



GRDC Irrigation Project **All Protocols**– 2019/20 season

GRDC Project No. (FAR1906-003RTX)

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Project Title:

Development and validation of soil amelioration and agronomic practices to realise the genetic potential of grain crops grown under a high yield potential, irrigated environment in the northern and southern regions.

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Contents

Project Outputs 3

Protocol Summary 4

Section 1.0 Maize 5

Section 2.0 Faba beans 14

Section 3.0 Chickpeas 23

Section 4.0 Durum wheat 29

Section 5.0 Canola 38

Section 6.0 Winter Barley and Spring Sown Spring Barley 47

Section 7.0 Soil Amelioration 53

Project Outputs

Output 1

By March 2023, locally validated, replicated field trial data set to addressing key constraints of yield and profit in irrigated cropping systems, with a focus on gaps in durum wheat, faba bean, canola, chickpea and maize crops grown under irrigation. This will include evaluation of crop response to agronomic practice across a range of irrigated systems and environments and quantify yield potential in different environments (targeting >4 t/ha canola, >6 t/ha in faba bean, >10 t/ha in durum and >19 t/ha in maize). Minimum 66 replicated field trials per year for 3 years over a four-year period, covering the major irrigation types in the region being geographically distributed across the Murrumbidgee and Murray Valleys of southern NSW, the Murray Valley of northern Victoria, south-east SA, SA/Vic Mallee and Tasmania (TBC). Action Learning Groups (ALG) engaged with trials where and when appropriate.

Output 1 - Research Programme

The research programme will be conducted at a minimum of six locations per annum and cover research into agronomic practices for six crops (faba beans, chickpeas, durum, canola, maize and winter/spring barley). 66 trials per annum will be dedicated to the five core crops specified and barley, although the exact numbers for each crop will vary between the different years of the project and the constraints identified. Little research has been conducted on winter or spring sown barley under irrigation in Australia and new germplasm has increased interest in this crop. In order to allow for more in depth research and to give greater control for management of the research programme it is proposed that the trials programme will be conducted at a series of Irrigated Research Centres (IRCs), which will address a range of agronomic issues at one field applied research site. The centres will vary in size (number of trials) depending on the region, crop types and agronomic issues being investigated. The principal Irrigated Research Centres (IRCs) at Kerang and Finlay will cover all four autumn sown crops (faba beans, chickpeas, durum, and canola) with the addition of maize sown in commercial paddocks in the Murrumbidgee and Murray region. Satellite centres will be established in Frances, Griffiths and Tasmania with a smaller number of trials per annum. Each year six trials will be reserved for other regions (e.g. Yarrawonga, Coleambally, Corop) that have smaller acreages of irrigated broad acre with individual trials covering different crop and agronomic issues.

Protocol Summary

Protocols cover two research components:

- i) Agronomy**
- ii) Soil amelioration**

66 trials based on four replicates will form the basis of the research program for Output 1 of the agronomy component. There will be a further two trials covering soil amelioration which will be conducted in large replicated blocks as opposed to small trial plots.

i) Agronomy

Nine protocols have been ascribed to cover the major agronomy components of growing the six irrigated crops with so far two additional protocols being generated for Maize. More maybe added as the project develops.

1. Influence of irrigation type on sowing date and subsequent crop establishment.
2. Investigating the influence of irrigated break crops on the yield and nutritional needs of following cereals.
3. Optimum timings and rates for the nitrogen (N) forms applied in irrigated crops of durum, canola, barley and maize.
4. Interaction between germplasm, nitrogen rate and PGR application in irrigated crops of durum, canola and maize.
5. The influence of rhizobium inoculation in irrigated crops of faba beans.
6. Interaction between stubble incorporation of faba bean stubbles on following durum crops.
7. Germplasm disease management interaction.
8. Disease management for irrigated crops – products, rates and timings.
9. Lodging control in irrigated crops.
10. Establishment – row spacing and plant population
11. Potassium nutrition

Each of these general protocols will be modified for the specific crops

Section 1.0 - Maize

Section 2.0 - Faba beans

Section 3.0 - Chickpeas

Section 4.0 - Durum

Section 5.0 - Canola

Section 6.0 - Barley

Not all protocols will be conducted on each specific crop.

Section 1.0 Maize

Protocol 3 & 4: Optimum timings and rates for the nitrogen (N) forms applied in irrigated crops of maize.

Output 1. – Agronomy research on maize

Protocol Objective:

These protocols evaluate nitrogen use efficiency in grain maize under different rates and timings of applied N fertiliser.

The individual objectives are as follows:

- Evaluating nitrogen use efficiency under different N rates and timings in grain maize (0 – 500kg N/ha total N).
- Influence of different rates of urea N fertiliser (46%N) applied pre-drill
- Influence of N rate and N timing on harvest index (HI) in grain maize
- Influence of plant population on nitrogen use efficiency and harvest index.

Treatment List:

Nitrogen Use Efficiency Trial – N rates

Trials 1 & 2

FAR trial codes: FAR IRR M19-01-1 (Trial 1) and ICC M19-01-2 (Trial 2)

Protocol version: Version 2 (29.09.2019)

Trial 1.

Location: Peechelba East, VIC 3678

Trial treatments: Eight rates of pre-drill N (46% solid urea fertiliser) when N dose is standardly applied as fertigation.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: October 2019

Hybrid: Pioneer Hybrid 1756 at 93,000 seeds/ha

Trial Treatments:

Trt.	Pre-drill (Urea 46%N) kg N/ha	Post – em kg N/ha*	Total
1	0	184	184
2	45	184	229
3	90	184	274
4	135	184	319
5	180 (Farm standard)	184	364
6	225	184	409
7	270	184	454
8	315	184	499

* 4 WAS (4 weeks after sowing) Standard farm approach of N (dissolved urea 46% N) through overhead irrigation

Management:

Standard farm management of inputs (irrigation and agrichemical input) except pre-drill nitrogen

Total Plot Number: 8 Pre-drill nitrogen x 4 reps = **32 plots**

Trial 2.

FAR trial codes: ICC M19-01-2

Protocol version: Version 2 (29.09.2019)

Location: Kerang, VIC 3579 (10km west of Kerang) Trial treatments:
10 rates of N (46% solid urea fertiliser) split 50% seedbed and 50% 3-4 leaf (or to coincide with irrigation in the 4-6 leaf stage)

Trial Design: Randomised complete block with four replicates.

Time of Sowing: October 2019

Hybrid: Pioneer Hybrid 1756

Trial Treatments:

Trt.	Pre-drill (Urea 46%N) kg N/ha	Post – em kg N/ha*	Total
1	0	0	0
2	50	50	100
3	75	75	150
4	100	100	200
5	125	125	250
6	150	150	300
7	175	175	350
8	200	200	400
9	225	225	450
10	250	250	500

* 4-6 leaf stage (to coincide with irrigation timing – before week 8)

Management:

Standard farm management of inputs (irrigation and agrichemical input) except overall nitrogen

Total Plot Number: 10 nitrogen rates x 4 reps = **40 plots**

Nitrogen Use Efficiency Trial - N Timing trial

Trials 3 & 4

FAR trial codes: **FAR IRR M19-02-1 (Trial 3) ICC M19-02-2 (Trial 4)**

Protocol version: Version 2 (30.09.2019 for Trial 4 only)

Trial 3.

FAR trial codes: FAR IRR M19-02-1

Protocol version: Version 1 (23.08.2019)

Location: Peechelba East, VIC 3678

Trial treatments: 3 N timings (pre-drill, 2wks post sow, 4 wks post sow) x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: November 13 2019

Hybrid: Pioneer Hybrid 1756 sown at 93,000 seeds/ha

Trt.	Timing (1 st N dose)	N rate (1 st N dose)	Standard 2 nd N dose	Total
	Factor 1	Factor 2 (Kg N/ha)	(Kg N/ha)	(Kg N/ha)
1	Pre-drill	0	184	184
2	Pre-drill	90	184	274
3	Pre-drill	180	184	364 (Farm standard)
4	3-4 leaf	0	184	184
5	3-4 leaf	90	184	274
6	3-4 leaf	180	184	364
7	6-8 leaf	0	184	184
8	6-8 leaf	90	184	274
9	6-8 leaf	180	184	364

** Standard farm approach of 4 x 46N (4 x 100kg/ha dissolved urea 46% N at 6-8 leaf, pre-bolt, just prior to silking and 1 week post silking) through overhead irrigation*

Management:

Standard farm management of inputs (irrigation and agrichemical input) except pre-drill nitrogen

Total Plot Number: 3 N timings x 3 N rates x 4 reps = **36 plots**

Trial 4.

FAR trial codes: ICC M19-02-2

Protocol version: Version 2 (30.09.2019)

Location: Kerang, VIC 3579 (10km west of Kerang)

Trial treatments: 3 N timings (pre-drill, 2wks post sow, 4 wks post sow) x 3 N rates x 4 replicates

Trial Design: Randomised complete block (subject to SAGI consultation)

Time of sowing: October 2019

Hybrid: Pioneer Hybrid 1756

Based on a N rate of 300 Kg N/ha

Trt.	Timing (1st N dose)	Timing 2nd N dose)	Timing 3rd N dose	Timing 4th N dose
	Seedbed	V2 (2-3 leaf)	V4 (3-4 leaf)	V6 (6-8 leaf)
1	---	---	---	---
2	300			
3	300 (Slow release Entec2)			
4	100	100	100	
5	100	---	100	100
6	100	66	66	66
7	200	---	---	100
8	200 (slow release Entec2)	---	---	100

Management:

Standard farm management of inputs (irrigation and agrichemical input) except nitrogen

Total Plot Number: 6 N timings + 1 zero control x 4 reps = **32 plots**

Nitrogen Use Efficiency – Plant population trial (*row spacing*) x nitrogen interaction

Trial 5 & 6

FAR trial codes: FAR IRR M19-03 (Trial 5) FAR ICC M19-03 (Trial 6)

Protocol version: Version 1 (23.08.2019)

Protocol objectives

Trial 5 evaluates the influence of plant population on nitrogen use efficiency (NUE), dry matter production, grain yield and harvest index in grain maize.

