AUSTRALIAN GRAIN

www.ausgrain.com.au
July–August 2020

Australian Grain
PO Box 766, Toowoomba 4350
Deliveries: 2 Kirk St Toowoomba 4350
P: 07 4659 3555
F: 07 4638 4520
E: grain@greenmountpress.com.au
www.ausgrain.com.au

Advertising
Michael Cook
(National Advertising Manager)
P: 07 4659 3555
F: 07 4638 4520
M: 0428 794 801
E: advertising@greenmountpress.com.au

Editor
Lloyd O'Connell

Associate Editor
David Dowling

Production and Design
Mick Allan

Accounts
Deb Meddleton

Published by Berekua Pty. Ltd.,
40 Creek Street, Brisbane
Registered by Australia Post Publication No. PP100002295. ISSN 1449–2970.

Published bi–monthly.
Grain Yearbook published in April
1 year subscription is $60 (incl GST)
(6 bi-monthly issues plus the Grain Yearbook)
2 year subscription is $100 (incl GST)
(12 bi-monthly issues plus the Grain Yearbook)
Ph: 07 4659 3555 to subscribe

FRONT COVER

Lupins look'n good

Flowering Jurien lupins in early July at Keith and Emma Green's property at Neridup, north east of Esperance (WA).
(PHOTO: Quenten Knight)

Contents

Focus Sections

Southern Australia Focus

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

Northern Focus

Covering Northern NSW and Queensland

SERVICING AUSTRALIA WIDE

1300 244 897

Big Tyre services industry locally and overseas from its factory at 226 North Street in Toowoomba

improved version of the 8RT mid-roller, which stands to significantly reduce the chances of premature failure with a 60% improvement in the load carrying capacity per wheel (compared to the original design built in polyurethane).

Big Tyre's expertise in the industry hasn't gone unnoticed by the leading manufacturers either. Both Continental and Firestone have awarded Big Tyre with the Australian distribution rights for their high quality agricultural tracks, which Big Tyre now imports directly from the USA and Japan to supply farmers and dealerships around the country. These distributorships give Big Tyre two of the leading three brands and enable the company to be an effective one-stop shop for tracks and undercarriage wheels to farmers.

In keeping with its name, a Big Tyre Store has been created on-line providing the most comprehensive catalogue of tyres in Australia complete with prices, photos and tyre specifications. Even without car and 4WD tyres, which will be added once fitting and wheel balancing services have been arranged throughout the country, Big Tyre lists over 4,500 different tyres (www.bigtyre.com.au) that they can supply throughout the country.

In an age of global economic uncertainty, it is refreshing to see this Australian manufacturer not only surviving major changes and challenges, but actually extending their services to the agricultural industry by focusing on continual development, applying new innovative technologies, and actively pursuing new opportunities as they arise.

Discover the XTRA benefits.

Local trial results show the new AXIAL XTRA formulation with an advanced built in adjuvant, delivers improved activity on Wild Oats, Phalaris and Ryegrass, with the same trusted crop safety.

Speak to your advisor about AXIAL XTRA today.

EXTENDED PAYMENT TERMS*
UNTIL
NOVEMBER 2020

Axial® Xtra

syngenta®

GROUP A HERBICIDE

Partner of WEEDsmart every weed every seed every farm every year

Visit syngenta.com.au/axialxtra

Editorial... Lloyd O'Connell

AFTER being beaten around the ears for several months now about the spiralling economic costs to the nation of Covid-19, you could be forgiven for feeling a little depressed about, well ... an impending depression. By this time next year Treasury estimates are that our national net debt will be the highest in terms of the proportion of Gross Domestic Product since just after WWII, more than 70 years ago.

A projected $677 billion in the red by the end of the 2020–21 financial year – or a 36 per cent net debt to GDP ratio – is apparently a 'good' number for Australia compared to other developed economies. For two high profile examples, the US and UK had net debt to GDP ratios more than twice this figure even before Covid-19 arrived.

As Federal Treasurer Josh Frydenberg pointed out in his budget update in late July, "Australia is in a better, stronger, more resilient position than just about any other country around the world and that gives us a very strong foundation from which to build the recovery on the other side."

With this statement, the Treasurer could have been channeling Bob Menzies because 70 years ago, our public debt was 120 per cent of GDP and our post-war economy had huge challenges ahead. But the Menzies government put in place policies and strategies that reduced this debt ratio to less than 50 per cent within two decades. And in a nutshell, these government policies were squarely aimed at creating a business environment within which the private sector prospered and became the drivers of a much bigger economy. A bigger economic cake was baked – our real GDP doubled between 1950 and 1965 – so as a nation, we all got to enjoy a bigger slice of the cake.

Farm sector will play a big part

The fact remains it will take many years of fiscal discipline and surplus budgets for Australia to slowly claw its way back into the black. And just like many times in the nation's economic history, the farm sector will play a big part in this recovery.

The National Farmers Federation is calling for reforms such as the waiving of export fees, simplifying industrial relations rules, cuts to green tape and millions poured into regional infrastructure to help put the country on the road to recovery.

Australian farmers and agricultural researchers are world-class in their jobs, and along with the resources sector, will continue to produce valuable commodities for domestic and international markets while being largely unaffected by pandemic restrictions.

Governments at all levels have been very clearly reminded that agriculture is not only an essential part of the Australian economy but also a very resilient sector with significant growth potential. The Government's 60 per cent reduction in university fees for agricultural courses is recognition of that.

There is a broad-based stirring around the ridges focussed on advancing the adoption of clever research and technologies to firmly establish Australian agricultural and local manufacturing as some of the best and most efficient in the world.

Governments at all levels need to help not hinder this process. They just need to find the right settings on the 'oven' and the private sector will do the baking.

Here's to a healthy and wet spring for everyone. ■

AUSTRALIAN GRAIN
www.ausgrain.com.au

In this issue...

IF WE'RE EMPTY, SEND US PACKING.

RETURN YOUR EMPTY DRUMS AND SCHÜTZ IBCS TO YOUR RESELLER TO BE RECYCLED.

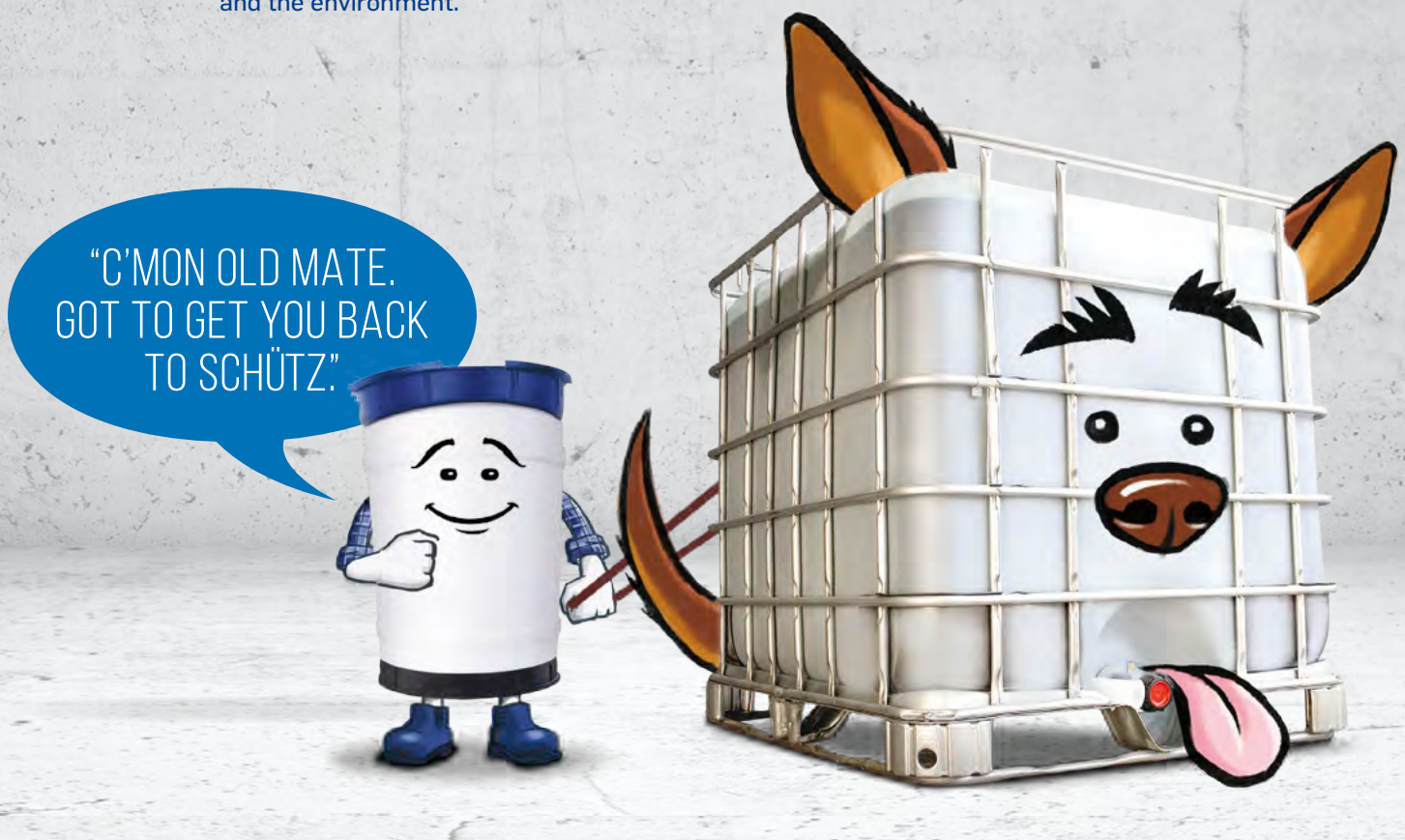
With spring in full swing, there's no better time to clean up the farm and return your empty drums and SCHÜTZ IBCs to your local reseller.

When returnable drums and IBCs are not returned, SCHÜTZ need to make new containers in order to meet demand and help ensure continuous supply of crucial crop protection products.

Manufacturing new containers increases supply chain costs - not returning empties may end up costing you more than just a messy farm!

Don't leave your empty drums and IBCs lying around the farm. There is no charge to return, so get them back to your local reseller and SCHÜTZ will arrange recycling. Together we can work to save money, resources and the environment.

Make sure you don't expose yourself or workers to chemicals by cleaning drums prior to disposal, that's our job. Simply send them back to SCHÜTZ so you can get on with looking after your farm.



GOT A LARGE STASH ON THE FARM?

Contact SCHÜTZ directly to organise an on-farm collection on 1800 336 228 or email salesau@schuetz.net

To find out more, head to returnyourdrums.com.au

SCHÜTZ PACKAGING SYSTEMS

WEED smart every weed every seed every farm every year

ASK AN EXPERT –

HOW CAN I MAXIMISE THE WEED CONTROL VALUE OF MY CROP ROTATION?

■ With Kevin Morthorpe, Pioneer Seeds

A DIVERSE crop rotation is the twine that holds a good farming system together and underpins an effective weed management program.

Kevin Morthorpe, Pioneer Seeds' Trait and Seed Technology Stewardship Manager says herbicide tolerance traits in crop hybrids can be used to maximise competition against weeds and increase the herbicide options available to growers while optimising yield and profitability of the crop sequence in rotations.

Plant breeders continue to introduce herbicide tolerance traits in a number of crops in Australia, including corn, canola, pulses, cereals, grain sorghum, summer forages and cotton.

"For example, in canola there are several herbicide tolerance traits and they are primarily available in hybrids," he says. "This means growers get both improved crop performance due to hybrid vigour and more flexibility in herbicide use patterns."

The increased vigour of canola hybrids also generates greater biomass production and early canopy closure that suppresses growth and seed set of weeds that germinate in-crop, complementing the use of pre-emergent herbicides.

"Hybrids super-charge crop competition through a strong root system and vigorous growth," Kevin says. "From an economic angle, hybrids optimise yield in both high input and tough environments. In fact, we see more growers selecting hybrids when producing canola in tough conditions."

Kevin Morthorpe (left), says the area sown to hybrid canola has risen to an impressive 47 per cent in Australia in the past 15 years and will increase further over coming years. Also pictured are Dr Ray Cowley, Corteva Agriscience, Pioneer Seeds' Rob Wilson and Clint Rogers, Pioneer, at a canola research trial near Jindera in southern NSW.

Since the release of the first herbicide tolerant canola in 1991, the popularity of herbicide tolerance has seen a 98 per cent adoption of canola varieties with tolerance to imidazolinone (Clearfield), triazine (TT) or glyphosate (RR). In the past 15 years, the area sown to hybrid canola has risen to an impressive 47 per cent in Australia. With glyphosate tolerant canola hybrids entering South Australia in 2021 and new hybrids coming to market, the hybrid percentage will increase further over coming years.

Kevin says that Pioneer Seeds have seen increasing demand for Clearfield canola in recent years following a dip in popularity. Through strategic application of herbicide tolerant traits in diverse crop rotations it seems that farmers are overcoming the resistance problems that were prevalent with the Clearfield technology and can now re-introduce these varieties and take advantage of the weed control benefits and high yields they offer, and manage herbicide residues in the soil.

"A diverse rotation of crops and pastures is one of the WeedSmart Big 6 tactics, which Pioneer Seeds endorses wholeheartedly to protect the longevity and effectiveness of herbicide tolerance traits," he says. "Through an effective crop rotation you can tick off all the herbicide and non-herbicide tactics needed to drive down weed numbers."

How do I make the most of a hybrid crop?

In brief: Employ best practice agronomy.

The details: Grain hybrids are vigorous plants that produce increased biomass and grain yield. To do this, they must be

AURORA
UNLOCK YOUR PROCESS POTENTIAL

Let's prepare your **product for market**

From single units through to fully automated packing lines
GRAIN — SEED — STOCKFEED — CEREALS

BAG & SACK FILLING
& CLOSING EQUIPMENT

ROBOTIC PALLETIZING
& WRAPPING

PACKING
CONSUMABLES
& EQUIPMENT
SERVICING

Arrange a site visit rural or city today:

1800 318 019

aurora-process.com

New glyphosate tolerance traits (Truflex and Optimum GLY) and the stacking of herbicide tolerance traits of triazine tolerant and Clearfield (TT+CL) have expanded the safe window for herbicide application in canola.

supported with adequate crop nutrition. When properly fed, hybrids will provide increased crop competition and achieve greater water use efficiency compared to their conventional counterparts.

Growing a hybrid crop with herbicide tolerance traits does not equate to a full weed control program. These crops must be used within the WeedSmart Big 6 framework, within a diverse crop rotation and using herbicide tactics such as double knocking alongside cultural practices such as harvest weed seed control and crop competition to reduce seed set. They also combine well with pre-emergent herbicides to achieve excellent early weed control and suppress seed set in any late germinating weeds.

Can I use hybrid crops with herbicide tolerance to fix a weed blow-out?

In brief: No. This technology is not suitable for salvage operations.

The details: When Roundup Ready canola varieties were first released there was an expectation that these traits could be used to reverse a weed infestation. This proved not to be the case.

Hybrid crops are best used in low weed density situations where they can effectively drive down the weed seedbank. They should be grown in rotations that include an effective double-break, brown manure crop or a pasture phase.

Having hybrid crop options for both summer and winter growing seasons increases the opportunities to tackle weeds throughout the year or to use different fallow herbicides while maintaining the ability to safely grow crops in the following season.

Are residues in grain a concern when using stacked trait herbicide tolerant hybrids?

In brief: Not if the stewardship program is followed.

The details: New glyphosate tolerance traits (Truflex and Optimum GLY) and the stacking of herbicide tolerance traits of triazine tolerant and Clearfield (TT+CL) have expanded the safe window for herbicide application in canola. This gives more options, more flexibility and more crop safety through the rotation.

The stewardship program for the herbicide tolerant trait hybrids describe herbicide use patterns that growers must follow to confidently avoid the accumulation of herbicide residue in the grain and ensure that Australian maximum residue limits (MRLs) will not be exceeded.

To avoid problems with crop safety within the rotation it is important to maintain accurate paddock records to avoid applying herbicide to the wrong crop variety and ensure susceptible crops are not sown into paddocks with herbicide residues in the soil.

On the flip-side, herbicide tolerance in crops increases the options for crop selection within the rotation.

Also, keep in mind the importance of controlling any volunteers from a herbicide tolerant crop in the summer fallow or following crop. ■

HOW TO ASK A WEEDSMART QUESTION

Ask your questions about using seed trait technology 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.

A devil of a time tackling ryegrass in Tasmania

THE wettest April in 60 years is likely to cause growers in Tasmania's high rainfall zone some unique challenges when it comes to controlling annual ryegrass – the Australian grain industry's #1 weed.

Blow-outs are mostly in wet years and in paddocks with other underlying issues where ryegrass can take advantage of any gaps or areas of lower crop vigour. Many growers are finding that ryegrass is particularly difficult to manage in winter cereal and canola crops where the long cool season allows multiple germinations of ryegrass and the wet conditions reduce the residual benefits of pre-emergent herbicides.

WeedSmart southern agronomist Greg Condon says creative farmers and agronomists are addressing the problem head on and finding ways to implement the WeedSmart Big 6 weed management tools to stop seed set and drive down weed numbers.

"Farmers need to operate in a low-weed environment so they have more options in their crop and livestock decisions," says Greg. "The principles of crop diversity, crop competition and mixing and rotating herbicide modes of action are central to keeping farming systems profitable."

"The creativity comes in with the problem-solving process needed to apply these principles in challenging environments. The practices that have been developed in other high rainfall zones do not always apply directly to the Tasmanian farming systems."

Growers and agronomists can use the WeedSmart Big 6 to keep ryegrass numbers under control while maintaining maximum flexibility in their cropping program. Greg says all the tactics will work in the Tasmanian high rainfall zone, with the exception of harvest weed seed control.

"Growers in the region have a distinct advantage when it comes to diversity in their farming system and this needs to drive the use of different weed control methods to keep the weeds guessing – using both herbicide and non-herbicide tools," he says.

"Unfortunately, harvest weed seed control is far less effective in the Tasmanian cropping zones than it is in other high rainfall zones," he says. "This is because a large percentage of the ryegrass that germinates in the crop will shed its seed before harvest. Some growers may still find value in this tactic to collect the seed from the later cohorts of the weed but it just isn't as cost-effective as it is in other areas."

War on weeds

Even without harvest weed seed control as a mainstay option, growers can still implement a three or four year 'war on weeds' program to drive down the ryegrass seed bank.

"To start with, tactics such as spring cropping, fodder crops and triple break crops can be used to maximise the efficacy of available herbicides and reduce ryegrass germinations," says Greg.

"When it comes to herbicides it is critical that a plan is put in place to mix and rotate herbicides across the whole crop sequence," he says. "In-crop herbicides are scarce and products like clethodim are registered for use in many crops so it is easy to keep using it, but we know that quickly leads to resistance problems."

Having diversity of crops in the system only helps with weed control if it is used as a way to rotate chemistry. Testing the weeds for their susceptibility to single products and mixes of herbicides allows growers to plan ahead with more confidence. Double knocking each herbicide application preserves the available chemistry, particularly glyphosate.

Growers can also take advantage of ryegrass' poor competitive ability. When placed in a competitive environment, ryegrass sets

Diversity in cropping and livestock operations needs to result in diverse weed control tactics. (PHOTO: Southern Farming Systems)

Cutting weedy areas of the crop for hay is a highly effective tactic that can reduce the impact of a weed blow-out.
(PHOTO: Southern Farming Systems)

less seed, reducing the pressure of this weed on farming system decisions.

"Crop agronomy has a major impact on competitiveness," says Greg. "The choice of crop, solid plant establishment, sowing early with a robust pre-emergent herbicide and attending to any soil constraints all swing the advantage toward the crop and away from the weeds."

Role of fodder crops and livestock

The final tactic that growers can implement is stopping weed seed set using hay and silage, crop-topping in canola or spraying under the cutter bar when swathing, or using camera-guided shielded sprayer technology to target weeds growing in the inter-row.

Ian Herbert, Southern Farming Systems' Tasmanian Projects and Trials Manager says fodder crops and livestock play a critical role in managing ryegrass on many Tasmanian farms.

"Growers can plant fodder crops directly after grain harvest, graze these fodder crops through winter, while allowing multiple germinations of ryegrass to occur, and then remove these plants using broad spectrum herbicides and or cultivation prior to planting a grain crop in spring," he says. "This tactic reduces the pressure on selective herbicides and changes the timing of when ryegrass is controlled, compared to years where the paddock is in a cereal production phase. Cultivation is often needed to remove the deep pugging from livestock, which often occurs during our wet winters."

Livestock can play an important role in weed management and there are many options available to growers.
(PHOTO: Southern Farming Systems)

Making the most of existing chemistry

Michael Chilvers is one grower who is embracing an integrated approach to managing ryegrass on his 1200 hectare farm south of Launceston, where he runs a diverse cropping enterprise of around 300 hectares of grain production along with intensive lucerne hay, potato and hybrid seed production.

Michael says the exceptionally wet autumn across much of the high rainfall zone, and particularly in their region, is going to put heavy pressure on the pre-emergent herbicides applied at planting.

"Incorporation of pre-em herbicides is critical and often not easy to achieve," he says. "Unfortunately, the newly released pre-em products are probably not going to be an option for us in very wet seasons so we need to focus on getting the most out of the existing products."

Michael is also very aware of the heavy reliance on Group A herbicides such as clethodim across his farming system and is doing what he can to rotate away from this key mode of action at every opportunity.

"Not only do we use it frequently, we also know that its efficacy can be compromised in our environment through a long cool growing season, which means we are running a real risk of losing it if we don't adopt a more diverse approach to managing ryegrass," he says.

For more information about WeedSmart visit the website:
www.weedsmart.org.au ■

WEED smart
every weed every seed every farm every year

ASK AN EXPERT –

WHAT ARE THE 'MIX AND ROTATE' OPTIONS FOR IN-CROP HERBICIDES?

With Jason Sabeeney, Technical Services Manager, Syngenta Australia

CHANCES are you have a suite of herbicides that are your 'go-to' products for weeds growing in-crop. Chances are you use them regularly because they work.

Jason Sabeeney, Technical Services Manager at Syngenta Australia is challenging growers and advisors to consider breaking established patterns and to start using as many herbicide modes of action as possible in their weed control program, at least on part of the farm.

"There are many options available and many considerations when it comes to planning an effective in-crop herbicide program," he says. "The heavy reliance on mainly Group B and I herbicides for broadleaf weed control in cereals, and on Group A and B grass selectives, is putting great pressure on high resistance risk chemistry."

There are currently 46 approved herbicide active ingredients or mixes for broadleaf weed control in cereals, spanning seven herbicide modes of action (MOA). Almost three-quarters (34 out of 46) of these actives are from herbicide Groups B (e.g. SU herbicides) or I (e.g. phenoxy herbicides).

Instead of one application with one herbicide mode of action, Jason is urging growers and agronomists to employ multiple modes of action in-crop, apply herbicides at the optimal times and integrate non-chemical weed control methods that prevent weed seed set.

