Wheat Trials

High Input Durum Wheat

Summit Ag
Agricultural Research

Agriculture Trials with an Agronomic Focus

IREC- Coleambally Irrigation Discussion Group 2020 Focus Paddock Report: High Input Irrigated Durum Wheat

June 2020

The Irrigation Research & Extension Committee has been facilitating research trials to benefit southern grain growers. For the Coleambally Irrigation Discussion Group there was a study into the impacts of management on the yield and quality of high input, irrigated durum wheat crops.

Technical Questions

- 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?

Details

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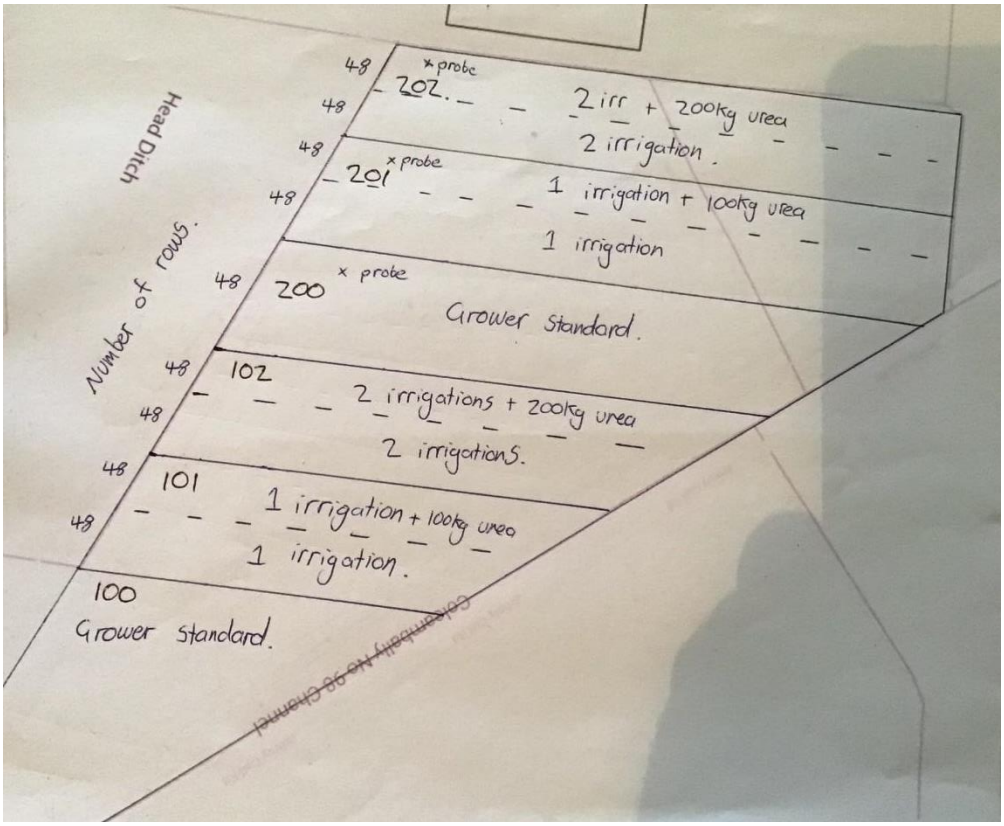
Trial Protocol: Durum Wheat Trial

Date Submitted: 9/04/2021

Table of Contents

1. Summary

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 as shown above:

- 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.

2. Introduction

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.

3. Experimental Details

3.1 Site Details

Location	Jimmy Cull Road, Coleambally
Crop	Durum Wheat
Variety	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

3.2 Full product details

Urea – 46% Nitrogen
Water
Moddus Evo – growth regulator

3.3 Formulation Details

N/A

3.4 Treatment Method

Urea	Spread 12m
Irrigation	Flood Furrow
Growth Regulator	NA

3.5 Application Details

Growth Regulator – not applied due to some light herbicide damage and the crop not requiring it.

3.6 Trial Design

Design	Block Demonstration
Replicates	0
Plot size	Approximately 4ha
Buffers	Nil between treatments

3.7 Assessments

- establishment and tiller counts
- leaf blade testing for nutritional levels
- grain quality analysis

3.8 Statistical Analysis

Not applicable as not replicated.

4. 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/m^2 to target 8-10 tonnes of wheat.