Trial 6 has the same objectives as trial 5 but looks at the three-way interaction of plant population, row spacing and nitrogen rate interaction and its influence on NUE, dry matter production, grain yield and harvest index in grain maize.

TRIAL 5. FAR IRR M19-03

FAR trial codes: FAR IRR M19-03

Protocol version: Version 1 (23.08.2019)

Location: Peechelba East, VIC 3678

Trial treatments: 3 plant populations x 3 N rates applied pre-drill x 4 replicates

Trial Design: Randomised complete block with plant population as the main plot and N rate as the sub plot (subject to SAGI consultation)

Time of sowing: November 13 2019

Hybrid: Pioneer Hybrid 1756 sown at 3 populations

Trt.	Plant pop (seeds sown/ha)	N rate (1 st N dose)	Standard 2 nd N dose*	Total
	Factor 1	Factor 2		
1	83,000	0	184	184
2	83,000	90	184	274
3	83,000	180	184	364 (Farm standard)
4	93,000	0	184	184
5	93,000	90	184	274
6	93,000	180	184	364
7	103,000	0	184	184
8	103,000	90	184	274
9	103,000	180	184	364

* Standard farm approach of 4 x 46N (4 x 100kg/ha dissolved urea 46% N at 6-8 leaf, pre-bolt, just prior to silking and 1 week post silking) through overhead irrigation

TRIAL 6. ICC M19-03

FAR trial codes: ICC M19-03

Protocol version: Version 1 (30.09.2019)

Location: Kerang, VIC 3579 (10km west of Kerang)

Trial treatments: 2 Plant populations x 2 row spacing (500mm & 750 x 2 N rates x 4 replicates

Trial Design: Randomised complete block with row spacing as the main plot and plant population & N rate as the sub plot (subject to SAGI consultation)

Time of sowing: October 2019

Hybrid: Pioneer Hybrid 1756

Trt.	Plant pop (seeds sown/ha)	Row spacing (mm)	N dose split* Kg N/ha	Total N dose Kg N/ha
	Factor 1	Factor 2	Factor 3	
1	83,000	500	Split 100/200	300
2	83,000	500	Split 150/300	450
3	83,000	750	Split 100/200	300
4	83,000	750	Split 150/300	450
5	103,000	500	Split 100/200	300
6	103,000	500	Split 150/300	450
7	103,000	750	Split 100/200	300
8	103,000	750	Split 150/300	450

* Split between seedbed and a post emergence stage where post emergence applications can still be applied.

Management:

Standard farm management of inputs (irrigation and agrichemical input) except seed rate at planting, row spacing and overall nitrogen rate

Total Plot Number: 2 seed rates (83 and 103 (000's) seeds/ha x 2 row spacing x 2 N rates pre-drill x 4 reps = **32 plots**

Protocol 7: Disease management for irrigated crops – products, rates and timings.

Influence of modern fungicides on the yield potential of grain maize

Influence of fungicide timing and rate for the prevention of disease and green leaf retention in grain maize

Trial 7, 8 & 9

Protocol objectives

Broad spectrum fungicides such as group 3 DMI triazoles, group 7 succinate dehydrogenase inhibitors and group 11 QoIs (strobilurins) are routinely used in irrigated cereal crops but the effects of these fungicides on grain maize is less well defined. In Protocols 7 & 8 objectives are related to disease management and green leaf retention.

Specifically, the individual objectives are as follows:

- To identify any foliar disease evident during the growing season (e.g. Northern Corn Leaf Blight - NCLB)
- To identify the influence of protectant and curative fungicide properties (using group 3 DMI triazoles and group 11 QoIs (strobilurins) on disease in grain maize
- To assess whether fungicides are associated with greater green leaf retention in grain maize hybrids in the absence of disease.

Trial 7, 8 & 9. FAR IRR M19-04-1, ICC M19-04-2 & ICC M19-04-3

FAR trial codes: FAR IRR M19-04-1 (Trial 7) & ICC M19-04-2 (Trial 8) & ICC M19-04-3 (Trial 9)

Protocol version: Version 1 (16.09.2019)

Location: Boort, VIC 3537 (Trial 7), Kerang, VIC 3579 (Trial 8) & Yenda, NSW 2681(Trial 9)

Trial treatments: 4 fungicide programmes x 2 fungicide timings (8 leaf & VT*) x 4 replicates

Trial Design: Randomised complete block with fungicide timings as the main plot and fungicide timings as the sub plot (subject to SAGI consultation)

Time of sowing: October 2019

Hybrid: Pioneer Hybrid 1756 (Howlong & Yenda) and TBC (Kerang)

Treatment List:

Trt.	Fungicide Product (active)	Timing *
	Factor 1 (rate of active ingredient)	Factor 2 (timing)
1	Untreated	----
2	DMI – Prothioconazole (Proline) (100g/ha)	Timing 1 (8 leaf)
3	DMI – Propiconazole (Tilt) (125g/ha)	Timing 1 (8 leaf)
4	QoI – Pyraclostrobin (Cabrio) (200g/ha)	Timing 1 (8 leaf)
5	DMI/QoI – Prothioconazole + Pyraclostrobin	Timing 1 (8 leaf)
6	Untreated	
7	DMI – Prothioconazole (Proline) (100g/ha)	Timing 2 (VT - Tasseling)
8	DMI – Propiconazole (Tilt) (125g/ha)	Timing 2 (VT - Tasseling)
9	QoI – Pyraclostrobin (Cabrio) (200g/ha)	Timing 2 (VT - Tasseling)
10	DMI/QoI – Prothioconazole + Pyraclostrobin	Timing 2 (VT - Tasseling)

* Foliar timings maybe adjusted according to safe operating height of boom sprayer for plot spraying equipment

Total Plot Number: 10 treatments x 4 reps = **40 plots**

Protocol 10: Crop establishment – row spacing x plant population interaction

Protocol objectives

A number of growers have expressed interest in whether 750mm row spacing allows the optimum spatial arrangement of maize plants in Australian environments. Narrower rows would allow greater plant to plant spacing within the row (similar to US experience). This protocol has been established to look at how the interaction between row spacing and plant population influences dry matter production, nitrogen use efficiency, final grain yield and harvest index in grain maize.

Specifically, the individual objectives are as follows:

- To identify the optimum plant populations for the grain maize Pioneer Hybrid 1756 at 500 and 750mm row spacing for grain yield.
- To examine whether there is an interaction between plant population and row spacing in terms of dry matter production, nitrogen use efficiency, final grain yield and harvest index.

Trial 10

Trial 10.

FAR trial codes: FAR IRR M19-05

Protocol version: Version 1 (16.09.2019)

Location: Boort, VIC 3537

Trial treatments: 3 plant populations x 2 row spacing (500mm & 750mm) x 4 replicates

Trial Design: Randomised complete block with row spacing as the main plot and plant population as the sub plot (subject to SAGI consultation)

Time of sowing: 7 November 2019

Hybrid: Pioneer Hybrid 1756

Treatment List:

Trt.	Plant pop (seeds sown/ha)	Row spacing (mm)
	Factor 1	Factor 2
1	90,000 (9 seeds/m ²)	500
2	90,000 (9 seeds/m ²)	750
3	105,000 (10.5/m ²)	500
4	105,000 (10.5/m ²)	750
5	120,000 (12/m ²)	500
6	120,000 (12/m ²)	750

Management:

Standard farm management of inputs (irrigation and agrichemical input) except seed rate and row spacing at planting.

Total Plot Number: 3 seed rates (90, 105 and 120 (000's) seeds/ha x 2 row spacings (500 & 750mm) x 4 reps = **24 plots**

Protocol 11: K nutrition

Protocol objectives

The individual objectives are as follows:

- To examine the value of additional K input at 4-6 leaf stage on grain yield and final harvest dry matter production.
- There is evidence of accelerated K uptake at the 8 leaf stage in maize, hence the post emergence timing of this application and the split of the highest rate

Trial 11 & 12.

FAR trial codes: ICC M19-06-01 (Kerang) & ICC M19-06-02 (Yenda)

Protocol version: Version 1 (30.09.2019)

Location: Kerang, VIC 3579, Yenda, NSW 2681

Trial treatments: 4 rates of potassium supplying 0 (control), 20, 40 and 80 kg K/ha as K₂SO₄

Trial Design: Randomised complete block (subject to SAGI consultation)

Time of sowing: October 2019

Hybrid: Pioneer Hybrid 1756

Trt.	K rate (kg K/ha) *	Timing
1	0	Leaf 4
2	20	Leaf 4
3	40	Leaf 4
4	80	Leaf 4
5	80	Split Leaf 4 and 8

** Applied as Potassium salt*

Management:

Standard farm management of inputs (N rate, irrigation and agrichemical input)

Total Plot Number: 5 K rates x 4 reps = **40 plots**

Section 2.0 Faba beans

Protocol 1 & 10: Optimum plant populations of faba beans grown under overhead and flood irrigation

Output 1. – Agronomy research on faba beans

Protocol Objective:

These protocols evaluate the plant population of faba beans grown at different plant populations under flood and overhead irrigation.