"Unfortunately, in-crop herbicide application frequently involves making compromises when it comes to efficacy and logistics," Jason says. "With large spray programs the temptation is to use wider gear and travel faster to get across the area as quickly as possible."

"There is also the temptation to minimise the number of passes by adding multiple products into each tank mix and to wait for a second or even third flush of weeds to emerge before spraying. These can be high risk practices that can compromise the efficacy of the herbicide treatments."

While understanding the constraints, Jason is recommending that growers and agronomists focus on maximum product efficacy and reducing the weed seedbank when making spray decisions. He says this approach will reduce the risk of weed blow-outs and slow the pace of herbicide resistance.

"The WeedSmart Big 6 includes a range of herbicide and non-herbicide tactics that can be implemented in-crop to minimise weed seed set. Mixing and rotating in-crop herbicides is just part of the bigger strategy," he says.

Can I just add more modes of action to the tank mix?

In brief: Not necessarily; but some herbicide mixes could be a very good option.

Jason Sabeeney, Technical Services Manager at Syngenta Australia is challenging growers and advisors to break established patterns and to start using as many herbicide modes of action as possible in their weed control program, at least on part of the farm.

Mixing and rotating herbicide modes of action in-crop is not as simple as just adding multiple herbicide modes of action to a tank mix. The products often need to be applied separately and with the aim of maximising weed control efficacy. (Photo: AHRI)

The details: Herbicide mixes of multiple modes of action can be useful to broaden the spectrum of weeds controlled and to assist with resistance management. If used in rotation with other herbicide options these products add to the diversity, increase overall weed control and reduce weed seed set.

The compatibility of herbicides, and other agricultural chemicals that might be added to the tank, such as insecticides, fungicides and trace elements, is not just about their physical compatibility. Conducting a jar test will show if the mix can be made without forming a glug or precipitate, but it doesn't tell you if the efficacy of the individual products is maintained, or if it is safe to the crop.

Using a proprietary mix or one that is recommended on the label takes out the guesswork because the mix has usually been thoroughly tested for biological compatibility, crop safety and weed efficacy within the prescribed use pattern.

Some mixes have an additive effect where each component improves the overall weed control, compared to using the products individually. Some are antagonistic, and when combined they reduce overall weed control compared to using the products individually. In rare cases, the combination produces a synergistic mix, where the combination delivers a result greater than the sum of their parts. Where this occurs, it should be exploited. A good example is a mix of Group H + Group C products. When combined these two modes of action deliver efficacy greater than the sum of their parts (true synergy) and are highly effective.

Do I need to treat broadleaf herbicide products differently?

In brief: Yes, understand the mode of action. Consider how each product works and the conditions and application parameters that maximise performance.

The details: Contact herbicides, for example mixes containing bromoxynil (Group C), carfentrazone (Group G) and diflufenican or picolinofen (Group F) are most effective when applied early in the season and onto small weeds (2 to 6 leaf stage). Contact herbicides rely on good weed coverage, which is best achieved before the crop canopy begins to shade the weeds. Light and temperature also play a significant role in activity of these products. These products are often combined with another mode of action like Group H, C, F or I to broaden the spectrum and or assist with coverage.

On the other hand, herbicides in Groups I and B are systemic, so whilst it is always best to target smaller weeds with good coverage, some of these products perform well even if sprayed later in the season and they are generally effective even on larger weeds.

What about using tank mixes for grass control?

In brief: The registered options for grass control post-emergent are primarily Group A and B herbicides, along with early post-emergent group J.

The details: Group A and B herbicides are generally very effective where there are still susceptible grass populations, but both have a high risk of evolving herbicide resistance. As a rule, Group A herbicides perform best when applied alone rather than mixed with broadleaf herbicide options. For example, a tank mix of Group A + some Group I herbicides is often antagonistic, resulting in a 10 to 30 per cent decrease in grass weed control compared to applying the Group A herbicide on its own.

For early post-emergent application, Boxer Gold (Groups J + K) can be tank mixed with broadleaf herbicides but it is generally accepted as suppressing, rather than controlling, grass weeds such as annual ryegrass.

The grass selective herbicides are very responsive to adjuvants and environmental factors. The recommended adjuvants will be listed on the label and it is important to follow these instructions to optimise efficacy. Whilst resistance is widespread to Group A and B chemistry in grass weeds, environmental conditions such as frost, waterlogging and drought can have a significant impact on performance of these herbicides, and resistance is sometimes mis-diagnosed as the cause of product failure.

Integrated weed management practices including non-herbicide tools, such as crop competition, harvest weed seed control and cutting for hay, are essential components in the grass weed control program, particularly in seasons where the pre-emergent herbicides don't perform to their full potential. ■

HOW TO ASK A WEEDSMART QUESTION

Ask your questions about mixing in-crop herbicides 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.

PAY LESS PAY LATER

THE 2020 SIMPLICITY EARLY ORDER PROGRAM IS RUNNING NOW

Simplicity Australia is offering huge factory discounts on our entire range of Air Seeders. With a tapering discount structure - the earlier you order, the more you save! Best of all, payment is not required until December 2020*. To find out more, visit our website or see your local Simplicity Dealer today.

As an added BONUS, every machine order received under the Early Order Program will receive a Limited Edition Simplicity Australia Leatherman Wave+ Multi-tool.

**Deposit required for placement of order. Conditions apply.*

BONUS

LEATHERMAN
Wave+ Multi-tool

Simplicity
AUSTRALIA

www.**simplicityaus**.com.au

Standard heat-stress test for wheat established

AGRICULTURAL scientists at the University of Sydney have developed a standard method to test how different wheat varieties cope with heat stress. Such a standard testing regime will become increasingly important, they say, as a changing climate impacts wheat cultivation worldwide.

Wheat is the most widely grown food crop in the world and supplies more plant-based protein for humans than any other source.

Lead author, Dr Rebecca Thistlethwaite from the Sydney Institute of Agriculture and School of Life and Environmental Sciences, said: "While much has been published on wheat responses to high temperature, the techniques that are often used to assess complex plant traits lack relevance to farming conditions or rely too heavily on a single screening strategy.

"For this reason, a three-tiered screening approach was developed and validated over a three-year period to screen large numbers of materials, primarily in the field."

The peer-reviewed study has been published in *Field Crops Research*.

Co-author Professor Richard Trethowan said: "Without reliable, repeatable and relevant ways of assessing plant response to high temperature we cannot provide farmers with the heat tolerant wheat cultivars so desperately needed in our increasingly variable environment."

Co-author Associate Professor Daniel Tan said: "In many heat experiments, the flowering stage was thought to be the most heat sensitive stage in wheat. Our work has shown that the meiosis stage of early cell division (where a single cell divides twice to produce four cells) is also extremely heat sensitive."

The methodology was effective in identifying genotypes with high and repeatable heat tolerance and will be beneficial to plant breeders globally.

For more information: *Field Crops Research*. ■

Dr Rebecca Thistlethwaite. (PHOTO: Kieran Shepherd)

Wheat plots being harvested at the Narrabri field site. (PHOTO: Kieran Shepherd)

Many wheat varieties have been screened for heat tolerance in field trials at Narrabri, northern NSW. (PHOTO: Kieran Shepherd)

Catcher of the rye: How sleuthing gluten just got easier

By Pamela Tyers, CSIRO

AROUND one per cent of the population are diagnosed with coeliac disease but it's estimated that around two per cent actually have the condition. Some people are gluten intolerant, which is a less well-defined condition. Other people avoid foods containing gluten for their own reasons.

Unfortunately, there is no cure to coeliac disease so strict avoidance is the only way to manage it. This is where the importance of accurate food labelling comes in.

The problem is that trace contamination of incoming raw ingredients with a gluten-containing grain can potentially happen. Current commercial tests can only tell that gluten is in a portion of food but not what grain it's from. The different detection kits available also give variable results of just how much gluten is present.

Detectives in search of gluten

Enter our protein analytics researchers. Our CSIRO scientists were the first to detect gluten proteins in all four of the gluten-containing grains.

- They detected the glutens specific to wheat (and its cousins like spelt and semolina) in 2015;
- Barley in 2016;
- Oats in 2018; and,
- Now in the less studied grain, rye.

Completing the spectrum with rye means we can detect any gluten protein, and which grain it comes from, in any food. This makes it easier for food companies to correctly label their products.

Protein analytics expert, Professor Michelle Colgrave and the team used high-resolution mass spectrometry. It analyses incredibly small fragments of each grain, to detect gluten in the rye. Existing methods are based on a different technology that tests for antibodies.

The researchers analysed 20 cultivars (plant varieties produced by selective breeding) of rye from 12 countries, which they milled into flour. They then extracted the gluten proteins with mass spectrometry to identify and quantify the proteins.

The analysis revealed six proteins specific to all rye varieties but not to any other grain.

Detecting gluten proteins in their original grain form is relatively simple. But when they're in food products we buy at the supermarket – which have been processed in a range of ways – it becomes a lot more complex.

Testing one, two, three

The team tested a range of commercial flours, breakfast cereals and snack foods. They detected the six rye proteins in all the foods that contained rye as a labelled ingredient. They found one sample of spelt flour that was contaminated with about two per cent rye. That in itself for a consumer probably isn't a problem because they'd know that spelt has gluten anyway. But for the manufacturer, it could indicate they had a contamination problem at a particular point in time.

They also found one breakfast cereal labelled gluten-free that contained trace amounts of rye, which did not appear on the ingredients list. This could be a problem for consumers expecting a gluten-free product as the pack says.

More confidence in gluten-free labelling

Now that we can detect any protein in food and beverage products, it will help companies ensure that what's on the pack is actually what's in the pack. And this will help customers to feel confident in gluten-free labelling.

The technology offers many applications for the food industry from helping track contamination in their raw ingredient supply chain, to improving product quality, food safety and meeting regulations.

The research has been recently published in the American Chemical Society's *Journal of Proteome Research*: Catcher of the Rye: Detection of Rye, a Gluten-Containing Grain, by LC–MS/MS. ■

CSIRO has found a way to detect gluten in rye – a first!

The research will help with labelling gluten-free products.

Looking for a low-gluten beer?

By Genelle Weule, ABC Science

LIKE many Australians, Justin Pedersen likes a good beer. But since cutting down on gluten four years ago, his beer drinking habits have changed. Before tasting any of his favourite beers, he uses a testing kit – akin to a pregnancy test – in search of a low-gluten option.

"There seems to be a huge variation in how much gluten is in some products," Justin said.

"They might look and taste the same, and yet one will contain a really high amount and I can't drink it, and the one right next to it will test as gluten-free on a test strip."

Justin is one of a growing number of Australians who avoid gluten or wheat. But is it really possible to avoid gluten if you drink beer? Do different types of beers have different levels of gluten? And how accurate are the tests?

Let's start with the grains

Barley and wheat – the main grains used in beer – contain a group of related proteins that cause inflammation, explains Michelle Colgrave of the CSIRO. Michelle's team at the CSIRO studies gluten levels in grains and developed a low-gluten variety of barley used in some beers.

"There could be up to 100 gluten proteins in wheat, probably 50 in barley," Michelle said.

In wheat, these proteins are known as gliadins and glutenins, while barley has a family of hordeins. Similar proteins are found in rye, spelt and oats.

"The proteins have different structures, they have different sizes, but they share some common features which make them resistant to digestion and which also trigger the coeliac response," Michelle said.

Coeliac disease is an autoimmune reaction to gluten that destroys the lining of the small intestine and causes inflammation in other organs. Around one per cent of Australians are diagnosed with coeliac disease and at least another one per cent have the disease, but are undiagnosed.

Testing by beer brewers may not pick up all the gluten in beer.

While these people need to stick to a strict gluten-free diet for life, up to 30 per cent of Australians are cutting down on gluten because of the belief it is healthier, Michelle said.

Just how much gluten a traditional beer contains depends upon the brewing process.

The basics of how beer is made

Standard beer is made out of four ingredients: barley or wheat, hops, water and yeast. The barley or wheat is soaked in water to start germination – a process called malting – then heated.

"The reason you malt the grain is to break down some of the starch and turn it into sugars," Michelle explained.

Malting helps develop flavour and style.

"If you want to make a pale beer like a lager, then the grain isn't heated as much during the malting process.

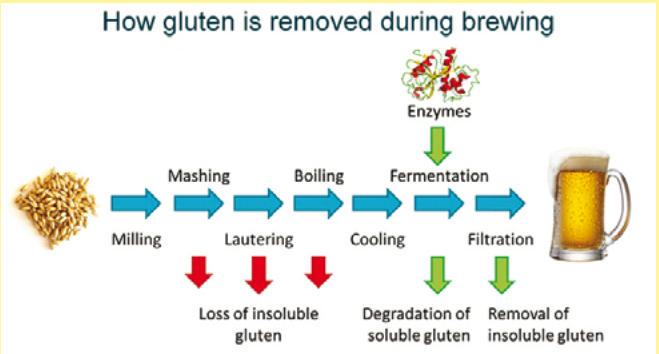
"Whereas if you're talking about a chocolate-like beer, more along the lines of your Guinnesses, they're made from what we call a dark chocolate malt."

The malted grain is then put into hot water where natural enzymes break down the starches. This process, known as mashing, produces a sugary syrup called wort. Hops, once used to preserve the brew, is added to drive flavour such as bitterness. The sugary wort is then boiled, cooled and strained in a process called lautering. Then it is placed in vats with yeast to ferment.

"Those sugars are the source that yeast uses to convert to alcohol and the CO_2 or gas that gives beer its fizz," Michelle said.

The final product is filtered and packaged ready for your enjoyment.

FIGURE 1: Red arrows show where gluten is reduced during the natural brewing process, and green arrows show where gluten is removed during the production of reduced or low gluten brews



Supplied: Michelle Colgrave, CSIRO.

Brewing breaks down gluten ... a bit

Along the way, gluten is reduced in beers through a number of steps (Figure 1). First, natural enzymes break down gluten into fragments during malting, mashing and lautering. Then, during heating and cooling, some of the protein rises to the top and can be removed by filtration, explained Michelle.

"So during a standard brewing process you will have up to 70 per cent reduction in gluten," she said.

In Germany, beer can only be made out of barley.

Gluten levels vary in different beers.

But there is no rule of thumb for which standard beers have lower gluten content.

"It will depend upon the style of brewing, the type of grain you started with, and many, many factors."

Some brewers also use sugar syrups or another grain to replace some of the barley, add more enzymes during fermentation to break down gluten faster, or filter using silica to remove more gluten to make low or reduced gluten brews.

Is my beer no gluten or low gluten?

This is where things start getting tricky. Australia and New Zealand have the tightest standards for the definition of gluten-free anywhere in the world, said gastroenterologist Jason Tye-Din of the Walter and Eliza Hall Institute.

In Australia, foods labelled "gluten-free" must contain no discernible levels of gluten, or be made of barley, wheat, rye or oats.

The only gluten-free beers available in Australia are made of pseudo grains such as buckwheat or gluten-free grains such as millet, sorghum, corn or rice. But if you're travelling overseas to the US, UK and Europe, products labelled gluten-free can contain up to 20 parts per million.

Jason said there had been discussions about bumping the Australian labelling standards up to the level used overseas but "there has been inadequate data to guide what really has been a safe threshold of gluten for people with coeliac disease".

Under the same standards, products labelled "low" or "reduced" gluten in Australia must contain less than 200 ppm – or 20 milligrams per 100 grams. But the safety of this level for people with coeliac disease is also up for debate.

The problem is, even though the tests used by manufacturers such as ELISA are very sensitive, they may not detect all the gluten in beer.

"They're good at measuring intact gluten, and they are specifically good at measuring intact wheat gluten," Michelle explained.

But they are not good at detecting protein that has been degraded into fragments by the brewing process.

What should a gluten-challenged beer lover do?

Michelle hasn't assessed home-based kits, but she suspects they will have the same limitations as the commercial tests.

"They do have the same type of technology, which is the antibodies that would be used in ELISA," she explained.

"I suspect it would also be unable to detect the small pieces.

"I would not recommend relying on any of the current tests that are available for measuring hydrolysed gluten – so that's beer, soya sauce or anything where you've got these fermentation processes."

Jason agreed, adding that the kits may be impractical to use and may not get reliable readings for many foods.

"A big issue is the need to adequately sample and then blend the food, and the effect of different food matrices on the sensitivity of gluten detection means the reliability will depend on the food product components being tested," Jason said.

Gluten affects different people in different ways. People with health conditions such as coeliac disease or gluten sensitivity should only make changes to their diet under medical supervision, Michelle advised.

"Use your medical practitioner so they can monitor any effects over time," she said.

"The effects may not be acute, you may not come down with the symptoms straight away, but there can be chronic issues.

"If you want to be 100 per cent safe and conservative, the best bet is to avoid the gluten-containing grains altogether."

This article was originally published on *ABC Science*. ■

COELIAC DISEASE Vs GLUTEN SENSITIVITY

- Coeliac disease affects around one in 70 Australians.
- It is an autoimmune condition that destroys the villi (pictured above) that line the small intestine. This affects the ability to absorb nutrients.
- It can cause vomiting, diarrhoea, anaemia, osteoporosis and inflammation of other body organs.
- Severity of symptoms vary from person to person. Some people can have symptoms after eating a tiny amount while others can eat a loaf of bread and not have symptoms but the gluten still affects their body.
- Correct diagnosis is essential.
- People with coeliac disease test positive to a blood antibody. A diagnosis is confirmed by a tissue biopsy. You must be still consuming gluten for these tests to be accurate.
- You can also be tested for a gene. Between 40 and 50 per cent of the Australian population test positive to this gene. All people with coeliac disease test positive to this gene, but not all people who test positive have coeliac disease.

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.

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 $200 per tonne sorghum prices, *Helicoverpa* thresholds are generally below 0.5 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 around Christmas 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.

Silo bags put to the test as a short-term, cost-effective storage solution

By South East Premium Wheat Growers' Association

At a glance…

- Grain silo bags have the proven advantage of providing a cheap, short-term storage solution to enable rapid harvest and avoid yield loss and quality degradation, especially in high yielding years.
- Like any grain storage system, bags need to be used properly with storage guidelines adhered to.
- A two-year project on the south east coast of Western Australia found that export barley stored within guidelines in the short term, showed negligible decline in germination energy or malting quality.

Silo bags provide efficient and effective storage for cereals, particularly in high-production regions that regularly experience quality damage and yield loss due to delays in harvest and exposure to inclement weather. But there have been concerns expressed by maltsters as to the impact that silo bags are perceived to have on the quality of barley (particularly germination).

Growers in the Esperance port zone region of WA have found that the seasonal benefits of silo bags very much outweigh the risks. Post-harvest seed cleaning and grading on farm as well as capturing freight cost and grain marketing peaks have been additional reasons for continuing to use them with few issues when managed well.

In southern coastal WA, mainly wheat, barley, and more recently some pulses have been stored for on average up to three months in bags. As growers have started planting more legumes, these have also been stored successfully sometimes up to twelve months in more recent years. By constant monitoring and using good quality bags, experienced silo bag users have reported minimal issues.

Testing grain quality in silo bags

A project undertaken by the South East Premium Wheat Growers' Association (SEPWA), Bagging Grain Profits – Technical Assessment of the use of Silo Bags in the WA Supply Chain, set out to test the quality of grain stored in bags over time.

The project monitored storage conditions (namely temperature and humidity) in the bags over time, as well as the grain moisture, germination, malting (through micro-malting) and brewing (pilot brewing) quality of barley that was stored in bags.

- Temperature of the grain within the silo bags was largely unaffected by diurnal fluctuations in ambient temperature (Figure 1), with temperatures inside the silo bags trending towards the average ambient temperature over time. As expected, temperature fluctuations were larger at shallower depths within the bag.
- Grain moisture (Figure 2), was largely unchanged over time or by sampling depth.
- Germination (%) was unaffected by silo bag storage, with grain samples taken prior to and after silo bag storage showing almost 100% germination (Table 1).
- Malt quality on barley correctly stored in bags for up to two months was also unaffected. Farmer practice on the south coast of WA is to store the barley for only a few months prior to delivering to CBH for export. The barley is tested as it goes

Silo bags are an alternative short-term storage option for wheat and malt barley to support harvest logistics if management guidelines are followed.

SEPWA

Department of Primary Industries and Regional Development, Melijinup Road, Esperance
PO Box 365 ESPERANCE WA 6450
Ph: 08 9083 1152
E: eo@sepwa.org.au – Web: www.sepwa.org.au

Executive Officer: Niki Curtis

Overview: SEPWA is a farmer initiated group that was started in 1993 to represent wheat growers in the Esperance Port Zone of Western Australia. The group currently has an active membership of around 340 farming entities which represents some of the most progressive growers in the region. This makes SEPWA one of the largest grower groups within WA.

The group was originally formed to address the perception that wheat from the south east of WA was of inferior quality to that of wheat from other regions. An energetic group of farmers, advisers and researchers set about assisting local growers to produce a premium quality product and to improve the marketing prospects of grain from the region.

SEPWA has moved on since this original aim but still strongly retains the production of premium grain as one of its major objectives. In more recent times, the group's interests have expanded into canola, grain legumes and break crops.

Today SEPWA's role is to improve profitability and sustainability of Esperance Port Zone grain growers.

Commercial sponsors:
Summit; Rabobank; CBH; Farm and General; Syngenta; Farm Weekly; BASF (Bayer); GrainGrowers; Esperance Freight Lines; RSM Bird Cameron; Farmanco; South East Petroleum & BP; Byfields; South Coast Insurance Brokers; NuSeed; Pacific Seeds (Advanta); Pioneer Seeds (GenTech); AGT; InterGrain; Seednet; Seedforce; Staines Esperance; Farmers Centre; and, AFGRI.

Table 1: Germination results of barley stored in bags showed no variation over time

	Initial sample (%)	Final sample (%)	Days in bag
Salmon Gums North	100	100	32
Salmon Gums West	100	100	74
Cascade	100	100	61
Munglinup	99	100	60

into the bags and then again on delivery. Barley that is destined for export markets needs to meet the minimum 98 per cent germination standard.

In March 2020, Barley Australia updated guidelines for malt barley stored in silo bags to raise concerns of using them for long periods, but as a short-term option they could be used to assist with harvest logistics.

Growers need to be aware that maintaining end use quality for malting barley is paramount to retaining its germination capacity in the malthouse and bags still pose a higher risk than other storage options. The process of making malt is dependent on live barley grain capable of vigorous germination.

So when storing barley for malt purposes, it is vital that optimum storage conditions are achieved.

To sum up

- Handling barley at harvest and avoiding delays is critical as viability of the grain must be maintained. Silo bags have been a proven tool in quality management for growers in high yielding years. The potential for a premium price and the possibility of lodging, head loss, grain swelling, colour staining, hardness and sprouting risk means malting barley should be harvested as soon as the crop is at the specified moisture content of below 12.5 per cent.
- A two-year trial to test the germination and temperature effects of storing grain in silo bags found that moisture and temperature conditions in bags remained stable and if stored in good condition, barley quality over time was stable.
- Barley Australia still cautions that bags are a risky option and they are to be used for short-term only, to minimise risks of germination vigour decline.