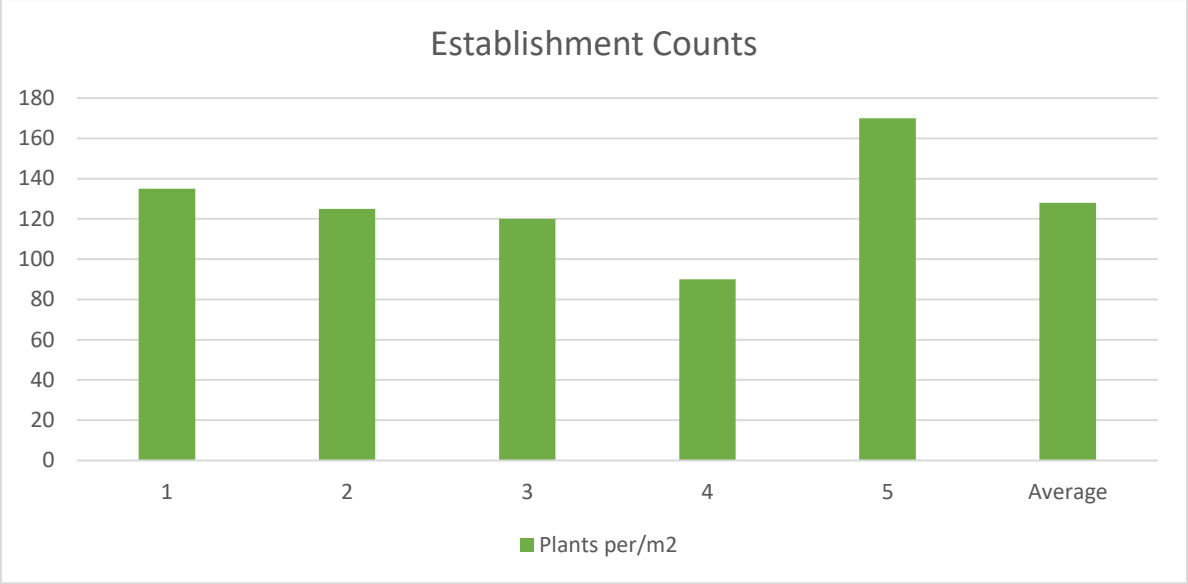


Table 1: establishment counts

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, as shown below:

