRI insight about multiple cross-resistance to pre-emergent herbicides is a testimony to this.

## So what?

If only target site resistance was at play, mixing and rotating herbicides would go a long way to solving our herbicide resistance problems because cross-resistance across herbicide groups would not exist. But metabolic resistance has the ability to work across herbicide groups and a weed may be resistant to a herbicide before it has even been sprayed with that herbicide.

We need to understand what resistance mechanisms are at play so we can work out the best strategies to prolong the life of our herbicides.

If only metabolic resistance was at play we may be able to figure out a way to switch this resistance off using a P450 inhibitor. But unfortunately, more often than not, we find multiple resistance mechanisms to a single herbicide.

## No target site resistance detected

The first step in this study was to determine if the known target site resistance mutations in the α–tubulin (e.g. mutations at 202, 239, 243 etc) were present. The researchers found a 243 target site resistance in one resistant population but two other resistant populations did not have target site mutations, hence metabolic resistance was suspected.

## No difference in translocation

The researchers then embarked on a process of elimination. They first used radiolabelled 14C-trifluralin to determine if there was any difference in root uptake of the herbicide between resistant and susceptible populations. Figure 1 shows that trifluralin was translocated equally between the resistant and susceptible populations so they knew that this was not the mechanism.

**But metabolic resistance has the ability to work across herbicide groups and a weed may be resistant to a herbicide before it has even been sprayed with that herbicide.**

## Enhanced metabolism is involved

The scientific methodology is pretty tricky to describe here. Given the volatile nature of trifluralin, Jinyi had to overcome significant technical hurdles to study this resistance mechanism. But she found that more trifluralin was metabolised (broken down) in the resistant populations than the susceptible ones.

I won't begin to try to explain this part of the study, and to be perfectly honest I don't understand it, but we will take the researchers word for it that the resistant plants could metabolise the herbicide before it could reach the target site.

## P450s are the prime suspect

Another tricky bit of research by AHRI researcher Roberto Busi gave us a clue that P450s are involved. P450s are a superfamily of enzymes that have many functions in plants including metabolising various molecules. Roberto treated ryegrass with an insecticide called phorate that is known to inhibit P450s and this reversed the metabolic trifluralin resistance.

If metabolic trifluralin resistance was the only mechanism we may be able to use this knowledge to work out a way to reverse resistance in the field, but alas, we have target site resistance as well. Bummer!

This will be the subject of future research to determine if P450s are in fact the culprit.

## To sum up

There's rarely a single resistance mechanism to a particular herbicide and this research confirms that there are multiple mechanisms for trifluralin resistance.

If there was a single mechanism we may be able to work out a way around it, but unfortunately nature bats last and evolution is powerful and diverse.

**This research is funded by GRDC, and PhD student Jinyi Chen is financially supported by UWA and China Scholarship Council.**

**Contributing researchers: Jinyi Chen, Danica Goggin, Heping Han, Roberto Busi, Qin Yu and Stephen Powles, all from AHRI.** ■

# Tackling weeds from the ground up – good tactics change over time

TREVOR and Renae Syme are throwing everything they've got at revamping non-wetting sands and driving down weed numbers on their property at Bolgart, WA. A few years ago they began an extensive liming and clay delving and spading program across 50 per cent of the 3500 hectare cropping area to improve the water holding capacity of the natural non-wetting sands.

With 75 per cent of the affected area now treated Trevor is looking forward to having this expensive but very beneficial operation behind him.

"Treating the non-wetting soils has assisted with weed control through 40 per cent higher yielding crops, more even crop germination and better efficacy with the pre-emergent herbicides," says Trevor. "It has also enabled us to grow canola in paddocks that were previously not an option and crops seem to finish better and are less prone to frosting."

They have also achieved good results building soil organic matter with brown manured cereal rye crops. Trevor has trialled summer crop brown manuring too but the results over three seasons were unreliable and he has decided to look for other options to reduce evaporation over summer and reduce the need for summer weed control.

The Symes' farming system is 100 per cent controlled traffic and stubble retention with a long winter crop rotation of lupins, wheat, canola, wheat, barley, with brown manured cereal rye replacing canola on the soils not suited to canola.

The summer fallow spray program involves 2,4-D ester, triclopyr and glyphosate to control melons, caltrop, fleabane, sowthistle and volunteer cereals. For the last 5–6 years Trevor has

**Trevor Syme farms in the Bolgart district of Western Australia, 125 km northeast of Perth. Trevor has found treating the non-wetting soils has assisted with weed control through 40 per cent higher yielding crops, more even crop germination and better efficacy with the pre-emergent herbicides.**

**Trevor is experimenting with a different way to manage the weeds that germinate in the tramlines after using the chaff-deck at harvest. One low-cost, non-herbicide method that seems effective is using the tractor tyres to create a crimp-roller effect on the weeds before they seed. The photos show the before and after using this crimp-roller tactic.**

applied a double knock of glyphosate followed with paraquat in preparation for sowing. "We try hard to get the timing right and target the right size weeds with the double knock," he says.

"We also avoid mixing a pre-emergent in with the paraquat because the aim is to get the paraquat on weed leaves using a high water rate and fine droplet size, whereas the aim with the pre-emergent is to achieve even coverage of the soil. Doing the pre-emergent spray separately costs us more but I believe it is worth using the right boom set up for the two jobs."

"Rotating crops and herbicide modes of action, and using the double knock tactic, are critical to our weed management program," he says. "RR canola, Clearfield barley and lupins all have a fit in the crop rotation and allow us to rotate herbicides effectively. The imi-tolerant barley has enabled quite effective control of brome grass and we croptop the canola with glyphosate. In the lupins we are using a pre-emergent propyzamide application followed with clethodim in-crop and finish with a croptopping spray of paraquat."

