Irrigated Cropping Council

FIELD DAY MAGAZINE

OCTOBER 2021

Irrigated Cropping Council

Contents

EO Highlights

The Irrigated Cropping Council (ICC) is proud to work with a variety of partners to bring locally lead independent research to the region. Although another challenging year for our extension activities we have had a huge year.

Six research programs which total 1,898 research plots in the ground at Kerang, Congupna and Wakool. This summer we continue to grow the research happening on irrigated grain and fodder crops with the Optimising Irrigated Grains Maize trials and with partnerships with Pioneer, Pacific Seeds, Murray Dairy and Agriculture Victoria.

Last year's average trial yields were 8t/ha wheat, 4.3t/ha canola, 6.5t/ha barley, 5.7t/ha fabas and 14t/ha maize. We produced just under 18 t DM/ha on the Pacific Seeds Sorghum trial and 23 t DM/ha for corn on the Murray Dairy irrigation trial.

Despite COVID and the unfortunate cancelling of both our conference and major field day, we still hosted in person farm visits in Congupna and Pretty Pine, a summer field day in Kerang and a soil pit day in a shed thanks to the rain. We have hosted virtual events when in-person has been impossible, our 2020 field day was a virtual event including videos and a webinar and we discussed decision making with Kate Burke via zoom.

ICC continues to grow the opportunities for members and irrigated mixed farming and cropping sectors in our region through the development of new partnerships. This year we have a number of exciting new projects.

Irrigated Business Planning Program This program helps farmers consider their exposure to water markets and the efficiency of their irrigation system, and the influence this may have on their future farming business. This project enables you to have one-on-one time with a business consultant to work on your whole-farm plan and work with a small group to tackle common issues. This project is a collaboration with The North Central Catchment Management Authority and Murray Dairy and is funded by the Australian Government's Future Drought Fund.

Southern NSW Drought Hub ICC is working with the Southern NSW Drought Hub to help increase the drought resilience capacity of the agricultural industry and rural, regional and remote communities living with the consequences of drought.

This is a user driven initiative where farmers, agribusiness, local business, and community will be asked to have a voice in drought resilience activities, and given the opportunity to collaborate with experts, gain access to resources, and participate in extension and adoption programs.

The Hub will focus on values as a key driver for change, to understand your needs and involve you in designing and implementing solutions. This will help us reimagine how we develop and deliver activities that will foster innovation and better address your needs. The Hub aims to speed up the adoption of innovations on farms, modernising approaches for improved community, landscape and production outcomes.

Fodder for the Future This project is a cross-sector collaboration designed to support complementary farming systems that optimise the use of resources and help farmers adapt to a water limited future. We currently have fodder trials investigating wheat, oats and our crazy punt crop faba beans in the ground at Kerang. The research is focused on reducing the play off between quantity and quality and ensuring we get the best return on water invested into fodder production.

Our collaboration with Murray Dairy started in the summer with a trial comparing sorghum and maize under three irrigation strategies. The aim of the trial was to assess a range of grain and sweet sorghums and maize species to see which are the most water efficient forage (silage) producers. During the season the white sorghum had reduced water use compared with maize, however maize was the highest yielding and gave the best dry matter/ Megalitre when compared to the sorghums across all irrigation treatments. This work will be repeated this year.

Investigating Heat Stress We have been contracted by the University of Western Australia to test a broad range of varieties for their tolerance to heat stress. Blocks have been sown from conventional sowing times, right through to the start of spring with the aim of achieving low to extreme levels of heat stress during flowering. We are looking forward to gaining a greater insight into the impact of heat stress on this crop and are excited to be part of the team influencing the varieties of the future.

Continuing work Research that is delivered over multiple years enables us to see the impact of season on different varieties and input strategies. Although there will never be silver bullets in farming, learning what treatments give good results in contrasting seasons helps us build a better equipped tool kit.

Continuing programs include:

GRDC Optimising Irrigated Grains We are just over the half way line delivering 30 trials per year to learn how to increase performance of irrigated canola, barley, durums, faba beans, chickpeas and maize.

As part of this project we also have a soil amelioration site at Wakool where a combination of deep ripping and soil amendments have been applied. In the first year we saw an impact on yield, we suspect from the nitrogen released with the breakdown of the lucerne pellets used. We are continuing to monitor to determine the impacts over multiple years.

To add further value to this project, we are running an **Irrigation Discussion Group.** We have been visiting farms to learn how people have built in flexibility to respond to a volatile water environment in their business. A number of farms have also been written up as case studies. We have focus paddocks in looking at the grain and graze potential of winter canola's in Kerang and deep ripping with soil amendments in Pretty Pine.

Smarter Irrigation for Profit (SIP2) We are in our final demonstration year for this project although we are currently seeking opportunities to extend this work. The focus has been on achieving the best returns per megalitre by strategically applying water. We have been targeting key growths stages as a way to reduce spring irrigations. The project will soon be releasing a mini series to showcase the findings from the key learning sites in Kerang, Finely, Griffith and Condobolin.

This program is supported by five Rural Development Corporations (grains, rice, cotton, dairy and sugar) through funding from the Australian Government Department of Agriculture as part of its Rural R&D for Profit Program.

Soil Carbon We continue to monitor the soil carbon site in Congupna to see if the treatments applied two years ago are having any impact on soil carbon levels. As a non-wetting issue was discovered at the site a number of additional treatments were applied to see if this could be overcome under a sprinkler system. This project is supported by the Goulburn Broken CMA through the Australian Government's National Landcare Program.

ICC Variety Trials These continue to provide value year on year thanks to the support of BASF, Pioneer, Pacific Seeds, Nuseed, AGT, Seed Force, Seednet, University of Adelaide and Longreach. With harvest results exclusively for members these trials are some of the only fully-irrigated wheat, canola, barley and faba bean trials in the country.

We are grateful for the continued support from our sponsors GrainGrowers, Pioneer, Pacific Seeds, AGT, Adama, Rubicon, Water Partners and Hybrid Ag. Sponsorships allows us to conduct relevant local research and provide key extension programs across the region.

This year we partnered with CottonInfo, Cotton extension, Rice Extension, Murray Dairy, Agrifutures and Rural Bank for the first time in the development of an Irrigated Ag Conference. Although this event had to be cancelled due to COVID these networks remain in place and we are looking forward to working with them to bring you this event next year.

Charlie Aves

Executive Officer


RØDE

Kerang Research Centre Seasonal Summary

2021 started with a water market that made pre-irrigation economically justifiable. Climate models (although autumn is probably when they have the poorest reliability) were indicating an average to slightly wetter season.

Most trials were to be sown onto wheaten hay stubbles. Soil N at sowing was far less than 2020 (which followed brown manured vetch) and ranged between 70 and 90 kg N/ha.

The first trials to be sown for the winter season were the Murray Dairy Fodder for the Future, planned for sowing in early April. Thanks to 42mm in late March, the first sowing occurred on March 31st into receding moisture, but with rain forecast. Pre-irrigation then happened for the rest of the trial area, starting on April 8th. As the forecast rain failed to materialize, the fodder trial was watered up/pre-irrigated as well. Sowing resumed on April 21st with the long season wheat trial, followed by the canola and cereal fodder trials.

April rainfall was very much below average with a decile 1, or 0.8mm for the month.

May rainfall was below average (11mm), but this was just enough to keep moisture in the soil surface and allow sowing to go close to planned as possible - the main season wheat trial was sown on May 6th, barley and fabas on May 7th, chickpeas on May 18th and the durum wheat trials on May 21st .

Another new project for the ICC is the national GRDC Canola Heat project. The aim of the project is to identify ecotypes and/or genes that will improve the heat tolerance of canola. This trial is made up of 24 selections of Brassica napus (the species name of canola) and these have been sown at 5 time of sowings (29/4, 25/5, 22/6, 13/7 and 9/8).

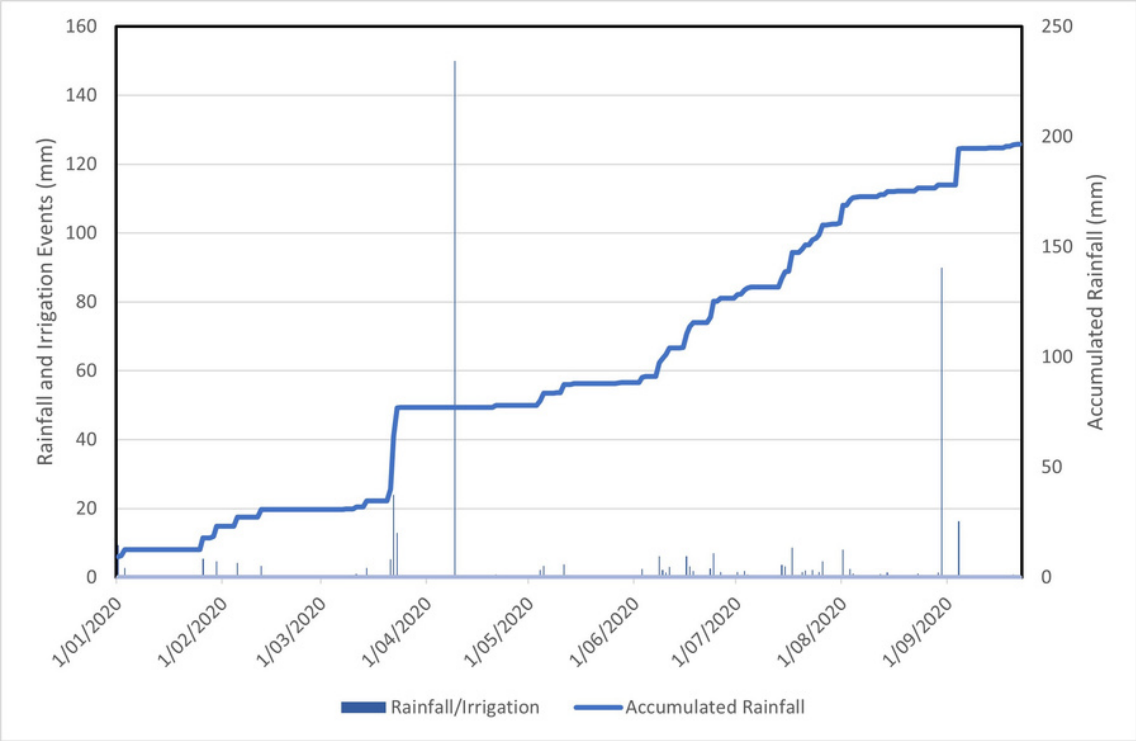
June and July saw average rainfall, with 38mm and 34mm respectively. However the rainfall occurred as many small events. June rainfall enabled us to sow the ‘non-trial’ areas to a mix of wheat and vetch as a brown manure, aiming to keep our ryegrass under control in anticipation for sowing to trials in 2022 and improve, or at the very least halt the decline of, our soil organic matter.

August was again drier than average, which resulted in the first irrigation in the Smarter Irrigation for Profit 2 (SIP2) trial on August 26th. This demonstration is on the ‘red dirt’ and had been pre-irrigated. The ‘grey dirt’ (the majority of the Trial Block) was irrigated on August 30th.

Stripe rust was observed in Trojan on September 3rd, with small ‘hot spots’ of septoria on Scout in our SIP2 demonstration prior to being sprayed with a fungicide at GS39 (full flag emergence). Other disease noted this season has been ascochyta in the chickpeas and very low levels of cercospera in the faba beans.

The start of September saw 16mm of rain shortly after irrigation, but no waterlogging occurred. The weather seemed to get stuck in a pattern of warming up with increasing wind during the week followed by a change over the weekend, sometimes bringing rain but generally resulting in poor totals. The second spring for the SIP2 demonstration was September 17th, and the second irrigation for the majority of the trials will be in late September.