Useful resources: Grain Storage Fact Sheet; Successful Storage in Grain Bags, GRDC 2014 (Project PAD00001))

Barley Australia: *www.barleyaustralia.com.au/update-on-silo-bag-use-for-malting-barley-27-march-2020/* ■

Tinytags were used during the trials to monitor the temperatures outside and inside the silo bags.

Figure 1: Ambient (orange), shallow (30 cm depth, purple) and deep (1.2 m depth, blue) temperature readings over eight months from multiple grain bags at various sites across the Esperance port zone

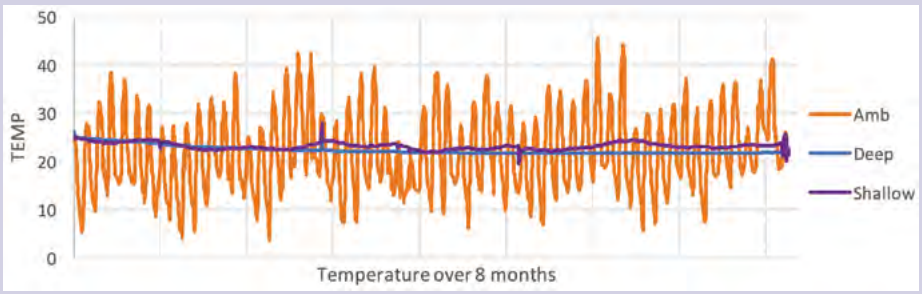


Figure 2: Moisture readings from grain sampled from shallow (30 cm depth, red) and deep (1.2 m depth, blue) depths within a grain bag at Salmon Gums showing little variation over time

Updated recommendations and further research

The findings from this research created vigorous debate within the Australian barley industry.

Following a presentation by SEPWA project officer, Aidan Sinnott at the Barley Technical Symposium in Perth in September 2019, Barley Australia updated recommendations in March 2020.

The recommendations now state that bags can be a useful tool for supporting harvest logistics and maintaining quality through rapid harvest storage, especially in coastal areas prone to wet spring conditions.

Further research

As most growers in Western Australia use bags for short to medium term storage, this project only investigated grain stored for less than eight months – and mostly only three months.

Additional research could be done to further explore the thresholds (upper limits of moisture content, storage time, temperature etc) for bag storage of barley and other grains in varying climates. These thresholds could be tested in comparison to grower best practice – the technique which was used in this research.

SEPWA also proposes further studies be done on the correct disposal of grainbags as this is still an issue for many growers. The local shires are unable to accept bags for disposal or recycling and recommends they are wrapped and stored on-farm until a solution is found.

The mail order tractor

By Ian M. Johnston

The other day I traipsed into town and entered the post office, where I collected a parcel containing a new toner cartridge for the computer printer. I had ordered it 'on line.' Buying goods 'on line' is of course, in these modern times, considered a normal alternative method of shopping.

But in actual fact, the habit of sending away for a product is not a recent occurrence. Indeed, more than a century before the advent of the Internet, farmers routinely purchased items by 'mail-order,' simply by posting a letter to any one of the multitude of mail-order firms, many of which had been in existence since the 19th century.

Sears Roebuck

The world's largest and by far the best known mail-order firm, was the Chicago based Sears Roebuck & Company.

Richard Warren Sears was born in Minnesota in the year 1863. In 1886 he opened a business which he named R.W. Sears Watch Company and engaged a watch repair technician named Alvah C. Roebuck. The following year, the two formed a partnership and created the mail-order firm of Sears Roebuck & Company, initially specialising in the sales of watches and jewellery. This was shortly expanded to include a vast range of products aimed specifically at rural families, many of whom resided many miles from towns and shops.

The company prospered and by 1895 their catalogue, regularly mailed out to thousands of farmers throughout North America, contained a staggering 532 pages. They claimed to be "The cheapest supply house on Earth" and offered items ranging from "sewing needles to anchors, cotton reels to wedding dresses, toy dolls to kitchen stoves – and everything in between". They even listed two storey homesteads, "which only require nailing together."

Over the ensuing years the company went from strength to strength. A range of farm implements was included, to which they gave the brand name of Graham Bradley. But in the 1930s, the period when farm tractors were rapidly replacing teams of horses and mules, the marketing executives realised to their consternation, that they had neglected this expanding tractor segment of the rural market. In other words – they were missing out. Urgent action was required!

The art deco design of the 1938 Graham Paige 'Spirit of Motion' was considered too advanced for the American car buying public. (Photo IMJ archives)

Graham Paige

In 1921 a family of three Paige brothers commenced building motor trucks in Evansville, Indiana, for the Dodge Motor Company of Detroit. In 1926 the brothers sold their interest to Dodge, and with the proceeds they purchased the Detroit Motor Car Company and changed its name to Graham Paige Motors Inc.

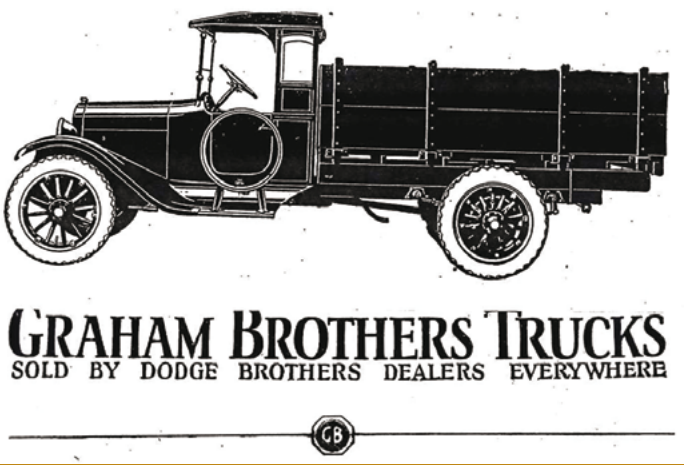
Various models of Graham Paige cars were successfully sold around the world, until in the 1930s, fierce competition from Ford, General Motors, Chrysler and others, encouraged Graham Paige to introduce into their range a radical new body style which they named Spirit of Motion. It was assumed the new vehicle would stimulate the sagging sales. But the art deco design failed to enthuse the car buying public and the firm's fortunes further declined.

At around this period, the board of Graham Paige was approached by Sears Roebuck who, knowing the car manufacturer's financial problems, suggested its engineering team design and manufacture a tractor, for exclusive sale by Sears.

The boffins went to work and in 1937 Sears Roebuck proudly announced the latest addition to their voluminous mail-order catalogue – The Graham Bradley farm tractor!

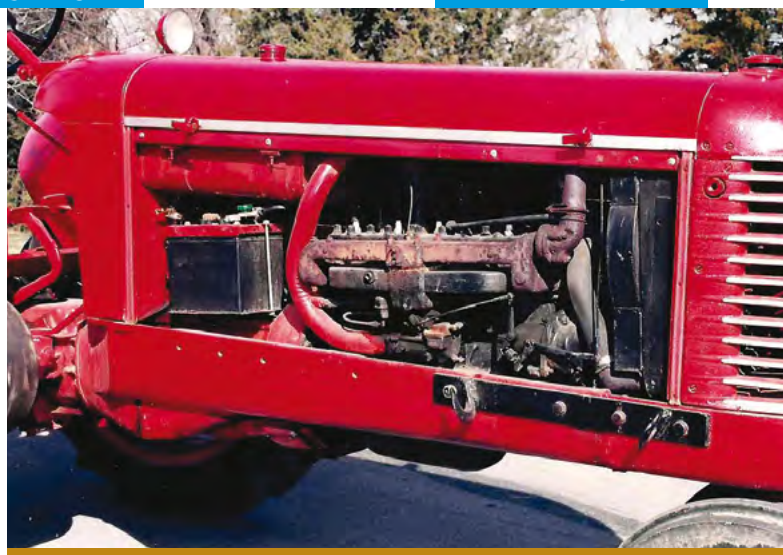
The mail order tractor

The introduction of the Graham Bradley confounded the established traditional tractor manufacturers. Here was a mail-order firm and a declining car company that in a mere two years could design and have in production a tractor that was rated by agricultural journalists as being the equivalent of the very best on offer.



1925 Graham Brothers two ton truck. (IMJ archives)

1938 Graham Bradley Row Crop Tricycle tractor. Restored by Vern Anderson of Lincoln Nebraska. (Photo IMJ)



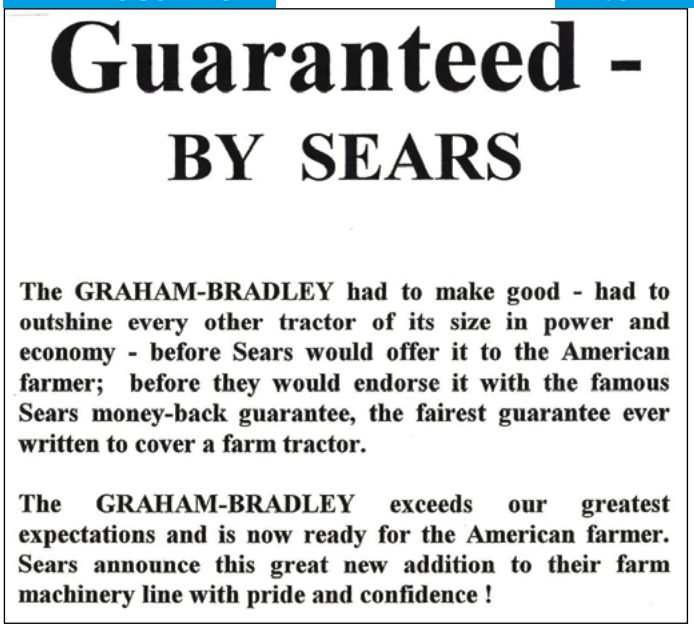
Continental six cylinder side valve 217 cubic inch engine mounted in Vern Anderson's Graham Bradley. (Photo IMJ)

While the efficiency of a farm tractor should not be judged by its handsome appearance, there is no doubt that aesthetically the Graham Bradley eclipsed the styling being offered by the majority of other manufacturers. But its beauty was not just skin deep!

The tractor was powered by a 32 hp Graham Paige six cylinder side valve engine, governed to a relaxed 1400 rpm enabling a three furrow 12 inch mouldboard plough to be handled with ease.

The transmission provided four forward speeds, including a transport speed of 22 mph. This was an important feature, as many Mid West farmers used their tractors to tow trailers laden with produce to adjacent towns. The cost of registering a tractor for road use was $8, significantly less than the $60 registration costs of a motor truck.

Only a light pedal pressure was required to operate the single plate semi-centrifugal Velvet Grip clutch. A centrally positioned pto shaft, swinging drawbar, fore and aft lights and a comprehensive instrument panel were all standard features. An added innovation was the side mounted belt pulley attached to



1938 Sears and Roebuck advertisement. (IMJ archives)

the gearbox. This enabled four forward and one reverse pulley speeds which, by adjusting the engine revolutions, could result in considerable fuel savings, dependent on the pulley work involved. A tricycle row crop version was also offered.

From late 1938, Graham Bradley tractors were fitted with a greater capacity engine than the original Graham Paige unit. The replacement engine was a Continental 217 cubic inch six cylinder, with similar horepower ratings but a higher torque backup, providing more lugging ability.

Facts

It is often difficult for a modern farmer, used to high horsepower, high tech implements, computerised navigation and air conditioned comfort, to relate to the worthiness of these grand old classic tractors. But, as in the case of the Graham Bradley, it is essential to remember we are evaluating technology that was inspired more than eight decades ago. Machines that were designed before computers had even been contemplated. An era when TV, and jet aircraft were only a dream. A time when flying to the moon was a wistful fantasy confined to the pages of children's comic books.

Therefore, when put into perspective, these early tractors were outstanding achievements. Certainly, when the Graham Bradley figure of 32 hp is considered, it may seem ridiculous to imagine how a tractor with such a meagre power output was capable of tilling soil, when today a 32 hp tractor would relate to a light-weight grass cutting machine.

The answer to the foregoing is the fact that the unit weighed a respectable 4955 pounds (around 2.25 tonnes). The common practise of adding water ballast within the tyres, plus counterweights, served to increase considerably the overall operating weight.

Accordingly, the tractor was able to obtain a maximum traction effort while operating on an average tilth, returning a mere 5.25 per cent wheel spin. (This degree of wheel spin created by an operating tractor is indiscernible to the human eye).

When submitted to the Nebraska Test in April 1938 (no. 296), the Graham Bradley returned a drawbar pull figure of 3013 pounds (1.4 tonnes) at 2.77 mph (4.45 kph), which is impressive for a 32 hp tractor!

Remarkably, Sears Roebuck offered Graham Bradley buyers an unprecedented money back guarantee – unique in the tractor industry.

Tailpiece

A few years ago, while on a fact finding mission to the United States, I had the distinct pleasure of being invited to put a Graham Bradley through its paces on a Nebraskan farm. Quite frankly my immediate impression came as a surprise!

Being accustomed to the somewhat rugged, unrefined and manually challenging controls of the majority of old tractors, I found driving the Graham Bradley more akin to sitting at the console of perhaps a Humber Pullman, or maybe a Daimler Majestic. The steering, the gear changes, the clutch action were all as smooth as velvet! It was a joy to drive.

There is no doubt, the designers at the Graham Paige factory, from an operator's perspective, had created a truly sublime tractor. ■

IAN'S MYSTERY TRACTOR QUIZ

Question: Can you identify this hard working dozer?

Degree of difficulty: As easy as boiling an egg – providing you can!

Clue: It is NOT a Caterpillar. Look at the chimney!

Answer: See page 48.

NORTHERN FOCUS
COVERING NORTHERN NSW & QUEENSLAND

Extent of herbicide resistance in summer weeds revealed

THE first multi-species herbicide resistance survey conducted in the northern grain growing regions of NSW and Queensland has shown that while resistance to key herbicides is prevalent, growers are keeping weed numbers low, for now.

Rising resistance to glyphosate has been clearly demonstrated but this key herbicide can continue to be a highly effective tool for weed control, provided growers and agronomists implement a variety of tactics, such as the double knock, mixing and rotating herbicides and seed bank management, as a matter of urgency.

With GRDC investment, Dr Adam Jalaludin, Department of Agriculture and Fisheries, Queensland and Dr John Broster, Charles Sturt University NSW led their respective teams through the process of testing samples and analysing the results for weed seed collected throughout the northern cropping region in 2016 and 2017.

Weed seed samples were collected from 440 paddocks across northern NSW (244) and Queensland (196). The seeds were sown in controlled conditions and when the plants reached the three to five leaf stage they were tested for resistance to a range of herbicides. While collecting weed seed samples the researchers also assessed the weed density in each surveyed paddock.

The summer weed species collected across the northern region and screened in Queensland included sowthistle, fleabane, awnless barnyard grass, feathertop Rhodes grass, windmill grass and liverseed grass.

Of these predominantly summer-active species, only sowthistle, awnless barnyard grass and liverseed grass are listed on the label as being controlled by glyphosate alone. There is no label claim that the other three species – fleabane, feathertop Rhodes grass and windmill grass, will be controlled at the registered label rates of glyphosate (729 g active ingredient per hectare).

Adam Jalaludin collecting weed seed to be screened for herbicide resistance in the first multi-species weed survey in the northern grains region.

Herbicide susceptibility testing is recommended as the first step in addressing patches of resistant weeds.

"Not surprisingly, all fleabane populations collected failed the glyphosate test," says Adam. "Interestingly, 32 per cent of the feathertop Rhodes grass populations and 42 per cent of the windmill grass populations were actually susceptible to glyphosate."

"Of concern was that 36 per cent of awnless barnyard grass populations and 14 per cent of the sowthistle populations were resistant to glyphosate.

"In this survey we detected evolved resistance to haloxyfop in feathertop Rhodes grass and to imazapic in windmill grass, albeit at a low frequency."

Glyphosate resistance is certainly entrenched in the northern region, and for sowthistle is much worse than in other areas of Australia. The good news is that weed density is relatively low and there is susceptibility to other herbicides.

"It is essential that an integrated approach is taken to manage these key weeds in summer crops and fallow," said Adam. "An increasing number of weeds from a range of species are surviving glyphosate treatment, giving a clear indication that over-reliance on this herbicide is unsustainable.

"Herbicide testing is a good place to start to identify which herbicides provide the best control. Herbicide applications should be supported with as many other WeedSmart tactics as possible and any survivors removed."

To sum up

- The populations of viable sowthistle seed were screened with glyphosate, 2,4-D amine, Velocity and chlorsulfuron. Glyphosate and cholsulfuron provided poor control while all populations were susceptible to 2,4-D amine and Velocity.
- Fleabane populations across the northern region were screened with glyphosate and 2, 4-D amine. All fleabane populations tested survived treatment with glyphosate while no sample survived the application of 2,4-D amine.

Fleabane weed seeds were collected during the northern region multi-species resistance survey and tested for susceptibility to a range of herbicides. This photo shows two fleabane populations one week after spraying with glyphosate. The susceptible control population is on the right, resistant fleabane weeds on the left.

- Screening of the feathertop Rhodes grass populations revealed 68 per cent were not controlled by glyphosate. One population survived treatment with haloxyfop, while all populations were controlled with clethodim.
- Thirty-six per cent of the awnless barnyard grass populations collected across the Northern region were resistant to glyphosate. Fortunately, all populations were susceptible to propaquizafop, clethodim and imazapic.
- Most of the windmill grass populations sampled in the survey were found in NSW. Screening showed that more than half (58 per cent) of the populations were not controlled with glyphosate. Similarly, 40 per cent of the populations survived imazapic treatment. All populations were totally controlled by propaquizafop and clethodim.
- The screening of the few viable liverseed grass populations collected across the northern region did not reveal any evolved herbicide resistance.

Weeds collected in this survey were screened against several herbicides for which there are no label claims for some species. In field conditions, these weeds are often subject to exposure to a range of herbicides, which may be observed to have some activity. It is illegal to apply herbicides in any way contrary to the label and the results from this research are not a recommendation of use.

For more information about WeedSmart visit the website *www.weedsmart.org.au*

■

Controlling feathertop Rhodes grass the economical way

WITH blanket applications of effective herbicides to control feathertop Rhodes grass (FTR) being cost prohibitive, spot spraying technology always was going to prove a logical step for Darling Downs producer Shane Peters.

Shane and his wife, Tabitha, together with their three children, farm 670 hectares of mainly black soils between Toowoomba and Warwick in southern Queensland, including their 'Ackmer' property as well as leased and share-farmed land.

Over 460 hectares, they grow predominantly summer crops of corn and sorghum, although recent drier seasons have impacted the corn production area. Winter crops include mainly barley and some wheat and chickpeas.

The remaining grass country accommodates Droughtmaster breeders running with Angus bulls.

Shane said FTR can become a problem following germinations from late spring.

"If you don't get on to it quick, it gets up and is a huge problem," Shane said.

He said FTR through the area was resistant to glyphosate and other effective herbicides against the weed can cost around $100 per hectare.

"You couldn't do a blanket spray with the other products. You would have to look at other strategies like cultivation," says Shane.

This prompted Shane to invest in the new WeedSeeker 2

Darling Downs farmers Tabitha and Shane Peters with the new WeedSeeker 2 spot spraying system installed on their older, three-point linkage, 24-metre Hardi boomspray at their 'Ackmer' property between Toowoomba and Warwick in Queensland.

Valor Brings Flexibility to Summer Weed Control

Valor® herbicides residual uses in fallow and prior to planting summer crops offers outstanding flexibility in crops grown and boosts efforts in combating herbicide resistance.

Valor herbicide is becoming very well known for its effective pre-emergent (residual) control of a broad range of problem weeds in fallow and prior to planting summer crops. Valor offers excellent residual control (8 weeks +) of problem weeds such as Barnyard Grass, Feathertop Rhodes Grass, Fleabane and Milk Thistle – even against glyphosate resistant strains. Valor is also known for its ability to boost the knockdown weed control of non-selective herbicides when used at lower spike rates.

Maize, Navy Beans, Field Peas and Chickpeas, only require a short plant-back period and just 15mm of rain prior to planting.

This is in great contrast to some other residual herbicides which can literally tie-up farming country for years, locking growers into growing only a narrow set of crops over an extended period (until rainfall and lengthy time requirements have been met). Valor is a Godsend in this regard, allowing growers the flexibility to grow a wide mix of crops whether they are coming out of drought conditions or not.

Summary of the Residual Uses for Valor Herbicide:

- **AT PLANTING**
  Peanuts and Soybean. Pre-plant (280g) or PSPE (210g)
- **1 MONTH PRE–SOWING**
  Pigeon Pea , Maize, Sorghum and Navy Bean (210–280g)
- **2 MONTH PRE-SOWING**
  Cotton, Sunflower and Mungbeans (210–280g)
- **CHANNEL BANKS**
  (560–700g)

Significantly, Valor can be used one month prior to sowing several summer crops including Sorghum. With no new herbicide modes of action being registered in Sorghum for many years, Sumitomo see this as filling a key need for Sorghum growers. The ability to apply Valor at high residual rates up to 1 month prior to sowing Sorghum offers growers a residual chemistry group that can keep country clean leading into sowing and well into the emerged crop. This reduces the need to continually rely on older options like Atrazine and metolochlor.

Sorghum planted minimum till at Pittsworth Qld into country with a history of heavy Feathertop Rhodes Grass. Valor was applied at 280g/ha pre-sowing. The photo shows excellent level of residual weed control carried well into the emerged crop.

Sumitomo agrosolutions point out there are no other Group G (PPO mode of action) herbicides registered for this residual use in fallow and prior to summer crops and there is no recorded resistance in Australia to Group G herbicides, making Valor an excellent option for resistance management.

With the steady increase in herbicide resistance in mixed cropping areas and the need for more flexible weed control strategies, growers and agronomists have a highly flexible and effective tool at their disposal with Valor. Ticking all the key boxes for mixed cropping systems, Valor offers:

- The ability to be used prior to a large range of crops;
- It has short and flexible re-cropping intervals (prior to summer and winter crops);
- It controls key problem weeds; and,
- Controls weeds resistant to other herbicides.

Valor's short plant backs to most summer crops makes it a highly convenient choice given the drought conditions many growers have experienced in recent years and the need for flexibility in crop choices that have occurred as a result. Valor's short plant-back requirements enable growers to respond quickly to opportunities including salvaging failed crops and being able to quickly plant alternate crops where needed.

As seen above, no plant-back period is required for Soybeans, Faba Beans and Peanuts while other crops such as Cotton, Sorghum,

Conserving moisture is critical any time of the year and a product like Valor that can help remove weed pressure in fallow – but also offer carryover residual protection into the emerging crop – is a valuable option for growers. This value is especially evident when Valor's lack of any highly restrictive long plant-backs, and its strong fit within herbicide resistance management strategies, are recognised.