Trevor is finding that weed control in the lupin phase is more critical than it used to be, but the value of lupins in boosting yields in the following wheat crop motivates him to look after the lupin crops, plant into clean paddocks and do everything he can to keep weed numbers low.

**In the 2015 harvest the Symes added a chaff deck to their weed control program, directing all the chaff, and weed seeds, into the harvester wheel tracks. Trevor harvests weedy paddocks first to maximise the value of harvest weed seed control and has found the chaff deck easy to use. The result is that relatively few weeds survive in the tramlines.**

The Symes have had good success with high biomass canola on sandy soils where multiple germinations of wild radish are the norm. They usually plan their crop and herbicide program with their agronomist at the end of September and then revise it in February or March.

## Moving away from narrow rows and discs

Trevor is going away from the current move toward narrow row spacing and disc seeders. "We are changing back from a disc seeder at 305 mm spacing to tynes on 381 mm with a split boot to sow cereals in paired rows and canola and lupin in single rows," he says. "We are working on the idea that less rows equals less disturbance equals less weeds in a controlled traffic system. The slightly wider row spacing also makes it easier to handle the stubble load accumulated over several years and allows us to inter-row sow."

He has found that high tillering wheat varieties, such as Magenta, offer an alternative way to increase crop competition through additional shading of the inter-row.

In the 2015 harvest the Symes added a chaff deck to their weed control program, directing all the chaff, and weed seeds, into the harvester wheel tracks. Trevor harvests weedy paddocks first to maximise the value of harvest weed seed control and has found the chaff deck easy to use and results in relatively few weeds surviving in the tramlines.

"The biggest benefit is that we can collect weed seed across the whole farm every year where previously we have only really been able to do narrow windrow burning in the canola phase. Now at harvest the whole job is done, with no need to return to burn.

"It is great to know where the weeds are and they are dumped on a hard, inhospitable surface," he says. "Any escapes are easily collected at the next harvest. We also have a back-up plan to use a shielded sprayer to weeds in the tramlines, but we really want to avoid using this option.

"In fields with high weed numbers in the tramlines we have tried simply driving a tractor, without any implement, along every tramline to achieve a crimp-rolling effect. This seems to have been a cost-effective way to stop seed set in weedy tramlines."

## Assumes all weeds have some resistance

Annual ryegrass, wild radish and brome grass are the main weed challenges on the Symes' property. Trevor has done some herbicide resistance testing but generally takes the approach that all weeds present are likely to have some level of resistance.

"The key is to keep weed numbers low so we take care to spray when weeds are small and avoid frost windows and high temperatures when the sprays are less effective," he says. "We also use quite high water rates – 80 litres per hectare for most post-emergent herbicides and 120 litres per hectare for pre-emergent herbicides and paraquat – and have two sprayers so we can cover as much ground as possible when the conditions are right.

"Fencelines and fire breaks are a weak point in our farming system as a source of glyphosate resistant weeds," he says. "We have removed as many fences as possible, now that we don't run any livestock, and are actively looking for an alternative herbicide that is not used in crop to manage weeds on the firebreaks."

Trevor takes considerable care when choosing seed production paddocks, ensuring weed numbers are low to start with and then treating the paddock as a nursery. He harvests the seed crops early and cleans the seed prior to planting.

**For more information about managing herbicide resistance, visit the WeedSmart website: *www.weedsmart.org.au***

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# The race for the world's first peanut allergy vaccine

By Andrew Spence

SOUTH Australian researchers will use a collaboration with a leading drug delivery system to bolster their credentials in the race to develop the world's first peanut allergy vaccine.

Australian biotechnology company Sementis recently announced a collaboration with UK-based Enesi Pharma. The partnership is focused on the development and evaluation of solid dose versions of Sementis' lead peanut hypoallergy vaccine and their single vectored Chikungunya/Zika vaccine candidates for administration via Enesi Pharma's ImplaVax technology.

ImplaVax is an innovative and proprietary needle-free solid dose implant and device technology for subcutaneous vaccination.

Researchers at the University of South Australia in Adelaide helped develop the scalable and stable Sementis Copenhagen Vector (SCV) platform system.

The Experimental Therapeutics Laboratory researchers have also played a key role in developing the single vectored combined Zika-Chikungunya vaccine in partnership with Sementis and are turning their attention to peanut allergy.

## Needle-free delivery

The team is now formulating the technology into a small sugar-based crystal suitable for needle-free ImplaVax delivery. Phase 1 clinical trials of the Zika-Chikungunya vaccine are expected to take place in 2019, dependent on funding.

**Peanut allergy is the world's most common food allergy but new research may lead to a vaccine.** (PHOTO: GRDC)

Chikungunya is a viral disease transmitted to humans by infected mosquitoes. It causes fever and severe joint pain. Other symptoms include muscle pain, headache, nausea, fatigue and rash. Zika virus is spread by the same group of mosquitoes that spread the Dengue viruses and Chikungunya virus.

Head of the Experimental Therapeutics Laboratory Professor John Hayball spoke about the partnership at the 19th World Vaccine Congress Europe in Lisbon late last month.

"The Chickagunya/Zika was always our test case to prove that the technology works so the sooner we can get that into a living breathing human in a clinical trial then that's going to help all our other pre-clinical and clinical development programs for the whole range of other targets that we're making vaccines against," John said.