The individual objectives are as follows:

- Evaluating the influence of faba bean three different plant populations on dry matter production and grain yield under flood and overhead irrigation.
- To compare the economics of faba beans grown under flood versus overhead irrigation sown at the same time.
- To examine the influence of plant population on disease levels and pod set under two different systems of irrigation.
- To examine whether cultivar susceptibility to disease interacts with the plant population under these two irrigation systems.

Treatment List:

Influence of irrigation system on faba bean performance

Trials 1,2,3 and 4

FAR trial codes: FAR IRR F20-01-1 (Trial 1) – overhead irrigation, FAR IRR F20-01-2 (Trial 2) – flood irrigation, ICC F20-01-3 (Trial 3) – sprinkler irrigation, ICC F20-01-4 (Trial 4) – flood irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR F20-01-1 – Under overhead Irrigation

Trial 2: FAR IRR F20-01-2 – Under flood Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Four seed rates applied to a disease susceptible and resistant cultivar.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Amberley (resistant) & Fiesta (disease susceptible)

Trt.	Variety	Seed rate (Seeds/m2)
1	Amberley	12 seeds/m2
2	Amberley	24 seeds/m2
3	Amberley	36 seeds/m2
4	Amberley	48 seeds/m2
5	Fiesta	12 seeds/m2
6	Fiesta	24 seeds/m2
7	Fiesta	36 seeds/m2
8	Fiesta	48 seeds/m2

Trial 3: ICC F20-01-3 – Sprinkler Irrigation

Trial 4: ICC F20-01-4 – Under flood Irrigation

Location: Kerang, VIC

Trial treatments: Four seed rates applied to a disease susceptible and resistant cultivar.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Amberley (resistant) & Fiesta (disease susceptible)

Trial Treatments:

Trt.	Variety	Seed rate (Seeds/m2)
1	Amberley	10 seeds/m2
2	Amberley	18 seeds/m2
3	Amberley	24 seeds/m2
4	Amberley	36 seeds/m2
5	Fiesta	10 seeds/m2
6	Fiesta	18 seeds/m2
7	Fiesta	24 seeds/m2
8	Fiesta	36 seeds/m2

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for each irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 2 Cultivars x 4 seed rates x 4 reps = **32 plots**

Protocol 2. Investigating the influence of irrigated break crops on the yield and nutritional needs of following cereals.

Research question: Can irrigation water applied to break crops provide ongoing value into the subsequent cereal crop?

Protocol Objective:

The research will look to quantify whether higher yielding break crops, such as chickpeas and faba beans, as a result of irrigation and improved agronomic practice provide greater productivity and profitability for the following irrigated canola or cereal crops. In essence, do higher yielding break crops give quantifiable benefits to other crops in the irrigated farming system?

The individual objectives are as follows:

- To compare the nodulation of direct drilled faba beans sown into cereal stubble with different inoculant treatments
- To assess whether rhizobium treatments improve dry matter, yield and grain yield under irrigation.
- To quantify the break crop effect of faba beans grown under irrigation and how inoculation or fertilisation effects the break effect.
- To assess the economics of inoculating faba beans under irrigation.
- To evaluate an acid tolerant rhizobium strain if available

Treatment List:

Influence of rhizobium inoculation on the break crop effect of faba bean yield and profitability

FAR trial codes: **FAR IRR F20-02-1 (Trial 1) – overhead irrigation**

Trial 1: FAR IRR F20-02-1 – Under overhead Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Five inoculant treatments versus an untreated control

Trial Design: Randomised complete block with four replicates

Time of Sowing: April 20-30 target window 2020

Cultivar: PBA Bendoc (herbicide tolerant- imidazolinone (Group B))

Trial Treatments:

Trt	Trt Name	Inoculant	Fertiliser
1.	Untreated	-	-
2.	Alosca Inoculant granules (rate 1) *	10kg/ha	-
3.	Alosca Inoculant granules (rate 2) *	20kg/ha	-
4.	Alosca Inoculant granules (rate 3) *	30kg/ha	-
5.	40 kg N/ha pod set	-	Urea 87kg/ha
6.	40 kg N/ha (incorporated by seeding)	-	Urea 87kg/ha

*Acid tolerant rhizobium would be tested if sufficient product was available or a single treatment could replace the nitrogen treatment

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for overhead irrigation system, monitored to prevent soil moisture deficit.

Total Plot Number: 6 Trts x 4 reps = **24 plots**

Protocol 6: Influence of faba bean stubble incorporation on yield and profitability of following durum wheat

Output 1. – Agronomy research on faba beans

Protocol Objective:

To evaluate the influence of top work cultivation (speed till) on durum wheat yield and profitability.

The individual objectives are as follows:

- Evaluating the influence of incorporating faba bean stubble into the seedbed prior to establishing faba bean, examining crop establishment and early vigor.
- To examine whether cultivation of faba bean stubbles is cost effective prior to establishment using a tyne seeding boot.
- Does the cultivation of faba bean stubbles influence the nitrogen requirements of the following durum wheat crop when both are grown under irrigation.

Treatment List:

Influence of faba cultivation on durum wheat yield and profitability

Trial 1

FAR trial codes: FAR IRR F20-06 (Trial 1) – overhead irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR F20-06-1– Under overhead Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Plus and minus surface work cultivation.

Trial Design: Randomised complete block with six replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window

Cultivar: Samira

Trial Treatments:

Trt.	Cultivation	Seed rate (Seeds/m ²)
1	Direct drill	12 seeds/m ²
2	Direct drill	24 seeds/m ²
3	Direct drill	36 seeds/m ²
4	Direct drill	48 seeds/m ²
5	Speed Till	12 seeds/m ²
6	Speed Till	24 seeds/m ²
7	Speed Till	36 seeds/m ²
8	Speed Till	48 seeds/m ²

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 2 Cultivation x 4 seed rates x 6 reps = **48 plots**

Protocol 7: Disease management strategies for faba beans grown under irrigation

Output 1. – Agronomy research on faba beans

Protocol Objective:

To evaluate the economics of disease management strategies of different costs in irrigated faba production.

The individual objectives are as follows:

- Evaluating the influence of cultivar resistance on the cost effectiveness of disease management strategies for irrigated faba bean production.
- To evaluate the disease control, yield response and quality effects of cheap (based on older fungicide chemistry) and expensive disease management strategies (based on new chemistries).

Treatment List:

Trials 1 & 2

FAR trial codes: FAR IRR F20-07-1 (Trial 1) – overhead irrigation, ICC F20-07-2 (Trial 2) – flood irrigation & FAR IRR F20-07-03 overhead (Trial 3)

Protocol version: Version 1 (11.02.2020)

Trial 1. FAR IRR F20-07-1 – Under overhead Irrigation - NSW

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182, Kerang, VIC and

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Amberley (resistant) & Fiesta (disease susceptible)

TRT	Variety	Management Strategy	4-6 Node	Pre-Flower	Mid-flower
1	Amberly	Untreated	-	-	-
2	Amberly	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
3	Amberly	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha
4	Fiesta	Untreated	-	-	-
5	Fiesta	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
6	Fiesta	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha

Trial 2: ICC F20-07-2 – Under flood Irrigation – VIC

Location: Kerang, VIC

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Samira (resistant/region standard) & Farah (disease susceptible)

TRT	Variety	Management Strategy	4-6 Node	Pre-Flower	Mid-flower
1	Samira	Untreated	-	-	-
2	Samira	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
3	Samira	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha
4	Farah	Untreated	-	-	-
5	Farah	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
6	Farah	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha

Trial 3: FAR IRR F20-07-03 – Under overhead irrigation - SA

Location: Frances IRC, SA

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot Disease management)

Time of Sowing: April 20-30 target window 2020

Cultivar: Amberley (resistant) & Fiesta (disease susceptible)

Trial Treatments:

TRT	Variety	Management Strategy	4-6 Node	Pre-Flower	Mid-flower
1	Amberly	Untreated	-	-	-
2	Amberly	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
3	Amberly	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha
4	Fiesta	Untreated	-	-	-
5	Fiesta	Cheap	Tebuconazole 430 @ 145ml/ha	Chlorothalonil 720 @ 1.4l/ha	Chlorothalonil 720 @ 1.4l/ha
6	Fiesta	Expensive	Veritas @ 1l/ha	Aviator Xpro 600ml/ha	Veritas @ 1l/ha

Management:

Standard farm management of inputs except fungicides (fertilisers and agrichemical input)

Irrigation input (mm) specific for irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 2 Cultivars x 3 disease management strategies x 4 reps = **24 plots**

Protocol 9: Influence of plant growth regulation on faba bean yield and profitability

Output 1. PROC 9175813 – Agronomy research on faba beans

Protocol Objective:

To evaluate the effect of PGR application on crop height, lodging and brackling reduction, yield and profitability of irrigated faba beans.