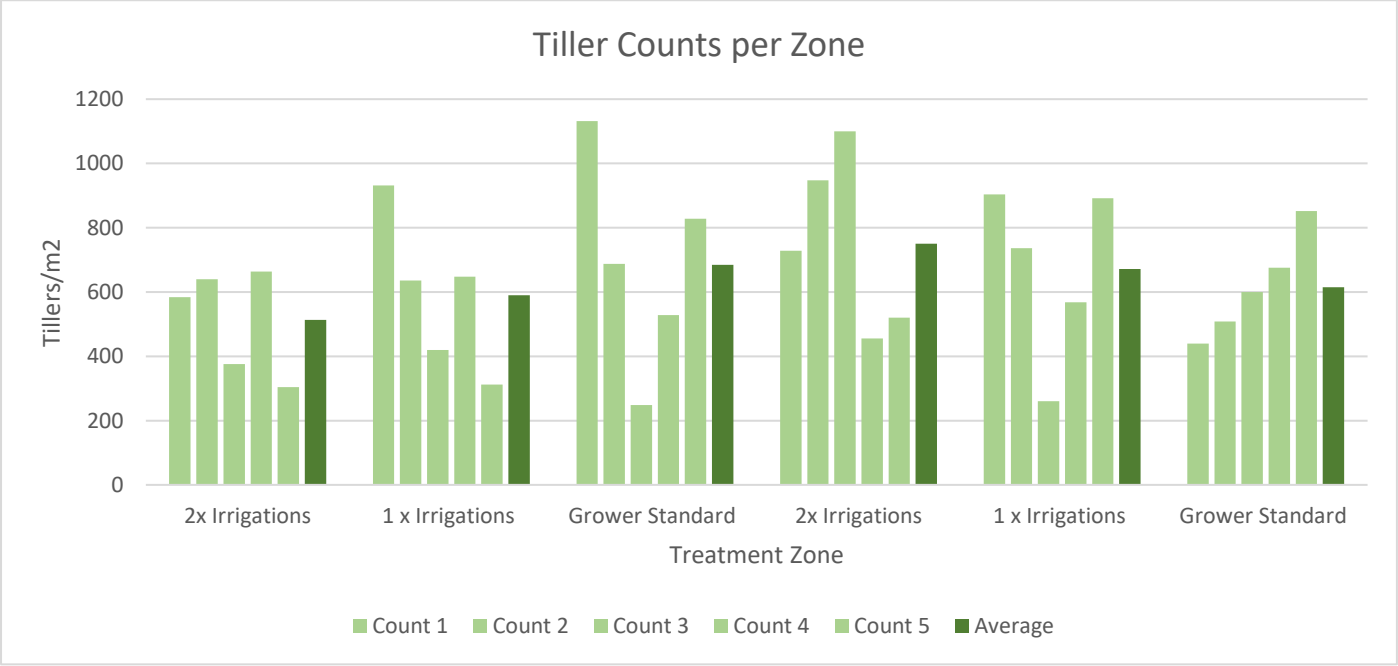
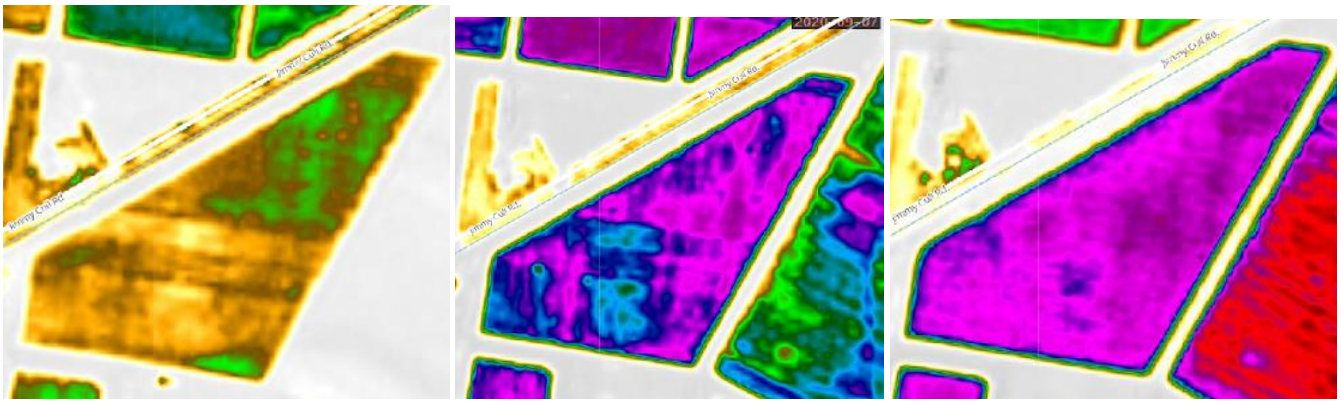


Table 2: Tiller counts per zone

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.



21/07/2020 7/09/2020 8/11/2020

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.

Above: Achieve damage 10 DAA

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 urea (46 units N) (+/- an irrigation) and the final treatment had 200kg/ha urea (92 units N) (+/- an irrigation) applied.