"We already know that our viral platform, which is based on the old smallpox vaccine, is already inherently stable and to mix it in with this new technology we will have something that in theory will be a totally stable vaccine that can be kept at room temperature, which is a huge step in the right direction.

"The whole idea is that any vaccine we produce will be in a completely cold-chain independent format."

The race to develop a peanut allergy vaccine has been gaining momentum with another Australian company, Aravax, nearing completion of the Phase 1 clinical trial of its novel treatment.

Researchers in the United States and Europe are also working on peanut vaccines.

John said the Sementis approach was to re-educate the immune system to provide people with a robust, non-allergic phenotype that could be maintained over time.

"We have quite a wealth of pre-clinical data and a lot of people are very interested in what we're discovering because it's a new way to try to treat pre-existing allergy, which is what we're trying to do," he said.

"We still need to finalise pre-clinical studies before publishing the research but we've got a lot of *ex vivo* human data from peanut allergic individuals and we have some relatively good mouse data.

"We are preparing for human clinical trials for that vaccine – obviously it's some time behind the Chikungunya/Zika but we will be trying to shirt tail on the back of what we discover from that vaccine given that we are using the same SCV platform delivery system."

## Most common food allergy

Peanut allergy is the world's most common food allergy and affects up to three per cent of children, particularly in western countries.

"There is a potential huge commercial market for it in the billions," John said.

"We have a range of other infectious targets that we are exploring using the SCV delivery system.

"There's also a huge unmet need for immunotherapy for allergies so we're interested in peanut allergy but we are also developing a vaccine for cat allergy and we have an interest in house dust mites associated with asthma." ■

# Getting back to basics with peanut production

WITH a significant peanut plant expected across Queensland and New South Wales this year, growers are being urged to `keep it simple' when it comes to agronomic management to maximise yield and quality.

Over the years, peanuts have attracted a reputation as being easy to grow – but difficult to grow well – given their reliance on adequate water, nutrition and protection from weeds and diseases. This results in concerns over unreliable yield and quality (grades).

But plantings are on the rise as growers increasingly embrace the rotational benefits of improved soil nutrition, broader weed control options and more effective management of soil-borne pests and disease.

This has sparked calls for growers to focus on the agronomy `basics' in order to maximise economic gains from this season's crop.

## Recent research highlights key factors

Department of Agriculture and Fisheries (DAF) principal agronomist and project leader of the Grains Research and Development Corporation's (GRDC) Coastal and Hinterland Grower Solutions Group, Neil Halpin said recent research had highlighted the importance of factors such as time of sowing, row configuration and plant population.

The research is part of a GRDC investment into tactical agronomy focussing on optimal legume selection within a cane system and maximising the productivity of Kairi.

Kairi is a new variety offering improved foliar disease resistance to rust and higher yield potential that was jointly developed by Peanut Company of Australia (PCA), GRDC and DAF.

"The take-home message from last year's research work was if the peanut crop is managed well agronomically it can generate significant gross margin returns," Neil said.

"In the cane/legume rotation research, both the Kairi and Holt peanut varieties generated a significantly higher gross margin than soybean, mungbean, pigeon pea, or cow pea when grown in rotation with cane, returning over $3000 per hectare.

"In terms of maximising the productivity of Kairi, research over the past couple of seasons has focused on factors such as time of sowing, plant population, row configuration and nutrition inputs. When it comes to yield response, population was found to be the dominant factor.

"With this year's peanut season about to begin, it's important for growers to start with soil testing pre-plant to help determine their soil ameliorant and fertiliser programs and from there, optimise sowing time and plant population."

## Attractive gross margins

"At the end of the day, if growers can focus on getting the agronomic basics right, especially in terms of ground preparation, planting and in-crop pest and disease management, then the gross margin returns can be extremely attractive," he said.

Interest in peanut production due to the crop's gross margin potential and farming system benefits has been particularly strong within sugar cane farming systems where it has helped alleviate the impact of root lesion (*Pratylenchus zeae*) and root-knot (*Meloidogyne javanica* and *M. incognita*) nematodes, improve available soil nitrogen, improve weed management effectiveness and enable employment of a year-round workforce.

This has coincided with favourable market prices which have been partly underpinned by Bega Cheese's recent acquisition of PCA and its pledge to increase the domestic supply of peanuts by expanding plantings and production.

**For more information on peanut production, download a copy of the GRDC's Peanut Grownotes module at *www.grdc.com.au/grownotes*** ■

**Experts such as Department of Agriculture and Fisheries (DAF) principal agronomist Neil Halpin are urging peanut growers to focus on agronomy 'basics' in order to maximise economic gains from this season's crop.** (PHOTO: GRDC)

# *Seed Sharing* gets 'good fit' varieties where they should be

FOR many years, southern Queensland farmers John and Pam Maher and their sons Clay and Ben have been keen and valuable cooperators within the Australian plant breeding industry. On their Bungunya district property 'Kingswood' (about 70 km west of Goondiwindi) they have been involved with trials beginning with the Queensland Wheat Research Institute wheat breeding program and continuing with QWRI's subsequent entities.

Their cooperation enabled the wheat breeding programs to conduct yield evaluation trials and make variety assessments in the Bungunya region. In more recent times the Maher family has been assisting the industry by hosting National Variety Trials (NVT).

With such a long history of cooperation with wheat breeding and NVT trials the Mahers have been able to make the most of the information emerging from this research to select wheat varieties that best suit their operations.

In 2015 John purchased some quality-assured Mitch seed from AGT. This decision was based on the variety's high yield performance and ability to maintain that yield under high crown rot pressure.