The individual objectives are as follows:

- To evaluate the ability of PGRs to reduce crop height and brackling in the long stemmed cultivar PBA Bendoc.
- To examine whether PGRs need to be sequenced in order to have a significant effect in faba beans.
- To understand if plant population has a greater impact on reducing height and lodging than PGRs in irrigated PBA Bendoc

Treatment List:

Influence of plant growth regulation on faba bean yield and profitability

Trials 1 & 2

FAR trial codes: FAR IRR F20-09-1 (Trial 1) – overhead irrigation, ICC F20-09-2 (Trial 2) – flood irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR F20-09-1 – Under overhead Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182, Kerang, VIC

Trial treatments: 3 plant populations x 3 PGR treatments x 4 reps

Trial Design: Factorial

Time of Sowing: April 20-30 target window

Cultivar: PBA Bendoc (long straw imidazolinone (Group B) tolerant cultivar)

Trial 2: ICC F20-09-2 – Under flood Irrigation

Location: Kerang, VIC

Trial treatments: 3 plant populations x 3 PGR treatments x 4 reps

Trial Design: Factorial

Time of Sowing: April 20-30 target window

Cultivar: PBA Bendoc (long straw imidazolinone (Group B) tolerant cultivar)

TRT	Seed rate	PGR - Start of flowering	PGR - End of flowering
1	12 seeds/m ²	-	-
2	12 seeds/m ²	Moddus Evo 400ml ha	-
3	12 seeds/m ²	Moddus Evo 400ml ha	Cerone 355ml ha
4	24 seeds/m ²	-	-
5	24 seeds/m ²	Moddus Evo 400ml ha	-
6	24 seeds/m ²	Moddus Evo 400ml ha	Cerone 355ml ha
7	36 seeds/m ²	-	-
8	36 seeds/m ²	Moddus Evo 400ml ha	-
9	36 seeds/m ²	Moddus Evo 400ml ha	Cerone 355ml ha

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for the trial with same sowing date window as small plots

Irrigation input (mm) specific for overhead irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 3 Plant populations x 3 PGR strategies x 4 reps = **36 plots**

Section 3.0 Chickpeas

Protocol 1 & 10: Optimum plant populations of chickpeas beans grown under overhead and flood irrigation

Output 1. – Agronomy research on chickpeas beans

Protocol Objective:

These protocols evaluate the plant population of chickpeas grown at different plant populations under flood (watered for emergence) and overhead irrigation (emerge on natural rainfall and irrigation differed to spring).

The individual objectives are as follows:

- Evaluating the influence of chickpeas sown at three different plant populations on dry matter production and grain yield under flood and overhead irrigation.
- To compare the economics of chickpeas beans grown under flood irrigation, where crop emerges from natural break and irrigation is differed to spring, versus overhead irrigation, watered at sowing for emergence,
- To examine the influence of plant population on disease levels and pod set under two different systems of irrigation.
- To examine whether cultivar susceptibility to disease interacts with the plant population under these two irrigation systems.

Treatment List:

Influence of irrigation system on chickpea performance

Trials 1 and 2

FAR trial codes: FAR IRR CP20-01-1 (Trial 1) – overhead irrigation, FAR IRR CP20-01-2 (Trial 2) – flood irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR CP20-01-1 – Under overhead Irrigation (Irrigate for emergence)

Trial 2: FAR IRR CP20-01-2 – Under flood Irrigation (emergence by natural rainfall)

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Four seed rates applied to a disease susceptible and resistant cultivar.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Genesis090 (resistant) & PBA Monarch (disease susceptible)

Trial Treatments:

Trt.	Variety	Seed rate (Seeds/m ²)
1	Genesis090	15 seeds/m ²
2	Genesis090	25 seeds/m ²
3	Genesis090	35 seeds/m ²
4	Genesis090	45 seeds/m ²
5	PBA Monarch	15 seeds/m ²
6	PBA Monarch	25 seeds/m ²
7	PBA Monarch	35 seeds/m ²
8	PBA Monarch	45 seeds/m ²

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date.

Irrigation input (mm) specific for overhead Irrigation system in order to establish a crop in April 20 – 30 sowing window. Flood irrigation to emerge on natural rainfall.

Total Plot Number: 2 Cultivars x 4 seed rates x 4 reps = **32 plots**

Protocol 5: Influence of different rhizobium inoculants on chickpea yield and profitability under overhead irrigation

Output 1. – Agronomy research on Chickpeas

Protocol Objective:

To evaluate the influence of different rhizobium treatments on chickpea nodulation, dry matter, grain yield and profitability under irrigation

The individual objectives are as follows:

- To compare the nodulation of direct drilled chickpeas sown into cereal stubble with different inoculant treatments
- To assess whether rhizobium treatments improve dry matter, yield and grain yield under irrigation. the economics of chickpeas grown under flood versus overhead irrigation sown at the same time.
- To assess the economics of inoculating chickpeas under irrigation.
- To evaluate an acid tolerant rhizobium strain if available

Treatment List:

Influence of rhizobium inoculation on Chickpeas yield and profitability

FAR trial codes: ICC CP20-05-1 (Kerrang), ICC CP20-05-2 (Griffith)

Protocol version: Version 1 (11.02.2020)

Trial 1: ICC CP20-05-1

Location: Kerrang, VIC

Trial treatments: Five inoculant treatments versus an untreated control

Trial Design: Randomised complete block with four replicates

Time of Sowing: April 20-30 target window 2020

Cultivar: PBA Royal

Trial 2: ICC CP20-05-2

Location: Griffith NSW

Trial treatments: Five inoculant treatments versus an untreated control

Trial Design: Randomised complete block with four replicates

Time of Sowing: April 20-30 target window 2020

Cultivar: PBA Royal

Trial Treatments:

Trt	Trt Name	Inoculant	Fertiliser
1.	Untreated	-	-
2.	Alosca Inoculant granules (rate 1) *	10kg/ha	-
3.	Alosca Inoculant granules (rate 2) *	20kg/ha	-
4.	Alosca Inoculant granules (rate 3) *	30kg/ha	-
5.	40 kg N/ha pod set	-	Urea 87kg/ha
6.	40 kg N/ha (incorporated by seeding)	-	Urea 87kg/ha

*Acid tolerant rhizobium would be tested if sufficient product was available or a single treatment could replace the nitrogen treatment

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for overhead irrigation system, monitored to prevent soil moisture deficit.

Total Plot Number: 2 Cultivars x 4 seed rates x 4 reps = **32 plots**

Protocol 6: Influence of chickpea stubble incorporation on yield and profitability of following durum wheat

Output 1. – Agronomy research on chickpeas

Protocol Objective:

To evaluate the influence of top work cultivation (speed till) on durum wheat yield and profitability.

The individual objectives are as follows:

- Evaluating the influence of incorporating chickpea stubble into the seedbed prior to establishing durum, examining crop establishment and early vigor.
- To examine whether cultivation of chickpea stubbles is cost effective prior to establishment using a tyne seeding boot.
- Does the cultivation of chickpea stubbles influence the nitrogen requirements of the following durum wheat crop when both are grown under irrigation.

Treatment List:**Influence of chickpea cultivation on durum wheat yield and profitability****Trials 1**

FAR trial codes: ICC CP20-06-1 (Trial 1)

Protocol version: Version 1 (11.02.2020)

Trial 1: ICC CP20-06-1

Location: Kerang NSW

Trial treatments: Plus and minus surface work cultivation.

Trial Design: Randomised complete block with six replicates (Main plot cultivation and sub plot plant population)

Time of Sowing: April 20-30 target window

Cultivar: Genesis 090

Trial Treatments:

Trt.	Cultivation	Seed rate (Seeds/m²)
1	Direct drill	15 seeds/m ²
2	Direct drill	25 seeds/m ²
3	Direct drill	35 seeds/m ²
4	Direct drill	45 seeds/m ²
5	Speed Till	15 seeds/m ²
6	Speed Till	25 seeds/m ²
7	Speed Till	35 seeds/m ²
8	Speed Till	45 seeds/m ²

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for each irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 2 Cultivations x 4 seed rates x 6 reps = **48 plots**

Protocol 7: Disease management strategies for chickpeas grown under irrigation

Output 1. – Agronomy research on chickpeas

Protocol Objective:

To evaluate the economics of disease management strategies of different costs in irrigated chickpea production.

The individual objectives are as follows:

- Evaluating the influence of cultivar resistance on the cost effectiveness of disease management strategies for irrigated chickpea production.
- To evaluate the disease control, yield response and quality effects of cheap (based on older fungicide chemistry) and expensive disease management strategies (based on new chemistries).

Treatment List:

Influence of disease management packages on chickpea yield and profitability

Trials 1 & 2

FAR trial codes: FAR IRR CP20-07-1 (Trial 1), ICC CP20-07-2 (Trial 2), & ICC CP20-07-03 (Trial 3)

Protocol version: Version 1 (11.02.2020)

Trial 1. FAR IRR CP20-07-1 (Finley)

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182,

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Genesis090 (MS Rated) and PBA Monarch (S Rated)

Trial 2: ICC CP20-07-2 (Kerang)

Location: Kerang, VIC

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Genesis090 (MS Rated) and PBA Monarch (S Rated)

Trial 3: ICC CP20-07-03 (Griffith)

Location: Griffith, NSW

Trial treatments: Three strategies applied to a disease resistant and susceptible cultivar

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window 2020

Cultivar: Genesis090 (MS Rated) and PBA Monarch (S Rated)

Trial Treatments:

TRT	Variety	Management Strategy	4-5 weeks post emergence	Pre-Flower	Mid-flower
1	Genesis 090	Untreated	-	-	-
2	Genesis 090	Cheap*	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha
3	Genesis 090	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha
4	PBA Monarch	Untreated	-	-	-
5	PBA Monarch	Cheap*	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha	Chlorothalonil 720 1 l/ha
6	PBA Monarch	Expensive	Veritas 1l/ha	Aviator Xpro 600ml/ha	Veritas 1l/ha

**Additional applications of Chlorothalonil 720 can be applied fortnightly if disease pressure is high during podding.*

Management:

Standard farm management of inputs except fungicides (fertilisers and agrichemical input)

Irrigation input (mm) specific for overhead irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 2 Cultivars x 3 disease management strategies x 4 reps = **24 plots**

Section 4.0 Durum wheat

Protocol 1 & 10: Optimum plant populations and crop structure of durum wheat grown under overhead and flood irrigation

Output 1. – Agronomy research on durum wheat

Protocol Objective:

These protocols evaluate the plant population of durum wheat grown at different plant populations under flood and overhead irrigation.