2021 Rainfall, Irrigation and Accumulated Rainfall



Irrigated Variety Trials

Damian Jones, Irrigated Cropping Council

The variety trials are comparative crop variety testing with standardised trial management, data generation and collection to provide meaningful results for growers.

Irrigation provides a unique environment that allows high yields to be targeted. However most varieties are developed and tested under dryland conditions.
In order to perform under irrigated conditions, a variety should have the following characteristics:

- High yield potential
- Maturity that matches sowing date and the optimal grain filling period (avoiding frost at flowering but also avoiding high temperatures during grain filling)
- High tolerance to crop lodging
- Waterlogging tolerance
- Good disease tolerance/rating, although a disease management plan can address some shortfalls

The decision was made to separate the early maturing (or early season) varieties from the main trial, and to sow them at a more appropriate time that suited their maturity.

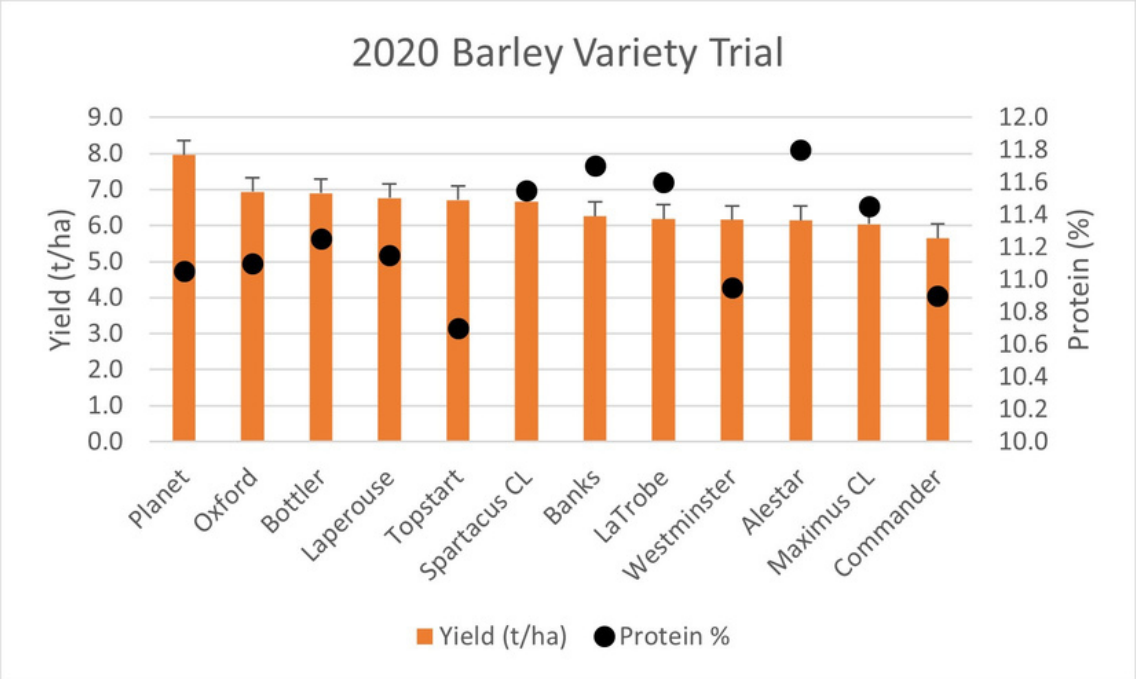
Variety trials in 2021 include:
Canola – 23 varieties and lines
Barley – 15 varieties and lines
Wheat – 19 varieties and lines
Faba beans – 7 varieties and lines
Durums - 9 varieties and lines

Thanks to the support of BASF, Pioneer, Pacific Seeds, Nuseed, AGT, Seed Force, Seednet, University of Adelaide and Longreach.

Irrigated Variety Trials
Barley 2021

Trial Summary

April 8th	Pre-irrigation – 1. 5 Ml/ha
May 7th	Boxer Gold (2.5 l/ha) + Gramoxone 2.0 l/ha
May 8th	Sown at 79-112 kg/ha with 125 kg/ha DAP, targeting 160 plants/m^2 Seed treated with Gaucho 600 (200ml/100kg)
July 22nd	N topdressing 90 kg N/ha
August 6th	Fungicide 500 ml/ha Veritas
August 10th	N topdressing 40 kg N/ha Total N was 260 kg N/ha, including soil N, starter and mineralisation through the season, enough for 8 t/ha
August 24th	First spring irrigation, 0.9 Ml/ha
September 20th	Second spring irrigation, 0.9 Ml/ha



Comments on the 2020 Variety Trial

Midway through the season, there was tipping and discoloration of the leaves in a few of the varieties, particularly Banks, which was diagnosed as cold temperature damage.
RGT Planet yielded considerably higher than all other varieties.

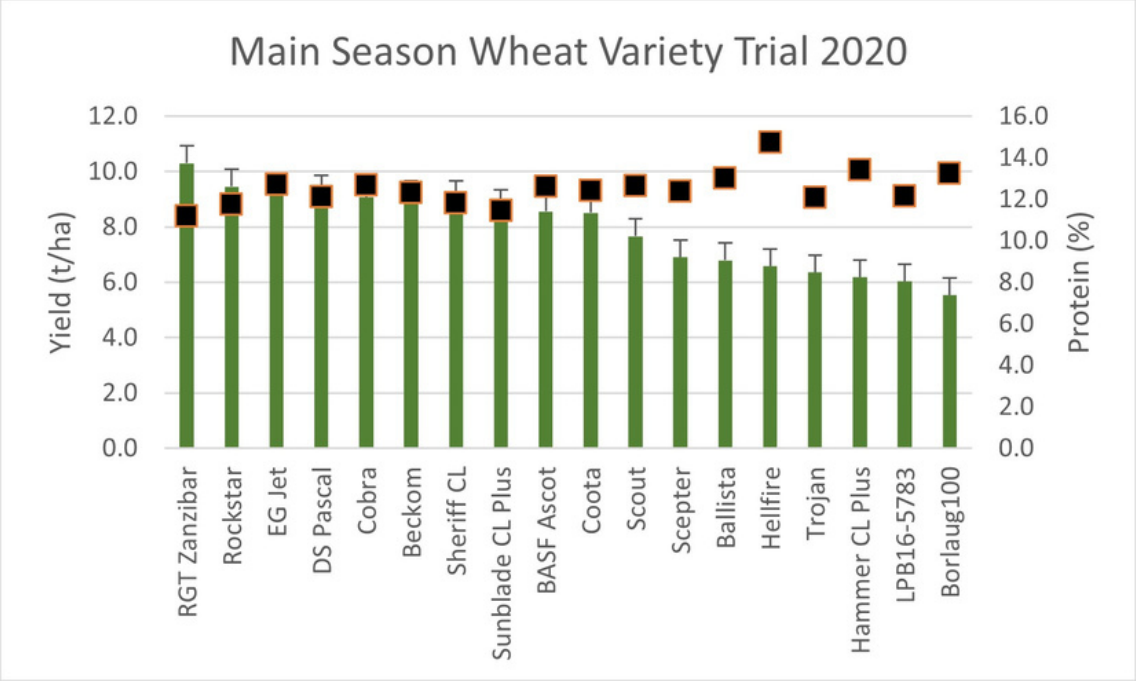
Lodging was an issue for most varieties. While some varieties do have weaker stem strength than others, nitrogen management does play a part. Early vegetative growth encouraged by either early N application of high fertility can lead to lodging later in the season.

Supported by Seednet, AGT and GRDC experimental seed supply

Irrigated Variety Trials
Main Season Wheat 2021

Trial Summary

April 9th	Pre-irrigation 1.5 Ml/ha
April 17th	Knockdown, Glyphosate (1.5 l/ha) + Goal (75 ml/ha)
May 6th	Sakura (118 g/ha) + Gramoxone (1.8 l/ha) Sown at 79 - 123 kg/ha with 120 kg/ha DAP, targeting 160 plants/m^2
July 22nd	Topdressed urea 100 kg N/ha
August 10th	Topdressed urea 100 kg N/ha Total N 320 kg N/ha, including soil N, starter and mineralisation through the season, enough for 8 t/ha
September 6th	Fungicide Tilt Xtra 250 ml/ha (majority of varieties were at GS39 or later)
August 30th	First spring irrigation – 1.0 Ml/ha
September 27th	Second spring irrigation, 1.0 Ml/ha



Comments on the 2020 Variety Trial

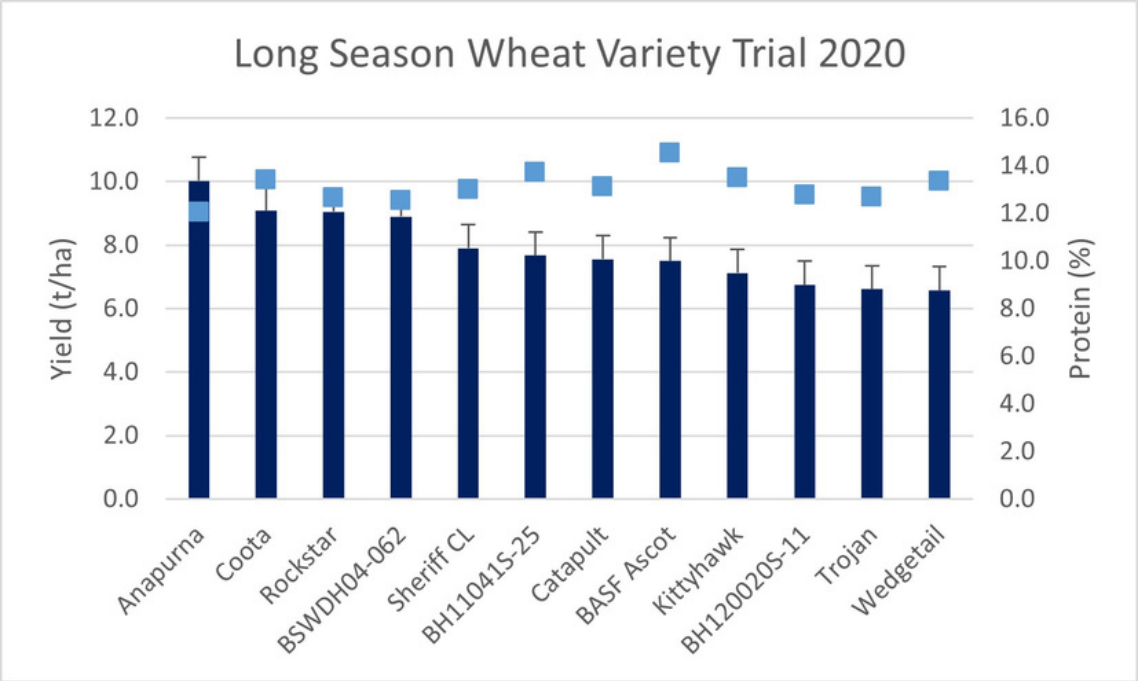
The trial did receive a foliar fungicide application on September 6th, based on when a majority of varieties had reached GS39 or full flag leaf emergence as well as prior to irrigation. Stripe rust was noted on Trojan, Borlaug 100 and a numbered line on August 27th.