Since 2015 the Maher family have adopted Mitch as their primary wheat variety at Bungunya as well as on another farm at Hannaford, about 150 km to the north.

"It is well suited to our farming operations, we know it will perform very well, even in paddocks with higher than ideal levels of crown rot," Ben Maher explains. "The fact that it is an AH variety is less of an issue now, as so much of our grain production is delivered directly to feedlots."

In a difficult 2018 season the Maher family harvested 4800 tonnes from 1800 hectares of Mitch, with the crop at Hannaford averaging 3.0 tonnes per hectare.

## *Seed Sharing*

From the initial harvest 100 tonnes of Mitch was sold through *Seed Sharing* and trucked directly to Moree and an additional 200 tonnes is stored on-farm. The Mahers have retained 600 tonnes of Mitch seed on-farm at 'Kingswood' which is available for sale to farmers through *Seed Sharing*.

"AGT has been very helpful in establishing a *Seed Sharing* Marketplace – we have advertised Mitch seed for sale through their website and expect that it will find homes far and wide in preparation for a better 2019 winter cropping season," said Clay Maher.

With the competitive nature of wheat breeding and new varieties being released every year, it is no wonder that some varieties get left behind.

Often it is because there are better options but in some instances it can be a matter of timing and perceptions at the time of release.

"We knew that Mitch was an excellent variety but the slow uptake of AH classified varieties in the northern region has held it back somewhat," says AGT Marketing Manager Douglas Lush. "We are very pleased to see a renewed demand for Mitch. The combination of *Seed Sharing* and the Marketplace website should help to keep varieties available in areas where they have a good fit." ■

**GT's Douglas Lush in a 2018 crop of Mitch wheat at Hannaford, southern Qld. In a tough season, the crop averaged an impressive 3 tonnes per hectare.**

# New sprayer is more than just a fuel saver

THE new RoGator C Series from Croplands has farmers around Australia reporting extensive fuel savings, with an average of 23 per cent on the new model when compared to the previous RoGator B Series.

The savings are owed to its revolutionary new SmartDrive system which not only enables the RoGator C Series to burn less fuel, it also makes life easier for the operator.

With each wheel monitored by a speed sensor, if any of the wheels start slipping the power to the ground is adjusted at the individual wheel motor. Like a CVT (continuously variable transmission) in a tractor, the TMS (tractor management system) controls the engine in conjunction with the transmission to adjust RPM automatically as required.

This feature of the SmartDrive enables the engine to run at the ideal RPM – not the highest RPM, resulting in a cooler system that burns less fuel and reduces wear on the engine.

Turn compensation is another key feature of the new RoGator C Series. The speed sensors register that the machine is turning on the headland and causes the inside wheel motors to operate at a different RPM to the outside wheel motors – reducing the soil disturbance on corners.

The RoGator C Series LiquidLogic system is another significant advancement on the previous model. It has a full boom recirculation system with E-Stop valves on each nozzle body, enabling on/off control at the nozzle body. The LiquidLogic system also keeps chemical in suspension – this feature enables the operator to prime the boom on the way to the paddock, eliminating any downtime.

The one-piece boom allows for product recovery, which can be performed by the operator from the cab. This feature is a real money saver when weather conditions suddenly change and any unused product in the pump, manifold or boom can be returned to the tank until weather conditions improve and the operator can prime the boom again and resume spraying.

The C Series LiquidLogic system also features auto-agitation which is especially important when applying powders or granular chemical products. It automatically agitates product in the tank as the tank level increases/decreases which eliminates foaming in the tank.

Croplands have also added lots of 'extras' for the Australian market – a bigger chemical hopper, fill pump and weather station to name a few. ■

# *Year of the Grower* winners

FIVE extremely happy growers – from McLaren Vale to Dimbulah – are celebrating delivery of a brand new $16,500 Polaris Ranger UTV following the first draw in Bayer's *Year of the Grower* promotion. Celebrating with the winners were the five rural supply stores where the growers purchased their prize-winning Bayer crop protection products, with each store receiving a $1000 eftpos gift card.

The *Year of the Grower* promotion rewards growers working in broadacre or horticulture with an entry into a draw for every $100 spent in a single transaction on Bayer crop protection products.

The winners are spread geographically to ensure growers across the country have a fair chance of winning. The first draw winners and stores they purchased from are: Jack Derrick through Landmark Temora (NSW); Richard Kirkland through Millicent Farm Supplies (SA); Kevin Watterson through Frankland Rural (WA); Michelle Milicevic through TGT Dimbulah (QLD); and, John Cranwell through E.E. Muir & Sons Mclaren Vale (SA).

**(L to R): Brendon McCoullough (Landmark Temora), Jack Derrick, Keryl Derrick and Ross Henley (Bayer).**

A typical response came from the Cranwells who were "A little shocked, but extremely grateful to win."

Ante Milicevic said of his new Polaris Ranger "It's going to get quite a bit of use on the farm – getting around checking irrigation on the limes and tea trees – it will be very handy".

Bayer's Commercial Sales Representative, Darren Alexander, said "It's really rewarding, not only to see the support for Bayer's *Year of the Grower* promotion, but to see these fantastic prizes going to richly deserving families and businesses."