Valor also has excellent credentials with respect to soil health, being proven to have minimal affect on beneficial soil biology, particularly mycorrhizae which is so beneficial to most summer crops like Sorghum, Mungbeans, Corn and Cotton. Growers considering inoculating their crop with a mycorrhizae inoculant such as EndoFuse this summer or their beans with a rhizobium inoculant, can be confident that Valor has no negative impact with these organisms.

Sumitomo encourages growers to try Valor this coming season so they can see how effective it is for increasing their cropping flexibility while managing resistance and ultimately improving the returns from their farming operations.

FOR MORE INFORMATION:

Jock LEYS Business Development Manager
SUMITOMO CHEMICAL AUSTRALIA PTY LTD
+02 8752 9011 0427 536 187 02 8752 9099
jock.leys@sumitomo-chem.com.au

VALOR® 500 WG HERBICIDE

RESIDUAL AND BURNDOWN CONTROL WITH FLEXIBILITY

- Reduced growth competition coupled with short re-cropping cycles gives growers more control over their crops.
- Removes weed pressure in fallow and the need for multiple sprays.
- More options, less sprays.

VALOR COTTON CONSCIOUS

SUMITOMO CHEMICAL
AgroSolutions Division

Scan here to see more information about Valor 500WG Herbicide

www.sumitomo-chem.com.au

The Hardi boomspray was sitting idle on the farm, but is now set up permanently for spot spraying applications. The WeedSeeker 2 sensors were installed over two planter widths (15 metres) to suit the family's tramline farming system, but Shane is keen to extend it to three planter widths.

spot spraying system from Trimble last year, purchased through Anthony Morgan at the Dalby branch of McIntosh and Son.

"After a decent rain to get a good flush of weeds, we do a blanket spray of Roundup, but the feathertop laughs at it, so we now come back after four weeks, and again later if necessary, with the WeedSeeker to clean it up," Shane said.

First foray into spot spraying

He said it was his first foray into the technology and he was targeting the chemical savings achieved by spot spraying.

"We did some sums and think it will pay for itself pretty quickly – maybe in four years."

"We've done the whole farm twice and the feathertop was only about 4 per cent, and the second time we sprayed about 10 per cent."

Shane first viewed the WeedSeeker 2 at AgQuip field days at Gunnedah and liked the look and layout of the system.

At Anthony's invitation, he later attended a demonstration of the system at Narrabri in New South Wales held by national distributor, McIntosh Distribution.

Anthony later coordinated a demonstration on Shane's property for the local Clifton Allora Top Crop Group.

The Peters' WeedSeeker 2 system was installed on an older, three-point linkage, 24-metre Hardi boomspray that was sitting idle on the farm, but which is now set up permanently for the spot spraying applications.

The WeedSeeker 2 sensors were installed over two planter widths (15 metre) to suit the family's tramline farming system, but Shane said he would be keen to extend it to three planter widths. They use a 7.2 metre planter on 2.4 metre wheel centres.

Shane said the ability to immediately "plug and play" with the system through the existing ISO display due to its ISOBUS compatibility was a great benefit with the WeedSeeker 2.

He said the sensors were light and simple and could operate at variable boom height, which was a bonus in their undulating country.

The WeedSeeker 2 sensors are 50 per cent lighter than their predecessor, helping to reduce the overall weight of the system on spray booms, while their spacing along booms has widened from 38 to 50 cm, effectively reducing sensor numbers by 30 per cent. The lighter sensors also allow the system to be used on wider platforms.

Double the resolution

Compared with other similar products that have sensors spaced at every metre along booms, the 50 cm spacing provides for double the resolution when targeting weeds, which is especially valuable in situations with heavy stubble burdens.

Shane said the automatic calibration with the intelligent, self-learning WeedSeeker 2 sensors was a major benefit, constantly adjusting to the environment they work in.

"They are recalibrating all the time. You can have a header track or a blocked row and it will recalibrate that one spot."

Section control and turn compensation are other popular features and, in addition to typical rate control and steering functions, the system also provides weed mapping, which pinpoints where and when weeds are treated in paddocks.

"I have been keeping the weed mapping in the back of my mind and thinking about applying pre-emergent (herbicides) in the problem weed areas," Shane said. ■

Developing a spray drift hazard alert and warning system

MINIMISING spray drift is a high priority for Australian agriculture and now two leading research organisations are calling for expressions of interest for the implementation of a hazardous weather warning system which will utilise remote sensing technology to provide real-time weather data to grain and cotton growers.

The Grains Research and Development Corporation (GRDC) and the Cotton Research and Development Corporation (CRDC) wish to partner with interested third parties to develop and deploy a Spray Drift Hazard Alert and Warning System for use in New South Wales and Queensland with potential to expand to other states and industries.

GRDC Manager Chemical Regulation Gordon Cumming said the aim of the investment was to create a system to improve on-farm decision making, by accurately identifying and predicting hazardous spray conditions.

"Reducing the risk of spray drift is imperative for social, environmental and financial reasons for Australian agriculture and the wider community," Gordon said.

"GRDC and CRDC are committed to investing in research to improve on-farm practices, the sustainability of agriculture and more specifically the enduring profitability of Australian growers."

Gordon said current regulations provided strict guidelines for the application of agricultural chemicals and did not permit spraying when hazardous surface temperature inversions were present.

In an inversion, chemical droplets can remain suspended in the inversion layer in concentrated form and be carried significant distances.

"Inversions are present most nights for different lengths of time, which can severely limit spray opportunities. This is a particular concern during summer when spraying during daylight is often compromised due to high temperatures or plants experiencing moisture stress," Gordon said.

"Until recently there has been no reliable and accurate method to determine when inversion conditions are hazardous for agricultural spraying."

Predicting hazardous inversions

This collaborative, new investment will build on research by the GRDC, CRDC and the West Australian Department of Primary Industries and Regional Development (DPIRD) that investigated the effect of near-surface temperature on spray operations and produced methodology and algorithms which allow accurate predictions of hazardous inversion conditions.

CRDC Executive Director Ian Taylor said the expression of interest (EOI) represented the next step in the process of improving spray drift hazard detection by creating an effective warning system for growers.

"Spray drift is a significant issue for agriculture and this investment represents a vital cross industry collaboration to improve information and outcomes at a farm level," Ian said.

The EOI seeks proposals for the building of a tower network, and the development of software with remote sensing capability to provide information back to grain and cotton growers and spray contractors about weather conditions.

"This work involves establishing, operating and maintaining a network of Profiling Automatic Weather Stations (PAWS), initially across the grain and cotton regions of Queensland and New South Wales, with the potential to expand nationally," Gordon said.

"Once developed and deployed this spray drift hazard alert and warning system will consist of PAWS which collect and process local weather data and provide accurate real time information as well as short-term forecasting about surface inversions to growers or spray contractors.

"Preferably this information would be presented alongside other relevant weather information that affects decision making by spray operators."

The GRDC and CRDC are equal investment partners in this project to develop the technology for this spray drift hazard alert and warning system.

"This work will be a significant venture into an innovative new space that will see the development of a continuous network of PAWS across the cropping areas of eastern Australia," Ian said.

"As the spray drift hazard alert and warning system is established it is envisaged that the network data would be available to industry to warn growers, spray contractors and other stakeholders of hazardous spray conditions."

For more information about the EOI on spray drift hazard alert and warning system go to *https://grdc.com.au/research/applying-and-reporting/current-procurement/expression-of-interest-and-other/spray-drift-hazard-alert-and-warning-system.* ■

A tower network will help to warn of hazardous spray conditions.

The science behind environmental flows in the Murray-Darling Basin

MURRAY-DARLING Basin communities can now access the science behind how and why water is being used to benefit the environment with the launch of a new public website.

No matter where you live in the Basin, you can look at the Flow-Monitoring Evaluation Research website – or Flow-MER for short – the Commonwealth Environmental Water Office's on-ground monitoring, evaluation and research program. CSIRO was commissioned by the CEWO to create the website.

The website brings together the work of independent scientists from some of Australia's leading regional universities and research institutions to collect evidence on how Commonwealth water for the environment is making a difference to the Basin's rivers, wetlands and floodplains.

"The Flow-MER website is a great step towards improving transparency of our decision making. It offers people a way to engage with the scientists and see for themselves the thinking behind when and where we deliver water for the environment," Commonwealth Environmental Water Holder Jody Swirepik said.

More than 120 scientists are working on Flow-MER at sites across the Murray-Darling Basin, often with the involvement of Traditional Owners, local water managers and landholders. The Flow-MER website was launched recently and can be accessed at *www.flow-mer.org.au.*

Through the Flow-MER program, scientists with a range of expertise share the findings of their research with managers of environmental water.

Primary means of monitoring

Flow-MER is now the primary means by which the Commonwealth Environmental Water Office will monitor and evaluate the delivery of Commonwealth environmental water in the Murray-Darling Basin.

The work of Flow-MER will support environmental water managers, demonstrate outcomes, inform adaptive management, and fulfil the legislative requirements associated with managing Commonwealth owned environmental water.

As an example, the Hydrology Theme assesses effects on flow regimes, which include relevant flow components set out in the Basin Plan (Section 8.51(1)(b)).

The outputs of the Hydrology Theme will comprise:

- Daily stream flow series at a set of representative hydrological sites for the Commonwealth environmental water scenarios and the counterfactual.
- Annual inundation map, showing where Commonwealth environmental water was delivered.
- Annual report on hydrological connectivity which includes annual statistics related to lateral and longitudinal connectivity.
- A scorecard report, showing flow components (cease-to-flow events; base flows; freshes; bank-full flows; and over-bank flows) delivered over the duration of the MER Program compared with the flow regime under the case where no Commonwealth environmental water was delivered.

As described in the Basin Scale Modelling Plan, the intent is to use the Hydrology Theme as an input to other Themes, to evaluate the contribution of Commonwealth environmental water to support ecosystem outcomes.

The outputs of this Theme strongly intersect with projects described in the Research Plan, particularly those for Vegetation, Waterbirds and Fish, and intersects with the Basin Modelling Plan.

The Flow-MER program has the following components:

- **Basin-scale –** Basin evaluation, research and engagement – The Basin-scale Evaluation and Research Plan has been developed to set out the schedule of evaluation, research and engagement activities to be undertaken in the Basin to June 2022. The Basin-scale evaluation and research plan is available at: *Commonwealth Environmental Water Office Monitoring Evaluation and Research Program: Basin Scale Evaluation and Research Plan.*
- **Seven selected areas –** on-ground monitoring, evaluation, research and engagement. For more information about the Flow-MER program visit the website at: *Flow Monitoring Evaluation Research*. The selected areas are:
  - Junction of the Warrego and Darling Rivers;
  - Gwydir River system;
  - Lachlan River system;
  - Murrumbidgee River system;
  - Edward–Wakool River system;
  - Goulburn River; and,
  - Lower Murray River.

■

SOUTHERN AUSTRALIA FOCUS

COVERING CROPPING SYSTEMS OF SOUTHERN NSW, VICTORIA, TASMANIA, SOUTH AUSTRALIA & WESTERN AUSTRALIA

Fungicide resistance to net blotch in barley detected

FIRST-YEAR results from a unique project have confirmed fungicide resistance to both spot and net forms of net blotch in barley is widespread in southern areas of Western Australia's grainbelt, with findings of reduced sensitivity or fungicide resistance the dominant situation.

The results are from the Barley Disease Cohort Project, involving innovative collaboration between researchers and WA barley growers, which is helping to find new in-field and locally relevant solutions to the growing issue of fungicide resistance.

The three-year pilot project, now in its second year, is being conducted by the Centre for Crop and Disease Management (CCDM), a leading Australian research centre with co-investment by the Grains Research and Development Corporation (GRDC) and Curtin University.

The project involves growers as collaborators in important fungicide resistance research.

"A cohort of 173 barley growers from WA's southern grainbelt participated in the project during the 2019 season," said CCDM director, Mark Gibberd.

"They helped to provide a clearer picture of the spread and impact of fungicide resistance in their region and worked alongside our research team to mount a local response to this growing issue."

Samples of 330 diseased barley leaves provided by the grower cohort for analysis in 2019 were from paddocks across the WA grainbelt, spreading from Cadoux in the north to Boyup Brook in the south-west and Boyatup in the far eastern area of the Esperance port zone.

The project focuses on the two barley diseases – spot and net forms of net blotch – as they are caused by pathogens with detected resistance to Demethylase Inhibitor (DMI) fungicides in the region.

Nutrien agronomist Kyran Brooks (left) and CCDM Director Mark Gibberd scouting for barley grower cohort trial sites in southern WA.

Spot form net blotch lesions starting to emerge on a barley crop in southern WA.

Innovative technologies

Using innovative and high-throughput laboratory-based technologies, CCDM researchers carried out 2250 disease and fungicide resistance diagnostic tests on the cohort's samples.

This work is continuing in 2020, when the centre will invite the growers to submit more paddock samples to help refine the 2019 results, and again provide feedback on the performance of their crops towards the end of the season. Several large-scale field trials comparing current management with alternative management techniques are also underway this year.

The centre will also contact cohort members to discuss their disease management strategies and continue to test fungicide resistance management techniques in-field, with the ultimate goal of providing growers with locally relevant options for managing fungicide resistance.

Mark says the 2019 results highlight both the threat of fungicide resistance and the benefits of a collaborative and local approach to research.

"Fungicide resistance is an issue that evolves over time and is borne out of a pathogen's ability to adapt, so local knowledge is vital for developing effective management strategies against it," he said.

"As fungicide resistance increases, industry demand for in-field techniques to manage the problem is growing.

"Strong co-investment is supporting our centre to tackle this worldwide issue from a local perspective – we are working closely with growers to share information and improve fungicide resistance management in their region."

In-field and lab detection

The CCDM has worked on fungicide resistant pathogens for many years, discovering cases across Australia, establishing cutting-edge techniques in the laboratory and in the field for detecting mutations in the fungus, and communicating this information to the Australian grains industry.

Fran Lopez-Ruiz, who leads the CCDM's Fungicide Resistance Management and Disease Impacts research theme, said the 'co-innovation approach' used in the Barley Disease Cohort Project was providing invaluable information to researchers.

"Information from the project has helped us uncover new mechanisms of fungicide resistance – and for net blotch these are much more complex than initially thought," Fran said.

"The samples from growers provide an ideal resource to underpin many of the more technical discoveries that will enable more effective detection, screening and management of fungicide resistance."

An important part of the centre's work is protecting the limited chemicals still effective for managing crop disease.

Fearful of fungicide loss

"Results from the Barley Disease Cohort Project's first year are concerning because they confirm the potential for the loss of some DMI fungicides is very widespread across the sampled area," Fran said.

Of the 330 barley samples tested in the Barley Disease Cohort Project in 2019:

- 153 (46 per cent) tested positive for the presence of both diseases spot form net blotch (SFNB) and net form net blotch (NFNB), 165 (50 per cent) were positive for the presence of SFNB only, and four (one per cent) for NFNB only. Eight (two per cent) had no SFNB or NFNB present.
- 51 (15 per cent) carried the CYP51A F489L mutation, which is associated with various levels of fungicide resistance in both SFNB and NFNB.
- Only 21 samples from the 450+ mm rainfall zone were categorised as sensitive. A high number of samples (161) had reduced sensitivity and 28 of the samples were fungicide resistant.
- A CCDM podcast on the 2019 results, including an overview of findings and some useful management advice, is available on the podcast page of the CCDM website at *https://bit.ly/2UsAOW3*.

Definitions of fungicide resistance

- A sensitive result means the fungicide should still work reasonably well.
- A reduced sensitivity result means the fungicide may still work reasonably well at controlling the target pathogen, but not as well as it would on a sensitive population. You still have management options, but, reduced sensitivity populations are also at greater risk of becoming fungicide resistant if you continue to use these actives.
- A fungicide resistant result means the fungicide is not likely to control these pathogen populations, and therefore should be avoided. ■

Fire grounds generating unique crop pest and disease information

THE devastating impact of bushfires which have ravaged many parts of rural Australia in recent times is known only too well. What is significantly less known is the effect these fires have on farming systems in terms of crop diseases, pests and beneficial species.

This research question is now being investigated in South Australia where fire grounds have become hubs for unprecedented studies.

The Grains Research and Development Corporation (GRDC) has invested in a unique research program which aims to provide grain growers with greater knowledge about the impact of bushfires to inform effective post-fire management strategies for crop pests and diseases into the future.

Surveillance of organisms is being undertaken by AgXtra at sites on Kangaroo Island and southern Yorke Peninsula where recent fires burnt large tracts of agricultural land, including crops and stubbles.

GRDC Crop Protection Manager – South, Ruth Peek, says these SA fires have provided a valuable opportunity to examine the implication of such events on cropping environments over a 12 month period.

"We are keen to assess the impact of bushfires on crop pests and diseases – to discover if they re-establish in the landscape post-fire and if they do, just how quickly they return and to what extent," Ruth says.

AgXtra researcher Julianne Farrell has been part of a team comparing invertebrate species and disease incidence in burnt and unburnt areas.

"This information will support growers in understanding the consequences of fire on their farms, and enable them to implement recommended strategies that may assist in their efforts to manage pests and diseases."

Comparative sites

AgXtra personnel have established comparative sites (burnt and unburnt) on KI and YP where they are regularly monitoring composition and abundance of invertebrate pest and beneficial species and disease incidence. Paddock management practices and crop yields for previous seasons are also being collated to assist understanding of other factors that may impact on invertebrate diversity in cropping systems.

AgXtra senior research officer Julianne Farrell says the comparative sites – three on KI and four on YP – have been located where wheat, barley and bean stubbles had remained adjacent to burnt cropping land. Nearby green bridge areas are also being trapped for comparison purposes.

A range of trapping mechanisms, including pitfalls and sticky traps, have been set up to provide analysis of species diversity and population dynamics over a year. The traps are replaced on a monthly basis and trap catch identified.

Julianne says she has so far been surprised at the invertebrate diversity – largely beneficials such as parasitoid wasps, honey bees, hover flies, spiders, moths, carabid and ladybird beetles – in unburnt stubbles.

These beneficial invertebrates are important predators and parasites of significant pests such as mites, aphids, caterpillars and earwigs.

Less beneficial species have been recorded in the burnt areas, although those populations are expected to increase as the landscape recovers and new crops are sown and established, according to Julianne.

Invertebrate traps set up in unburnt barley stubble.

Invertebrate pests under investigation include Egyptian beetles, black Portuguese millipedes and European earwigs – all introduced species that cause damage to a range of broadacre crops.

Mice and KI dunnarts included

Mice are included in the studies on YP, while the endangered Kangaroo Island dunnart (a mouse-sized native marsupial predator of crop pests) will be monitored on KI.

While lack of food and cover has driven mice out of burnt areas, they are still quite active in the unburnt areas.

"Now that sowing has been completed, I urge growers to monitor activity in their paddocks and bait where necessary," Julianne says.

Soil samples were extracted from burnt and unburnt sites at the beginning of the research project and have been provided for crop disease and soil beneficial organism analysis to the South Australian Research and Development Institute (SARDI), the research division of Primary Industries and Regions SA.

Soil sampling will be repeated towards the end of the year to gauge any change in disease and beneficial organism presence.

For more information contact: Julianne Farrell, AgXtra 0411 257 831. ■

BOSS®
AGRICULTURE

TAKE ADVANTAGE OF THE BACKING BUSINESS INVESTMENT
50% ACCELERATED ASSET DEPRECIATION
ON PRODUCTS DELIVERED BEFORE 30/06/2021*





PLANTER SPECIALISTS

- Frame designs from 6 Metre to 36 Metre working widths, with Single and Double folding options
- BOSS Air Seeders available in Steerable & Castoring with hydraulic Drive & ISO compatible
- Proven parallelogram tyne & double disc planting units with 300mm of travel for consistent seed placement
- Inter-changeable single & double disc assemblies to suit our TX Series of Row Units
- 2 & 3 Bar flexing frame designs to follow ground contours
- Spring & hydraulic planting units available
- Single disc row units with hydraulic or spring downforce
- Double disc row units and Strip tillage row units
- Stump jump tyne planting & cultivating row units\
- True parallelogram tyne row units available from 400lb to 1400lb breakout hydraulic and spring
- Various tyne breakout models with and without front coulter assemblies
- Sowing depths from 6mm to 250mm
- Coulter or presswheel depth control
- Single or double shoot options available
- Air Seeders from 4500L to 20,000L, ISO Variable rate, Hydraulic bin lids, hydraulic lift & swing auger, and LED work lights are all standard
- Single disc and double disc planters for no till in a wide range of soil types

PHONE 02 6721 2677

Boss Agriculture
A division of BOSS Engineering Pty Ltd
40 Taylor Ave Inverell NSW 2360

DAN RYAN – 0488 512 677
DAVE HERBERT (QLD) – 0439 286 277
WARREN ANDERSON – 0447 560 815

WWW.BOSSAGRICULTURE.COM.AU | WWW.BOSSAGPARTS.COM.AU

AHRI insight...

Something old, something new in annual ryegrass control

By Cindy Benjamin

It's a quaint tradition that many brides follow – "Something old" represents continuity with the past and "Something new" offers optimism for the future. "Something borrowed" passes on another's secrets for success and "Something blue" represent key features of a solid relationship. Finally, "A sixpence in your shoe" for prosperity.

WITH the release of several new modes of action and chemical formulations, it is helpful to first consider how these 'new' chemicals might revive some 'old' chemistry. Some herbicide resistant learnings be 'borrowed' and used to build a solid or 'blue' stewardship program for each farm. With a 'sixpence in your shoe' ensuring the best weed control bang for your buck when using more expensive products.

Pre-emergent herbicides are now a central component of annual ryegrass control in no-till farming systems. Recent findings by the University of Adelaide have confirmed that populations of ryegrass from the Eyre Peninsula, SA have resistance to all the available pre-emergent herbicides, albeit some at low levels – triallate (Group J, Avadex), prosulfocarb (Group J, Arcade), trifluralin (Group D), propyzamide (Group D) and pyroxasulfone (Group K, Sakura).

Metabolic cross-resistance is a serious threat to the future use of pre-emergent herbicides. For example, some of the annual ryegrass populations with widespread resistance to other herbicides already have low level resistance to some of the new chemistry coming to market.

Australian researchers have been on the front foot with testing the new chemistry prior to release to better understand the features of the new products and how they can be used in a robust integrated weed control program.

At the GRDC Updates in February 2020, at least five papers reported on research related to annual ryegrass control using new herbicides, herbicide mixtures and crop competition.

Ryegrass under intensive herbicide resistance testing (10 days after treatment) – testing standalone herbicides and mixtures of old and new chemistry.

What are the new chemicals?

Dr Chris Preston (School of Agriculture, Food & Wine, University of Adelaide) provided an overview of the new pre-emergent herbicides that have been recently released or that are likely to be released in the next year or two for control of annual ryegrass.

Growing a competitive crop reduces weed seed production even without herbicide. These pots are from the control treatment (no herbicide): From left to right, 0, 150 and 300 wheat plants/m^2.