Supported by Pacific Seeds, AGT, BAS-F and GRDC experimental seed supply

Irrigated Variety Trials
Long Season Wheat 2021

Trial Summary

April 9th	Pre-irrigation 1. 5 Ml/ha
April 21st	Glyphosate (1.5 l/ha) + Goal (75ml/ha) + Sakura (118 g/ha) Sown at 79 – 117 kg/ha with 120 kg/ha DAP, targeting 160 plants/m
July 22nd	Topdressed urea 100 kg N/ha 2
August 10th	Topdressed urea 100 kg N/ha. Total N was 320 kg N/ha, including soil N, starter and mineralisation through the season, enough for 8 t/ha
August 17th	Fungicide Tilt Xtra (250 ml/ha)
August 30th	First spring irrigation, 1.0 Ml/ha
September 27th	Second spring irrigation, 1.0 Ml/ha

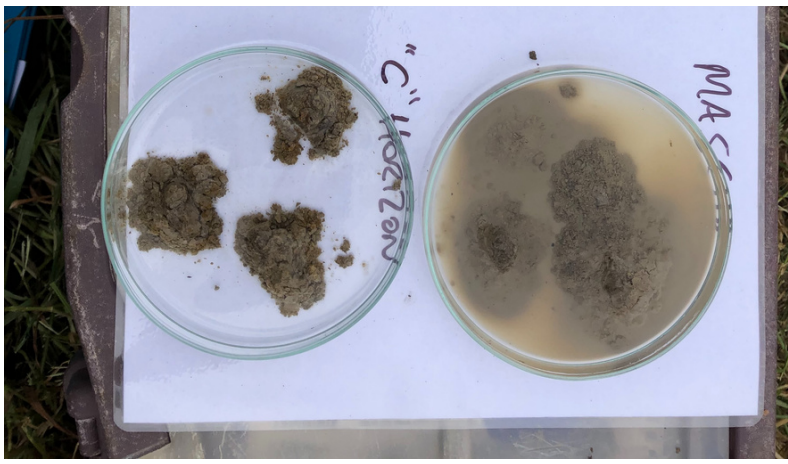


Supported by Pacific Seeds, AGT, BAS-F and Intergrain

Irrigated Variety Trials
Durum Wheat 2021

Trial Summary

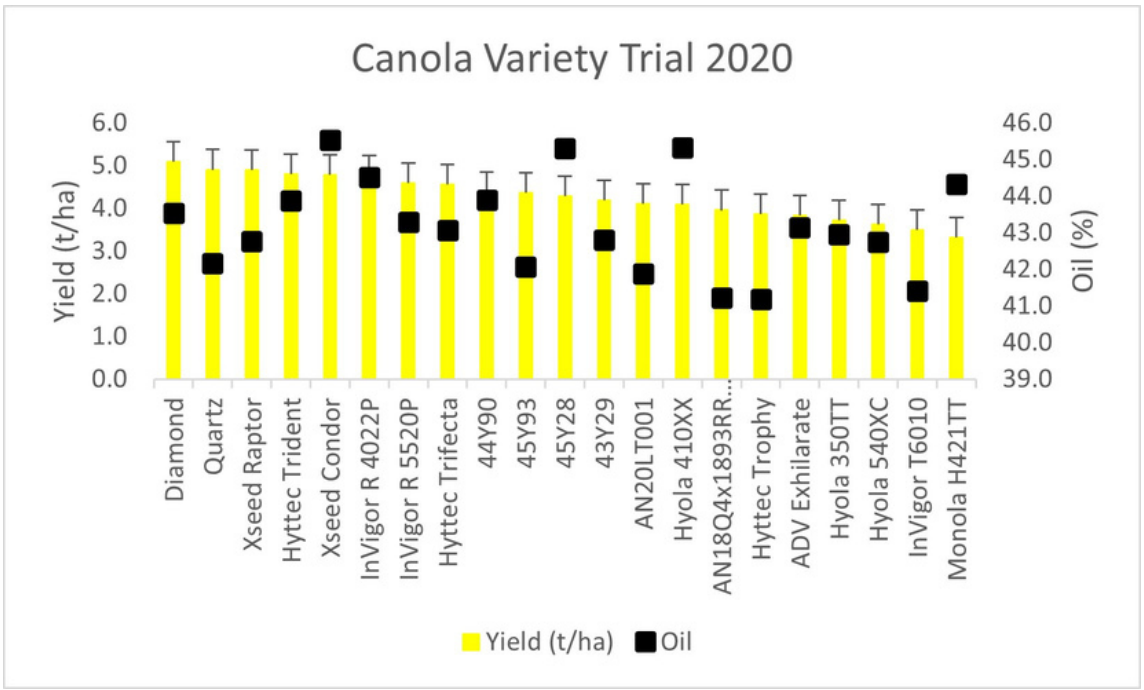
April 10th	Pre-irrigation 1. 5 Ml/ha
April 21st	Glyphosate (1.5 l/ha) + Goal (75ml/ha)
May 21st	Boxer Gold (2.5 l/ha) + Gramoxone (2.0 l/ha)
	Sown at 97 – 1120 kg/ha with 120 kg/ha DAP, targeting 160 plants/m^2
August 9th	Topik (200ml/ha)
August 11th	Topdressed urea 95 kg N/ha
August 16th	Precept (1.0 l/ha)
August 22nd	Topdressed urea 100 kg N/ha. Total N will be 400 kg N/ha, including soil N, starter and mineralisation through the season, enough for 8 t/ha
August 24th	First spring irrigation, 0.9 Ml/ha
September 20th	Second spring irrigation, 0.9 Ml/ha



Irrigated Variety Trials
Canola 2021

Trial Summary

April 23rd	Sown at 2.0 – 4.0 kg/ha with 125 kg/ha DAP, targeting 40 plants/m ^{2} and watered up (1.5 Ml/ha)
May 21st	Clethodim 240 (500 ml/ha)
June 17th	Lontrel Adv (125ml/ha)
July 1st	Topdressing 80 kg N/ha
July 29th	Topdressing 80 kg N/ha. Total N was 280 kg N/ha, including soil N, starter and mineralisation through the season, enough for 4.5 t/ha
August 31st	First spring irrigation, 0.9 Ml/ha
September 27th	Second spring irrigation, 1.0 Ml/ha

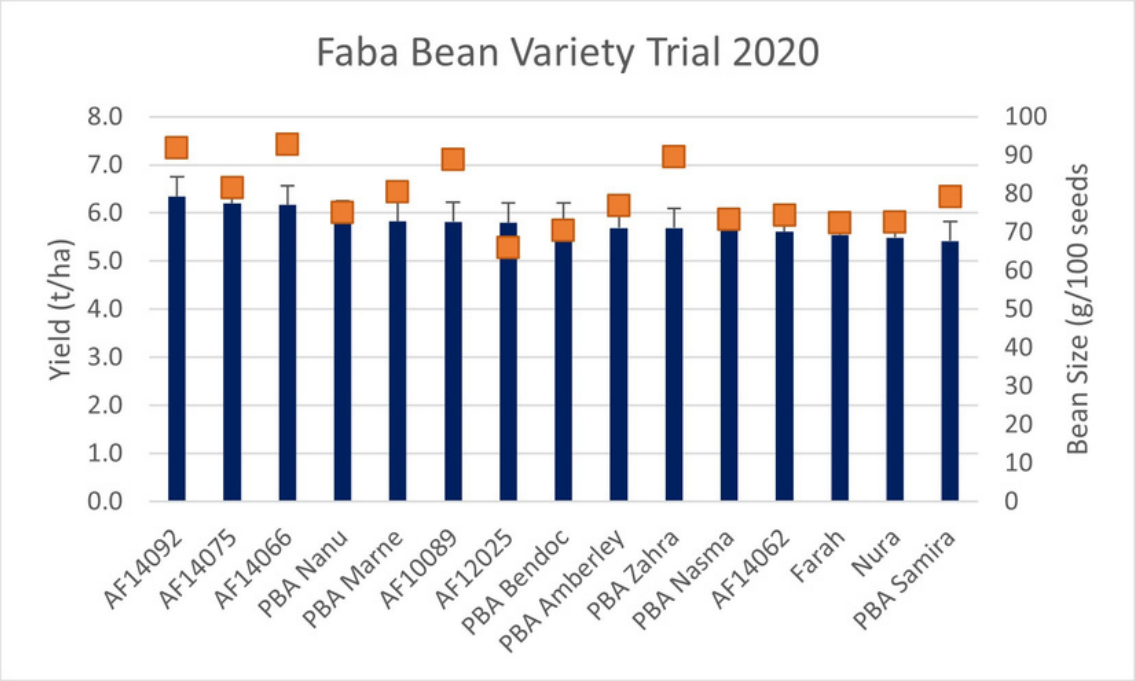


Supported by Pacific Seeds, Pioneer, BAS-F and NuSeed

Irrigated Variety Trials
Faba Bean 2021

Trial Summary

April 8th	Pre-irrigation – 1. 5 Ml/ha
May 7th	Terbyne (1.0 kg/ha) + Gramoxone 2.0 l/ha
May 7th	Sown at 158-237 kg/ha with 200 kg/ha Superfect, targeting 25 plants/m^2 Seed treated with Gaucho 600 (200ml/100kg)
July 22nd	Herbicide Clethodim 240 (500ml/ha) + Factor (180 g/ha)
August 6th	Fungicide 1500 ml/ha Chlorothalonil 720
August 30th	First spring irrigation 0.9 Ml/ha
September 21st	Fungicide 1500 ml/ha Chlorothalonil 720
September 27th	Second spring irrigation, 0.9 Ml/ha



Supported by Seednet and University of Adelaide

Optimising the Productivity of Irrigated Grains

Ben Morris, Tom Price, Nick Poole, Kenton Porker from Field Applied Research (FAR) Australia, and Damian Jones from Irrigated Cropping Council

The Optimising Irrigated Grains project aims to lift the productivity and profitability of irrigated farming systems in Southeast Australia. The research component of the project is led by Field Applied Research (FAR) Australia in collaboration with Irrigated Cropping Council (ICC) and NSW DPI and is underpinned by 65-70 field trials conducted annually on six crops (grain maize, canola, durum wheat, barley, chickpeas and faba beans).

It is a four-year Grains Research Development Corporation (GRDC) investment which aims to develop and evaluate the effectiveness of novel soil management technologies and crop specific agronomic management practices in irrigated environments on system profitability. It's early days but initial results covering grain maize, canola and durum wheat would suggest that N off takes at harvest regularly exceed the economic optimum levels of N fertiliser to which those crops will respond to during the growing season.

So, what is being addressed in the research being conducted?

The project which has now completed its first year of results with winter crops and second year with summer crops has a major focus on examining the major agronomic levers that influence irrigated crop profitability. Of the agronomic practices being evaluated there is a major emphasis on nutrition asking the questions around how hard we need to push nitrogen (N) fertiliser inputs to achieve high yields under surface and overhead irrigation.

Optimising the return on nitrogen through improved nitrogen use efficiency has been a major focus of the initial trials in crops such as grain maize, canola, and durum wheat. In addition, the research is looking at the other major agronomic levers that can be manipulated to maximise productivity in irrigated crops, these include irrigation system (surface v overhead), sowing date, disease management, plant growth regulation and its effects on plant architecture and standing power. Below we have presented examples of trials underpinning these key findings.

Key Preliminary Learnings

Early indications suggest the economic optima for nitrogen (N) applications in irrigated winter and summer crops is less than the crop takes up during the growing season.

Maximising productivity and margins with high rates of applied N have on the whole been unsuccessful. Irrigated crops have seemingly not been able to respond in a growing season to the extra applied N. Particularly in grain maize, canola and durum wheat.

High yields have been achieved under irrigation in results to date but it's clear that N mineralisation from the soil has been a key contributor to N in the canopy at harvest, meaning that the fertility of the farming systems is key to providing sufficient soil N supply with large crop canopies and higher yields resulting from irrigation.

The results so far illustrate that irrigated soils that are moist and warm are more efficient than dryland soils at turning kg N/ha into t/ha of grain and that soil N supply from mineralisation is typically greater than dryland soils through the course of the season. However irrigated crops maybe more vulnerable to N losses over winter if soils reach field capacity quicker.