The *Year of the Grower* is a year-long event, so the message to growers and stores who missed out this time is to keep using Bayer's crop protection products as there are still five more Polaris Ranger UTVs to be won in March 2019. ■


**(L to R): Polaris agent James Well (Extreme Motorcycles), Michelle, Josef, Martan and Ante Milicevic, Tony Fitzgerald (Bayer) and Sheldon Mulla (GM, TGT Dimbulah).**


**L to R): Darren Alexander (Bayer), Robert and John Cranwell), Craig Mathew (E. E. Muir & Sons, Manager) and Nigel Dolenec (Agronomist).**

# Design, innovation and quality

BROOKFIELD live and breathe their brand 'Farming the Future' through high quality products, unending design and innovation. Their satisfaction is realised when a Brookfield product supports a producer in their own farming enterprise to make their work easier, safer, quicker and more productive.

Brookfield is a family owned and operated business based in Cowra, NSW and they live by the philosophy that "there is always a better way". In the past six months, Brookfield have been working tirelessly to release three new machines to the market.

The D60 Series 2 (D60-II) ChainBar was released at AgQuip Field Days, the SD150S-TR SuperDrill was released and demonstrated at Henty Field Days and a brand-new product – the CrossBar – has just been released to the market.

As with all Brookfield models of ChainBar, the D60-II has been built to optimise soil health and ensure all tillage needs are covered from stubble management post-harvest, weed control during fallow right through to levelling and preparing the paddock for seeding. The new model is simple, clean and has been built with a high clearance to provide a greater trash flow capacity. The addition of larger wheels has improved flotation of the frame as well as individual floating wings which improve results when working in rough terrain.

Where tough soil conditions prevail, the breakaway droppers have been incorporated into the new design as well as the addition of wing tip wheels that provide improved ground follow.

The new model features a narrow 2.45 m transport width for simple road transport as well a low 3.0 m transport height for easy low loader transport.

**The new model ChainBar offers improved stubble management, weed control and levelling.**

## SD150S-TR Super Drill

The Brookfield SuperDrill is your entire soil management in the one tool – a sowing rig with the added capabilities of a ChainBar. It is the only seeding machine of its kind in the world and allows you to look after your farm just like you would your vegetable garden. With reduced capital investment and maximum return on investment in mind, Brookfield have developed the next generation seeder.

The SD150S-TR is fitted with twin row gangs of coulters at 250 mm (10") spacing as 'standard', or the option of 200 mm (8") or 300 mm (12") is available. Farmers are looking for many sowing options in one machine, and the SuperDrill brings the ability to interrow fertiliser in one gang and sow seed on the other at different depths. In addition to this, they can sow down both rows which effectively halves the sowing width. The wavy coulters in combination with the finishing chain gives superior soil disturbance and matchless seed soil contact. This versatile seeding system combined with the proven capabilities of the ChainBar gives you the ability to plant most broadacre crops and fine seeds in all types of conditions, levelling the soil in front, seeding with the centre coulters and finishing with the rear chains.

**Brookfield can be contacted on 1800 774 274 or visit *www.brookfield.net.au*** ■

**SuperDrill is a new release seeding machine merging sowing capability with the ChainBar.**

# Western region

# District Reports...

November–December 2018

## WESTERN AUSTRALIA SUMMARY

The widespread rain over the majority of central regions of the state immediately following the October *Crop Report* arrested the slide in grain yields from the very dry September and added at least 500,000 tonnes of potential total grain for Western Australia. Since then, the very mild temperatures and lack of heat shock has seen grain yield potential increase further. Paddocks harvested to date are in most cases yielding higher than expected.

The northern agricultural zones where most of the harvest activity is occurring are returning above average grain yields for all crops with some outstanding individual paddock yields being recorded. This trend is expected to continue as harvest gets going in the West Kwinana and West Albany zones over the next few weeks.

Barley grain yields for the East Kwinana zone have generally been disappointing and growers are hoping wheat may have made better use of the rains during early October.

The season has been a roller coaster and grain tonnage estimates have varied widely over the year from a potential record harvest in mid-August to a significant reduction at the end of August and September from frost events and lack of rain, to a big spike in expectations following the late rains in October and continuing mild conditions during grain-fill. Total tonnage for the state is now on track for an above average harvest with some upside to our current estimates.

Barley area planted for the state this year is the largest on record and wheat the lowest on record. This trend is likely to continue as barley expands further to the north in recent years where wheat has been the dominant crop. Canola tonnage in the state will be the lowest for several years and has exposed the fragile crop in a very difficult year.

**GIWA gratefully acknowledges the support of DPIRD, CBH and contributions from independent agricultural consultants and agronomists in the production of this report.**

**GIWA Crop Report – November 9, 2018**

## NORTHERN DISTRICT

Harvest is well underway in our region with some northern growers likely to finish up toward the end of November. Crop yields are generally very good considering the season we have had with very little rain after the end of August. Frost damage is at low levels across the region but there is likely to be some damage in frost prone pockets of the landscape.

North eastern areas with significant summer rain have very good crop yields. Paddocks, even close by, are back to average or slightly below average yields.

**End of October, 2018 – GIWA WA crop production estimates (tonnes)**

| Port zone | Wheat | Barley | Canola | Oats | Lupins | Pulses | State total |
|---|---|---|---|---|---|---|---|
| Kwinana | 4,500,000 | 2,000,000 | 470,000 | 285,000 | 140,000 | 5,000 | 7,400,000 |
| Albany | 1,500,000 | 1,100,000 | 450,000 | 230,000 | 55,000 | 1,000 | 3,336,000 |
| Esperance | 1,200,000 | 600,000 | 300,000 | 20,000 | 50,000 | 40,000 | 2,210,000 |
| Geraldton | 1,900,000 | 200,000 | 240,000 | 15,000 | 350,000 | 2,000 | 2,707,000 |
| **Totals** | **9,100,000** | **3,900,000** | **1,460,000** | **550,000** | **595,000** | **48,000** | **15,653,000** |
| % change to Sept 2018 | 11.7% | 10.5% | 2.8% | 0% | 9.2% | 2.1% | 9.9% |

Note: the grain totals reported are for whole farm production. This includes on-farm seed and feed requirements as well as trade outside of the CBH network.