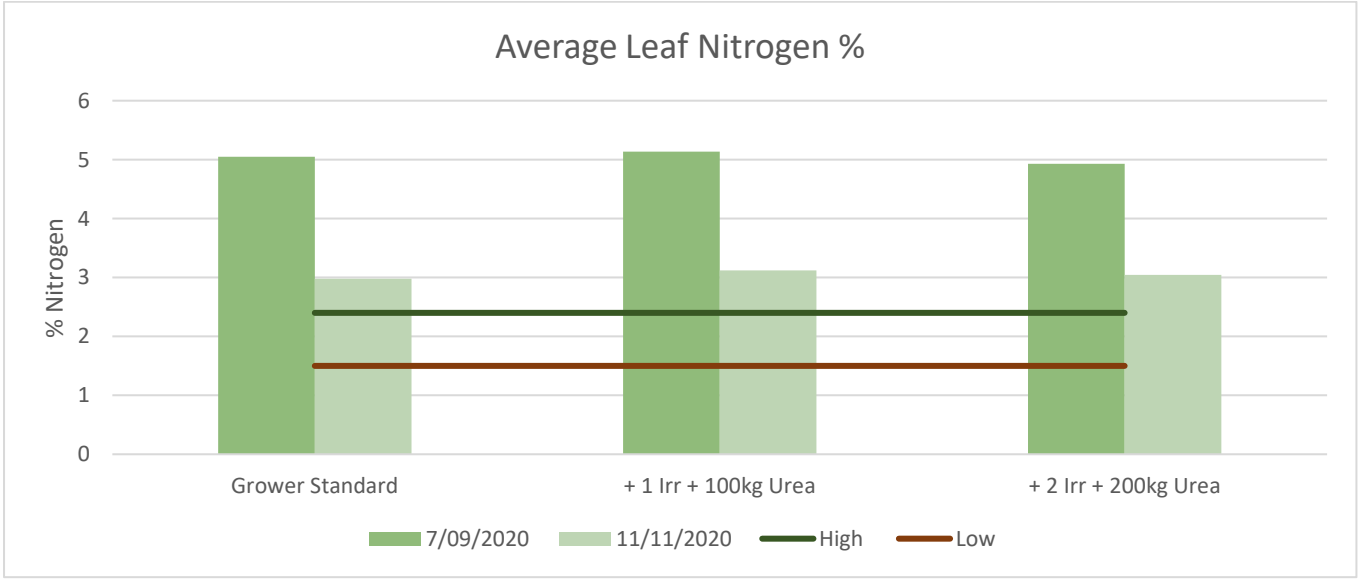


Table 3: Average % of leaf nitrogen, with baseline nitrogen % shown

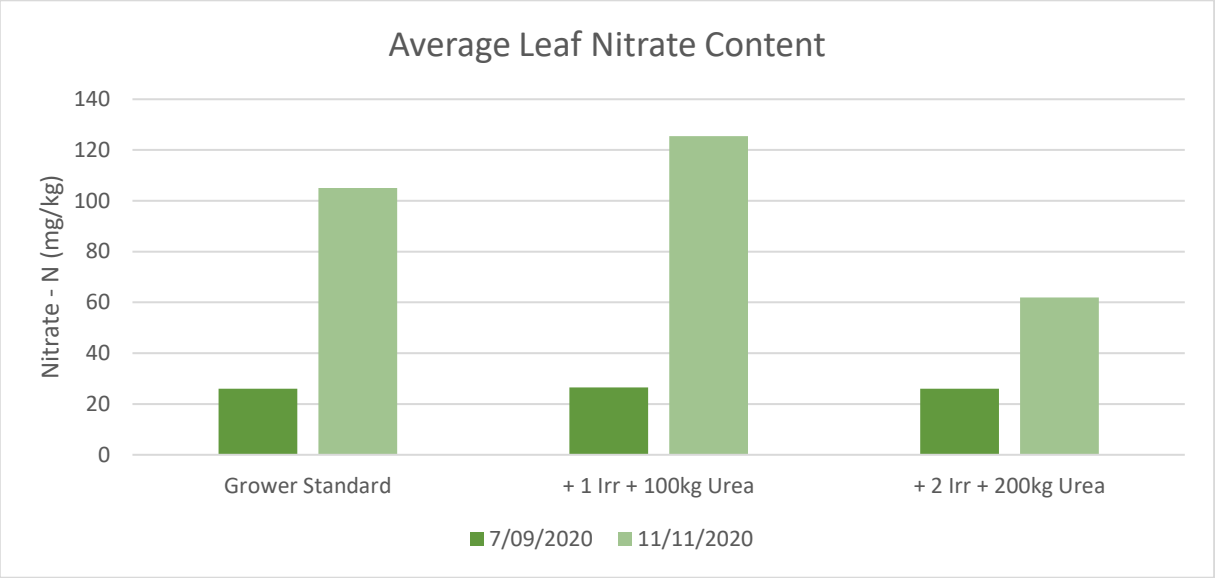


Table 4: Leaf nitrogen content average mg/kg

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.