The individual objectives are as follows:

- Evaluating the influence of three different plant populations on crop structure, dry matter production and grain yield of durum wheat grown under flood and overhead irrigation (Protocol 1 & 10 objective).
- To compare the economics of durum wheat grown under flood versus overhead irrigation sown at the same time (Protocol 1 objective).
- To observe whether cultivar susceptibility to disease interacts with the plant population under these two irrigation systems.

Treatment List:

Influence of irrigation system on durum wheat profitability

Trials 1, 2,3 & 4

FAR trial codes: FAR IRR D20-01-1 (Trial 1) – overhead irrigation, FAR IRR D20-01-2 (Trial 2) – flood irrigation, ICC D20-01-3 (Trial 3) – sprinkler irrigation, ICC D20-01-4 (Trial 4) – flood irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR D20-01-1 – Under overhead Irrigation

Trial 2: FAR IRR D20-01-2 – Under flood Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Four seed rates applied to a disease susceptible and resistant cultivar.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: May 10 -20 target sowing window

Cultivar: Aurora (resistant) and Vitaroi (disease susceptible)

Trial 3: ICC D20-01-3 – Under sprinkler Irrigation

Trial 4: ICC D20-01-4 – Under flood Irrigation

Location: Kerang, VIC

Trial treatments: Four seed rates applied to a disease susceptible and resistant cultivar.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: May 10 -20 target sowing window

Cultivar: Aurora (resistant) and Vitaroi (disease susceptible)

Trial Treatments:

Trt.	Variety	Seed rate (Seeds/m ²)
1	Aurora	100 seeds/m ²
2	Aurora	200 seeds/m ²
3	Aurora	300 seeds/m ²
4	Aurora	400 seeds/m ²
5	Vitaroi	100 seeds/m ²
6	Vitaroi	200 seeds/m ²
7	Vitaroi	300 seeds/m ²
8	Vitaroi	400 seeds/m ²

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for both trials with same sowing date

Irrigation input (mm) specific for each irrigation system in order to establish a crop in 10 -20 May sowing window

Total Plot Number: 2 Cultivars x 4 seed rates x 4 reps = **32 plots**

Protocol 3 & 4: Optimum timings and rates for the nitrogen (N) applied in irrigated crops of durum wheat.

Output 1. – Agronomy research on durum wheat

Protocol Objective:

These protocols evaluate nitrogen use efficiency in durum under different rates and timings of applied N fertiliser under overhead irrigation.

The individual objectives are as follows:

- Evaluating nitrogen use efficiency under different N rates and timings in durum wheat (0 – 320kg N/ha total N) under overhead and flood irrigation.
- Influence of different rates of urea N fertiliser (46%N) on yield and grain quality applied as split applications between Incorporated by sowing & GS30 (pseudo stem erect), GS30 & GS32 (2nd node) and GS32 & GS37 (flag leaf just visible)
- Influence of N rate and N timing on harvest index (HI) in durum wheat

Treatment List:

Trials 1 & 2 Nitrogen Use Efficiency Trial – N rates

FAR trial codes: FAR IRR D20-03-1 (Trial 1) and ICC D20-03-2 (Trial 2)

Protocol version: Version 4 (30.03.20)

Trial 1: FAR IRR D20-03-1

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Eight rates of nitrogen (46% solid urea fertiliser) applied at GS30 and GS32 (start of stem elongation).

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: May 10 -20 target sowing window

Cultivar: Durum wheat – Vitaroi

Trial 2: ICC D20-03-2

Location: Kerang, VIC

Trial treatments: Eight rates of nitrogen (46% solid urea fertiliser) applied at GS30 and GS32 (start of stem elongation).

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: May 10 -20 target sowing window

Cultivar: Durum wheat – Vitaroi

Trial Treatments:

Trt.	GS30 (Urea 46%N) kg N/ha	GS32 (Urea 46%N) kg N/ha	GS39 (Urea 46%N) kg N/ha	Total
1	0	0	----	0
2	50	50	----	100
3	75	75	----	150
4	100	100	----	200
5	125	125	----	250
6	150	150	----	300
7	100	100	100	300
8	125	125	100	350

* Standard split PGR management applied at GS30 & GS32.

Management:

Standard farm management of inputs (irrigation, agrichemical input – 3 fungicides, PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 8 N rates x 4 reps = **32 plots**

Trials 3 & 4 Nitrogen Use Efficiency Trial - N Timing trial

FAR trial codes: FAR IRR D20-04-1 (Trial 3) ICC D20-04-2 (Trial 4)

Protocol version: Version 1 (11.02.20)

Trial 3: FAR IRR D20-04-1

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: 3 N timings (IBS/GS30, GS30/GS32, GS32/GS37) + 1 untreated x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: May 10 -20 target sowing window

Cultivar: Durum wheat - Vitaroi

Trial 4: ICC D20-04-2

Location: Kerang, VIC

Trial treatments: 3 N timings (IBS/GS30, GS30/GS32, GS32/GS37) + 1 untreated x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: May 10 -20 target sowing window

Cultivar: Durum wheat - Vitaroi

Trt.	Timing Split (50%: 50%)	(1 st N dose)	2 nd N dose	Total
		(Kg N/ha)	(Kg N/ha)	(Kg N/ha)
1	GS00/GS30	50	50	100
2	GS00/GS30	100	100	200
3	GS00/GS30	150	150	300
4	GS30 & GS32	50	50	100
5	GS30 & GS32	100	100	200
6	GS30 & GS32	150	150	300
7	GS32 & GS37	50	50	100
8	GS32 & GS37	100	100	200
9	GS32 & GS37	150	150	300
10	Unfertilised Zero N	0	0	0

* Standard split PGR management applied at GS30 & GS32.

Management:

Standard farm management of inputs (irrigation, agrichemical input – 3 fungicides, PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)
Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 3 N timings + 1 untreated x 3 N rates x 4 reps = **40 plots**

Protocol 7 & 8 - Germplasm disease management interaction and fungicide products, rates and timings.

Protocol 7 – Germplasm disease management interaction.

Protocol 8 – Disease management for irrigated crops – products, rates and timings.

Protocol 7 - Trials 1, 2 & 3 *Germplasm disease management interaction.*

FAR trial codes: FAR IRR D20-07-1 (Trial 1 - overhead), ICC D20-07-2 (Trial 2 - flood), FAR IRR D20-07-3 (Trial 3 - overhead)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR D20-07-1

Location: Finley, NSW

Trial treatments: 6 fungicide strategy treatments applied to 2 cultivars

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 – 20

Cultivar: Aurora - Disease resistant cultivar, Vitaroi – Disease susceptible cultivar

Trial 2: ICC D20-07-2

Location: Kerang, Vic,

Trial treatments: 6 fungicide strategy treatments applied to 2 cultivars

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 – 20

Cultivar: Aurora - Disease resistant cultivar, Vitaroi – Disease susceptible cultivar

Trial 3: FAR IRR D20-07-3

Location: Frances SA

Trial treatments: 6 fungicide strategy treatments applied to 2 cultivars

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 – 20

Cultivar: Aurora - Disease resistant cultivar, Vitaroi – Disease susceptible cultivar

Trial Treatments:

i) Cultivars

Aurora - Disease resistant cultivar

Vitaroi – Disease susceptible cultivar

ii) Fungicide strategies (mL/ha)

Trt.	Trt Name	GS00	GS31	GS39	GS65
1	Nil	Untreated			
2	1 spray (GS39)	---	---	Amistar Xtra 400	---
3	1 spray (GS31)	---	Amistar Xtra 400	---	---
4	2 spray	---	Prosaro 300	Amistar Xtra 400	---
5	s.t.+2 spray	Systiva	----	Amistar Xtra 400	Prosaro 300
6	3 spray	---	Aviator 416	Amistar Xtra 400	Prosaro 300

Management:

Standard farm management of inputs (irrigation, agrichemical input – PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 2 cultivars x 6 treatments x 4 reps = **48 plots**

Protocol 8 - Trials 1, 2 & 3 Disease management for irrigated crops – products, rates and timings.