New grass pre-em herbicides that include control of annual ryegrass

Luximax (Group Z)

Luximax from BASF is a new mode of action herbicide (currently Group Z), containing cinmethylin. Luximax is a pre-emergent herbicide for annual ryegrass control in wheat, but not durum. It will provide some suppression of brome grass and wild oats. In Chris' trials, control of ryegrass was as good as Sakura.

Mixtures with trifluralin, triallate and prosulfocarb are good and can provide some additional ryegrass control; but, mixtures with Sakura, Boxer Gold or Dual Gold are likely to cause crop damage and need to be avoided.

Overwatch (Group Q)

Overwatch, active ingredient bixlozone, from FMC is a Group Q herbicide that will be available for 2021. Overwatch controls annual ryegrass and some broadleaf weeds and is registered in wheat, barley and canola. Suppression of barley grass, brome grass and wild oats can occur. The level of ryegrass control in Chris' trials was just behind Sakura.

Mixtures with other herbicides can increase control levels and in their trials in the high rainfall zones, the mixture of Overwatch plus Sakura has been very good.

Devrinol-C (Group K)

Devrinol-C, active ingredient napropamide, is a Group K herbicide from UPL registered in 2019 for annual grass weed control (including annual ryegrass) in canola. Devrinol-C offers an alternative pre-emergent herbicide to propyzamide or trifluralin for canola.

Voraxor (2 x Group G) – dual use pre-em and knockdown

Voraxor, from BASF, contains the active ingredients trifludimoxazin and saflufenacil, which are both Group G herbicides. Voraxor will provide broadleaf weed control and some annual ryegrass control as a pre-emergent herbicide in cereals.

Voraxor will be best used where broadleaf weeds are the main problem and annual ryegrass populations are very low. Grass pre-emergent herbicides cannot be tank mixed with Voraxor and will have to go out as a separate application.

Ultro (Group E) – not registered

Ultro, active ingredient carbetamide, from Adama is a Group E herbicide that will be available from 2021. Ultro will be registered for the control of annual ryegrass, barley grass and brome grass in all pulse crops. Although the active ingredient was registered previously in Australia for turf and pasture, this is the first product seeking registration using this active ingredient in grain production and it is a new formulation and use pattern.

BAY167 – not registered

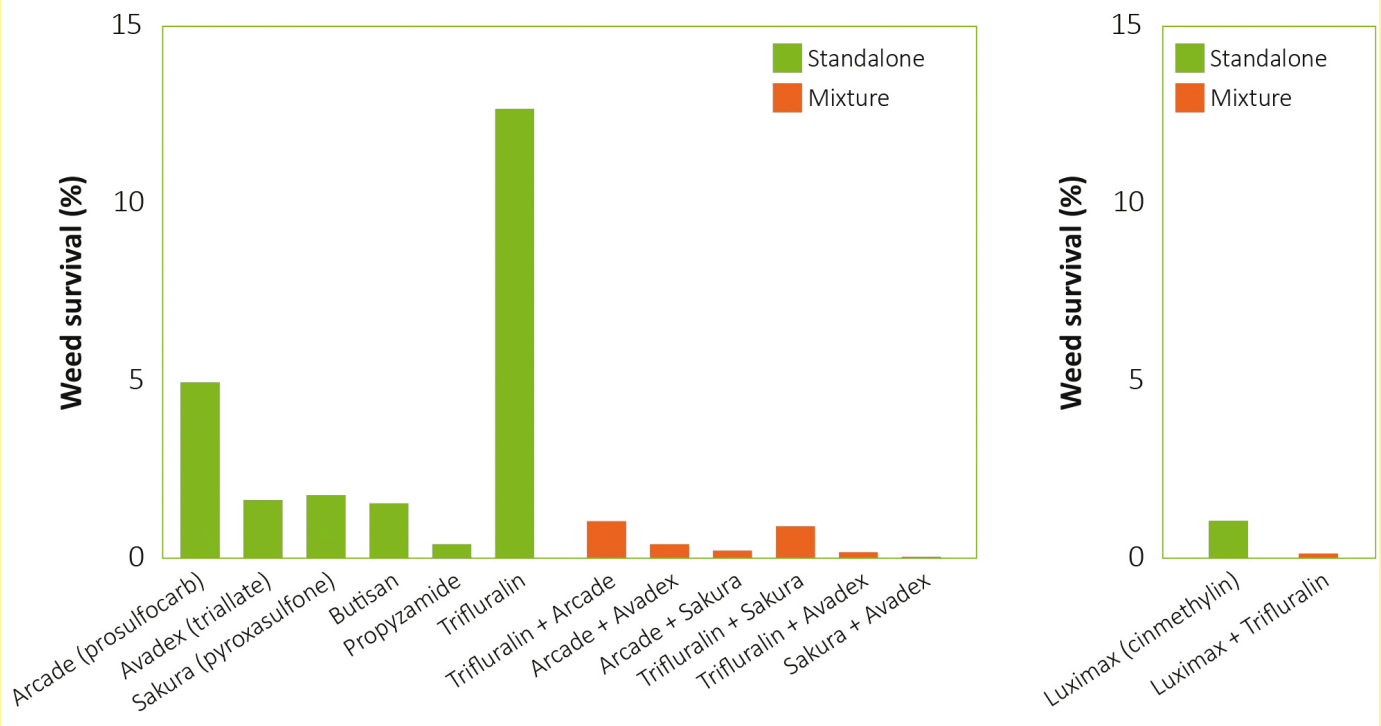
BAY167 is a new product under development from Bayer. It will contain a new mode of action and is a pre-emergent and early post-emergent herbicide for the control of grass and some broadleaf weeds in wheat and barley. Registration is expected in 2022.

Does mixing help stave off herbicide resistance?

AHRI's Dr Roberto Busi conducted extensive herbicide resistance testing on 140 populations of annual ryegrass in WA to demonstrate that two-way herbicide mixtures (at the highest recommended label rate) can provide highly effective control (Figure 1). Seed used in this research was collected from weeds found in cropped paddocks that the grower or agronomist considered problematic in terms of herbicide resistance.

The testing of single pre-emergent herbicides and mixtures

FIGURE 1: Left: Mean plant survival (per cent) observed across 140 field populations of annual ryegrass collected in Western Australia in 2018–19 and tested for herbicide resistance at the recommended label dose to six PRE-standalone herbicides versus six binary mixtures of the same herbicides. Right: Mean plant survival observed in a reduced set of ryegrass samples and tested for resistance to a new herbicide (cinmethylin) standalone and in a mixture with trifluralin.



showed that two mixtures – trifluralin + triallate; and, pyroxasulfone + triallate were highly effective. Survival rates were very low for the mixtures and all populations were found to be 100 per cent susceptible to these two mixtures.

In a separate screening trial Roberto tested cinmethylin (Luximax) standalone versus cinmethylin mixed with trifluralin on a reduced set of ryegrass populations. In both cases survival was very low but still the mix performed better than the standalone herbicide.

Pre-emergent herbicide mixtures + crop competition = Winning

AHRI student researcher Facundo Cortese (supervised by Dr Roberto Busi, Prof. Hugh Beckie and Dr Danica Goggin), investigated the impact of applying pre-em herbicide mixtures to resistant annual ryegrass in a controlled competitive situation (pot trial Figure 2).

The treatments were untreated (control), pyroxasulfone (Sakura) applied at rates of 50 and 100 grams active ingredient (a.i) per hectare, prosulfocarb (Arcade) applied at a rate of 2500 g a.i per hectare and a mixture of pyroxasulfone (Sakura) 100 g a.i + prosulfocarb (Arcade) 2500 g a.i.

The mixture of pyroxasulfone and prosulfocarb increased the control of resistant annual ryegrass by 11 per cent (vs prosulfocarb alone) and 29 per cent (vs pyroxasulfone alone) and reduced seed production of surviving resistant plants by 88 per cent when compared to an untreated control. Mixing two herbicides with different modes of action significantly decreased the survival and seed production of pyroxasulfone-resistant ryegrass.

Crop competition provided an additive benefit to further reduce annual ryegrass seed production. The effect of a competitive wheat crop at 150 plants per m^2 reduced seed production of resistant plants by 56 per cent. Increasing plant density to 300 plants per m^2 did not further reduce seed set or production.

How to hang on to the new herbicides

None of the shiny new products offer growers a weed control panacea. But they do add diversity to the weed control toolbox for annual ryegrass and some extra flexibility in use patterns. With some clever planning these products can help 'bring back' some previously lost chemistry using the mix and rotate tactic, extending the effective life of a broader range of herbicide options. When coupled with some non-herbicide tactics the grower can regain control of herbicide resistance on their farm and operate in a low-weed situation.

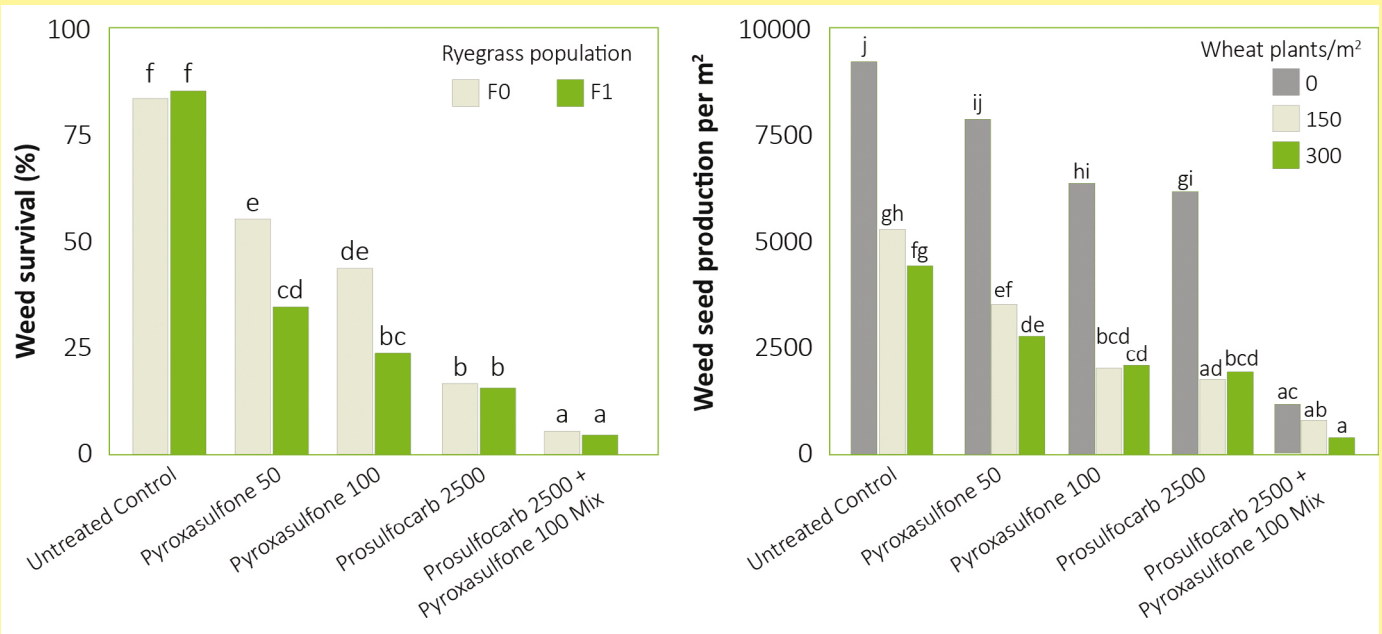
WeedSmart extension agronomist Greg Condon recommends growers and agronomists first conduct testing to identify herbicide mixtures that provide effective control of the annual ryegrass present in a paddock. Then use the WeedSmart Big 6 to build a robust weed control program that includes the rotation of effective herbicides and mixtures in a diverse cropping program, double-knocking, crop competition, stopping seed set and harvest weed seed control.

Further information

Luximax (Group Z)
http://websvr.infopest.com.au/LabelRouter?LabelType=L&Mode=1&ProductCode=86413
Overwatch (Group Q)
http://websvr.infopest.com.au/LabelRouter?LabelType=L&Mode=1&ProductCode=86427
Devrinol-C (Group K)
http://websvr.infopest.com.au/LabelRouter?LabelType=L&Mode=1&ProductCode=51479
Voraxor (2 x Group G) – dual use pre-em and knockdown
http://websvr.infopest.com.au/LabelRouter?LabelType=L&Mode=1&ProductCode=86452

The research summarised here was made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC. ■

FIGURE 2: Left: Annual ryegrass survival (28 days after herbicide application), where light bars represent the parental resistant population (F0) and green bars represent the crosses with a susceptible population (F1). Right: Effect of crop competition and herbicide treatment on ryegrass seed production.



Different letters indicate significant differences after a post-hoc Tukey test ($p<0.05$).

Global wheat production down...

By Peter McMeekin

WHILE still a record, it appears global wheat production for the 2020/21 season may have peaked as the crop comes under yield pressure in a number of the major producing countries. The United States Department of Agriculture (USDA) released their latest World Agricultural Supply and Demand Estimates (WASDE) in mid-July, and total wheat production was reduced by a tad over 4 million tonnes (mt) to 769.3 mt.


Peter McMeekin.

The USDA reduced **US** production by 1.5 mt to 49.6 mt compared to June figures on the back of record-low plantings of 14.84 million hectares (mha) and an average yield of 3.34 tonnes per hectare (t/ha). This will only be the fourth US wheat crop below 50 mt since the 1981/82 season when the US harvested their largest ever crop of 75.8 mt.

North of the border the WASDE report left **Canadian** wheat production unchanged at 34 mt, up 5 per cent on last year's production. The USDA estimated the total area sown to wheat at 9.8 mha, up slightly on the 9.7 mha planted last year, but lower than the June StatsCan estimate at 10.1 mha.

Wheat production in the **European Union** and the **United Kingdom** is also down 1.5 mt to 139.5 mt relative to June. This is a year-on-year decrease of 15.4 mt and is 10.2 mt below the 5-year average. The planted area is estimated at 25.3 mha, unchanged from last month, but 0.9 mha below last year and 4 per cent below the 5-year average. Yield is down at 5.52 t/ha.

Soft wheat production in **France**, Europe's biggest wheat producer, is forecast to fall by almost 21 per cent to 31.3 mt in 2020/21 after many regions suffered from adverse winter and spring weather conditions. A crop of that size would be 12.4 per cent below the five-year average and would be the second smallest French soft wheat crop in the past 17 years.

In **Russia**, the USDA pegged total wheat production at 76.5 mt, down 0.5 mt from last month. The total winter and spring wheat areas are estimated at 15.6 mha and 12.1 mha, respectively. Yields between the two vary dramatically with the winter wheat yield forecast at 3.59 t/ha and spring wheat at 1.68 t/ha. That puts the total planted area at 27.7 mha, up slightly year-on-year, and places the average yield at 2.76 t/ha.

Last month most of the Russian analysts and crop forecasters were increasing their 2020/21 production estimates after weather conditions improved in June. But poor yields in the early harvested areas has seen a sharp about-turn in sentiment. IKAR lowered their forecast to 78 mt and SovEcon – who have been quite bullish all season – reduced their estimate to 80.9 mt.

The Russian Ag Ministry is calling the wheat crop 75 mt. In their most recent harvest update, the Ministry stated that 9.4 mt of winter wheat had been harvested at an average yield of 3.24 t/ha. It is only early days, with around 10 per cent of the winter wheat area harvested, and the upward trend is expected to continue as headers move into the higher yielding regions.

The WASDE report left **Ukraine** wheat production unchanged at 26.5 mt, down more than 9 per cent on last season. Local consultancy ProAgro is even lower at 26 mt, suggesting extreme heat throughout spring in the south and east of the country has severely impacted yields. The area planted to wheat is estimated to be unchanged at 6.8 mha, but Ukraine's projected yield is more than 40 per cent higher than Russia's at 3.9 t/ha.

Argentina a big surprise

Perhaps one of the bigger surprises in the WASDE report, from a wheat viewpoint, was leaving **Argentinian** production steady at a record 21 mt, off 6.5 mha, with an average yield of 2.23 t/ha. Prolonged dry conditions have severely impacted planting of this season's winter crop and emergence has been poor.

The Buenos Aires Grain Exchange has cut their projected planted area for the second consecutive month to 6.5 mha, the same as the latest USDA number. And late last week, wheat production guidance from the Rosario Grains Exchange was decreased from 21 to 22 mt to 18 to 19 mt, citing lack of rainfall in western and northern regions.

Here in **Australia**, the USDA maths was quite simple: 13 mha at an average yield of 2 t/ha giving a total crop of 26 mt – unchanged from the June estimate. While that may seem low in contrast to numbers that have been bandied around in recent months, the WA crop is living hand to mouth at the moment and needs a serious drink this month to maintain yield potential.

Additionally, production in Queensland will be lower than expected as much of the intended area was not planted.

Leave China out of global exportable wheat stocks

Global ending wheat stocks come in at a very healthy 314.8 mt, generating a stocks-to-use ratio of 40.9 per cent. Taking China out of the equation, ending wheat stocks fall to 152.7 mt and the stocks-to-use ratio is much tighter at 24.6 per cent.

The key take-home point here is 2020/21 closing stocks in the major exporters are down almost 2 mt compared to June and production – therefore exportable surplus – is declining.

Wheat prices were on the rise during the first half of July as production issues began to outweigh the pressure of an approaching winter crop harvest north of the equator. Black Sea values, in particular Russia, are the barometer for export values, and it is quite possible that the season-low for that benchmark is now behind us.

The USDA has some lofty wheat export numbers built into their global supply and demand equation for the two major southern hemisphere wheat exporters. Moisture conditions will need to improve in both Argentina and Australia for those expectations to become a reality in 2021. Otherwise, further upward price pressure may materialise.

A bullish grain and feed update for Australia

By Zeljko Biki, USDA Foreign Agricultural Service, Canberra

AT A GLANCE

- Following a multi-year drought in eastern Australia, much improved seasonal conditions and rainfall in the first half of 2020 have set the scene for a sharp increase in wheat production.
- FAS/Canberra forecasts production at 27 million tonnes (mt) in marketing year 2020–21 – a 78 per cent increase from last year as a result of increased acreage and improved yields.
- Wheat exports are forecast to substantially increase to 17.5 mt from 9.2 mt in 2019–20.
- Barley production is forecast to increase to 9.8 mt, up from 9.0 mt in 2019–20.
- The 80.5 per cent tariff on barley imports imposed by China on May 18, 2020 is causing a major shift in both exports and domestic feeding.

AFTER two years of drought, beneficial and widespread rainfall in early 2020 in the eastern states of Australia has created a strong start to the winter crop season. Although conditions in Western Australia are drier than average, with greatly increased area and yields in the eastern states Australia is forecast to produce the biggest total wheat crop since 2016–17.

After an early autumn break and good follow up rains in the eastern states, crops are now sown with high moisture profiles, and Australia's wheat production is forecast at 27 million tonnes (mt) in 2020–21. This is 78 per cent higher than the 2019–20 crop, driven by a forecast 29 per cent increase in acreage, along with a 37 per cent improvement in average yields.

Barley production is also forecast to rise to 9.8 mt, up nine per cent in 2020–21.

Overall feed consumption of grain is expected to fall as the Australian beef industry enters a period of herd rebuilding, and increased pasture production has reduced the need for on-farm grain feeding.

But there has been a shift of feeding between wheat and barley as a result of an increased price differential between these grains, primarily due to China imposing an 80.5 per cent tariff on Australian barley. This has resulted in the domestic feed industry substituting barley in the place of wheat.

A much larger wheat crop and reduced feed consumption is forecast to boost exports to 17.5 mt in 2020–21, from just 9.2 in 2019–20. Barley exports are also forecast to rise to 3.8 mt in 2020–21, from 3.2 mt in 2019–20, although they will be impacted by the Chinese tariffs.

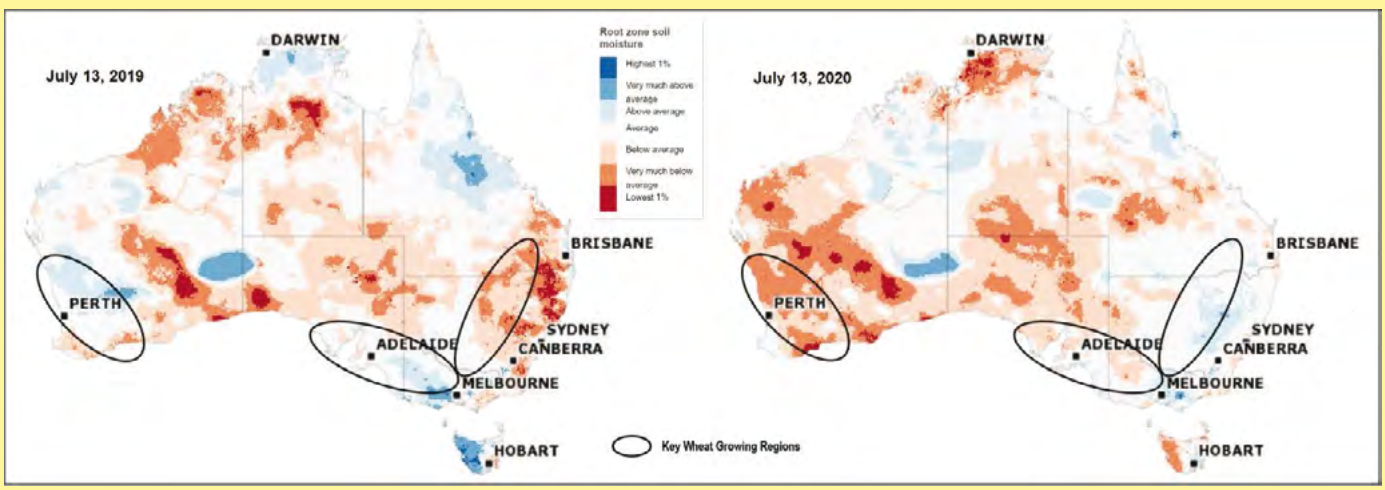
Sorghum production is also forecast to recover in 2020–21 to 1.4 mt from the smallest crop in 50 years in 2019–20. For rice, rains in early 2020 have boosted soil moisture and improved irrigation water storages and water trade prices have declined. Although there is a long way to go before the start of the next summer planting season, rice production is forecast to increase to 300,000 mt, but remain at only approximately 70 per cent of the previous 10-year average level.

Wheat production

The marked improvement in seasonal conditions in the eastern states has resulted in our FAS USDA forecast of wheat production in 2020–21 at 27 mt. This is 14 per cent above the 10-year average. It is also sharply higher than the poor 2019–20 wheat crop of only 15.2 mt.

After two years of severe drought conditions in the eastern states of Australia and consequently very low wheat production, rains in early 2020 prior to planting were uncharacteristically strong, sparking a turnaround in the cropping outlook.

FIGURE 1: Soil moisture profile maps for August through July 2019 and July 2020



Source: Bureau of Meteorology.

The main drought-impacted wheat growing regions of NSW (the second largest wheat producing state) followed the good pre-planting start with an early autumn break, and further timely rains during the planting window of April to June. This provided the most drought affected growers, particularly in NSW with the impetus to proceed with a full winter crop planting program and resulted in a near doubling of wheat area.