Irrigation/Moisture Probes

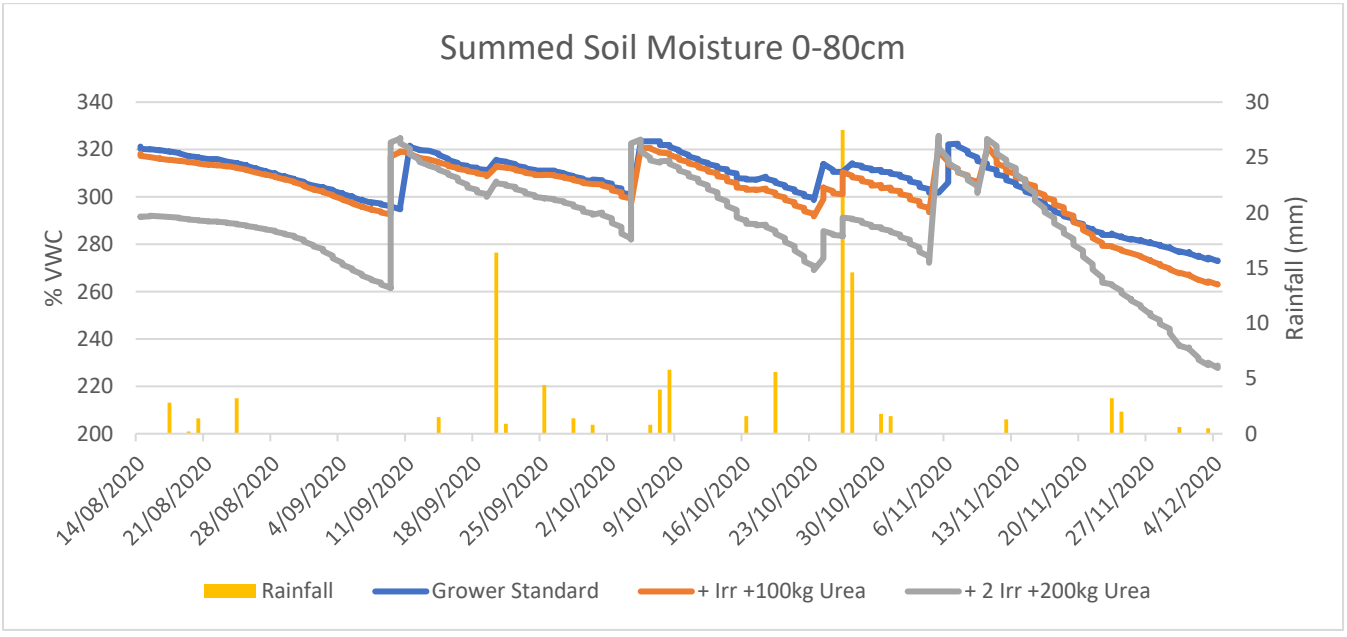


Table 5: Summed moisture probe readings from 3 zones, and rainfall.

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 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.