FAR trial codes: FAR IRR D20-08-1 (Trial 1 - overhead), ICC D20-08-2 (Trial 2 – flood), FAR IRR D20-08-3 (Trial 3 - overhead)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR D20-08-1

Location: Finley, NSW

Trial treatments: 9 fungicide treatments x 4 replicates

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 -20 2020

Cultivar: Vitaroi

Trial 2: ICC D20-08-2**Location:** Kerang, Vic**Trial treatments:** 9 fungicide treatments x 4 replicates**Trial Design:** (subject to SAGI consultation).**Time of sowing:** May 10 -20 2020**Cultivar:** Vitaroi**Trial 3: FAR IRR D20-08-3****Location:** Frances, SA**Trial treatments:** 9 fungicide treatments x 4 replicates**Trial Design:** (subject to SAGI consultation).**Time of sowing:** May 10 -20 2020**Cultivar:** Vitaroi**Trial Treatments (mL/ha)**

Trt.	GS00	GS31	GS39	GS59-61
1 0 units	Untreated	---	---	---
2 1 spray unit	Systiva seed trt.	---	Prosaro 300	---
3 1 spray unit	Jockey seed trt.	---	Prosaro 300	---
4 1 spray unit	Flutriafol (I.F)	---	Prosaro 300	---
5 2 spray units	---	Opus 500	Prosaro 300	---
6 2 spray units	---	Opus 500	Aviator 416	---
7 2 spray units	---	Radial 840	Aviator 416	---
8 3 spray units	---	Opus 500	Prosaro 300	Opus 250
9 3 spray units	---	Opus 500	Aviator 416	Opus 250
10 3 spray units	---	Radial 840	Aviator 416	Opus 250

Trt 5 – 9 standard seedborne control seed treatment

Management:

Standard farm management of inputs (irrigation, agrichemical input –PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 10 treatments x 4 reps = 40 plots

Protocol 9 – Plant growth regulation for lodging control in irrigated crops

FAR trial codes: FAR IRR D20-09-1 (Trial 1 - overhead), ICC D20-09-2 (Trial 2 – flood), FAR IRR D20-09-3 (Trial 3 - overhead)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR D20-09-1

Location: Finley, NSW

Trial treatments: 10 treatments x 4 replicates

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 -20 2020

Cultivar: Aurora

Trial 2: ICC D20-09-2

Location: Kerang, Vic,

Trial treatments: 10 treatments x 4 replicates

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 -20 2020

Cultivar: Aurora

Trial 3: FAR IRR D20-09-3

Location: Frances, SA

Trial treatments: 10 treatments x 4 replicates

Trial Design: (subject to SAGI consultation).

Time of sowing: May 10 -20 2020

Cultivar: Aurora

Trial Treatments

Treatment List:

No.	Rate	Timing
1.	Untreated	
2.	Moddus Evo 200mL/ha + Errex 1.3L/ha	GS31-32
3.	Moddus Evo 100mL/ha + Errex 0.65L/ha	GS30
	Moddus Evo 100mL/ha + Errex 0.65L/ha	GS32
4.	Errex 1.3L/ha	GS30
	Moddus Evo 200mL/ha	GS32
5.	Errex 0.65L/ha	GS30
	Moddus Evo 200mL/ha + Errex 0.65L/ha	GS32
6.	Moddus Evo 200mL/ha + Errex 1.3L/ha	GS31-32
	Sabre 0.75 L/ha	GS39
7.	Moddus Evo 100mL/ha + Errex 0.65L/ha	GS30
	Moddus Evo 100mL/ha + Errex 0.65L/ha	GS32
	Sabre 0.75 L/ha	GS37
8.	Sabre 0.75 L/ha	GS39
9.	Grazing (twice GS22 & GS30)	GS22 & GS30
10.	Sabre 0.75 L/ha + Errex 1.3 L/ha	GS32

* Sabre to be referred to as FAR PGR 20/01

Management:

Standard farm management of inputs (irrigation, agrichemical input) Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 10 treatments x 4 reps = 40 **plots**

Section 5.0 Canola

Protocol 1 & 10: Optimum plant populations of canola grown under overhead and flood irrigation

Output 1. – Agronomy research on canola under irrigation

Protocol Objective:

These protocols evaluate the plant population of hybrid TT (Triazine tolerant) and Roundup Ready hybrid grown at different plant populations under flood and overhead irrigation.

The individual objectives are as follows:

- Evaluating the influence of three different plant populations on dry matter production and grain yield under flood and overhead irrigation.
- To compare the economics of canola grown under flood versus overhead irrigation sown at the same time.
- To examine the influence of plant population on disease levels and canopy structure under two different systems of irrigation with non-limiting nutrition and full crop protection.

Treatment List:

Influence of irrigation system on canola canopy structure and yield performance

Trials 1, 2, 3 & 4

FAR trial codes: FAR IRR C20-01-1 (Trial 1) – overhead irrigation, FAR IRR C20-01-2 (Trial 2) – flood irrigation, ICC C20-01-3 (Trial 3) – sprinkler irrigation, ICC C20-01-4 (Trial 4) – flood irrigation

Protocol version: Version 1 (11.02.2020)

Trial 1. FAR IRR C20-01-1 – Under overhead Irrigation

Trial 2. FAR IRR C20-01-2 – Under flood Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: Four seed rates applied to regionally adapted TT hybrid and RR Hybrid.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 (target window for 2020)

Cultivar: HyTTec® Trophy (TT hybrid) and 45Y28 (Roundup Ready® hybrid)

Trial 3. ICC C20-01-3 – Under sprinkler Irrigation

Trial 4. ICC C20-01-4 – Under flood Irrigation

Location: Kerang, VIC

Trial treatments: Four seed rates applied to a regionally adapted TT hybrid and RR Hybrid.

Trial Design: Randomised complete block with four replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 (target window for 2020)

Cultivar: HyTTec[®] Trophy (TT hybrid) and 45Y28 (Roundup Ready[®] hybrid)

Trial Treatments:

Trt.	Variety	Seed rate (Seeds/m²)
1	HyTTec [®] Trophy (TT hybrid)	20 seeds/m ²
2	HyTTec [®] Trophy (TT hybrid)	40 seeds/m ²
3	HyTTec [®] Trophy (TT hybrid)	60 seeds/m ²
4	HyTTec [®] Trophy (TT hybrid)	80 seeds/m ²
5	45Y28 (Roundup Ready [®] hybrid)	20 seeds/m ²
6	45Y28 (Roundup Ready [®] hybrid)	40 seeds/m ²
7	45Y28 (Roundup Ready [®] hybrid)	60 seeds/m ²
8	45Y28 (Roundup Ready [®] hybrid)	80 seeds/m ²

Management:

Non-limiting nutrition of inputs and full crop protection (fertilisers and agrichemical input) for trials. 150 kg N/ha at 6 leaf stage followed by 150kg N/ha at start of stem elongation (green bud visible and starting to run up. MAP to supply adequate nutrition for a 5t/ha crop.

Irrigation input (mm) specific for each irrigation system in order to establish a crop in April 20 – 30 sowing window.

Total Plot Number: 2 Cultivars x 4 seed rates x 4 reps = **32 plots**

Protocol 3 & 4: Optimum timings and rates for the nitrogen (N) applied in irrigated crops of canola.

Output 1. – Agronomy research on canola

Protocol Objective:

These protocols evaluate nitrogen use efficiency in canola under different rates and timings of applied N fertiliser under overhead irrigation.

The individual objectives are as follows:

- Evaluating nitrogen use efficiency under different N rates and timings in durum canola (0 – 320kg N/ha total N) under overhead.

- Influence of different rates of urea N fertiliser (46%N) on yield and oilseed quality applied as split applications between Incorporated by sowing and yellow bud.
- Influence of N rate and N timing on harvest index (HI) in canola
- Evaluating the influence of N rate and timing on crop canopy structure and dry matter at the early flower stage. Testing the hypothesis that to maximize yield the crop needs to have 7t/ha dry matter by the early flower stage (10% flower).

Treatment List:

Protocol 3.

Trials 1, 2, 3 and 4. Nitrogen Use Efficiency Trial – N rates

FAR trial codes: FAR IRR C20-03-1 (Trial 1), ICC C20-03-2 (Trial 2), FAR IRR C20-03-3 (Trial 3) and FAR IRR C20-03-4 (Trial 4)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR C20-03-1

Location: Finley, NSW

Trial treatments: Eight rates of N (46% solid urea fertiliser) applied 50 % at 6 leaf and 50 % at greenbud.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30

Cultivar: HyTTec® Trophy (TT hybrid) or 45Y28 (Roundup Ready® hybrid)

Trial 2: ICC C20-03-2

Location: Kerang, VIC

Trial treatments: Eight rates of N (46% solid urea fertiliser) applied 50 % at 6 leaf and 50 % at greenbud.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30

Cultivar: HyTTec® Trophy (TT hybrid) or 45Y28 (Roundup Ready® hybrid) *

Trial 3. FAR IRR C20-03-3

Location: Frances, SA

Trial treatments: Eight rates of N (46% solid urea fertiliser) applied 50 % at 6 leaf and 50 % at greenbud.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30

Cultivar: HyTTec® Trophy (TT hybrid) or 45Y28 (Roundup Ready® hybrid) *

Trial 4: FAR IRR C20-03-4

Location: Tasmania

Trial treatments: Eight rates of N (46% solid urea fertiliser) applied 50 % at 6 leaf and 50 % at greenbud.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30

Cultivar: HyTTec® Trophy (TT hybrid) or 45Y28 (Roundup Ready® hybrid) *

*Substitute for a regionally adapted high yielding variety if not suited to region.