The conundrum growers are likely to now face is how do we replace the N we have removed with higher yielding crops in our farming systems?

There may be two pathways to place more N into the system. Do we over fertilise with N in irrigated crops (exceeding economic optima) to compensate for higher crop N uptake (with the thought that it will be there in subsequent seasons, or do we adopt a N restorative crops (annual or perennial) to put N back into irrigated farming systems to balance N depletive crops?

At Finley canola yields have approached 5t/ha (4.90t/ha cv 45Y28 RR Hybrid) and harvest dry matters approximately 15t/ha. Optimum applied N rates to achieve these yields have been no higher than 160kg N/ha applied (129 - 158kg N/ha 0 – 90cm in the soil) at Finley, and Kerang
Despite lower applied N rates, there is evidence that these crops are accumulating 300kg N/ha in the canopy at harvest. More work will be done in 2021.

In grain maize at both Kerang and Peechelba East it's been shown that 16 -19t/ha yields (cv P1756) accumulate approximately 400kg N/ha in crop canopy at harvest. In work conducted so far approximately one third of this N is returned to the soil as residue.

In the two years of grain maize trials conducted so far it has not been possible to get these same high yielding crops to respond with significant yield increases above 240-250kg N/ha applied.

At Peechelba East in 2021 where both nutrition and plant density were combined crops gave their highest margins where 230kg N/ha applied as fertigation was applied to a plant population of 80,000 plants/ha in a maize-on-maize scenario.

Early Field Results

Grain Maize Nutrition

The following are some of the trials that have given rise to the key learnings presented. Kerang 2021 – N Fertiliser optimum for Grain Maize (surface irrigation 11.6 mega L/ha). Grain maize established following grass dominant pasture (3 years) for the second year running gave an optimum applied N fertiliser rate of 240kg N/ha with N accumulation in the canopy at harvest of approximately 400kg N/ha.

Table 1: Influence of fertiliser N rate (applied as 50% split between predrill and V6) on grain yield (t/ha @ 14% moisture), dry matter (t/ha), test weight (kg/hl) and harvest index (H.I.), 20 May 2021.

Treatment				Grain Yield, Dry Matter Yield and Quality					
Kg N/ha				Yield		DM		Test Wt	H.I.
	Pre-drill	Post drill	Total kg	t/ha		t/ha		kg/hL	
1.	0	0	Nil (Control)	9.70	d	21.78	d	82.4	0.38
2.	40	40	80	12.89	c	29.27	c	83.3	0.38
3.	80	80	160	14.07	b	32.93	bc	82.5	0.37
4.	120	120	240	16.18	a	35.79	ab	82.3	0.39
5.	160	160	320	15.75	a	34.91	ab	83.1	0.39
6.	200	200	400	16.25	a	34.00	ab	81.9	0.42
7.	200	200 (+80)	480	16.12	a	37.70	a	82.4	0.37
8.	280	280	560	16.42	a	37.09	a	83.7	0.38
	LSD			1.02		3.67		ns	ns
	Mean			14.67		32.93		82.7	0.39
	P Val			<0.001		<0.001		0.153333	0.677
	CV			4.7		7.9		1.1	9.2

Figures followed by different letters are considered to be statistically different (p=0.05). Treatment 7 was the same as treatment 6 with 80 kg N/ha (46% N urea) was applied at tasselling to bring the total to 480kgN/ha.

Peechelba East 2020 – N accumulation in the canopy at harvest in Grain Maize
(lateral irrigation 6.08mega L/ha)

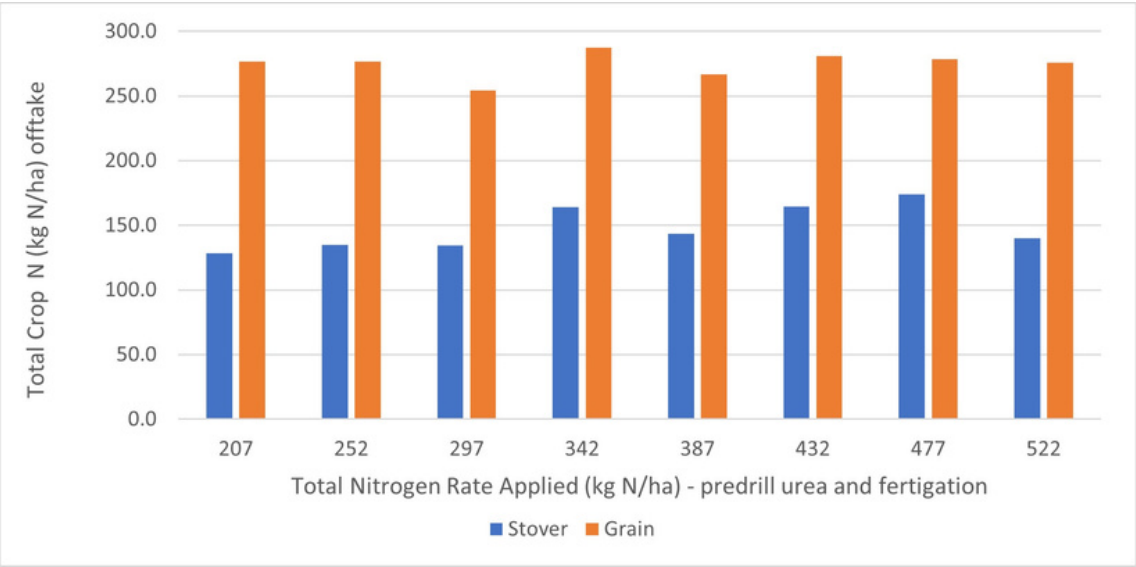


Figure 1. Grain maize total crop N (kg N/ha) offtake at harvest in the stover (stalks, leaves, husk) and grain Peechelba East, Victoria 2020, Hybrid 1756 – Grain yields of all treatments between 18.12 – 19.02t/ha.
There were no statistically significant differences in N offtakes totalling between 405 – 452 kg N/ha
* Post sowing nitrogen (207 N) was applied via fertigation with applications on V4 (46N), V8 (60N), pre-tasselling (101 N) on 10 Dec, 26 Dec, 14 Jan and Jan 15
Available soil N assessed prior to sowing 33 kg N/ha (0-60cm) . Harvest index based on grain and stover recorded at 0% moisture

Finley, NSW 2020 - N response in irrigated Canola (1.5 mega L/ha plus GSR)

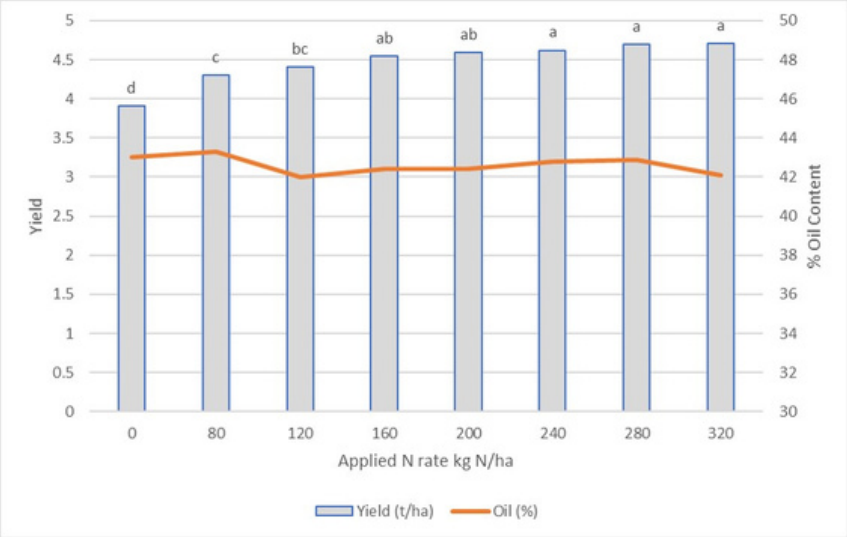


Figure 2. Influence of applied nitrogen fertiliser rate (split 50:50) at six leaf (6L) & Green bud (GB) on predicted seed yield (t/ha) and oil content (%). N applied as prilled Urea (46% N content)

GRDC project code: DAW1903-008RMX, FAR00003

Optimising Irrigated Grains Discussion Groups

As part of the optimisng irrigated grains project, we are running irrigation Discussion Groups. The ICC are partnering with IREC, Southern Growers, Riverine Plains, the Maize Association, MFMG and Southern Farming Systems to facilitate discussion groups in Griffith, Coleambally, Finely, Mulwala, Kerang, Corop, Frances and Longford.

Each group is unique and farmers drive the topics discussed at farm walks.

Focus paddocks are implemented to trial topics of interest to the group at a paddock scale. Focus paddocks have ranged from high input durum wheat, growing maize to heat stress in canola and soil amelioration.

Case studies have also been developed as part of the discussion groups to share some on farm strategies to help farmers learn from each other and be more adaptive to changing climates and water environments.

Focus Paddocks
Growing Maize in Tasmania

Ian Herbert, Southern Farming Systems

For those who ventured into growing maize over the 2019/20 summer it has certainly been a learning experience with a difficult season delivering less than expected yields of around 10t/ha of grain which did not meet grain delivery specifications.

In the coming season growers in Tasmania are again planning to plant maize and will aim to sow earlier and include shorter season varieties in the plantings where possible.

Season Summary

The growing season was a difficult one which included issues such as irrigation water shortages, a very windy dry spring with cooler conditions. This was then followed by one of the wettest autumns on record delaying dry down and the harvesting of crops. Many crops were unable to reach the required grain test weight specifications, creating uncertainty about the sale of the grain. Some crops remain unharvested and are unlikely to be harvested until late September 2020.

A number of crops remained un-harvested, so final yield results are not all available, I have summarised some yield information to help growers make decisions.

Ormley Sariety Strips

With the assistance of the crew at 'Ormley' and Terry Horan from Nutrien, strips of 4 varieties of maize were planted on the 7 November 2019 and harvested through June and July in 2020. The majority of the paddock was sown to Pioneer's 9400, with the paddock taken through to grain harvest with a small area being chopped for silage. Including the trial strips a total of 210t of grain was harvested from 22ha, giving an average yield, (including the chopped area) of 9.5t/ha, not quite the yield that was desired.

Like many growers, harvesting of the maize at Ormley was difficult given the weather conditions, fortunately Ormley have a smaller capacity grain dryer so were able to chip away at harvest, drying and delivering small batches of grain as conditions allowed.

The paddock had some slope and as a result bogging of machinery was only an issue in some areas, rather than the whole circle.

Also like many growers the test weight of the maize grain was lower than the contract requirement of 65. The consensus is that the crop did not have enough time to finish grain fill before the season turned. Perhaps this is due to the tough windy and dry spring that was experienced which did not provide suitable conditions, particularly enough heat for the crop to grow well through the vegetative and then reproductive stages. Then the very wet autumn conditions did not allow the crop to finish maturing as normally expected.

The strips were harvested using a John Deere harvester fitted with a 6-row corn front and the grain weighed in a mixing wagon with scales, (normally used in the on-farm field lot). The trial was not replicated so the data being presented is an average of each treatment. Harvesting was completed during the first week of July and was a slow process interrupted by harvester bogging events.

Grain moisture data was also collected to try and identify if some varieties had a quicker dry down time that others. This data should also be considered as an indication as strips were harvested at different times of the day given their location within the circle, i.e. daily variation in moisture levels was not accounted for. In addition, the wet weather may have also reduced the potential grain moisture difference between the varieties at a certain point in time.