# District Reports…

**November–December 2018**

The western fringes have had a damp cool start to harvest and progress has been slower than many would like. Also this area had a very wet July which has left some crops – particularly on sand soil – washed out and low in protein.

The cracker crops are on medium soils and the stronger sands that have been well looked after with lime and ripping etc. These are generally going well above expectation with canola yields in the 1.5 to 2.5 tonnes per hectare range and wheat double these numbers.

There have been thunder storms with lightning starting fires and hail damage in a couple of areas. This is disappointing for the growers involved who were looking at possibly record crops. A couple of thousand hectares have been destroyed and several thousand more damaged across the landscape.

CBH is expecting around 3.0 million tonnes for the Geraldton region which I think will be close to the mark. The average is around 2.2 mt so it is looking like a great year in our part of the world. The east coast drought and frosts have pushed grain prices up so it will possibly be the best year yet for gross farm returns. Hopefully we get it all into the bin and a good rain across the east soon. Time to get back on the header…

**Peter Norris**
**Agronomy For Profit and Synergy Consulting, Geraldton**
**November 16, 2018**

## SOUTH COAST

The mild spring conditions have continued on the South Coast. While this has been favourable for finishing crops, it has created a very slow start to harvest as grain moisture levels hover above acceptable delivery standards. As a consequence, all types of moisture management strategies have been employed – driers, grain sheds, bagging and blending.

**A bird's eye view of canola harvest underway at 'Bedford Harbour' Jerdacuttup, about 170 km west of Esperance. Elisa Parisi from Italy, David Large (farm manager) and Annie Jemmeson wave the headers in. For many growers on the WA South Coast, 2018 was the first season they have seen hybrid canola varieties out-yield open-pollinated types.**

**A GT53 Roundup Ready canola crop swathed and ready to go at 'MKM Farming' in the Scaddan district of the WA South Coast. A pink salt lake dominates the foreground.**

Grain yields have been quite good and most growers are enjoying some pleasant surprises. Of course there are some exceptions to this in areas that were frosted or simply did not receive adequate growing season rainfall.

Canola yields have varied from 0.7 to 3.0 tonnes per hectare with high oil content. An early trend is that hybrid canola varieties are out-yielding open pollinated varieties. We haven't seen this in previous seasons.

Barley yields vary from 1.5 to 6.5 tonnes per hectare. Achieving malt grades has been variable with germ end staining being problematic.

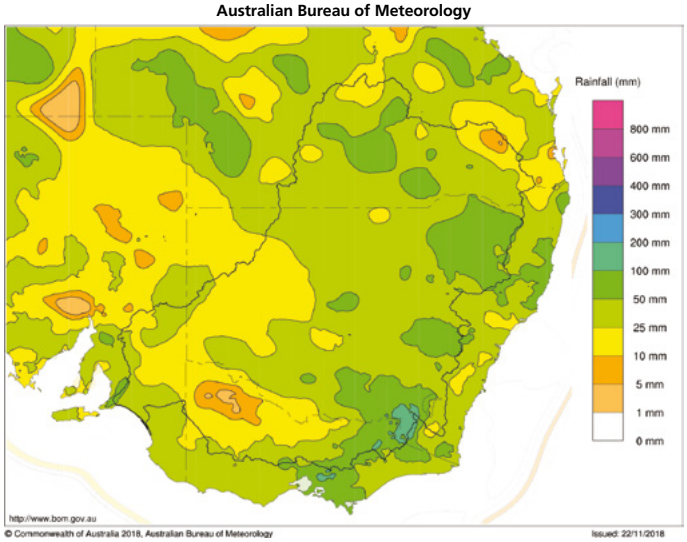
Very little wheat has been harvested at the time of writing but what has been harvested looks good for yield and quality.

For most growers the aim is now to have a good run of weather and try to wrap up harvest before Christmas.

**Quenten Knight**
**Agronomist, Agronomy Focus, Esperance**
**November 18, 2018**

# Southern region

**Murray–Darling Basin rainfall totals (mm) November 1–22, 2018**
**Australian Bureau of Meteorology**




**Patchy growing season rainfall created a mixed bag of winter crops for the Murray-Darling Basin. But recent and widespread rainfall in northern NSW and Qld has lifted summer crop prospects in that region.**

## SOUTH AUSTRALIA SUMMARY

Winter crop prospects deteriorated in South Australia in September because of lower than average September rainfall and significant frost events. September rainfall in most cropping regions was in the 10th percentile.

The lowest average minimum temperatures on record for September occurred in many parts of eastern Eyre Peninsula, upper Yorke Peninsula, the mid to upper north, the Murray lands and the upper south east, which resulted in significant frost events.

Timely October rainfall has benefitted southern cropping regions, especially lower Eyre Peninsula, lower Yorke Peninsula and the south east.

Winter crop production in South Australia is now expected to be around 20 per cent below the September forecast of 6.6 million tonnes, which would be the state's lowest winter crop production since 2008–09.

Winter crop area devoted to grains and oilseeds production in South Australia is estimated to have fallen by around 9 per cent.

This is largely due to significant areas planted to cereal crops being cut for hay. The main regions in which this occurred are upper Eyre Peninsula, upper Yorke Peninsula, lower to mid north, southern Mallee and upper south east.