Trial Treatments:

Trt.	6 leaf stage (Urea 46%N) kg N/ha	Green bud starting to elongate (Urea 46%N) kg N/ha	Total
1	0	0	0
2	40	40	80
3	60	60	120
4	80	80	160
5	100	100	200
6	120	120	240
7	140	140	280
8	160	160	320

Management:

Standard farm management of inputs (irrigation, agrichemical input – 2 sprays for disease management based on autumn 4-6 leaf spray and 10% flower spray
Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 8 split nitrogen rates x 4 reps = **32 plots**

Protocol 4.**Trials 1 and 2 Nitrogen Use Efficiency Trial - N Timing trial**

FAR trial codes: FAR IRR C20-04-1 (Trial 1) and ICC C20-04-2 (Trial 2)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR C20-04-1

Location: Finley, NSW

Trial treatments: 3 N timings (PSPE/6 leaf, 6 leaf/Green bud, G. bud/Yellow bud) + 1 untreated x 3 N rates x 4 replicates

Trial Design: Factorial design

Time of sowing: April 20-30

Cultivar: Diamond (Conventional Type)

Trial 2: ICC C20-04-2

Location: Kerang, VIC

Trial treatments: 3 N timings (PSPE/6 leaf, 6 leaf/Green bud, G. bud/Yellow bud) + 1 untreated x 3 N rates x 4 replicates

Trial Design: Factorial design

Time of sowing: April 20-30

Cultivar: Diamond (Conventional Type) *

*Substitute for a regionally adapted high yielding variety if not suited to region.

Trt.	Timing Split (50%: 50%)	(1 st N dose)	2 nd N dose	Total
		(Kg N/ha)	(Kg N/ha)	(Kg N/ha)
1	PSPE/6 leaf	40	40	80
2	PSPE/6 leaf	80	80	160
3	PSPE/6 leaf	120	120	240
4	6 leaf/Green bud	40	40	80
5	6 leaf/Green bud	80	80	160
6	6 leaf/Green bud	120	120	240
7	G. bud/Yellow bud	40	40	80
8	G. bud/Yellow bud	80	80	160
9	G. bud/Yellow bud	120	120	240
10	Zero N	0	0	0

Management:

Standard farm management of inputs (irrigation, agrichemical input – 2 sprays for disease management based on autumn 4-6 leaf spray and 10% flower spray)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 3 N timings x 3 N rates + 1 untreated x 4 reps = **40 plots**

Protocol 8: Products rates and timing for disease management strategies in canola grown under overhead irrigation

Output 1. – Agronomy research on canola

Protocol Objective:

To evaluate the economics of different fungicide strategies for disease control in irrigated canola production of TT and RR Hybrids.

The individual objectives are as follows:

- Evaluating the influence of different fungicide strategies for the control of blackleg and sclerotinia in canola using combinations of at sowing, 4-6 leaf and early flower fungicide timings on disease control, yield response and economics.
- To assess whether at sowing or in crop approaches are the best strategies for controlling blackleg in canola.
- To assess whether early flower sprays for Sclerotinia are effective against aerial blackleg infection

Treatment List:

Influence of fungicide management strategies on blackleg and sclerotinia infection under overhead irrigation

Trials 1 & 2

FAR trial codes: FAR IRR C20-08-1 (Trial 1), FAR IRR C20-08-2 (Trial 2)

Protocol version: Version 1 (11.02.2020)

Trial 1. FAR IRR C20-08-1 –Finley

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: 13 fungicide strategies applied to a disease susceptible hybrid cultivar

Trial Design: Randomised complete block with four replicates

Time of Sowing: April 20-30 target window 2020

Cultivar: Bonito (TT Hybrid)

Trial 2 – FAR IRR C20-08-2 - Tas

Location: Tasmania

Trial treatments: 13 fungicide strategies applied to a disease susceptible hybrid cultivar

Trial Design: Randomised complete block with four replicates

Time of Sowing: April 20-30 target window 2020

Cultivar: Bonito (TT Hybrid) *

*Substitute for a regionally adapted high yielding variety if not suited to region.

Trial Treatments:

Trt.	At sowing	4 – 6 leaf	20-30% Flower main raceme
1	Untreated		
2	ILeVO seed treatment 800 mL/100 kg of seed	----	----
3	ILeVO & flutriafol (I.F)	----	----
4	ILeVO (seed trt)	Prosaro 375mL/ha	----
5	Flutriafol (I.F)	Miravis 450mL/ha	----
6	----	Miravis 450mL/ha	----
7	----	Prosaro 375mL/ha	----
8	----	Miravis 450mL/ha	Prosaro 450mL/ha
9	----	Prosaro 375mL/ha	Aviator 650mL/ha
10	----	----	Prosaro 450mL/ha
11	----	----	Aviator 650mL/ha
12	ILeVO & flutriafol (I.F)	Prosaro 375mL/ha	Aviator 650mL/ha
13	Flutriafol (I.F)	Miravis 450mL/ha	Prosaro 450mL/ha

I.F. – In furrow application.

Management:

Standard farm management of inputs except fungicides (fertilisers and agrichemical input)
Irrigation input (mm) specific for overhead irrigation system in order to establish a crop in the April 20 – 30 sowing window

Total Plot Number: 13 Fungicide strategies x 4 reps = **52 plots**

Protocol 9: Influence of plant growth regulation on canola yield and profitability under overhead irrigation

Output 1. PROC 9175813 – Agronomy research on canola

Protocol Objective:

To evaluate the effect of PGR application on crop height, lodging and brackling reduction, yield and profitability of canola.

The individual objectives are as follows:

- To evaluate the ability of PGRs to reduce crop height and lodging in the long strawed RR hybrids
- To examine whether PGRs need to be sequenced in order to have a significant effect in canola.
- To understand if plant population has a greater impact on reducing height and lodging than PGRs in irrigated canola

Treatment List:

Influence of plant growth regulation on canola yield and profitability under irrigation

Trial 1

FAR trial codes: FAR IRR C20-09-1 – overhead irrigation,

Protocol version: Version 1 (11.02.2020)

Trial 1: FAR IRR C20-09-1

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: 3 plant populations x 3 PGR treatments x 4 reps

Trial Design: Factorial

Time of Sowing: April 20-30 target window

Cultivar: HyTTec® Trophy (TT hybrid)

Trial Treatments:

Trt	Trt Name	Seed Rate	Green Bud	Yellow Bud
1	Untreated	20 seeds/m ²	-	-
2	Moddus Evo	20 seeds/m ²	Moddus Evo 400ml/ha	-
3	Errex + Moddus Evo	20 seeds/m ²	Errex 1.3L/ha	Moddus Evo 400ml/ha

4	Untreated	60 seeds/m ²	-	-
5	Moddus Evo	60 seeds/m ²	Moddus Evo 400ml/ha	-
6	Errex + Moddus Evo	60 seeds/m ²	Errex 1.3L/ha	Moddus Evo 400ml/ha
7	Untreated	100 seeds/m ²	-	-
8	Moddus Evo	100 seeds/m ²	Moddus Evo 400ml/ha	-
9	Errex + Moddus Evo	100 seeds/m ²	Errex 1.3L/ha	Moddus Evo 400ml/ha

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for the trial with same sowing date window as small plots

Irrigation input (mm) specific for overhead irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 3 Plant populations x 3 PGR strategies x 4 reps = **36 plots**

Section 6.0 Winter Barley and Spring Sown Spring Barley

Protocol 3 & 4: Optimum timings and rates for the nitrogen (N) applied in irrigated crops of Winter Barley (and spring sown barley).

Output 1. – Agronomy research on winter barley and spring sown spring barley (Tasmania only)

Protocol Objective:

These protocols evaluate nitrogen use efficiency in winter barley under different rates and timings of applied N fertiliser under overhead irrigation.

The individual objectives are as follows:

- Evaluating nitrogen use efficiency under different N rates and timings in winter barley (0 – 320kg N/ha total N) and spring barley under overhead and flood irrigation.
- Influence of different rates of urea N fertiliser (46%N) on yield and grain quality applied as split applications between Incorporated by sowing & GS30 (pseudo stem erect), GS30 & GS32 (2nd node) and GS32 & GS37 (flag leaf just visible)
- Influence of N rate and N timing on harvest index (HI) in winter barley and spring sown spring barley

Treatment List:

Trials 1 & 2 Nitrogen Use Efficiency Trial – N rates

FAR trial codes: FAR IRR B20-03-1 (Trial 1) and ICC B20-03-2 (Trial 2)

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR B20-03-1

Location: Finley, NSW

Trial treatments: Eight rates of stem elongation N (46% solid urea fertiliser) N dose is standardly split into two applications.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30 target sowing window

Cultivar: Cassiopee

Trial 2: ICC B20-03-2

Location: Kerang, Vic

Trial treatments: Eight rates of stem elongation N (46% solid urea fertiliser) N dose is standardly split into two applications.

Trial Design: Randomised complete block with four replicates (subject to SAGI consultation).

Time of Sowing: April 20-30 target sowing window

Cultivar: Cassiopee

Trial Treatments:

Trt.	GS30 (Urea 46%N) kg N/ha	GS32 (Urea 46%N) kg N/ha	Total
1	0	0	0
2	40	40	80
3	60	60	120
4	80	80	160
5	100	100	200
6	120	120	240
7	140	140	280
8	160	160	320

* Standard split PGR management applied at GS30 & GS32.