The highest average grain yield of 10.7t/ha at a moisture of 14% was achieved by the Pioneer variety 9400. The longer season Pioneer variety 9911 yielded around 9.4t/ha and as expected was much slower maturing than the others and was harvested with a high moisture level of 32%, visually it was much greener for longer than the other varieties as the growing season neared completion.

The HSR variety Asterix yielded around 9.2t/ha compared to the other HSR variety Obelix which yielded around 9.0t/ha. The trial area was impacted by abnormally severe winds late in the season with damage being evident in all varieties, in particular, the variety Obelix was impacted severely with small areas where the wind was strongest causing the majority of plant storks to fracture and lodge about 60cm from the ground(see picture). This made harvesting difficult and perhaps is reflected in the lower yields of Obelix.

In Northern America some growers are planting their maize in 2 rows adjacent to each other, by nudging the GPS at planting and adjusting the seeding rate down, the Ormley trial area also had a twin row treatment. This treatment had the highest number of cobs per meter of row. However, we also noted that it had much smaller cobs, with the treatment being the lowest yielding strips at an average of 8.5t/ha.

To help the grain dry down the cob as it ripens will droop towards the ground, with the help of gravity this ensure moisture is not trapped by the leaves around the cob. All varieties exhibited good cob droop similar to the picture below.

Pisa Estate Crop

The crop grown near Cressy by Pisa Estate was the HSR variety Obelix and planted on 20 November 2019. It yielded 9t/ha with a disappointing test weight of 55. The grower feels that his planting date was too late and then given the difficult season the plants were unable to complete grain fill.

A standard harvester front normally used for harvesting cereals was used to harvest the crop and it was noted that large numbers of cobs were on the ground following the harvest operations. If maize becomes part of the cropping programme a designated corn front will be purchased.

North West Coast

At Sisters Creek on the North West Coast, Michael Nichols successfully harvested his maize in July also obtaining less than desired yields. He has an on-farm dryer so was able to harvest his grain at high moisture percentages of up to 35% and then dry it down. He had the Pioneer varieties 9400 and 9911 sown. The variety 9400 yielded just over 11.0t/ha at 14% moisture and the longer season 9911 yielded 10.0t/ha at 14% moisture and was noticeably greener and damper at harvest time.

Both varieties also had a low-test weight and a feed test was conducted with the results showing the grain had a ME value of 13.4MJ, 9% protein and digestibility of 91.5. His dairy farmer clients have advised that at these numbers the maize grain is suitable for inclusion in their cow rations.

Michael has noted each of his cobs had about 400 grains per cob which is 50 to 100 less than he expected, suggesting individual plants reduced yield potential due to seasonal conditions. The reduced number of grains in combination with the lighter grain weight Michael feels has had large impact on the final yield he achieved.

His crop was planted on 500mm rows and he thinks a wider row spacing of 750mm is more desirable. This would let more light into the crop when it is growing and allow more air to circulate when it is drying down. In the coming season he will also reduce his sowing rates to around 95,000 seeds/ha with the aim of establishing between 85,000 to 90,000 plants/ha.

This year's maize crops did not return the results that many had hope for, with the season including a very wet autumn and with lower than normal heat units contributed in not allowing the crop to reach yield potential.

The crops surveyed yielded an average around 10t/ha at 14% moisture, commonly with poor grain quality and losses occurring either; prior to or during harvest operations. The consensus is that had the grain produced been of a size and quality to meet specification and the crop had been in a condition to allow efficient harvesting with appropriate harvester fronts then average yields may have been closer to 12t/ha.

For the production of grain maize to become common place in Tasmanian farming systems these production issues need to be resolved. Experience elsewhere in the world, for example Ashburton in New Zealand, shows that profitable production of maize grain in our environment is possible.

This years' experience has shown that to advance growing the crop we will need to demonstrate in an average year that the crop will grow, develop, and deliver grain quality specs at profitable yields. To achieve this, we will need to consider.

- Planting shorter season varieties
- Planning for an earlier planting date, conditions allowing
- With the aim to ensure grain fill is complete and grain moisture is at a harvestable level earlier in autumn.

In this past season the varieties Asterix and Obelix from HSR and 9400 and 9911 from Pioneer were grown with results tabulated in Table 1 : Trial strips and surveyed maize crop results from 2019/20 season. To ascertain how these varieties perform in a normal season both Jamie Loane and Michael Nichols are going to again sow strips of various varieties this coming growing season. They are also both aiming to plant earlier in the planting window. Both HSR and Pioneer are going to provide some shorter season varieties that will also be planted and evaluated.

In discussion with John Auer (HSR) and Tim Lovell (Pioneer) they encourage growers to make use of those with experience including agronomists, growers and the seed company representatives and to consider the following:

- Plant when soil temp is 10 degrees and rising over 3 consecutive days
- Have planting activities organised well before target date
- Consider strip till, or similar, to improve planting timeliness
- For grain production use varieties which have a CRM of 94 or less.
- Use short season grain hybrids, discuss selection options with HSR and Pioneer seed reps.

Hybrid-Ag introduces the Differential Leaf Sap Analysis for Broadacre Crops

Hybrid-Ag have been using Differential Leaf Sap Analysis (DSA) in horticulture for over three seasons. This method has been used effectively in broadacre crops across the globe for over 12 years with excellent results and we are excited to launch it here in Australia.

The DSA test varies from the current method of testing sap from the petiole. Instead of a single leaf sample bag, each DSA test is comprised of 2 samples: the newest fully formed leaf (young leaves sample) and the second or third mature leaf (old leaves sample) of the plant. This unique test, combined with proprietary methods of extracting the sap from the plant leaf, enables us to detect nutrient imbalances very early and correct these before symptoms appear in the plant.

The analysis methods used in the DSA have been developed by Nova Crop Control, a laboratory established in the Netherlands in2008, who are widely regarded as the best in the world in sap analysis.

To effectively collect a sample we need to have at least 80g of leaves in each bag. When enough leaf has been gathered, remove any water from off the leaves, place in a zip lock plastic bag, expel all air from the bag and seal it.

The bags need to be kept cool (but not frozen) and sent to Hybrid-Ag as rapidly as possible. The whole process takes between seven and ten days between picking the leaves to discussing the results with a Hybrid-Ag Agronomist.

The Benefits of the DSA test:
Being able to see not only the levels of each nutrient, but also the nutrient flow within the plant. This allows us to see any nutrient imbalances, which may be a precursor to disease or insect attack, well before symptoms appear. Nitrogen and Phosphorus are 2 big drivers of yield. The plant needs not only these, but all the nutrients to be in balance to photosynthesize efficiently and produce protein. When a plant has the right balance of nutrients this can prevent lodging and head loss in cereal crops, as well as helping develop increased resistance to pathogens.

Farmers worldwide are now examining methods to reduce reliance on synthetic fertilizers and chemical control of insects and fungal disease. DSA testing offers farmers a chance to correct nutrient imbalance and get their crops functioning at levels of plant health that minimize the impact of plant disease and insect attack.

Stacked in your Favour

As environmental challenges emerge across Australia's agricultural sector, research and technology continue to open new doors. One of the most recent instances of this is herbicide-tolerance stacking in canola hybrids.

Justin Kudnig, Pacific Seeds national canola technical manager, is confident that these dual-stacked hybrids will deliver notable benefits to Australian canola growers. "Our three new canola hybrids have been adapted to grow across all states, and with high yields, high oils and an excellent tri-gene blackleg rating of R, these hybrids will be a strong addition to any farmer's rotations." He notes that these hybrids provide enhanced solutions by taking integrated weed management programs to the next level, adding protection against chemical carryover from previous crops – and have also proven to deliver competitive financial returns per hectare.

"As Aussie canola growers experience the full commercial value and agronomic protection provided by dual-stacked technologies, they will be able to see the advantage firsthand of adding products like Hyola Enforcer CT and Hyola Garrison XC to their program."

And he isn't alone in this assessment. Agronomists and growers are all seeing favourable results.
Craig Farlow, tech services manager for Victoria and the Riverina at Elders Rural, works with an agronomy team to run trials.

"We work very closely with our key partners, such as Pacific Seeds, to demonstrate in the field, in the local environments, in the different seasons," he said. "Because it's really important for growers to see how these technologies perform in the good seasons, as well as the marginal seasons."

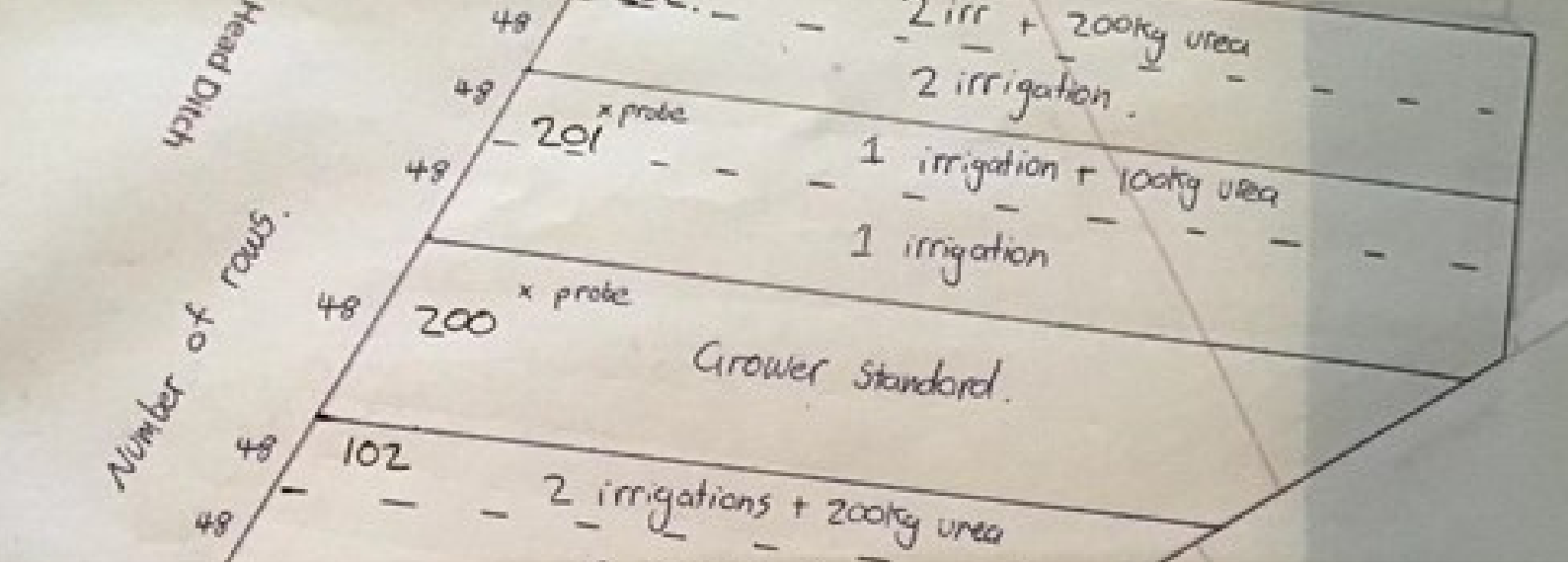
Craig noted several benefits from hybrids with dual-herbicide tolerance, particularly when it came to managing hard-to-kill weeds.

"With dual-technology varieties, we've got multiple modes of action, and we can ensure that we've got a clean paddock. And coming into harvest, we've got the opportunity to make sure that there's no weed seed set for the following season.

Gerard Bardwell, from Vectis – ten-kilometres west of Horsham – grows wheat, barley, canola and pulses. "We've chosen the [Hyola] Enforcer CT in this situation for a couple of reasons," Gerard stated. "It enables us to get some IMI chemistry onto the canola. We use a high rate of Sentry as an IBS-type situation. That does a really good job at controlling a whole range of broadleaf weeds – but also gives us some really good residual control. "The other important part is making sure we get that full rate of triazine onto the canola as well. So we're using that as an early post-emergent option and giving it the best possible chance to control any escaping ryegrass from our pre-em.