Key Victorian and South Australian wheat growing regions also had plentiful rains.

Western Australian (the largest wheat producing state) grain growing regions also had good rain in the early part of 2020 prior to planting but during April to July 2020 generally had below well below average rainfall during the planting period. Nevertheless, sub-surface moisture from the preceding period was enough for growers to progress with a full crop planting program. Although soil moisture remains below average in Western Australia and is of concern, recent rains have somewhat improved the situation.

In addition to increased national wheat area, yields are also forecast to improve. The soil moisture map as at July 13, 2020 compared to July 13, 2019 (see Figure 1) shows a tale of the eastern state growers in a much improved position this year, and well placed to meet the crop demands leading in the spring period.

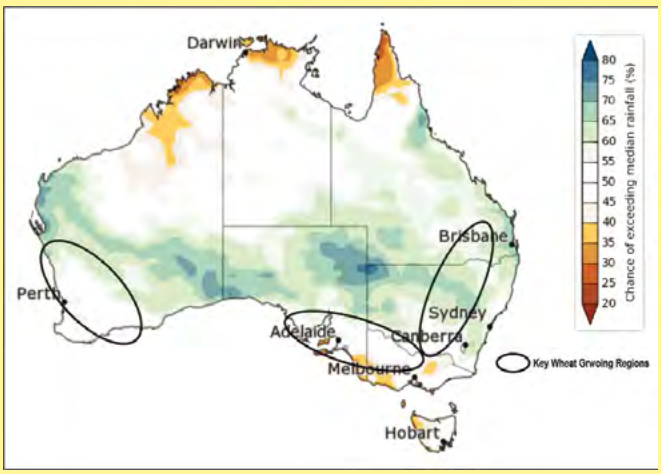
Although WA and the western parts of South Australia have been dry, recent reports indicate that crops are in good condition and are well placed as long as rains continue to come.

Australian Bureau of Meteorology forecasts for the July to September period (see Figure 2) indicate that for much of the cropping regions of NSW and Queensland there is an above-average chance of exceeding median rainfall.

There is also a near average chance of exceeding median rainfall in the crop growing regions of WA and most of Victoria and South Australia.

Overall, the forecast for July to September 2020 indicates that most of the cropping regions have good rainfall prospects in the coming months.

FIGURE 2: Chance of exceeding median rainfall July to September, 2020



Source: Bureau of Meteorology.

Wheat domestic consumption

Domestic Australian consumption of wheat is forecast to decrease to 7.05 mt in 2020–21, a 16 per cent reduction from the 8.4 mt in 2019–20. This is largely due to a forecast decrease in feed industry demand.

After two years of drought impacting much of the beef cattle industry, improved rains have resulted in re-stocker demand for cattle to rebuild the size of the national herd. This has resulted in a significant decline in feedlot cattle and therefore reduced grain demand for feedlot rations.

The improved conditions since early 2020 has also greatly increased pasture production and decreased on-farm supplementary feed demand from both beef and dairy industries.

A further important impact on the demand for wheat from the livestock sector has been the widening price gap between wheat and barley. This was caused by China imposing an 80.5 per cent tariff for a period of five years on imports of Australian barley, and a subsequent fall in barley prices.

While the price spread between wheat and barley in the preceding six months was in the order of $60 per tonne, in May 2020 after the tariff announcement, this had widened dramatically to around $140 per tonne. This has since moderated to about $100 per tonne.

Wheat is generally a favoured grain over barley to include in feedlot rations, but the increased price gap has resulted in many sectors switching almost entirely from wheat to barley.

Domestic consumption for flour milling is forecast to largely remain unchanged at 3.55 mt in 2020–21, a modest increase from 3.50 mt for the previous two years. Consumption of wheat for flour has typically only been increasing with population growth.

Recently, the impact of COVID-19 has caused a short-term ramp up in flour milling, as mills boosted production to provide flour for consumers stocking up on supplies. Conversely there has been a negative impact on the food service sector caused by restrictions implemented by federal and state governments.

The overall change in domestic demand for flour milling wheat, is forecast to be minimal.

Wheat trade

FAS/Canberra has forecast wheat exports in 2020–21 at 17.5 mt, up from only 9.2 last year. The forecast is a 90 per cent increase on the prior year, and slightly above the previous 10-year average of 16.8 mt.

Australian wheat shipments to Indonesia have continued to be at sharply reduced levels. In the October 2019 to May 2020 period, shipments fell to the lowest level in a quarter of a century to less than 600,000 mt. This compares to the 3.5 mt exported as recently as 2016–17.

Wheat stocks

Australian wheat ending stocks are forecast to increase in 2020–21 to 6.39 mt as a result of larger supply and strong global export competition. The 2019–20 ending stocks are estimated to be at the lowest levels in more than a decade due to low production.

Source: USDA–FAS *Grain and Feed Update – Australia*, July 15, 2020.

The corn market impacts all grains

By Robert Herrmann, Mecardo

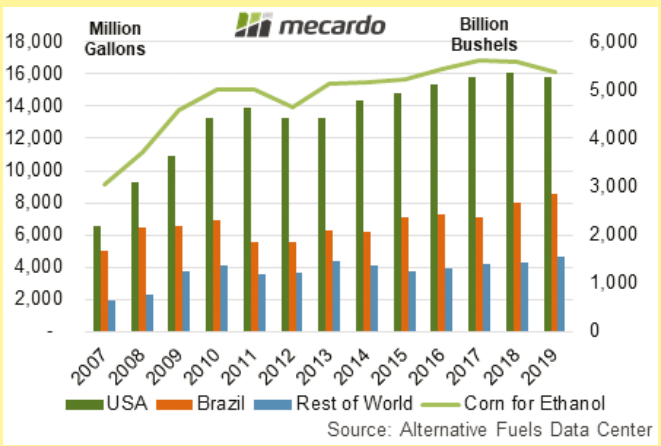
THE world looks closely at the market prospects for corn, as it's the largest crop grown in the US – with 96.9 million acres planted in 2020, up 8 per cent on 2019 – and it is a significant exported product onto the world market. The latest USDA crop progress report comes at an important time for the market, noting that the corn crop is entering the yield critical stage of "silking".

Silking is the stage where the corn cob begins to push out the shiny, thread-like fibres that grow as part of the ears of the corn, and is the first critical measure of possible crop yield.

The US consumes for stockfeed about a third of domestic corn production, with just over a third usually used to produce ethanol. The remainder is either consumed in the US or exported.

The US corn crop has grown over the past 12 years on the back of increased ethanol demand both domestically and globally (see Figure 1). The CV-19 impact has been keenly felt by the crude oil markets, as travelling has been significantly curtailed.

FIGURE 1: Global ethanol production



The big driver on the positive side, for now, is exports of US grains to China. The Phase #1 deal appears to be working with China imports surging in June as the economy appears to be recovering.

The way this plays out is not only critical for grain demand and price this year, but it will also impact on future production with the latest USDA forecasting prices for 2021 to be below the cost of production. Without additional government aid, US farmers will be reviewing their crop intentions.

What does it mean?

Due to its scale and the export component of the US corn crop, the prospects of all grain prices – be they wheat, barley, soybean, maize or corn – are tied to the US corn market. While increased export sales will support corn prices, with this demand spilling over to other grains, any prolonged CV-19 impact on fuel demand is negative for ethanol, corn and therefore grain prices more generally.

For more information see: www.mecardo.com.au ■

Australian whole grain wheat has the advantage in Asia

By Australian Export Grains Innovation Centre

BRIGHT, white Australian wheat has a clear advantage over major competitors in the burgeoning Asian whole grain market, according to research from the Australian Export Grains Innovation Centre (AEGIC).

Australian wheat varieties have a white seed coat, while competitor regions such as North America and the Black Sea grow wheat with a darker red colour.

AEGIC General Manager Research and Services Dr Ken Quail said this contrast in bran colour could make all the difference in Asian markets.

"Asian consumers generally prefer bright, stable colour and neutral flavours in wheat-based products," he said.

"AEGIC found that red bran not only has a large impact on the colour of whole grain bread, it also imparts a bitter flavour. The white bran of Australian wheat does not have these issues, giving it a significant advantage in Asian countries."

Whole grain benefits

Ken said Asian consumers were increasingly interested in the nutritional and health benefits of whole grain products.

"The health story of whole grain products is becoming more and more well-known in Asian markets," he said.

"By 2030 it is estimated that whole grain products could make up 10 per cent of the bread market in Asia. This equates to a one million tonne market worth over $350 million.

"This uptake is likely to be driven by health authorities in countries seeking to reduce the growing burden of health costs."

AEGIC's research involved laboratory analysis of a range of quality and nutritional attributes.

Sensory trials evaluated bread made with red and white bran types to identify the bitterness impact of red bran on flavour.

Ken said the cleanliness of Australian wheat was also a major advantage for wholegrain products in Australia's export markets.

"Most bacterial and fungal contamination of grain occurs on the surface of the bran and this can become an issue when it is included in wholegrain products," he said.

"Thankfully Australian wheat has very low levels of contamination, making it a far safer option than wheat supplied from other destinations."

Whole grain bread assessment under way at the AEGIC lab in Sydney. It is forecast that whole grain products could make up 10 per cent of the Asian bread market by 2030.

Ken said this was likely to be more important in the future as countries increase their focus on health and food safety following the Covid-19 pandemic.

"Using AEGIC's research, the Australian grains industry can now promote the benefits of using Australian white wheat over red wheat and establish it as the preferred choice for whole grain products," he said.

More information: See *www.aegic.org.au*

WE NEED YOUR WEEVILS

As part of a continuing, national effort to measure the resistance of insects in stored grain to phosphine, Victoria's Grains Biosecurity Officer, Jim Moran, wants to visit farms to collect insects in and around grain storages.

The project is funded by the GRDC via grain grower levies and will benchmark the distribution of insect resistance to phosphine around Australia. It builds on previous efforts in this important research area that has shown a growing trend for insects in stored grain to be resistant to treatment.

Phosphine resistance threatens the livelihood of grain growers by wasting time, money and effort on futile treatments. The damage to grain by insects also lowers grain quality, price and marketing opportunities.

Jim says that insect resistance needs to be measured and managed carefully and safely, in conjunction with hygiene and other practices.

What level of resistance?

"We need to know where and what level of resistance exists now to minimise the impact in the future through more informed resistance management strategies," said Jim.

The national surveillance project will collect insect samples from grain storages on farms in Australia. This will provide technical data on overall resistance trends and contribute to identification of new resistance hotspots and the efficacy of current resistance management activities.

"I expect to collect insects of various species in Victoria. Each species will be tested for phosphine resistance at the NSW Department of Primary Industries laboratory in Wagga Wagga."

If you are not in Victoria but would like to have your storages checked for phosphine resistance, contact Jim and he can put you in touch with Grains Biosecurity Officers in other states.

"If growers would like insect samples collected from their property for free testing for the degree of phosphine resistance, they need to contact me. Even if you were involved in the last survey, I would like to resample to check for resistance trends."

Once on site, Jim will explain the sampling process and ask about the types of grain stored, pesticides used and any pest problems.

All visits and results are confidential and free. Jim will also provide free biosecurity signs and grain biosecurity manuals on request. To contact Jim phone 03 5430 4479 or email Jim.Moran@agriculture.vic.gov.au

Accurate, timely monitoring of airborne agricultural pests and pathogens is limited. A coordinated surveillance, diagnostic and reporting program is addressing this problem.

In collaboration with the Society of Precision Agriculture Australia, Australian Grain presents a series of articles on a wide range of precision agriculture technologies and how best to put PA to Work on your farm.

iMapPESTS – new approach to surveillance

Written for SPAA by Emma Leonard

At a glance…

- iMapPESTS is a proof of concept research project enabled by a multifaceted industry, research and government network; including GRDC.
- Through state-of-the-art surveillance and diagnostics tools and techniques, iMapPESTS aims to demonstrate how on-farm plant pest management can benefit from rapid and accurate monitoring and reporting of airborne pests and pathogens affecting all major agricultural sectors across the country.
- iMapPESTS is designed to deliver tangible benefits to the industry, which is why engagement and on-farm adoption is critical. Visit us and get involved at the iMapPESTS website (*imappests.com.au*).

Airborne crop pests and pathogens know no boundaries. Yet, the current lack of a coordinated, rapid and localised alert system hinders the ability of industry sectors to work together to minimise pest and pathogen build-up. The iMapPESTS Program aims to address the problem by providing enhanced and coordinated surveillance, diagnostics and reporting tools to its industry stakeholders.

One of the program's key researchers is SARDI scientist Dr Rohan Kimber. Western flower thrips, he says, are a good example of how airborne pests and pathogens can spread across the Australian landscape, and across industries.

"The Sentinel is a state-of-the-art mobile surveillance unit."

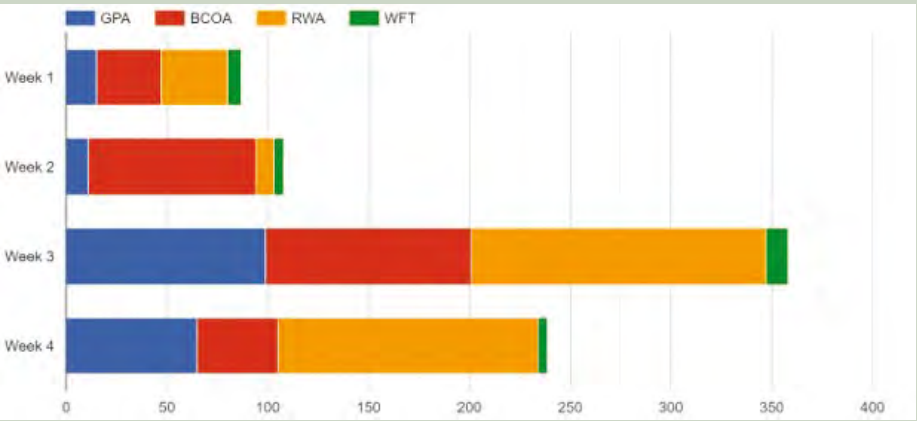
"They can survive and build up in cereals that have low susceptibility, and then fly to vegetable crops where they transmit viruses, such as tomato spotted wilt virus."

One of the key outputs from this multimillion-dollar, cross industry investment is the Sentinel, a state-of-the-art unit.

The Sentinel (pictured above) is the first of a suite of custom-designed, solar powered, mobile surveillance units. They use automated sampling technology to collect airborne fungal spores and insects. The cone on the roof extends to 6 metres to provide a suction trap that monitors long-distance migratory insect flights. This was specifically designed for the unit with Rothamsted Research (UK) and Burkard Agri Ltd. An insect suction trap, located 2 metres off the ground, monitors local insect dynamics. Specially designed, high volume air samplers collect airborne spores. In collaboration with BioScout, fungal pathogens are monitored in real-time.

While the mobile surveillance system gathers the pests and pathogens, it is supported by diagnostic tools and techniques that are key to the rapid and accurate turnaround of this information. Another component is delivering actionable information to growers as easy-to-access data visualisations and

FIGURE 1: Relative abundance (by week) of each insect target identified in the suction trap samples during the first field trial



GPA – Green peach aphid; BCOA – Bird cherry oat aphid; RWA – Russian wheat aphid; WFT – Western flower thrip.

outputs, including via the iMapPESTS webpage *(https://www.imappests.com.au/)*.

The localised reporting of pests and pathogens will provide farmers across industry sectors with an improved ability to collaborate and target appropriate management.

Field trials

Already the system is bringing benefits. Results from a four-week field trial in spring 2019 showed clear differences in pest development patterns that would be missed from a single sampling activity.

Five species of aphid, and three other crop pests including Western flower thrips, were monitored in trials in the mid-north grain and grape production region of South Australia (Figure 1). In addition, six fungal pathogens including blackleg of canola, Septoria of wheat and Botrytis cinerea, that can impact pulse and grape crops, were identified.

Rohan says the work is at the proof of concept stage. "That is where we aim to accurately and rapidly monitor and report on key pests and pathogens."

Laboratory analyses of the Sentinel samples quantifies and prioritises the pests present. Molecular testing can deal with large numbers of samples rapidly and accurately. Yet, molecular tests for many of the pests and pathogens that the program aims to track do not yet exist. The iMapPESTS investment includes the development of more diagnostic tests using next-generation sequencing by Agriculture Victoria.

For the first field trial, a combination of traditional methods of identification (morphological identification) were compared against more rapid, high-throughput molecular technologies. These were provided by SARDI's Molecular Diagnostics Centre and Agriculture Victoria.

"It is important that we use both traditional and more modern, molecular methods. Molecular tests will only identify species for which they have been developed. Morphological identification can identify any pest but is often difficult and very time consuming, particularly in mixed population samples like those collected by the Sentinel," Rohan says.

An example of why this is important occurred in the very first field trial. The molecular tests for

Plague thrips.

Western flower thrips were run and numbers were found to be low, despite large numbers of thrips having been collected. The visual identification revealed the dominant thrips were a different species – the similar but far less damaging Plague thrips.

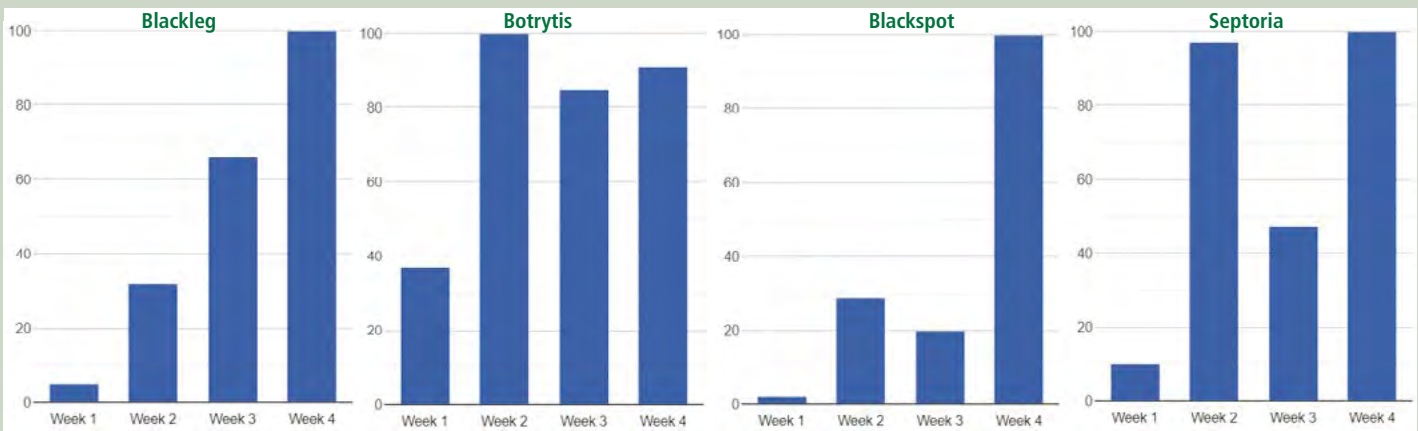
The results for four pests and four pathogens monitored in the trial are reported in Figures 1 and 2. Time stamped samples were collected at regular intervals each day. Sampling frequency depends on the trap. The Sentinel is also fitted with a weather station so that samples can be cross referenced with rainfall, humidity, wind and temperature. The location of the Sentinel is GPS referenced.

The greatest abundance of all the four pests was recorded in week three, with a decline in week four as the host plants matured and died back. Bird cherry oat aphids were the only species to increase progressively.

"If a farmer had only sampled in week two," Rohan said, "they would have considered no treatment was required for Russian wheat aphid. But the population exploded the following week to damaging levels."

The pests collected in the 2 metre and 6 metre traps were also compared. The 2 metre trap, reflecting populations in the paddock, contained lower numbers than the 6 metre trap. The latter represents what is occurring on a regional scale. This tall trap generally captures smaller insects caught up in higher wind currents and larger migratory insect. The lower numbers in the 2 metre trap indicated good pest control.

FIGURE 2: Total counts of various pathogen spores identified in the spore samples over a 4 week period. From left to right: Blackleg of canola; Botrytis grey mould; Blackspot of field peas; and, Septoria.



Rohan Kimber outlining the iMapPESTS project to growers at the Hart Fieldsite trial, SA.

Spore data (Figure 2) is normalised to 100 per cent of the maximum counts detected for each target pathogen by week. Blackspot of field peas released spores steadily over the 4-week period. The highest counts of blackleg in canola and blackspot in field peas occurred in week 4, with botrytis grey mould and Septoria showing two peaks in weeks 2 and 4.

The site received 10 mm of rain the week before monitoring started and 2 mm at the end of the second week. Both these events influenced the patterns of spore maturation and release by the pathogens. For example, botrytis spore release is known to be driven by high humidity in the crop canopy, while Septoria spore release is driven by periods of leaf and leaf debris wetness.

The patterns of spore release illustrated in Figure 2, show a strong relationship to weather events.

The integration of datasets of the patterns of individual pest and pathogen occurrences, with weather and crop data will help the researchers build an understanding of pest and population dynamics.

Trials in the region

A second field trial in the Barossa Valley occurred in November 2019 and the prototype Sentinel was recently deployed for field trials in northern Queensland for autumn 2020. Two more Sentinels will soon be deployed in South Australia's Adelaide Hills region and the intensive cropping region near Virginia for early trials prior to travelling further afield for deployment and testing in different regions across the country.

Additional sentinels with different sampler arrays and presented on different platforms are also being explored to cater to different environments and industry requirements. These will be delivered by the end of 2020, and subsequently deployed at strategic locations around the country in 2021 for trialling.

"These trials are not only providing us with valuable insights into pest and pathogen populations and dynamics, but are helping us identify the most effective and efficient insect and spore samplers for target capture."

By the end of the project in 2022 the team hope to demonstrate a proof-of-concept surveillance system, suitable to different regions, supported by the appropriate rapid diagnostic tests for key insect pests and pathogens across industry sectors.

The research team is working hard on keeping levy payers informed of the outcomes via the webpage (*https://www.imappests.com.au/*) and social media (@iMapPESTS). They are also looking at the use of open source software Grafana to create a reporting dashboard. This approach to make data readily available will help raise awareness of potential threats cross industry, opening the opportunity for collaboration on control programs at a landscape level.

Shakira Johnson from AUSVEG points out the pest and pathogen surveillance capabilities of the state-of-the-art Sentinel unit.

Acknowledgements

iMapPESTS is a $21 million research, development and extension investment. It is supported by Hort Innovation, through funding from the Australian Government as part of its Rural R&D for Profit program as well as investment from plant industry Research and Development Corporations. In addition, in-kind contributions from national and international partner organisations have been received. These include SARDI, Agriculture Victoria and Rothamsted Research (UK).

Contact Dr Rohan Kimber, Rohan.Kimber@sa.gov.au or AUSVEG engagement and adoption coordinator – Shakira Johnson, 0433 937 564, Shakira.johnson@ausveg.com.au

First published in Precision Ag News (SPAA) Vol. 16 Issue 3.■

Successful detailed tracking of major plant disease's global spread

AGRICULTURAL Research Service (ARS) scientists from the USDA and their Oregon State University (OSU) collaborators have developed a new, highly detailed genetic way to trace the spread of Agrobacterium, one of the world's most important bacterial plant pathogens, according to research just published in *Science*.