**ABARES National Winter Crop Update**
**End of October, 2018**

# District Reports...

**November–December 2018**

## VICTORIA SUMMARY

Victorian winter crop prospects deteriorated in September due to lower than average September rainfall and significant frost events. Less than 20 per cent of average rainfall fell in most cropping regions for the month.

Minimum temperatures were the lowest on record in most cropping regions, which resulted in significant frost events.

Timely rainfall in early October is expected to benefit winter crop production in the southern Wimmera.

Winter crop production in Victoria is now expected to be around 32 per cent below the September forecast of 5.4 million tonnes, which would be the lowest winter crop production in Victoria since 2015–16. Winter crop area devoted to grains and oilseeds production in Victoria is estimated to have fallen by around 15 per cent, largely due to significant areas planted to canola and wheat being cut for hay.

**ABARES National Winter Crop Update**
**End of October, 2018**

## Seasonal rainfall across the grain regions – 25 year averages and year to date

*Brought to you in association with* JOHN DEERE

| | 25yr Annual Average (mm) | 2018 rainfall to date (mm) | Summer | | Autumn | | Winter | | Spring | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25yr Annual Average (mm) | 2017–18 | 25yr Annual Average (mm) | 2018 | 25yr Annual Average (mm) | 2018 | 25yr Annual Average (mm) | 2018 to date |
| Emerald Qld | 561 | 411 | 251 | 330 | 105 | 21 | 69 | 29 | 127 | 113 |
| Toowoomba Qld | 675 | 491 | 269 | 302 | 138 | 82 | 88 | 36 | 179 | 175 |
| Roma Qld | 581 | 377 | 251 | 208 | 116 | 94 | 78 | 34 | 135 | 124 |
| Goondiwindi Qld | 623 | 343 | 254 | 113 | 122 | 62 | 102 | 45 | 145 | 173 |
| Narrabri NSW | 631 | 319 | 220 | 95 | 118 | 67 | 130 | 47 | 164 | 148 |
| Gunnedah NSW | 634 | 327 | 217 | 118 | 108 | 35 | 129 | 42 | 183 | 199 |
| Dubbo NSW | 604 | 252 | 190 | 85 | 127 | 24 | 133 | 57 | 157 | 141 |
| West Wyalong NSW | 454 | 203 | 119 | 156 | 80 | 40 | 124 | 60 | 131 | 65 |
| Wagga Wagga NSW | 540 | 326 | 133 | 177 | 111 | 47 | 150 | 77 | 146 | 127 |
| Swan Hill Vic | 317 | 136 | 71 | 69 | 65 | 28 | 87 | 59 | 95 | 34 |
| Bendigo Vic | 504 | 274 | 109 | 60 | 106 | 70 | 159 | 128 | 135 | 54 |
| Horsham Vic | 374 | 220 | 79 | 43 | 71 | 54 | 122 | 109 | 104 | 41 |
| Lake Bolac Vic | 515 | 342 | 114 | 66 | 101 | 103 | 153 | 165 | 148 | 55 |
| Murray Bridge SA | 364 | 154 | 70 | 64 | 79 | 39 | 121 | 83 | 97 | 16 |
| Kadina SA | 336 | 155 | 63 | 60 | 78 | 18 | 112 | 51 | 85 | 42 |
| Cummins SA | 388 | 368 | 55 | 49 | 88 | 55 | 170 | 241 | 78 | 48 |
| Esperance WA | 614 | 550 | 88 | 75 | 141 | 68 | 248 | 285 | 138 | 131 |
| Wagin WA | 397 | 366 | 50 | 62 | 97 | 50 | 163 | 213 | 87 | 57 |
| Northam WA | 401 | 437 | 47 | 97 | 88 | 40 | 185 | 262 | 80 | 53 |
| Mingenew WA | 347 | 352 | 30 | 75 | 89 | 50 | 170 | 134 | 58 | 27 |
| Moora WA | 382 | 474 | 43 | 88 | 85 | 51 | 185 | 281 | 69 | 65 |
| Mullewa WA | 321 | 299 | 53 | 88 | 93 | 47 | 130 | 165 | 45 | 24 |

Last rainfall reading November 23, 2018.

# District Reports...

**November–December 2018**

## VICTORIAN MALLEE

A field of harvesters, chaser bins, field bins and trucks across the Mallee horizon are actively stripping, loading, storing and delivering grain.

Most growers are about halfway through their harvest program (as of November 20). While lower yields are contributing to a faster harvest, the winter crop area that has already been cut for hay will also mean a shorter than usual harvest period for the Mallee.

A significant area of crops were cut for hay. Hay quality was generally good – and due to high domestic demand – prices were excellent for the sellers. For those with sheep, there has been a balancing act to keep adequate hay for their own use versus the temptation of selling.

Yield reports from several growers indicate ranges of 0.3–0.5 tonnes per hectare for lentils; around 1.0 tonne for barley; and, 0.3–2.5 tonnes per hectare for wheat crops.

Although yields are relatively low, the grain quality in cereals is quite good with high protein. Pulse crops are of a lesser quality.

The recent rainfall outlook from the Bureau of Meteorology indicates an average to slightly wetter December period for most of South East Australia. Thankfully, for much of the Mallee, most of the grain will be harvested by mid December. But if rain does arrive before then there will likely be some juggling of the harvester and the boom sprayer for summer weed management.

The benefits of summer weed control are well known and if any lesson was learnt in 2018 it was that summer weed control was crucial. Mallee weeds that will be first to germinate on summer rain will be melons and fleabane.