"The canola's doing a great job in setting up the rest of the rotation for us. It's getting good weed control in that particular year, but it's also handling any potential residual constraints that may be there as well."

To find out more about the dual-herbicide-stacked hybrids, visit pacificseeds.com.au



Optimising Irrigated Grains

Focus Paddocks
High Input Irrigated Durum Wheat

Emma Ayliffe Summit Ag Agricultural Consulting, IREC Discussion Group Manager Iva Quarisa

IS THERE IMPROVED PROFITABILITY FOR ADDITIONAL WATER AND FERTILISER FOR DURUM WHEAT CROPS?

WHAT ARE THE NITROGEN REQUIREMENTS FOR SAFEGUARDING HIGH PROTEIN TO ENSURE DR2+ IS MET?

WHAT IS THE ROLE GROWTH REGULATORS PLAY?

In a changing water market, higher value winter crops are sought after to grow as water value increases. The aim being to have a profitable rotation crop that fits in the current cropping systems and allow for land area to be capitalised on. Many growers are turning to durum wheat to grow high yielding, high protein crops using less water than a traditional summer crop thus making water go a little further while still producing a good profit margin.

If durum doesn't meet strict protein specifications to make milling grade then it goes into the feed market providing a steep cliff edge type market. Careful nitrogen and water management needs to be undertaken to get the maximum yield and correct protein to insure that return on water investment can be made.

The aim of this trial was to build on older work done from Griffiths and Lacey on growing high yielding cereal crops under irrigation. The majority of durum growers are trying to push their crops to high protein and yielding towards 10 tonnes/ha which is resulting in some variability in quality. This trial looked at end of season nitrogen (flag leaf) application, growth regulants and irrigation strategies and the influence that these have on final yield and quality.

The Coleambally Focus Paddock site was established with 6 treatments applied. It was not replicated as it was established as a demonstration site.

The treatments applied:

There were 3 irrigation treatments

- Grower standard 3 spring irrigations
- Above + 1 additional water
- Above + 2 additional waters

There were 3 fertiliser treatments overlayed on this .

- Grower Standard 200kg/ha urea at flag leaf
- 1 additional water + an additional 100kg/ha urea at flag leaf
- 2 additional waters + an additional 200kg/ha urea at flag leaf

Growth regulant application timings:
This was planned for Z31 but there was a stress event at this time so this pass was not done.

Variety	Durum Wheat - Vittaroi
Soil type	Grey Clay
Irrigation type	Flood Furrow
Crop History	Fallow > Wheat
Pre-plant fertiliser (Standard)	200kg/ha MAP + 200kg/ha Urea
In crop fertiliser (all)	Z25 200kg urea
Seed sowing rate	100kg/ha
Sowing date	18/05/2020
Establishment	Watered Up 02/06/2020

Results and Discussion

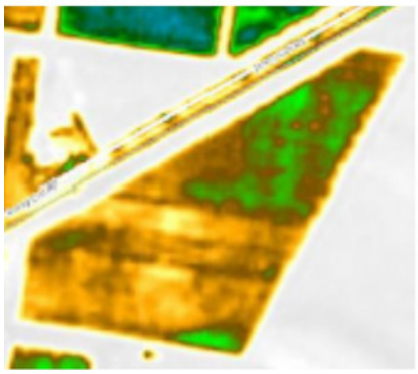
Establishment

The trial was established in a commercial wheat paddock in Coleambally. It was sown using a tyne seeder, with the aim of establishing 100-150 plants/m2 to target 8-10 tonnes of wheat.

Tiller Counts

The number of tillers in the zones were counted to ensure that their starting tiller counts were high enough to support a high yielding grain crop.

The crop was monitored over the course of the season using NDVI imagery to see if there were any significant biomass differences over the winter. The crop progressed very evenly over the course of the year.



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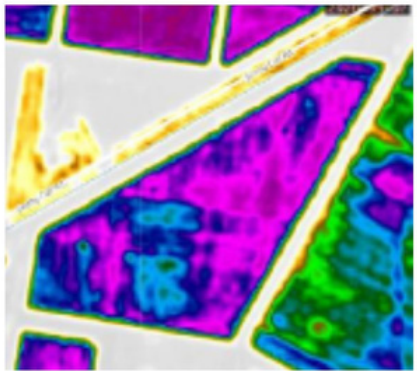

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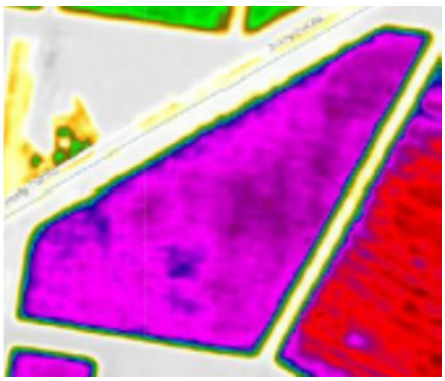

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Achieve Damage

The crop was sprayed with Achieve on the 14th of July to control ryegrass. Following this the crop suffered some damage which meant that the growth regulant wasn't applied as this damage slowed growth enough to not warrant it.

Leaf Blade Tests

The crop was applied with a background fertiliser program of 200 kg/ha urea and 200 kg/ha MAP upfront supplying the crop 135.8kg/ha nitrogen. The grower standard was top dressed with a further 75.9kg/ha nitrogen on the 10th of July and a further 92 units at flag leaf emergence in August. The final application of nitrogen was applied in late September to support protein levels at grain fill.

The grower standard had no additional nitrogen applied, one treatment had 100 kg/ha urea (46 units N) (+/- an irrigation) and the final treatment had 200kg/ha urea (92 units N) (+/- an irrigation) applied.

Leaf blade samples were taken from the plots before and after the application of the urea and at the end of main grain fill to look at the nitrogen content in the crop. All levels both before and after application were above required, ensuring that nitrogen wasn't limiting.

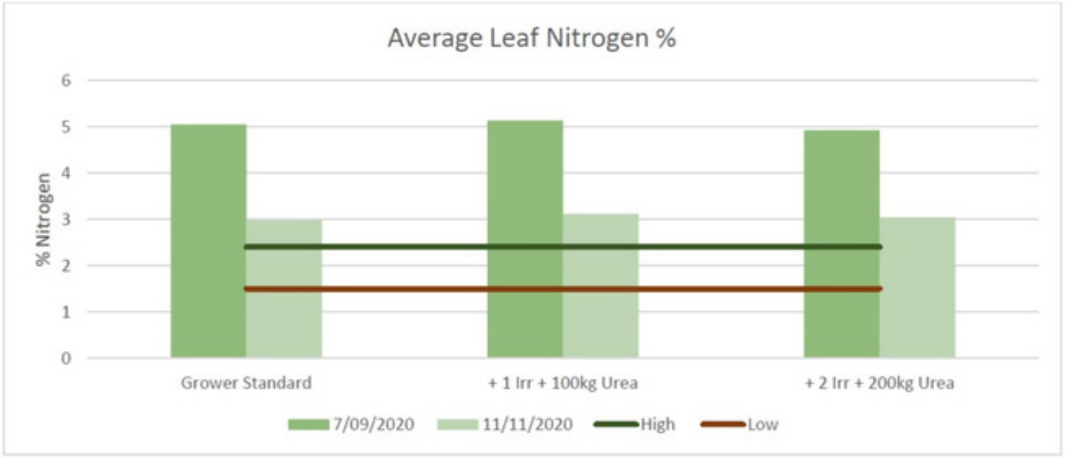

Figure 1 Average % of leaf nitrogen, with baseline nitrogen % shown

Irrigation/Moisture Probes

A probe was placed in each irrigation treatment to look at water use in the different treatments.

The aim of the irrigations was to time the final watering at the same time and stretch/adjust the previous season irrigations and the time between irrigations. Due to significant rain events, we were unable to execute this as desired.

The +1 irrigation essentially ended up being the same as the Grower Standard as the rain event on the 30th October filled the profile when not planned on the Grower Standard. The +2 irrigations essentially ended up with + 1 irrigation.

The biggest observation was the effect that additional urea had on the amount of water that the crop pulled out compared to the + 100kg/ha and the Grower Standard. This tells us that if you are looking to feed the crop out you need to have enough water to be able to match the crop growth.

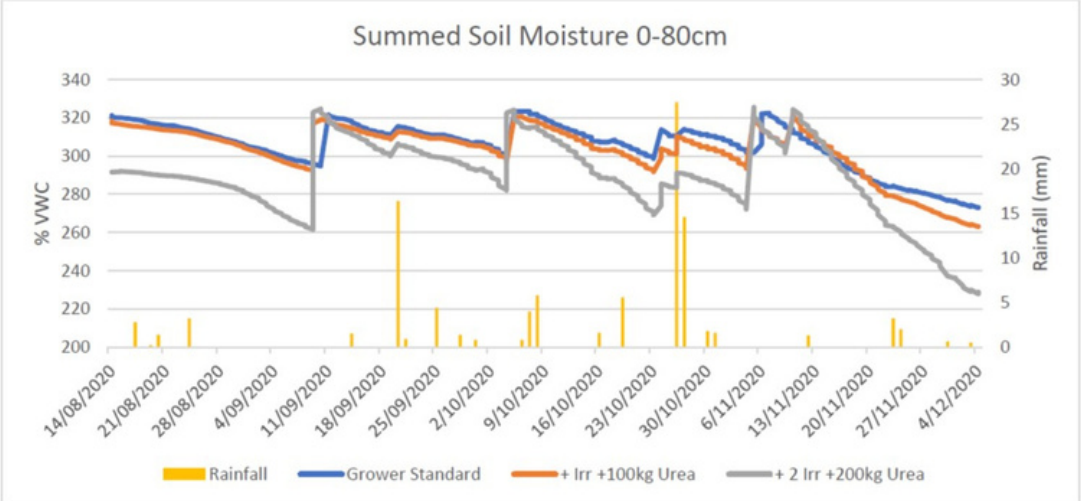

Figure 2 Summed moisture probe readings from 3 zones, and rainfall.

Quality Data

When harvested a subsample of grain from each plot was taken to assess the grain protein content in order to establish if there were any quality differences based on treatments. Due to the fallow history and nitrogen inputs, there was clearly enough residual N to support protein levels in the crop for the yields achieved. This highlights the need to do soil tests, regardless of the previous history to ensure that the growing conditions are fully understood before planting and managing a durum crop.

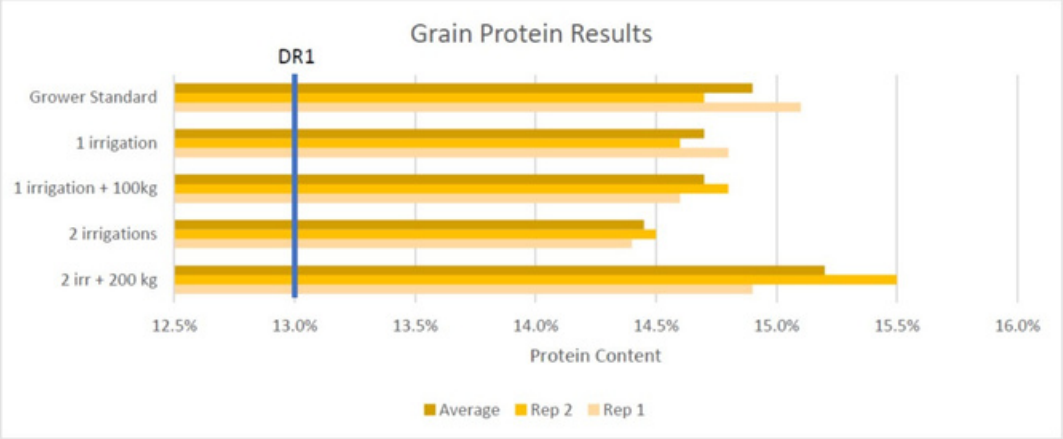

Figure 3 Grain protein by treatment

The overall growing season conditions for durum in 2020 were good, with a soft finish and good nitrogen. This resulted in no significant differences between the crops yields achieved.