Quality Data

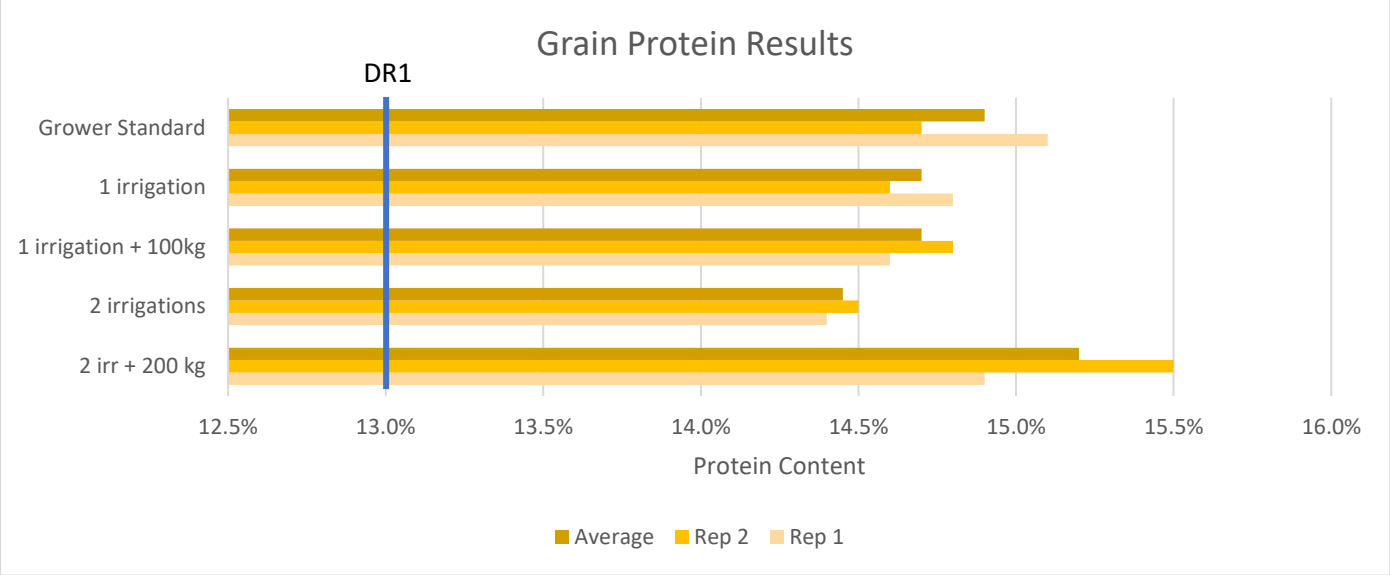


Table 6: Grain protein by treatment

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.

Final Yields

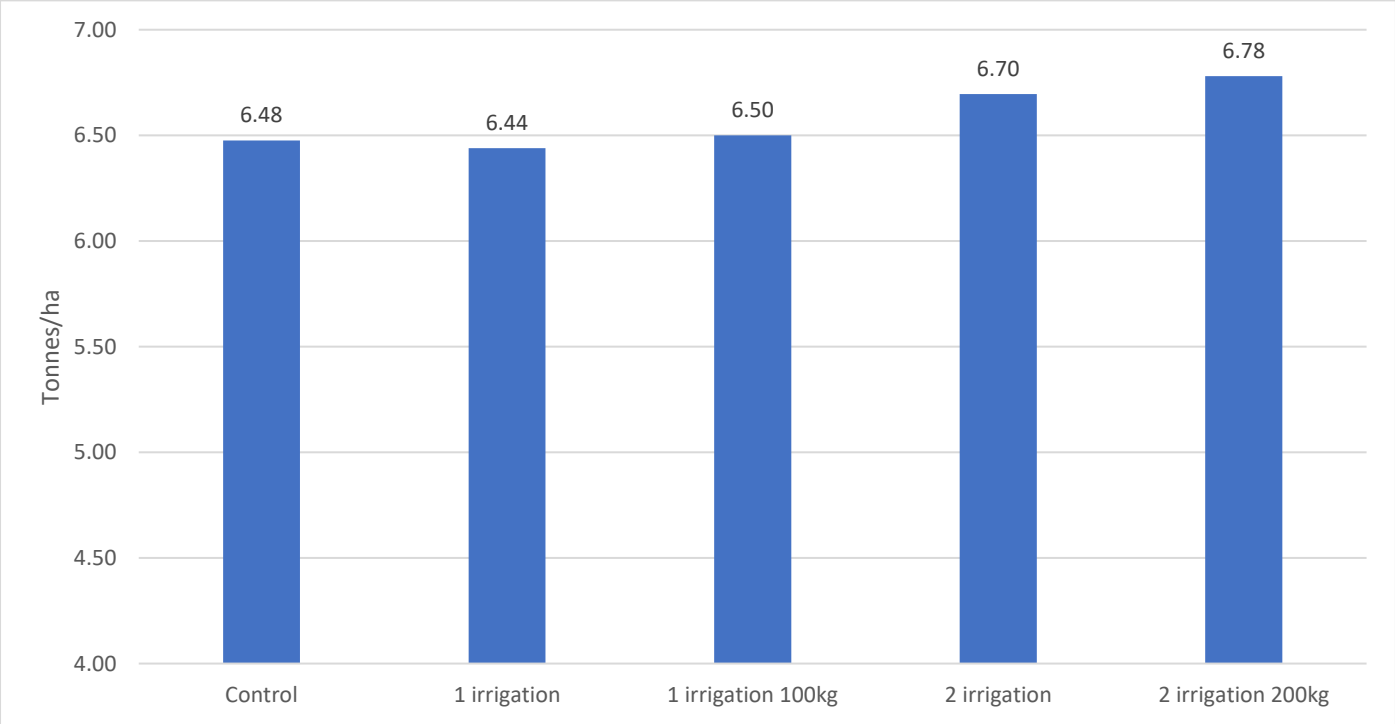


Table 7: Final yield average by treatments.

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.

5. 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.

6. Thanks

Thanks for this project must be given to GRDC for funding, the Irrigation Research & Extension Committee for arranging the project. Tom Lynch for allowing the work to be done on his farm and co-operation. Sam O'Rafferty and Heath McWhirter from Summit Ag for managing the site.

Appendix 1

Associated spreadsheet with raw data can be supplied.