Grain, sheep and wool prices remain excellent so mixed farming enterprises are likely to come through 2018 in an okay position.

With harvest mostly at the half way point or better, the focus now moves to assessing the 2018 season, summer weed control, grazing stubbles or feeding out to sheep, marketing grain, planning for 2019 (including crop rotations and variety selection) and hopefully having a break with family.

**Ciara Cullen**
**BCG Extension Manager, Birchip**
**November 22, 2018**

**At the BCG Manangatang trial site, some wheat varieties yielded around 2.0 tonnes per hectare in a tough Decile 1 growing season.**

# Northern region

## NSW SUMMARY

Less than 60 per cent of average rainfall fell in most cropping regions in NSW in September. Lower-layer soil moisture in September was very much below average in most cropping regions and the lowest on record in parts of the northwest cropping region. The lowest September minimum temperatures on record occurred in regions along the Murray River, which resulted in significant frost events.

Timely rainfall in October fell in most cropping regions in southern NSW, where the vast majority of viable crops in NSW are located. This rainfall is expected to benefit cereal crops in these regions.

Winter crop production in NSW is now expected to be around 10 per cent below the September forecast of 3.9 million tonnes, which would be the state's lowest winter crop production since 2002–03.

Winter crop area devoted to grains and oilseeds production in New South Wales is estimated to have fallen by around 10 per cent, largely due to significant areas planted to canola and wheat being cut for hay.

**ABARES National Winter Crop Update**
**End of October, 2018**

## LIVERPOOL PLAINS

There has been little relief from the dry for most on the Plains. Most people still need 50–100 mm to be comfortable with planting moisture for summer crops.

The majority of successful planting has only been on the irrigation country and mostly cotton. But almost everyone will have some sorghum seed in the shed with the hope that they can combine high prices with a fair yield this year.

We have long fallow paddocks out of chickpea that we are hoping for about 50 mm of rain to fall on. We have good

moisture lower down in the profile but we need some good rain to help the moistures meet up.

Most people we speak to on the Liverpool Plains have had their driest year on record. So we are hoping things turn around with a big wet.

**David McGavin**
**Precision Seeding Solutions**
**November 19, 2018**

## QUEENSLAND SUMMARY

Seasonal conditions in Queensland during September were generally unfavourable but are not expected to have damaged winter crop prospects significantly because of the advanced stage of development of crops. Rainfall was below average in most Queensland cropping regions and maximum temperatures were above average.

Good rainfall fell in the first few weeks of October, with falls of between 50 to 100 mm in some cropping regions. But the impact of this rainfall on winter crop production is expected to be minimal.

Winter crop production in Queensland is still expected to be around the September forecast of 0.9 million tonnes, which would be Queensland's lowest winter crop production in over 10 years.

**ABARES National Winter Crop Update**
**End of October, 2018**

## DARLING DOWNS

It finally rained in October on the Darling Downs with falls on 12 separate days allowing excellent infiltration. Most farms had between 100 and 175 mm for the month. November so far has been dry but there is rain forecast as this report is being written. Some good moisture is badly needed with the topsoil dried out and crops and pastures needing assistance.

### Winter crop

The 2018 planting of barley, wheat and chickpeas was very patchy on the Downs. A high proportion of the barley was cut for silage or hay, but of the crops allowed through to harvest, the best have yielded up to 3.0 tonnes per hectare dryland and 6.0 tonnes irrigated.

# District Reports...

**November–December 2018**

Cereal crops planted very early in April were not successful, but the harvested crops have had good quality.

Barley has been attacked this winter by stem rust, which has caused some yield loss on the Central Downs.

There were a few chickpea paddocks on the Eastern Downs but there was more across the Central Downs with harvestable crops yielding between 1.0 to 2.0 tonnes per hectare. The later

**A Darling Downs' sorghum crop sown into stubble (left) and into bare ground (right). The bare ground was as a result of the drought conditions for much of 2018. But local growers are looking to take advantage of the recent summer crop planting opportunities.**

# District Reports...



It's great to see sorghum on the go around the Darling Downs. But (as at November 21) all summer crops in the region would benefit from some good rain.

sown crops are looking better, and even with the dry conditions, the late rain did spark off some ascochyta infection.

### Summer crop

Since the October rain there has been a massive demand for grain and forage sorghum seed – along with other forage crops such as millet, cowpeas and lab lab – and over 80 per cent of this area is now planted.

There has been a strong demand for, and planting of, corn seed for both gritting and silage needs.

The sorghum and forage planting area will be almost twice that of the past summer.

Emergence of these summer crops has been fair to good but with the conditions drying out, crops are struggling to get their secondary roots into the deeper moisture.

There has been more herbicide damage than usual from pre-emergent herbicides being washed into the root zone straight after application, and from residual herbicides not breaking down enough from previous crop or fallow application. These affected crops are generally recovering but have a reduced population. But this may not be so detrimental if rainfall is short.

There has been heliothis attacking sorghum and corn in the vegetative phase requiring some control.

The cotton area is roughly as expected, and although the irrigated area has been reduced with shortages of irrigation water, the rain has allowed a fair dryland planting. But with the lack of soil moisture and a possible El Niño approaching, more ground has been planted as single skip rather than solid.

If there is late rain we expect to see the usual area of mung beans planted, and more sunflowers on the Eastern Downs. As always, this is dependent on the weather.

**Hugh Reardon-Smith**
**Agronomist – Landmark, Pittsworth**
**November 21, 2018**

## ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

You are looking over the bonnet of a Case Model LA. (This example restored by Chris Broers.)


## ADVERTISERS' DIRECTORY