There was a response to the additional water and nitrogen in the +2, +200kg urea treatments but there were no economic returns for the additional investment in 2021. It would be expected that under a harsher finish there would be a significant response to both the different irrigation and nitrogen schedules.

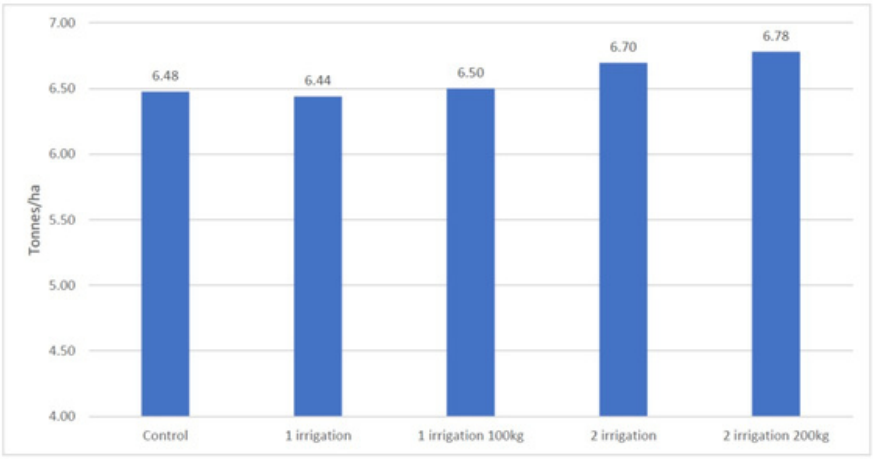

Figure 4 Final yield average by treatments.

Conclusions

Although this trial wasn't executed exactly as planned due to weather there were still some good to be drawn out of it.

The first is that soil testing is critical prior to planting a durum crop, to ensure that the starting nitrogen is known and that the crop can be fertilised and managed correctly. Without knowing where the starting nitrogen is for the crop it is easy to over or under estimate and subsequently under fertilise and have low grade, or over fertiliser increasing risk of lodging, higher screenings and wasting resources and money.

When applying fertiliser to target 7+ tonne crop, it is important you have the water required to meet this yield commitment.

As seen in this project, when top dressing with these larger amounts of nitrogen, the water use of these crops increases dramatically with the crop drawing from deeper and harder over the same period of time as crop with less N applied. This indicates that in the planning process the cost of water needs to be considered and secured to ensure that the water applied matches what the likely increase in use will be.

The use of moisture probes also becomes more critical to ensure that the timing of irrigations is correct and to monitor the crop to ensure that there is no water stress during critical periods such as flowering. It would be expected in a lower starting N paddock and a drier year there would be much more substantial differences between treatments.

GrainGrowers Launches State of the Australian Grains Industry Report (2016 – 2021) & Podcast

GrainGrowers is proud to publish the 'State of the Australian Grains Industry' report every five years, with the latest version (2016 – 2021) launching in October.

The report is an amalgamation of insightful facts, findings and figures to help growers and industry representatives assess 'where they've been,' to better prepare for what lies ahead and capitalise on opportunities. GrainGrowers is also releasing a complementary six-episode podcast to hear directly from growers across Australia and key industry players on what they've seen 2016 - 2021, plus challenges and opportunities on the horizon.

The State of the Industry report takes both a macro and micro snapshot of the 'lay of the land,' with topics including production, trade and market access, transport and infrastructure, and the policy environment.

The last five years mixed some of the best production years with some of the worst, as much of Australia grappled with drought. Booming markets, with barley into China and chickpeas into India, also suffered from crippling tariffs.

Despite this backdrop, the sector performed well, with a gross value of production averaging $13 billion per year - a 1% increase on the previous five years.

Another theme evident throughout the report - reaffirmed in conversations with growers - is the importance of sustainability and the changing needs of consumers. Market commentators and innovative growers affirm that whilst we can't predict what will happen in the future, we can benefit from a robust strategy to help the sector meet future challenges.

Improvements in technology are assessed for their ability to change what's possible even under harsh weather conditions, strengthening the future of grain growing in a changing climate. An innovative sector, filled with innovative growers, will continue to embrace opportunities to increase production and meet the ever-changing needs of discerning consumers.

If you would like to read GrainGrowers' State of the Australian Grains Industry Report (2016-2021) please visit graingrowers.com.au. The podcast will be available on all major streaming platforms.

Optimising Irrigated Grains

Case Study
Developing Farm Systems to Adapt to a Changing Water Environment

Location: Pretty Pine, NSW
Farmers: Michael and Simone Hughes
Total Area: 2000ha
Area Under Irrigation: 350ha
Irrigation Infrastructure: Various degrees of flood
Average Annual Rainfall: 300mm (evenly spread across year)
Soil Type: Mixed soil types including heavy sodic soils
Crops: barley, lupins, maize, vetch, rice
Livestock: 3000 self replacing merino's
400 beef cattle in feedlot system

Michael and Simone have been seriously considering their options to ensure their farm business remains profitable with increasing water values and decreasing allocation and rainfall. They developed a process to determine a viable business model with reduced water availability, by ranking paddocks based on their productivity potential. They were assessed on suitability for irrigation, grazing or dryland, current infrastructure, soil type, layout, location etc. and classified into three land use areas.

They are now managing the farm according to three key land use areas:

1a - Fully irrigated - 20% of land about 400ha, good irrigation layout, good soils, highly productive, mostly used for pasture, irrigated winter cereals and summer cropping.

1b - Rice infrastructure - approximately 10% of land, good country, good rice terraces to be irrigated in viable water years.

2 - Opportunistic Irrigation - irrigated when there is viable water available, basically leave all critical infrastructure (channels, supply) but remove earth infrastructure such as banks removed.

3 - Dryland - generally undeveloped country, poorer soil structure. Use as dryland cropping/opportunistic grazing.

Optimising soil management was also a key to developing this land use system. With much of the country having a rice history, they have some soil issues that need to be considered and improved. Part of the thinking is "how to rectify old irrigation layouts to a dryland opportunity. Now that the land classes are established the next step is maximising their potential and looking at transitioning any relevant areas into different classes, for example, from 2 to 1.

Their system is a mixed farm which includes a merino enterprise and beef feedlot. The feedlot was a way to intensify - "if we have water and we are not using it on rice, how do we use it in the business". The beef enterprise provided risk mitigation for feed produced and it produces a lot of manure that is used on the farm to help improve soils.

The sheep are an integral part of the system, but do not change how crop rotation decisions are made, they fit in to utilise feed, but they do form a key part in water decisions, enough water needs to be allocated to ensure they can be finished off in spring.

What was your motivation to make this change?

The motivation was to establish a viable farm business model based on predicted external changes that will impact farm businesses such as decreased water availability and increased prices. The key driver behind setting up land use areas was the realisation that the above mentioned changes made the economics of the traditional rice based systems unviable in the region. Michael doesn't focus on water allocation he focus on the water price "can you make money out of it". He estimated that about 35-40% of the yield comes from water, he needed a system where water can be turned on or off instantly and areas of the farm can be flexible to ensure realistic targets/aims are set for the different land use areas, hence optimising inputs.

What key benefits were you looking for?

The main driver behind developing this land class system was to determine a viable business model for the future with reduced water availability. The key benefits included:

- To be smarter with yields, smarter with water and more targeted with our capital expenditure.
- Strategically applying water for maximum benefit and flexible system.
- Improving soils.
- Flexibility with managing the cropping rotations and livestock.

Results so far

It is early days, however the system has provided some clarity around managing the different land categories to ensure production, inputs and water use is maximised. Some of the key results we are noticing with changed management include:

- Better able to set realistic target yields and be more efficient with water and inputs.
- Positive change in areas where we have improved subsoils.
- Feedlot produces manure to apply to poorer soils.
- Long term legacy gains from using pulses in the system, particularly around nitrogen in the soil.

The plan for the future is to build a program around having 2000ML of water available and developing a mixed farm system to maximise returns for that resource.

When to Irrigate? What have we seen so far in Smarter Irrigation for Profit 2?

Alex Schultz, NSW Department of Primary Industries and Damian Jones, Irrigated Cropping Council

Should I pre-irrigate or wait until Spring and if I wait till Spring, when should I irrigate? Irrigated Cropping Council (ICC) through the Smarter Irrigation for Profit phase 2 project (SIP2) have been running demonstrations to explore irrigation strategies more suited to increasing water productivity to help answer these questions.

When deciding whether to pre-irrigate or not there are several key things to consider:

- Water and commodity price
- Target yield and water use
- Weather forecast and soil moisture
- Weed management

Practically pre-irrigation can be a useful practice to germinate weeds and assist in using non select herbicides to control problem weeds and could be considered in some situations good for this reason. Another useful aspect is that it can help to ensure good seed bed moisture for good germination and crop establishment. The difficulty is timing, ensuring that it is not followed by wet weather delaying sowing or done too early losing the topsoil moisture. Management aside pre-irrigating needs to be economical. A useful approach for assessing the benefits and costs involved and comparing one irrigation practice to another, is partial budgeting. A partial budget is a technique used to compare the extra costs and returns of the new activity with those of the present activity.

Although the ICC site received above average rainfall at the start of the 2019 seasons, pre-irrigation still resulted in the highest returns per ML in Barley, Canola and Faba Beans. This was due to a dry winter leading to crop moisture stress before the irrigation season opened in mid-August. The extra soil moisture resulting from pre-irrigation reduced the water stress these crops experienced, as a result they were in a vegetative state longer than the no pre-irrigated treatments. Thus, increasing their biomass, and ability to respond to the Spring irrigations and yields achieved.

When deciding to pre-irrigate or not, consider expected water and commodity price along with your target yield. Targeting high yields will likely mean pre-irrigating, and in seasons like 2019 can produce the highest returns per ML when combined with appropriate Spring irrigation strategy, for certain crops.

Wheat responded differently with the highest returns per ML coming from the treatment no pre-irrigation + one Spring irrigation treatment in 2019. This poses the question, if I only irrigate in Spring what is my best strategy? Again, there are some key considerations:

- Current yield potential of the crop (including available soil nutrition)
- Growth stage and ability to respond to irrigations
- Water and commodity price
- Weather forecast and soil moisture

Table 1 Partial budget opproach to irrigation treatments of winter crop species of combined per hectare and ML economic ($/ha) Gross Margin response, using ICC gross margin analysis and referenced water and crop input assumptions.

2019 (price/t)	2020 (price/t)	Highest $/ML Irrigation Treatment	Water used (ML/ha)	Yield (t/ha)	Gross Margin $/ha (@$60/ML)	Gross Margin $/ML (amount payable for water to break even)
Barley ($291/t)		Pre-irrigation + 1 Spring	2.75	4.69	$860/ha	$373/ML
Canola ($605/t)		Pre irrigation + full Spring	3.75	3.7	$1,463/ha	$450/ML
Faba Beans ($600/t)		Pre irrigation + full Spring	4.65	4.2	$1,779/ha	$443/ML
Wheat (329/t)		No pre-irrig. + 1 Spring	1.5	3.62	$780/ha	$580/ML
	Wheat ($270/t)	No pre-irrig. + 1 Spring	1.1	4.7	$725/ha	$719/ML

Does the crop have sufficient soil moisture?
The best way to monitor soil moisture is with the use of soil probes. Tracking soil moisture over time will help forecast irrigations ensuring the crop does not experience drought stress. In wheat crops the highest returns per ML are expected from the first Spring irrigation. By monitoring soil moisture this first irrigation can be applied as late as possible while still ensuring good soil moisture and crop growth. When irrigating in Spring it is important to evaluate the crops potential to respond to the irrigation in t/ML and what this equates to in potential $ returned from $ spent.