Management:

Standard farm management of inputs (irrigation, agrichemical input – 3 fungicides PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)
Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 8 rates of split nitrogen x 4 reps = **32 plots**

Trials 3, 4 and 5 Nitrogen Use Efficiency Trial - N Timing trial

FAR trial codes: **FAR IRR B20-04-1 (Trial 3) FAR IRR B20-04-2 (Trial 4) FAR IRR B20-04-3 (Trial 5)**
Protocol version: Version 1 (11.02.20)

Trial 3: FAR IRR B20-04-1

Location: Finley, NSW

Trial treatments: 3 N timings (IBS/GS30, GS30/GS32, GS32/GS37) x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: April 20 -30,

Cultivar: Cassiopee (winter barley NSW)

Trial 4: FAR IRR B20-04-2

Location: Francis, SA

Trial treatments: 3 N timings (IBS/GS30, GS30/GS32, GS32/GS37) x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: April 20 -30

Cultivar: Cassiopee (winter barley SA)

Trt.	Timing Split (50%: 50%)	1 st N dose	2 nd N dose	Total
------	-------------------------	------------------------	------------------------	-------

		(Kg N/ha)	(Kg N/ha)	(Kg N/ha)
1	GS00/GS30	40	40	80
2	GS00/GS30	80	80	160
3	GS00/GS30	120	120	240
4	GS30 & GS32	40	40	80
5	GS30 & GS32	80	80	160
6	GS30 & GS32	120	120	240
7	GS32 & GS37	40	40	80
8	GS32 & GS37	80	80	160
9	GS32 & GS37	120	120	240
10	Zero N	0	0	0

* Standard split PGR management applied at GS30 & GS32.

Trial 5: FAR IRR B20-04-3

Location: Hagley, Tas

Trial treatments: 3 N timings (IBS/GS30, GS30/GS32, GS32/GS37) x 3 N rates x 4 replicates

Trial Design: Randomised complete block with N timing as the main plot and N rate as the sub plot (subject to SAGI consultation).

Time of sowing: August 20-30 (spring sown crop)

Cultivar: RGT Planet (spring sown barley TAS)

Trt.	Timing Split (50%: 50%)	1 st N dose	2 nd N dose	Total
		(Kg N/ha)	(Kg N/ha)	(Kg N/ha)
1	GS00/GS23	40	40	80
2	GS00/GS23	80	80	160
3	GS00/GS23	120	120	240
4	GS23 & GS30	40	40	80
5	GS23 & GS30	80	80	160
6	GS23 & GS30	120	120	240
7	GS30 & GS33	40	40	80
8	GS30 & GS33	80	80	160
9	GS30 & GS33	120	120	240
10	Zero N	0	0	0

* Standard split PGR management applied at GS30 & GS32.

Management:

Standard farm management of inputs (irrigation, agrichemical input – 3 fungicides PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 3 N timings x 3 N rates + zero N x 4 reps = **40 plots**

Protocol 7 & 8 - Germplasm disease management interaction and fungicide products, rates and timings.

Protocol 7 – Germplasm disease management interaction.

Trials 1 Germplasm disease management interaction.

FAR trial codes: FAR IRR B20-07-1

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR B20-07-1

Location: Francis SA

Trial treatments: 8 fungicide programmes x 2 cultivars x 4 replicates

Trial Design: (subject to SAGI consultation).

Time of sowing: April sowing target April 20 -30

Cultivar: Cassiopee (resistant winter barley) & RGT Planet (susceptible spring barley)

Cultivar i) Cassiopee
 ii) RGT Planet

Trt.	GS00	GS31	GS39 -49
1	Systiva	----	----
2	Systiva	Prosaro 300	----
3	Systiva	----	Aviator 416
4	Systiva	Prosaro 300	Aviator 416
5	----	----	----
6.	----	Prosaro 300	----
7.	----	----	Aviator 416
8.	----	Prosaro 300	Aviator 416

Management:

Standard farm management of inputs (irrigation, agrichemical input –PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 8 x 2 x 4 reps = **64 plots**

Protocol 8 – Disease management for irrigated crops – products, rates and timings.

FAR trial codes: FAR IRR B20-08-1 (Trial 1) and FAR IRR B20-08-02 (Trial 2)

Protocol version: Version 1 (11.02.20)

Trials 1 & 2 Disease management for irrigated crops – products, rates and timings.

Trial 1: FAR IRR B20-08-1

Location: Francis, SA

Trial treatments: 9 two spray fungicide treatments x 4 reps = 36

Trial Design: (subject to SAGI consultation).

Time of sowing: April sowing target April 20 -30

Cultivar: Cassiopee – Frances (moderately resistant)

Trial 2: FAR IRR B20-08-02

Location: North Midlands, Tasmania

Trial treatments: 9 two spray fungicide treatments x 4 reps = 36

Trial Design: (subject to SAGI consultation).

Time of sowing: August 20 -30

Cultivar: RGT Planet (susceptible) – Tasmania

Trial Treatments: (mL/ha) – rates and timings based on the best fungicide chemistry available for barley

Trt.	GS00	GS31	GS39 - 49
1	Untreated	----	----
2		Prosaro (300)	Radial (840)
3		Aviator (416)	Radial (840)
4		BAS 752 (750)	Radial (840)
5		BAS 750 (750)	Radial (840)
6		Radial (840)	Prosaro (300)
7		Radial (840)	Aviator (416)
8		Radial (840)	BAS 752 (750)
9		Radial (840)	BAS 750 (750)

BAS750 and BAS750 will be coded as FAR F1/20 and FAR F2/20 respectively

Management:

Standard farm management of inputs (irrigation, agrichemical input –PGR as standard based on split Moddus Evo 0.2 + Errex 0.65 x 2 at GS30 & 32)

Standard overhead irrigation to avoid soil moisture deficit

Total Plot Number: 9 x 4 reps = **36 plots**

Protocol 9 – Lodging control in irrigated crops

Trials 1 Lodging control in irrigated crops – winter and spring barley

FAR trial codes: FAR IRR B20-09-1

Protocol version: Version 1 (11.02.20)

Trial 1: FAR IRR B20-09-1

Location: Finley, NSW

Trial treatments: 2 Cultivars (one spring, one winter) x 4 management strategies x 4 reps

Trial Design: (subject to SAGI consultation).

Time of sowing: 20-30 April sowing target

Cultivar: Cassiopee (winter) & RGT Planet (spring control)

Cultivars

- i) Cassiopee (winter barley)
- ii) RGT Planet (spring barley)

Treatments – (mL/ha)

Trt.	TRT Name	GS31	GS33
1	Untreated		
2	1 PGR – Full rate	Moddus Evo (400)	
3	2 PGR – Half rate split	Moddus Evo (200)	Moddus Evo (200)
4	Grazed (GS30)		

Total Plot Number: 2 cultivars x 4 PGR/Graze treatments x 4 reps = 32 plots

Section 7.0 Soil Amelioration

Protocol 6a: Influence of soil amelioration and soil amendments on crop yield and profitability

Output 1. PROC 9175813 and interaction with PROC 9175815 – Agronomy research on irrigated crops

Protocol Objective:

To evaluate the influence of deep rip cultivation and soil amendment (organic manure and gypsum on a red duplex soil) on crop establishment, yield and profitability.

The individual objectives are as follows:

- To evaluate the influence of incorporating organic amendments (based on pea residue) with and without gypsum at 35-40cm depth on establishment and crop vigor.
- To evaluate the yield response and profitability in faba beans of deep ripping cultivation (35 – 40cm) versus direct drilling under overhead irrigation.
- The trial area would be sown to canola in the following year to assess the impact of irrigated faba beans on following crops of canola. Following the canola durum wheat will be established.

Treatment List:

Influence of soil amelioration and soil amendments on faba bean yield and profitability

Trials 1 & 2

FAR trial codes: FAR IRR F20-06a-1 (Trial 1) – overhead irrigation, ICC O20-06a-2 (Trial 2) – flood irrigation

Protocol version: Version 4 (30.03.2020)

Trial 1: FAR IRR F20-06a-1 – Under overhead Irrigation

Location: Newell Highway Finley, NSW, GPS: -35.614731, 145.59182

Trial treatments: six deep rip and soil amendment combinations versus their un-ripped controls.

Trial Design: Randomised complete block with six replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window

Cultivar: Amberley (disease resistant)

Trial Treatments: (blocks 35m x 7.5m)

Trt	Amelioration
1	Nil (control)
2	Deep rip (tillage control)
3	Surface applied organic amendment (surface applied control)
4	Deep rip + deep applied organic amendment (subsurface amendment)
5	Deep rip + deep applied organic amendment + gypsum
6	Deep rip + deep applied gypsum

Trial 2: ICC O20-06a-2 – Under flood Irrigation

Location: Kerang

Trial treatments: six deep rip and soil amendment combinations versus their un-ripped controls.

Trial Design: Randomised complete block with six replicates (Main plot cultivar and sub plot plant population)

Time of Sowing: April 20-30 target window

Cultivar: Oats

Trial Treatments: (blocks 35m x 7.5m)

Trt	Amelioration
1	Nil (control)
2	Deep rip (tillage control)
3	Surface applied organic amendment (surface applied control)
4	Deep rip + deep applied organic amendment (subsurface amendment)
5	Deep rip + deep applied organic amendment + gypsum
6	Deep rip + deep applied gypsum

Management:

Standard farm management of inputs (fertilisers and agrichemical input) for the trial with same sowing date window as small plots

Irrigation input (mm) specific for irrigation system in order to establish a crop in April 20 – 30 sowing window

Total Plot Number: 6 amelioration/amendment treatments x 4 reps = **24 plots**