Agrobacterium causes crown-gall disease in numerous commercial and ornamental 'woody' plant species. It is also particularly problematic in hydroponic crop growing.

What gives Agrobacterium its virulence is the presence of plasmids inside the bacterial cells. Plasmids are autonomously replicating DNA molecules that have become part of the bacterium but are not essential to the physiology of the cells. These plasmids have genes that give Agrobacterium the unique ability to transfer a portion of the plasmid into plant cells and genetically reprogram the host to cause disease.

Difficult to control and track

These plasmids also have genes that allow Agrobacterium to transfer the entire plasmid horizontally from one bacterium to another rather than only vertically as in parent to offspring.

Once acquiring a harmful plasmid, a previously benign strain of Agrobacterium can become a novel pathogen line. This ability has made control of the pathogen and tracking of an outbreak very difficult.

To develop their tracking system, the researchers first had to figure out the actual evolution and classification of the plasmids found in Agrobacterium. The plasmids come in two main classes: Tumor inducing (Ti) and Root inducing (Ri), neither of which are directly genetically related to Agrobacterium.

Before these studies, the accepted scientific view was that the frequent transfer of genetic information among plasmids and large amount of genetic variation among Agrobacterium species made drawing evolutionary relationships practically impossible. Without such information, it is not possible to track disease outbreaks.

Surprisingly, the ARS/OSU team discovered Ti and Ri plasmids are all descended from just six and three lineages, respectively.

They analysed whole genome sequences of more than 1500 strains from the Rhizobiales order, to which Agrobacterium belongs, which showed different lineages of Agrobacterium emerged independently and at different times in the past.

"What we found was that following the transmission of plasmids themselves between bacterial cells was key to tracking disease outbreaks" said OSU postdoctoral scientist and computational biologist Dr. Alexandra J. Weisberg. She is co-advised by plant pathologist Niklaus Grunwald with the ARS Horticultural Crops Research Unit in Corvallis, Oregon and Professor Jeff Chang with OSU.

"Armed with this extensive genetic sequencing information about how to classify plasmids and Agrobacterium, we could infer both how bacteria move among nurseries and how the plasmids move among bacteria," Alexandra said.

Having whole genome sequences of Agrobacterium allowed linking nursery outbreaks on the basis of having strains with the same genome and plasmid sequences, the same genome sequence but different plasmid sequences, or different genome sequences but the same plasmid sequences, Alexandra explained.

The researchers were able to track at least seven cases

Crown-gall disease on a grape vine. Scientists have developed a tracking system to help in the control of this disease which affects commercial, horticultural and nursery crops worldwide.

in which global distribution of plants contributed to the widespread transmission of a single Agrobacterium strain-plasmid combination. In one case, they tracked one nursery that produces plants for wholesalers that may have served as a kind of patient zero source for many outbreaks. Strains of the same genotype-plasmid combination were later identified in two other nurseries in another part of the world.

With the ability to separately analyse the bacteria from the plasmid, they found many cases in which plasmid transmission perpetuated disease spread. For example, the researchers found one strain/plasmid combination that was collected in 1964. Plasmids with the same sequences were identified in strains collected 30-40 years later in very different parts of the world.

Potential tracking strategy for animal/human diseases

Understanding the genetic basis for how pathogens like Agrobacterium evolve and diversify, especially in agricultural settings, provides a new foundation for determining their spread, at high resolution, and assessing risks of future outbreaks, Alexandra explained.

It allows researchers to determine whether agricultural practices are spreading bacteria/plasmid combinations or plasmids by themselves and in turn, will help growers use appropriate strategies to limit spread.

"The strategy has the potential to be applied in tracking other diseases in plant and human/animal epidemiology and even tracking food safety disease outbreaks," she added. ■

Rewiring plant reproduction for higher seed yields

EXPLOITING quirks in plant reproduction could boost yields in two staple crops – sorghum and cowpea – for crop farming worldwide and particularly for communities in sub-Saharan Africa (SA).

That's the endgame of 'Hy-Gain', a multi-million dollar international collaborative research project led by University of Queensland's Professor Anna Koltunow, with support from the Bill and Melinda Gates Foundation.

"Hy-Gain aims to empower smallholder farmers to save and sow high yielding sorghum and cowpea hybrid seed," Anna said.

Hybrids – the offspring of in-bred, genetically-divergent parents – can be exceptionally tough and produce significantly higher yield gains.

Professor Anna Koltunow.

But these traits are not preserved in any of the seeds the hybrid plant produces because they form via sexual seed formation – a pathway, requiring meiosis and fertilisation.

Anna said sexual reproduction naturally separated genetic traits in seeds formed in flowers of the hybrid.

Cowpea plant in flower. (PHOTO: UQ's Brett Ferguson).

A quirky key

"The key to preserving the seed yield gains of hybrids from one generation to the next lies with one of the quirkiest aspects of plant reproductive biology: 'apomixis' – a naturally occurring asexual seed formation pathway in plants," she said.

"If a high quality hybrid seed is equipped with genetic switches to allow it to produce a plant with new seeds asexually– that is without meiosis and fertilisation – the resulting seeds would produce plants that are identical clones of the hybrid parent.

"This would allow hybrid seed to be retained and re-sown on-farm for a number of generations, with the farmer able to realise yield gains and pocket the cost of purchasing hybrid seed each year."

The Hy-Gain project, which involves six research organisations and a multinational seed company, follows a prior five-year project led by Anna, also funded in part by the Bill and Melinda Gates Foundation.

Anna said one of the most striking aspects identified in the previous research was the relatively small number of changes required to switch from the sexual to an asexual mode of seed formation.

"In Hy-Gain, we are developing plant prototypes to test if we can lock in those valuable hybrid characteristics over generations when the hybrid seed is planted, flowers, and produces more seed," she said.

"The goal is to deliver African-adapted sorghum and cowpea varieties with improved yield and resilience traits, targeted to specific regions.

"The Hy-Gain team is aiming for forward delivery of a very useful technology that can be readily, and cheaply, used in breeding.

Pictured L to R: Basam Tabet, Professor David Jordan, Dr Emma Mace and Professor Ian Godwin from the Queensland Alliance for Agriculture and Food Innovation at UQ Gatton.

Cowpea is a staple crop in sub-Saharan Africa.
(PHOTO: Brett Ferguson)

"In-country cowpea and sorghum breeders need to be able to make decisions on varieties to develop in their regions, as they are connected with their farming communities."

Hy-Gain project researchers inspecting sorghum trials at the University of Queensland.

A game-changer for farmers everywhere

Anna said, if successful, the Hy-Gain technology was a potential "game-changer" for farmers everywhere, including within Australia's sorghum breeding program.

"This technology could enable much more effective plant breeding and seed production at a time when the grains industry is dealing with the challenge of maintaining yields under increasingly hotter and drier growing conditions," Anna said.

The UQ team includes world-leading sorghum researchers Professor David Jordan, Dr Emma Mace and Professor Ian Godwin from the Queensland Alliance for Agriculture and Food Innovation – a UQ research institute supported by industry and the Queensland Government, and Associate Professor Brett Ferguson from UQ's School of Agriculture and Food Sciences who has expertise in legumes.

Strong linkage to the Department of Agriculture and Fisheries, Queensland with its sorghum and legume breeding programs and facilities, provides significant opportunity for future crop testing.

This project is funded in part by the Bill and Melinda Gates Foundation with further support from The University of Queensland and the Department of Agriculture and Fisheries, Queensland.

New Guinness world record for highest wheat yield

AT A GLANCE...

- Location – Paddock 15, Wakanui, Canterbury, New Zealand.
- Yield – 17.398 tonnes per hectare (6.93 tonnes per acre).
- New Zealand farmers harvest approximately 400,000 tonnes of wheat each year.
- Wheat is used to produce high quality ingredients for the food industry in New Zealand and contributes to millions of dollars in export revenue.

ERIC Watson from Ashburton, New Zealand has taken out the Guinness world record for the highest wheat yield for the second consecutive time. Eric produced an incredible 17.398 tonnes per hectare wheat crop, beating his previous record crop grown in 2017 of 16.791 tonnes per hectare.

On average, irrigated wheat yields in New Zealand produce around 12 tonnes per hectare, demonstrating how remarkable the new record is – an achievement admired by the wider industry, and providing insights into innovations for future growth.

Eric was thrilled with the result as he strives to continually improve and make advancements to his yields and farming operation.

"We are very proud to have achieved such a result. The Guiness world record is a nice recognition of our hard work and new innovations we've put in place. While we were thrilled with the record result in 2017, we saw ways in which we could make improvements and achieve an even higher yield," said Eric. "By trying new cultivars, switching to liquid nitrogen and monitoring plant health more regularly we were able to achieve another incredible result.

Harvesting the record wheat crop which tipped the scales at more than 17 tonnes per hectare.

Eric Watson (left) and Bayer's David Weith in the new world record yielding wheat crop.

Because of the high wheat yields we can grow on our farm we are pleased if we see yields increase year-on-year by 100 to 200 kilograms per hectare. So to beat my last crop by almost 600 kilograms per hectare exceeded even my hopes" said Eric.

Planted in April 2019 and harvested on February 17, 2020, the wheat variety is Kerrin, bred by KWS and supplied by Carrfields Grain and Seed. The grain will likely be used for feeding New Zealand's beef or dairy herd.

Eric worked closely with Bayer Crop Science for both of his records receiving agronomy advice and using a range of their crop protection herbicides and fungicides.

Bayer Regional Business Manager for mid and south Canterbury David Weith said the latest Guinness world record shows New Zealand is an important part of the global arable market and puts the country at the forefront in developing farming techniques and technologies that can be utilised by other farming nations to feed the world.

"We are delighted to see another Guinness World Record come out of New Zealand and to have contributed to this incredible result," said David.

"Bayer is focused on improving crop yields through developing innovative products and crop management solutions. Our aim is to assist New Zealand to sustainably become the highest yield producing country in the world."

The record attempt was a team partnership with PGG Wrightson Rural Supplies, Yara Fertilisers, SGS, Davis Ogilvie and Hill Laboratories in particular, working alongside Bayer to help Eric achieve his fantastic result.

For more information please visit *www.bayer.co.nz* ■

Project to combat fall armyworm in Australia and South East Asia

By CSIRO

AT A GLANCE...

Australia's national science agency, CSIRO, is leading a research project to understand and manage fall armyworm (FAW), a transboundary pest threatening crop production across South East Asia and Oceania.

A CSIRO-LED project will provide an understanding of fall armyworm's genetic make-up and insecticide sensitivities to see which practices are the most effective for managing FAW. This will help develop effective pest management plans.

CSIRO researcher and project leader Dr Wee Tek Tay said FAW was capable of damaging various crops, including maize, sorghum, cotton, ginger and sugarcane.

"This particular species of armyworm has developed resistance to commonly used insecticides in other parts of the world, making management more difficult," Tek said.

It has spread rapidly since the first reported detection in Africa in 2016, across Asia and Africa and to Australia in early 2020, potentially carrying new insecticide resistance or feeding traits.

"The resistance status of the current incursion, potential

CSIRO project leader Dr Wee Tek Tay says the particular species of armyworm now in Australia has developed resistance to commonly used insecticides in other parts of the world. This will make management of this exotic pest more difficult. (PHOTO: CSIRO)

Research will focus on a genetic characterisation of the similarities and differences in the populations found in Australia and South East Asia as well as insecticide sensitivities of these populations.

for resistance to develop over time and the ongoing migration of FAW into Australia and the region may present significant challenges to agricultural industries.

"The more we know about this armyworm, its genetics and its response to insecticides, the better we can plan for effective management and eradication strategies," Tek says.

Gaps in understanding

Historically, the pest has been classified as either rice-preferred or corn-preferred fall armyworm. But recent genomic studies confirmed the presence of hybrids in both native and invasive ranges, leading to gaps in understanding of host crop preferences, especially in invasive populations.

ACIAR's Associated Research Program Manager for Farming Systems Analysis, Dr Sarina Macfadyen, said it was hoped the research would help develop individual country responses and facilitate co-ordinated actions.

"The team will focus on developing new knowledge in two areas – firstly, conducting a genetic characterisation of the similarities and differences in the populations found in Australia and the countries in South East Asia," Sarina said.

"The second area of research involves testing the insecticide sensitivities of these populations that may already show some level of resistance to commonly used products.

"The team will look for genetic markers that, if present, may suggest some populations already carry mutations that make them able to withstand specific insecticides, and they will conduct bioassays on live caterpillars exposed to different insecticide modes of action.

"This knowledge will feed into the development of resistance management plans by individual countries and inform insecticide recommendations to farmers," Sarina says.

Easily reach pandemic proportions

Transboundary plant pests and diseases may easily spread to several countries and reach epidemic proportions. Outbreaks may cause significant losses to crops and pastures, threatening the livelihoods of farmers and the food and nutrition security of many people.

The spread of transboundary pests, such as FAW, has increased dramatically in recent years. Globalisation, trade and climate change, as well as reduced resilience in production systems due to decades of agricultural intensification, may all have played a part.

"This co-investment brings together partners in government, RDCs, the private sector and the research community to address an immediate priority – the characterisation of FAW in Australia and South East Asia," said Dr Jeevan Khurana, GRDC's Manager Biosecurity who is co-ordinating the partnership.

"The information generated will be an important component in the development of sustainable management strategies."

The research is due to run until the middle of 2021 with a final report of the findings to be published by CSIRO and ACIAR.

The project is co-funded by the Australian Centre for International Agricultural Research, Grains Research and Development Corporation, Cotton Research and Development Corporation, FMC Australasia and Corteva Agriscience. It involves partner organisations in Indonesia, Vietnam, Laos, Myanmar, Cambodia, Philippines, Malaysia and Uganda.

■

Fungicide resistance a growing issue in barley disease

BARLEY growers are advised to monitor their crops for early signs of fungicide resistance, with research uncovering new developments in the resistance to fungicides in a common barley disease of the southern cropping region.

Recent studies have detected more cases of resistance to succinate dehydrogenase inhibitor (SDHI) fungicide in the disease net form net blotch (NFNB).

In 2019, researchers identified dual resistance to both the SDHI seed dressing fungicide fluxapyroxad and some demethylation inhibitor (DMI) fungicides on farms affected by NFNB on South Australia's Yorke Peninsula (YP).

More incidences of SDHI resistance in NFNB have since been confirmed in samples from YP, and reduced sensitivity (reduction in the performance of the fungicide treatment that does not necessarily result in field failure) has been observed in samples collected on the border between South Australia and Victoria, as well as from Eyre Peninsula (EP).

The work has involved researchers from the Grains Research and Development Corporation (GRDC) and Curtin University co-invested Centre for Crop and Disease Management (CCDM), and the South Australian Research and Development Institute (SARDI) which is the research division of Primary Industries and Regions SA (PIRSA). They have been working together to test samples they've collected from YP over recent months, as well as samples

Tara Garrard (SARDI) advises growers to be vigilant with disease monitoring and be ready to put management strategies in place.

Wesley Mair tests barley samples in the CCDM lab. More incidences of SDHI fungicide resistance in the southern region have been detected.

sent to them by SARDI collaborators, growers and agronomists from various regions of SA.

Analysing barley samples collected from 15 locations on YP, the CCDM's fungicide resistance team has been able to paint a more detailed picture of the incidence of SDHI, DMI and dual resistance.

Better understanding of incidence and spread

Building on testing already undertaken late last year, CCDM researcher Wesley Mair and his team spent the first half of 2020 analysing more than 400 NFNB lesions to determine the incidence of resistance.

Additional testing of samples collected by SARDI researchers, agronomists and growers from across the rest of SA have also helped CCDM researchers develop a better understanding of incidence and spread.

"Our previously released findings from 2019 showed that NFNB on YP was resistant to the SDHI seed dressing fungicide fluxapyroxad, and at the same time samples also showed resistance to the Group 3 DMI tebuconazole, which is a mixing partner in some DMI foliar fungicides," Wesley said.

"This latest testing now tells us that DMI resistance appears to be quite common, especially in the south of YP even though it hadn't been reported in SA previously.

"On the other hand, SDHI resistance appears to be absent on northern YP but is concentrated towards the south. As a result, dual resistance is found in the southern area and is more prevalent near Minlaton."

According to the CCDM's fungicide resistance expert Fran Lopez-Ruiz, the testing of the more recent samples indicates that the SDHI resistance found on YP late last year is more widespread than first thought.

A different mutation

Reduced sensitivity to SDHI also showed up in samples sent in from near the SA-Victorian border, although in this case the team's analysis uncovered a different mutation.

"In samples from the variety Oxford collected from the Kybybolite region in the South-East of SA, we're seeing new cases of reduced sensitivity to SDHI but these ones are displaying a 'new' mutation that is different to what we have seen on YP," Fran said.

"What's not clear at this stage is whether the new form of reduced sensitivity has emerged independently from those cases on YP."

The analysis of samples collected from the Lock area on EP also revealed the presence of reduced sensitivity to SDHI, but as yet no mutation has been associated with this result.

"The key now is to put in place steps to limit development and incidence of resistance as best growers can," Fran said.

It is hoped the latest discoveries of reduced sensitivity to SDHI from outside YP will help to better inform growers about what to look for across the season.

SARDI plant pathologist Tara Garrard advised growers to be vigilant in watching for the disease and to put management strategies in place to help combat it.

"Anything we can help growers do to limit the amount of disease in the area is paramount and by taking the right steps they can help control resistance," Tara said.

These steps include:

- If you are farming in an area that has reported SDHI resistance, avoid using SDHI fungicides as further use will apply additional selection pressure, accelerate the development of resistance and potentially lead to fungicide failure;
- In all other areas, if SDHI fungicides are used as a seed dressing then follow up with a foliar fungicide with a different mode of action;
- Choose fungicide mixtures with different modes of action;
- Avoid planting susceptible varieties – look for diversity in varieties;
- Avoid planting barley on barley; and,
- Closely monitor crops for signs of early resistance.

Growers or agronomists who suspect SDHI and/or DMI resistance should contact SARDI (tara.garrard@sa.gov.au) or CCDM at frg@curtin.edu.au or ccdm@curtin.edu.au. ■

Wild radish research reinforces IWM push

A WILD radish population in Western Australia with signs of reduced sensitivity to a popular broadleaf weed herbicide has reinforced the need to plan applications carefully and adopt integrated weed management (IWM) practices to help safeguard the future use of products.

Matt Willis, Market Development Agronomist with Bayer in WA, said the Australian Herbicide Resistance Initiative (AHRI) recently reported a shift in sensitivity to HPPD (hydroxyphenylpyruvate dioxygenase) inhibitor herbicides in a wild radish population at Wongan Hills in WA.

Palmer amaranth and waterhemp are the only two weeds worldwide with known field resistance to HPPD herbicide.

Matt said the Wongan Hills population had known resistance to Groups C, I, B and F herbicides. HPPD (Group H) herbicides had not previously been used at the site.

"The population has never had any Group H herbicides applied to it, but when treated with previously effective rates of a number of HPPD herbicides in a greenhouse pot study, there were survivors detected," Matt told listeners in the latest episode of the company's popular podcast.

"But, it is important to note that the rates tested were below the recommended label rates. By the definition of the global Herbicide Resistance Action Committee (HRAC), this is not field resistance, but it is showing that sensitivities are changing, and, in this case, it was believed to be through metabolic cross resistance."

Matt said it follows some concern over several wild radish populations in the state's northern agricultural region, which were also being tested.

Maintaining effectiveness of existing products

He said the latest developments once again highlighted the importance for industry to employ strategies that could help maintain the effectiveness of existing herbicides.

"This means not using sequential applications of Group H products and, where we can, using coformulations or tank mixtures so we are not just relying on a single active (ingredient)."

"With a broadleaf herbicide like Velocity, it contains both pyrasulfotole (Group H) and bromoxynil (Group C), so two different modes of action and, importantly, there is synergism between them. In a nutshell, one plus one equals more than two when it comes to efficacy.

"This is in addition to good application recommendations including using the maximum herbicide rate required, high water rates, targeting small weeds at the early crop stage when there is minimal shading, as well as using the appropriate nozzle set-up to ensure maximum efficacy out of these herbicides."

Use non-chemical options where possible

Matt said growers are also encouraged to use non-chemical weed control methods where possible to help extend the effective use of existing herbicides.

"Harvest weed seed management is a big one, as well as looking at crop rotations and increased crop competition. Pasture/sheep also is an option that can help control things. Don't just rely on herbicides."

Matt Willis, Market Development Agronomist with Bayer in WA, says news of a wild radish population at Wongan Hills with reduced sensitivity to a popular broadleaf weed herbicide, highlights the importance for industry to employ strategies that could help maintain the effectiveness of existing herbicides.

Fellow Market Development Agronomist with Bayer in WA and the company's IWM lead in Australia, Craig White, agreed.

He said while the sensitivity shift in populations was complex and researchers were still investigating the cross resistance in wild radish, the message remained the same as that expressed over many years.

"Mix, rotate and do everything you can, including using every weed control option at your disposal, to keep these tools alive and viable for as long as possible," Craig told the listeners.

He said to help growers with IWM strategies, Bayer had a dedicated website (*www.crop.bayer.com.au/tools/mix-it-up*) that included extensive information and resources, as well as recommendations from the global HRAC and Australian industry's WeedSmart program.

It also includes a 'Resistance Tracker', which updates growers on weed resistance in their local areas. By simply entering a postcode, they can determine which weeds need to be closely monitored. ■

Introducing the Seed Storm

ONE might wonder why a manufacturer dedicated to supplying quality, innovative transport equipment solutions, and founder of the ground-breaking seed and fertiliser trailers – Tornado – would venture into the seeding bar market.

But Gnowangerup (WA) based manufacturers, Duraquip, saw a niche in the market and decided to put their background of 110 years of farming experience to the task and create something that would tick all the boxes.

Garry Richardson, Director of Duraquip, has a passion for perfection that led to the development of the Seed Storm, an Australian made seeding bar demonstrating strength and flexibility. The newly released bar has been subjected to rigorous testing and scrutiny over the previous 12 months.

According to Garry, "the 80 foot seeding bar market is growing, there are farmers out there who want to get more done, and we now have tractors that can pull these machines.

"Farmers are chasing efficiency. Times and seasons are changing, to the point that what was once considered a good start date for seeding has now become a finish date. We wanted to build a bar that would perform well in whatever conditions it had to work in and get a lot of crop in fast."

Some of the patent-pending design features of the Seed Storm:

- 35 to 80 foot bar options
- 10 to 12 inch spacing options
- Transport width up to 7.5 metres maximum
- Flexible frame connections
- Retractable tine system
- Single lift cylinder controlling whole frame
- Optional castor lock system to assist with bar tracking

With four generations of farming experience in Gnowangerup behind them, Duraquip looked for a solution in the 80 foot market – and a solution that could easily be transported on road. "We needed every box ticked," said Garry. "We have two machines in the field – an 80 foot and a 60 foot – each covering around 4000 hectares with minimal issues."