In 2020 ICC tested a variety of different Spring irrigation strategies , the 2020 season also had above average rainfall with good soil moisture at the start of the season and again a dry winter. The soil moisture can be seen in Figure 1, with the first irrigation required four weeks before irrigation water was available in August. Like in 2019 one Spring irrigation was shown to give the highest returns per ML (Table 1).

A key learning from this work is to consider crop variety season length when considering an irrigation strategy. Overall wheat responded to one Spring but there was a difference in maturity where the early maturing wheats did not respond but the later maturing wheats did.

Although maturities were considered and tested for the results were unexpected.

It was initially thought that a short season variety, sown 'early' could mature with one Spring irrigation. But in 2019 the short season wheat sown early May was too advanced to respond to the Spring irrigation, but the late maturing variety did respond. This is also important in selecting what crops receive irrigation and it should only be those that can respond. Raising the question about selecting sowing date to match maturity with growth stage at the opening of the irrigation season, opposed to focusing only on matching flowering with frost risk?

The decision on when to irrigate is not an easy one, irrigation should be used to target and achieve high yields, but as water becomes more valuable the economics change and irrigation management should aim for highest water productivity in $/ML not $/ha.

Results from this project should be considered but with caution as costs and crop response will change from season to season resulting in different 'winning strategy', also what is achievable in your operation with your soil types and irrigation systems.

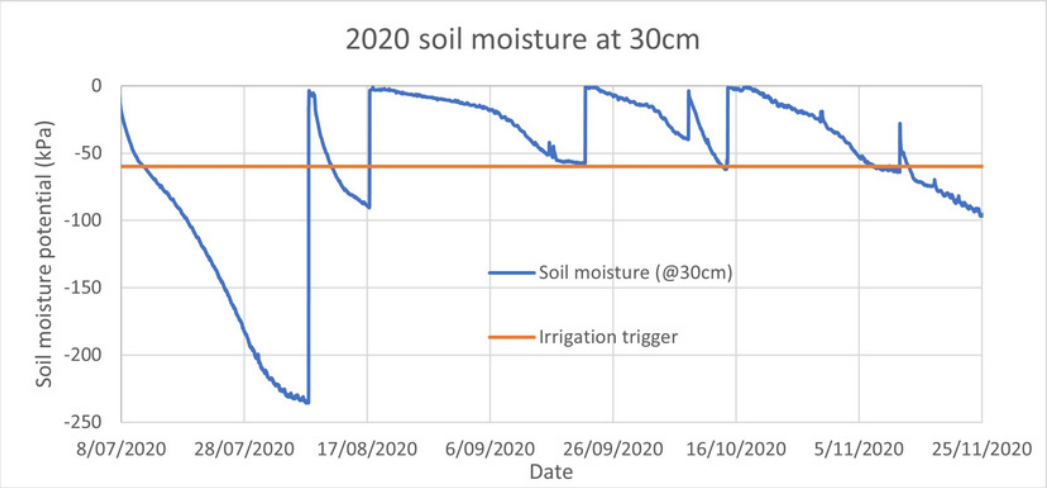

Figure 1: Soil moisture monitoring data from full Spring irrigation strategy in 2020, readings of 0 kPa indicate soil moisture at field capacity, readings beyond -60 kPa indicate irrigation required.

About the research

Smarter Irrigation for Profit Phase 2 (SIP2) is a partnership between the irrigation industries of sugar, cotton, grains, dairy and rice, research organisations and farmer groups. The aim of the key learning sites, SIP2 project is to optimise the limited availability of water resources to obtain maximum dollars per mega litre across a range of irrigated cropping systems. Led by NSW DPI with grower groups the SIP2 project is supporting sites in the Lachlan, Murrumbidgee, and Murray Valleys. The information in this case study is taken from the ICC managed site at Kerang.

Australian Government Department of Agriculture, Water and the Environment
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AgriFutures Australia
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GRDC Grains Research & Development Corporation
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Rubicon Expands Proven Technology On-Farm

Rubicon Water's focus is to help the world's farmers best manage their precious water resources. Rubicon's solutions manage the distribution of water to approximately 1.5 million hectares of irrigated farmland in 17 countries, and have now installed more than 35,000 water measurement and control sites worldwide.

Rubicon continues to improve the water management solutions available to farmers with the introduction of their New Generation of FarmConnect. FarmConnect leverages the proven technologies within Rubicon's irrigation district solutions to deliver innovative automated gate and valve solutions on-farm that enhance irrigators' operations to provide significant water savings, reduced labour and increased yields.

Account manager for FarmConnect, Kevin Saillard say's "this new range of on-farm products are set to revolutionise surface irrigation. We've been busy running trials in both Australia and the USA and the outcomes are beyond what we could've anticipated. We're seeing significant labour savings and yield improvements."

"Our development team have dedicated a lot of time into formulating these products and we're extremely proud to extend the technology to the ICC community of farmers." Independent studies have demonstrated that precision surface irrigation solutions can improve application efficiencies to 85% or better, while significantly reducing labour costs and enhancing yields. Precision surface irrigation has minimal input energy requirements, allowing high application efficiencies to be achieved with low energy bills.

Satellite, soil moisture and climate inputs, plus communications via IoT-enabled nodes help farmers know when to irrigate their crops and how much water to apply. The cloud-based software provides farmers with irrigation scheduling and the ability to operate the system from any device, anywhere in the world. This enables the management of on-farm devices via a single platform.

Rubicon's FarmConnect footprint is growing in the GMID area, with the adoption of precision surface irrigation gaining increased attention from innovative crop farmers. Automation via remote control, monitoring and scheduling of irrigations, plus the provision of predictive data are just some of benefits that irrigators are seeing from their investments - ultimately freeing their time for other tasks.

Fodder for the Future

Shane Bynre, Murray Dairy

This is project is a cross-sector collaboration designed to support complementary farming systems that optimise the use resources and help farmers adapt to a water limited future. We're running fodder trials investigating wheat, oats, maize, sorghum and our crazy punt crop faba beans. The research is focused on reducing the play off between quantity and quality and ensuring we get the best return on water invested into fodder production.

Murray Dairy has partnered with the Irrigated Cropping Council through the Fodder for the Future project to conduct demonstration trials investigating management strategies for cereals and faba-beans as fodder for dairy cows.

The first trial looks at the impact of sowing dates and seeding rates for wheat (Cesario) and oats (Forrester). Sowing dates were early and late April. Sowing rates were 80, 120, 180 and 270 plants per m^2. Two different cutting times will also be measured to understand the impact of harvest time on quality and yield for each cut. All plots have been sown with successful weed and pest free establishment. The crops are all growing well, with some plots quite advanced in their growth stage. This may create a management challenge if harvest time is very early.

The second trial looks at how faba-beans (PBA Bendoc) might fit into a dairy farm fodder strategy. Faba-beans are a high yielding , high quality crop that could potentially provide excellent feed for dairy cows.

Faba-beans are high in moisture and could create a challenge when harvested for silage. This trial looks at two sowing rates and three harvest dates. The faba-bean plots are now all sown and established, with some early weed challenges. Plots will continue to be monitored for weed and insect pests.

It is well understood that there is often a compromise between achieving maximum dry matter yield and high quality. The results of these trials will provide valuable information on the impact various strategies have on final yield and quality.

This project is a cross-industry collaboration between the dairy, cropping and fodder industries. By working closely with other industries, Murray Dairy hopes to learn from the experts in the cropping industry and share this information with dairy farmers. It also provides us with the opportunity to better understand the needs of cropping farmers so that we can work better together, while at the same time informing crop growers of dairy farmers' requirements for high quality fodder.

45Y93 CL GRAZING

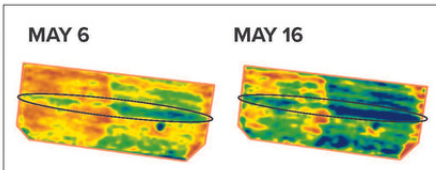
PIONEER BRAND · SEEDS

A mixed farmer from Serpentine in central Victoria was looking at options to fill his feed gap for his sheep enterprise. In doing so they opted to sow a true winter type canola and they agreed to trial the Pioneer 45Y93 CL, which is a spring canola type. The grower sowed both varieties of canola on April 4 and irrigated it up.

PRE GRAZING

45Y93 CL Pre Grazing displayed good biomass, which provided an excellent feed wedge of early winter feed. Early biomass showed in the below NDVI images demonstrated the increased biomass of 45Y93 CL compared with the winter type.

June 6, plants show good early vigour.



NDVI images – pre graze. Biomass of the 45Y93 CL is easily recognisable – see the blue strip down the middle.

POST GRAZING

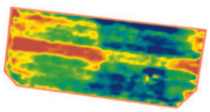
612 first cross ewes and 720 lambs grazed the 13ha paddock for 20 days between June 7 & June 27.

As you can see the sheep have heavily grazed the paddock.

Strong regrowth on the 45Y93 CL following heavy grazing.

Pioneer Canola Product Lead Clint Rogers inspecting a 45Y93 CL plant on September 5, 70 days after the sheep grazed it.

- The plant has recovered very well, and the grazing has resulted in the plant branching/tillering increasing its pod potential and potential yield.
- The 45Y93 CL was at full flower in early September, while the winter type was still in the vegetative state.
- Post grazing the 45Y93 CL was irrigated once prior to harvest, while the winter type received 2 irrigations.
- The 45Y93 CL was windrowed on the 16th November, while the winter type was windrowed 10 days later.
- Both the 45Y93 CL and the winter type were harvested on the 13th December. The 45Y93 CL yielded 2.96t/ha, while the winter type yielded 1.70t/ha in the trial paddock.



NDVI image post grazing identifies the strip where the 45Y93 CL is. There is less biomass as the sheep have grazed the 45Y93 CL more heavily than the winter type.

KEY CONSIDERATIONS

When grazing you need to be mindful of grazing pressure and the time period available for the plant to regenerate a canopy prior to the reproductive phase.
You should look to lock paddocks up not later than the end of June. Additional nutrition will be required post grazing to achieve target yields.

Grazing may delay flowering depending on grazing pressure. Harvest timing will occur within the traditional window.

Spring type canola has exceptional early vigour building valuable biomass prior to grazing.

Grazing can encourage increased branching and reduce crop height.

45Y93 CL able to perform exceptionally in the grazing system.

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Our Directors are passionate advocates for profitable, sustainable irrigated cropping systems. Our Board is comprised of growers, industry and State Government Department representatives. We are lucky to have such forward thinking and motivated people on the board that drive ICC to be delivering quality research and extension for the grains industry.

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More Information

The information in this magazine is a summary of our projects and programs, for full details, videos, case studies and results please visit our website.

www.irrigatedcroppingcouncil.com.au

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We are grateful to our sponsors GrainGrowers, Water Partners, Pioneer, Pacific Seeds, AGT, Adama, Rubicon and Hybrid Ag. Sponsorships enable us to deliver locally relevant research and extension to ensure a competitive and sustainable mixed farming and cropping sector that can confidently use best practice irrigation to respond flexibly and rapidly to market demands in an environmentally and socially responsible manner.

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