"One thing we want to eliminate is uneven depth control. We developed a single cylinder hydraulic lift system which mechanically maintains the frame level 100 per cent of the time."

"The Seed Storm has a strong frame but we made it flexible enough so it would avoid cracking. It also has a floating drawbar, for contour following ability and excellent fore and aft frame stability. It rides where you set it, doesn't twist into the ground, and doesn't skate along the top either, even in exceptionally hard digging conditions," says Garry.

The Seed Storm 80 foot bar features 20 large diameter, high flotation wheels, to keep it rolling with ease and which offer excellent flotation across deep sandy or wet soils. Rim patterns and wheel bearings are uniform across the machine.

Trash flow is maximised with the Seed Storm as all wheels sit clear of the seeding area, situated in front and behind the tine ranks. This ensures the maximum possible trash flow through the machine, without drag up around wheels.

Garry said that the ease of maintenance also played a key part in the ingenuity of their design. The main frame uses long-lasting Gar-Max bushes throughout, making it virtually greaseless. The development of the retracting hydraulic tine system and main frame lift has resulted in a manageable 7.5 metre transport width and road clearance on an 80 foot bar, and "makes for a lot of room to change points – you're not crawling through a jungle of tines only just off the ground".

Duraquip's field testing involved 'Jase', an agricultural contractor from Queensland, who put the Seed Storm to work. Having been involved with farming for most of his life and having had exposure to many other seeding bar brands across Australia, Jase was unsure at first, if the Seed Storm at 80 foot width would work when put to the test.

Jase operated the bar in very dry soils, but the Seed Storm sustained its performance in both sandy ground and the hardest ground Jase could find, as well as heady, rocky, clay ground.

"It blew me away," he said, "most new products have teething issues but for something this quality to work straight away, that's a feat in itself. It doesn't move around, everything stays level, precision wise, it's one of the best I've seen."

"The thing I like about Duraquip is that they take a critical eye to their own products, makes it easier for owners down the line… they want a machine out there that people can't fault." ■

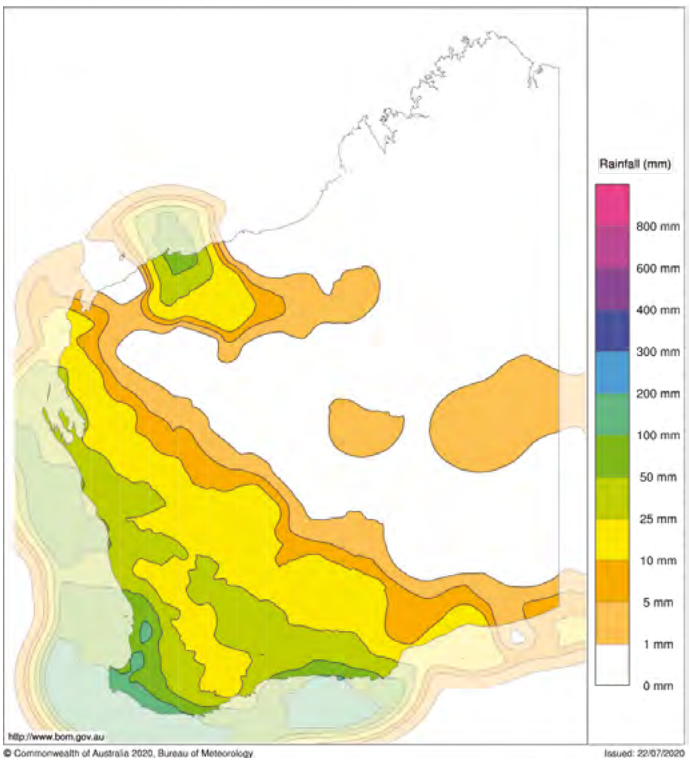
The strength, flexibility, precision and transportability of the new Seed Storm ticks all the boxes.

Western region

District Reports...

July–August 2020

Western Australia rainfall totals (mm) July 1 to 22, 2020
Australian Bureau of Meteorology



Patchy and light rainfall events during the first three weeks of July in most cropping regions of WA, have kept crops just ticking over. A widespread and soaking rain is needed as the season heads into spring.

WESTERN AUSTRALIA SUMMARY

Potential still there, need moisture in the bank

The 2020 grain growing season is finally starting to look like it has the potential to return at least an average harvest. Whilst it is too early to make a call on tonnages, in most regions crops have made up ground from the warm winter conditions to date and are at growth stages similar to a traditional mid to late May break.

But the question that everyone is asking is: "Will the rain keep on falling?"

Crops in most areas of WA's grain growing regions have been living 'hand to mouth' with rainfall events, and many have had only one event of greater than 10 mm. There is little subsoil moisture and crops will crash in the spring if there are not decent falls of rain over the next month.

Grain yield potential is above average in much of the north of the state, the central western rim, the south west and the eastern corridor north and south of Merredin down to Hyden and in the north western Lakes district.

Crops in the west coastal regions north of Perth, the central midlands down to the central Kwinana zone, the whole south coast and the majority of the Esperance port zone are mostly below average due to very low soil moisture reserves, uneven plant establishment and later emergence of crops.

The season to date has been dominated by the very strong high-pressure systems resulting in severe north/south wind events and scattered rain rather than good soaking falls when the cold fronts hit the west coast.

The traditional fundamentals of warm sea surface temperatures and other indicators have been completely overridden by these high-pressure systems. It has made it very difficult for growers to implement cropping programs as most predictions of good rainfall events have fallen away to either nothing or very little rain of value.

Total winter crop area estimate for WA stands at just under 8.5 million hectares. The per crop total hectare estimates are:

- Wheat 4,930,000
- Barley 1,620,000
- Canola 1,100,000
- Oat 485,000
- Lupins 280,000
- Other pulses 69,000

Grain Industry Association of WA, July 10, 2020

SOUTH COAST

Seasonal conditions on the South Coast have remained dry and windy over the past two months and with higher than average temperatures. Fortunately, the cold fronts have been regular enough to provide weekly rainfall events of around three to five mm but these falls are often after a big drying northwesterly wind.

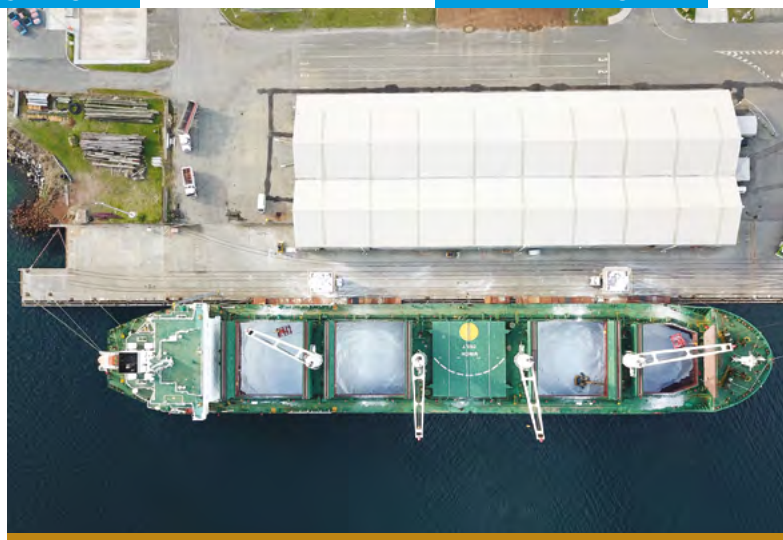
Some wind erosion has occurred which in some cases has

Scaddan farmer Gavin Egan checking soil moisture levels in early July in his Scepter wheat crop. (PHOTO: Quenten Knight)

District Reports...

Flowering Jurien lupins in early July at Keith and Emma Green's property at Neridup, north east of Esperance (WA). (PHOTO: Quenten Knight)

The Lily Dutch Windmill is a tower mill located near the towns of Amelup and Borden in the Stirling Range region of WA. While being one of Australia's very few working traditional windmills, it also provides an intriguing backdrop for an establishing lupin crop. (PHOTO: Quenten Knight)



A drone's eye view of unloading a urea ship at the Albany Port. (PHOTO: Quenten Knight)

required crops to be re-sown. Fortunately these areas are quite small which, in years like this, underlines how invaluable our no till and stubble retention farming system really is.

In spite of the dry conditions, crop establishment has been quite good and yield potential remains positive if the season can provide a decile 5, or better, finish.

To date, there have been no major agronomic problems. Weed pressure has been minimal with the dry conditions and top-up nitrogen decisions are being reviewed in line with the dry season.

Green peach aphids are being problematic in some canola crops in the North Beaumont region, particularly where they are moisture stressed.

Quenten Knight
Agronomist – Agronomy Focus, Esperance
July 8, 2020

Southern region

SOUTHERN AUSTRALIA SUMMARY

Despite very little rainfall in early July across southern Australia, most cropping regions had average to above average levels of root-zone soil moisture, with the exception of parts of South Australia and northern Victoria.

But during the week ending July 15, a complex low-pressure system moved over south-eastern Australia with several cold fronts and troughs, bringing variable rainfall, thunderstorms and severe weather to the region.

In south-eastern Australia's cropping regions, rainfall totals of between 10 and 50 mm were recorded across much of New South Wales, eastern Victoria and western South Australia. Some cropping regions of central New South Wales enjoyed falls in excess of 50 mm.

Grain production outcomes in regions across southern Australia with low root-zone soil moisture, will be heavily reliant on rainfall during the remainder of winter and early spring to support crop development.

It is expected that further cooling in the central and eastern tropical Pacific Ocean will occur and a La Niña-like pattern could emerge, potentially contributing to the above average late winter and spring rainfall outlook for parts of Australia.

There is a high chance that rainfall between July and

District Reports...

September will be sufficient to sustain crop and pasture development across much of southern Australia. Across most of New South Wales, Victoria and South Australia there is a 75 per cent chance of receiving between 50 and 100 mm in this period.

ABARES, July 16, 2020

VICTORIAN MALLEE

Things are green in the Wimmera-Mallee after a good start to the season. But this dry start to winter looks like it's going to continue with the Bureau of Meteorology's ACCESS model suggesting that July is likely to be 'below average' for parts of southeast Australia.

Paddock management – particularly the logistics of urea spreading – and spray applications have been challenging throughout June, with frosts, windy and showery conditions across the Mallee impacting efforts.

Most canola top-dressing has been completed, as has the first application of urea for cereals, and decisions are being made about a second application.

Broadleaf herbicide sprays are starting, although product supply is a bit of an issue this year, and fungicide applications are underway in early sown crops.

Mice and armyworm are causing trouble in isolated patches, and the summer green bridge has meant that detrimental insect levels were an issue.

With winter lambing finishing up for mixed farmers in July,

Barley establishing well at the 2020 BCG Main Site. (PHOTO: BCG)

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)	2020 rainfall to date (mm)	Summer 25yr Annual Average (mm)	Summer 2019–20	Autumn 25yr Annual Average (mm)	Autumn 2020	Winter 25yr Annual Average (mm)	Winter 2020 to date	Spring 25yr Annual Average (mm)	Spring 2019
Emerald Qld	560	377	256	287	106	61	67	29	125	6
Toowoomba Qld	678	381	271	304	143	53	87	48	179	124
Roma Qld	567	444	245	385	118	49	74	20	131	35
Goondiwindi Qld	609	200	242	212	124	23	98	0	145	36
Narrabri NSW	617	450	213	272	121	152	122	33	161	60
Gunnedah NSW	622	411	206	220	110	150	125	43	182	38
Dubbo NSW	583	474	183	120	125	280	127	76	180	32
West Wyalong NSW	433	423	114	112	79	239	121	78	120	41
Wagga Wagga NSW	524	301	130	39	110	201	146	70	141	91
Swan Hill Vic	307	168	68	44	65	109	87	21	88	37
Bendigo Vic	491	348	96	74	107	233	159	46	129	81
Horsham Vic	365	212	73	67	72	110	121	35	98	58
Lake Bolac Vic	507	311	105	102	107	140	155	77	141	113
Murray Bridge SA	356	194	64	38	81	108	120	51	93	50
Kadina SA	328	101	59	41	79	40	108	33	82	59
Cummins SA	394	153	50	43	92	100	176	18	76	68
Esperance WA	620	199	91	36	137	31	253	136	138	97
Wagin WA	392	184	50	49	89	60	168	77	85	49
Northam WA	407	177	51	44	84	55	192	79	80	38
Mingenew WA	347	225	32	87	84	46	174	91	57	26
Moora WA	385	149	46	46	79	41	191	64	69	36
Mullewa WA	310	193	48	66	89	49	130	82	43	12

Last rainfall reading July 23, 2020.

District Reports...

July–August 2020

there is plenty of feed growing in the southern Mallee, although farmers further north will be looking for some additional feed sooner rather than later.

BCG's trials team has officially hit the finish line for the sowing program of 2020. Trials have been sown in 34 paddocks at 24 different locations across the northwest, with approximately 10,000 individual plots sown.

The BCG research team have been busy converting the specialised BCG Lab from the sowing set-up into the configuration required for the next stage of work which involves plant establishment counts, undertaking biomass cuts, plot nutrition, disease assessments and spraying.

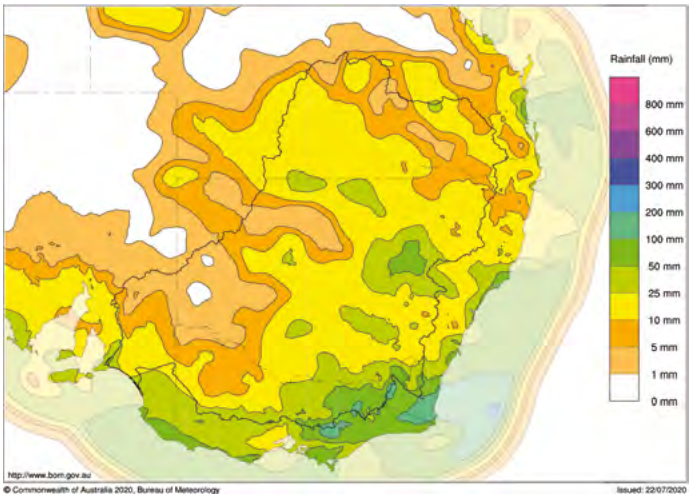
The latest long-range forecast from the BOM is still suggesting 'above average' rainfall for August to October. BOM's modelling also suggests that both maximum and minimum temperatures across much of southern Australia are expected to be 'above average' over this period.

Furthermore, with the Bureau of Meteorology's ENSO Outlook recently shifting to a La Niña watch for the coming months, most BCG members and Wimmera Mallee growers are optimistic for the remainder of the season.

Tom Draffen and Amy Harwood
Birchip Cropping Group
July 8, 2020

Time of sowing wheat trials are underway at the 2020 BCG Main Site. (PHOTO: BCG)

Murray–Darling Basin rainfall totals (mm) for July 1 to 22, 2020
Australian Bureau of Meteorology



Some very handy rainfall during July in the very southern reaches of the Murray-Darling Basin, has set winter crops up nicely across that region. But falls have been more patchy in NSW and Queensland so growers are looking to general, soaking rain as the season heads into the critical spring months.

District Reports...

July–August 2020

Northern region

DARLING DOWNS

In summary

Finally, June brought some much needed rain to allow planting over most of the Downs. Over the month, falls ranged from 30 to 50 mm. The moisture moved down into the soil profile well so most planted paddocks have some reasonable moisture underneath them.

Harvest of the 2019/20 summer crops

Summer crops were all planted very late from mid-January into February, and into good through to poor stored moisture – so yields have varied accordingly.

This Darling Downs' crop of Taurus sorghum was yielding a very respectable 6.0 tonnes plus per hectare.

District Reports...

July–August 2020

Mungbeans have been the main success story with yields around 1.0 to 2.0 tonnes per hectare coupled with good quality and high prices resulting in a profitable return.

Most sorghum crops were racing to fill grain before the frosts arrived but unfortunately on the southern Downs, some crops lost the race and were frost-affected. This lead to low yields and small seed. But overall, most sorghum crops produced between 3 to 5 tonnes per hectare, with the best over 6 tonnes. The only difficulty has been high moisture in the sorghum, and all crops have needed to be dried, or at least aerated.

Late corn is yielding 3.5 to 4.5 tonnes per hectare dryland.

Sunflowers have performed relatively well with fair yields and high prices giving good returns.

The 2020 winter crop

There has been slightly more wheat than barley planted as growers look for stubble cover alongside a profitable return. Establishment has been good and early weed control is underway.

The chickpea area is back on "normal" years but well ahead of the past two seasons, and emergence so far is good.

Some of the early planted crops of barley are at some risk of frost damage, with a number of paddocks damaged in early July.

There have also been some plantings across the Downs of faba beans and canary.

The next summer crop outlook

There is renewed interest in cotton both under irrigation and dryland, but the main crop in area will be sorghum again.

Irrigators will also consider corn for silage and gritting – and if the wet spring eventuates – we will see some double cropping into mungbeans and possibly sunflowers.

Hugh Reardon-Smith
Senior Sales Agronomist – Nutrien Ag Solutions Pittsworth
July 8, 2020

ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

The crawler is an early 1950s Fowler VF – which is the crawler version of the Field Marshall and powered by the same single cylinder two stroke 40 hp diesel engine. Photographed at a Mudgee field day in 2002. (Photo IMJ)

ADVERTISERS' DIRECTORY

Winter cereals establishing well on the Downs. "It's great to finally see some green paddocks."

BIG TYRE

The Tyre, Wheel & Rubber Track Specialists

AUSTRALIAN MANUFACTURER LEADS THE WAY

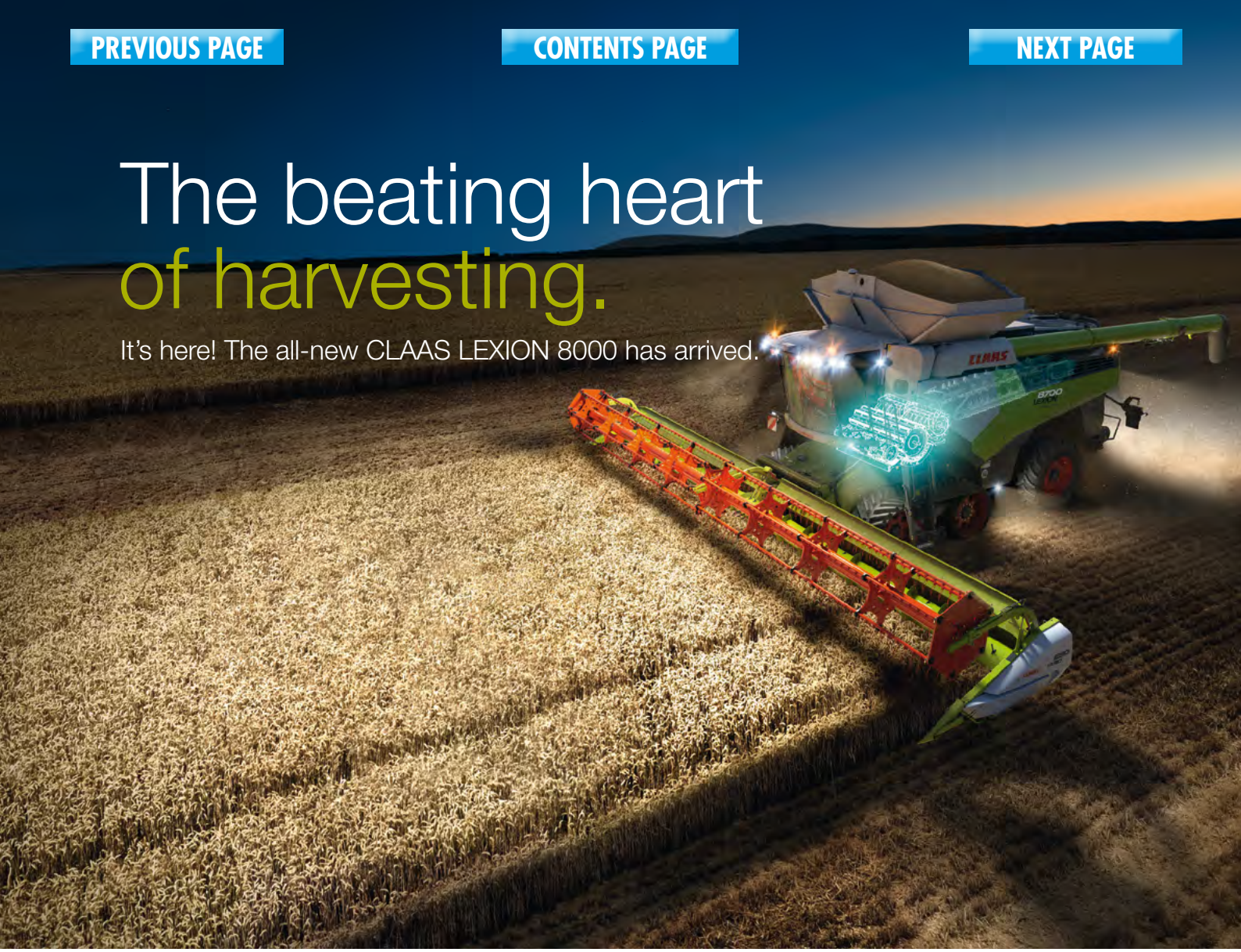
At a time when the Australian Manufacturing industry is at a cross roads due to the stress on supply chains from COVID-19, family owned and operated company, Big Tyre, is stepping up its game. In operation for over 60 years, Big Tyre has weathered many storms and learned many lessons to become Australia's leading specialist in tyres, wheels and rubber tracks.

Since its beginning in 1954, when it was known as Vacu-lug, Big Tyre has maintained a strong focus on the agricultural sector. For its first 40 years, Big Tyre's work was mainly focused on relugging and repairing tractor tyres. Over the last 20 years, Big Tyre has reconditioned over 1,000 rubber tracks for agricultural tractors, rebuilt thousands of undercarriage wheels, become a world leader in the manufacture of solid underground mining wheels, and, yes, they still relug and repair tyres.

In recent years, Big Tyre has led the way in switching from the use of rubber to polyurethane on rebuilding mid-rollers (to handle the high loading) whilst still maintaining the use of rubber on the drive and idler wheels to maximise grip. In the last couple of months, Big Tyre has also released its own new and

The beating heart of harvesting.

It's here! The all-new CLAAS LEXION 8000 has arrived.



CLAAS LEXION 8000/7000 combine harvester

CLAAS LEXION is already recognised as the world's most advanced combine harvester. The all-new LEXION 8000/7000 series pushes the boundaries even further. Featuring the revolutionary APS SYNFLOW HYBRID threshing system at its heart, LEXION 8000/7000 is even more productive, efficient, reliable and easy to operate.

New APS SYNFLOW HYBRID

– 26% bigger treshing drum
– 23% more concave area
– 57% bigger separator drum
– 10% more throughput

CLAAS Harvest Centre
claasharvestcentre.com

CLAAS