Optimising
Irrigated Grains

CANOLA

GOOD MANAGEMENT GUIDELINES for Irrigated Crops:

2020 to 2022

SOWING THE SEED FOR A BRIGHTER FUTURE

Introduction

Good management guidelines for irrigated canola

This good management guidelines summary for canola has been taken from the results of the Optimising Irrigated Grain (OIG) research project, a GRDC investment conducted in south-east Australia ((FAR1906-003RTX) from 2019-23. The guidelines are laid out as key points with a small amount of supporting data taken from the trials conducted over these three years. ***Please note these guidelines only cover agronomy topics that were researched during the project (2020 – 2022), it is not intended to be a complete guide to growing irrigated crops. Instead, it carries key points noted to be instrumental in growing productive and profitable irrigated crops.*** These guidelines can be supplemented by reading the *Good Management Guidelines for Irrigated Crops* produced as a result of the project.

What did we do in the GRDC Optimising Irrigated Grains project?

This GRDC investment Optimising Irrigated Grains (OIG) (FAR1906-003RTX) was set up to identify gaps in our knowledge regarding the true economically attainable yield potential of winter and summer crops grown in south-eastern Australian irrigated farming systems. The focus was on crops where there was less knowledge of upper end yield potential, particularly in light of newer germplasm, management advances and innovations in soil amelioration.

The field research team (FAR Australia and Irrigated Cropping Council (ICC)) was charged with conducting over 60 individual trials per annum, in six crops, over a three-year research period (2020 – 2022). To conduct such a large number of trials, field experiments were consolidated into two major Irrigated Research Centres (IRCs) based at Kerang in Victoria and Finley in southern NSW. Most trials focussed on crop agronomy and were conducted on a grey clay soil at Kerang using predominately surface irrigation (flood), and at Finley on a red duplex using overhead and surface irrigation in collaboration with Southern Growers, NSW DPI and the Maize Association of Australia. Three satellite sites carried a smaller number of trials in the north midlands of Tasmania, south-eastern Australia and Griffiths in NSW in collaboration with Irrigation Research and Extension Committee (IREC), Riverine Plains Inc, Southern Farming Systems, South Australian Research and Development Institute (SARDI) and MacKillop Farm Management Group.

The research programmes were uniquely developed to evaluate crop specific agronomic management practices in irrigated environments in order to ascertain their effects on system productivity and profitability.

Crop specific agronomic practices were focussed on maximising system profitability through:

1. Understanding the yield potential of irrigated crops in the principal environments where research was taking place.
2. Understanding how to consistently optimise yield for the crops where gaps in knowledge were most apparent.
3. Optimising the return on nitrogen through improved nitrogen use efficiency (grain maize, canola, barley and durum).

ACKNOWLEDGEMENTS

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In addition, we would like to acknowledge the collaborative support of our principal trials research partner Irrigated Cropping Council (ICC). We would also like to acknowledge all the OIG partners and collaborators in the project, University of Tasmania, Southern Growers, NSW DPI and the Maize Association of Australia, Irrigation Research and Extension Committee (IREC), Riverine Plains Inc, Southern Farming Systems, South Australian Research and Development Institute (SARDI) and MacKillop Farm Management Group.

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Crop structure and Plant population

Key point summary

- ***The penalty for growing canola crops that are too thin is significant under irrigation.***
- ***At $700/t the influence of thinner canola populations can result in productivity losses of $448 - $532/ha.***
- ***Under irrigation it's better to have hybrid canola populations that are too thick than too thin when assessing seedbed conditions and establishment.***
- ***80 seeds/m^2 resulting in plant populations averaging 43-45 plants/m^2 were the most profitable populations tested under surface and overhead irrigations systems.***
- ***If autumn surface irrigation 80-100mm (0.8-1.0 Mega litre) was followed by heavy winter rainfall on poorly drained red duplex soil, canola establishment could be severely reduced (2-9 plants/m^2) and productivity reduced to yields of 1-2.5t/ha.***
- ***Under irrigation at Finley the yield advantage of RR hybrid over TT hybrid was 17% (0.64t/ha) resulting in a $488/ha increase in productivity at $700/t.***
- ***In the warmer irrigation region of Kerang on grey clay the advantage of the RR hybrid was approximately half that observed at Finley with a yield advantage valued at $231/ha.***
- ***Higher plant populations resulted in test weights that achieved the minimum standard (62kg/hL) which was not the case with the lowest TT plant populations tested.***

Growing canola under irrigation with the aim of producing 5t/ha has illustrated significant penalties in yields and margins from growing crops that are too thin. With higher yield potential under irrigation small differences in plant population have a "magnifying" effect in terms of yield. With plant populations below the optimum there are significant yield penalties, whilst in the same varieties' populations that might be regarded as above the optimum have been either equal or higher yielding than the optimum. As a result, dropping to populations between 10-20 plants/m^2 can produce a significant drop in productivity compared to plant populations that are above 40 plants/m^2 when canola has been grown under irrigation. In the research looking at optimum crop canopy performance for irrigated canola the following key points emerged in 2020 and 2021.

Influence of hybrid RR vs. TT

- Higher yields under irrigation magnify differences relative to dryland. Roundup Ready hybrid 45Y28 has been consistently higher yielding than the hybrid TT HyTTec. A mean 17% advantage (range 15-18% mean 0.64t/ha) was observed at Finley Irrigated Research Centre worth $448/ha at $700/t.
- The advantage of 45Y28 over HyTTec Trophy in the warmer region of Kerang on grey clay was approximately half that observed at Finley (9%-0.33t/ha) worth $231/ha.

Influence of plant population

- Roundup ready hybrid 45Y28 has shown 15% higher productivity (mean of 0.64t/ha) from an average plant population of 45 plants/m^2 (based on 80 seeds/m^2) compared to populations of 14 plants/m^2 (based on 20 seeds/m^2) (Figure 1). Thicker canopies based on 45 plants/m^2 under irrigation generated a $448/ha return for an investment of approximately $110/ha in extra hybrid seed planted (additional 3kg/ha seed). Approximately $4 return for each $ spent on additional seed.
- The differences in hybrid TT populations under irrigation produced even greater differences in productivity and again illustrated that growing crops with higher plant populations was important to secure the additional productivity offered by irrigation. Hybrid TT HyTTec Trophy showed 23% higher productivity (mean of 0.76t/ha) from a mean population of 43 plants/m^2

with this thicker crop generating an additional $532/ha return from a similar $110/ha investment in additional seed. Approximately $5 return for each $ spent.

Influence of irrigation system (relative to winter rainfall)

- The poorest yield results observed in the project resulted from autumn irrigation immediately post sowing in early May following sowing in late April. Poor drainage and flow of surface irrigation at the Finley site led to early winter water logging and very low plant establishment. Crop establishment that fell to between 2-9 plants/m^2 yielded 0.83-2.67t/ha with 45Y28 and 3-7 plants/m^2 with HyTTec Trophy yielding 1.14-1.71t/ha.

The results illustrate that under irrigation the penalty of growing crops too thinly is increased with very large losses of income if population falls to 10-15 plants/m^2. Although hybrid plant populations of 25-30 plants/m^2 removes much of this penalty, productivity and profitability was increased further with populations at 40-50 plants/m^2, despite the additional cost of seed.

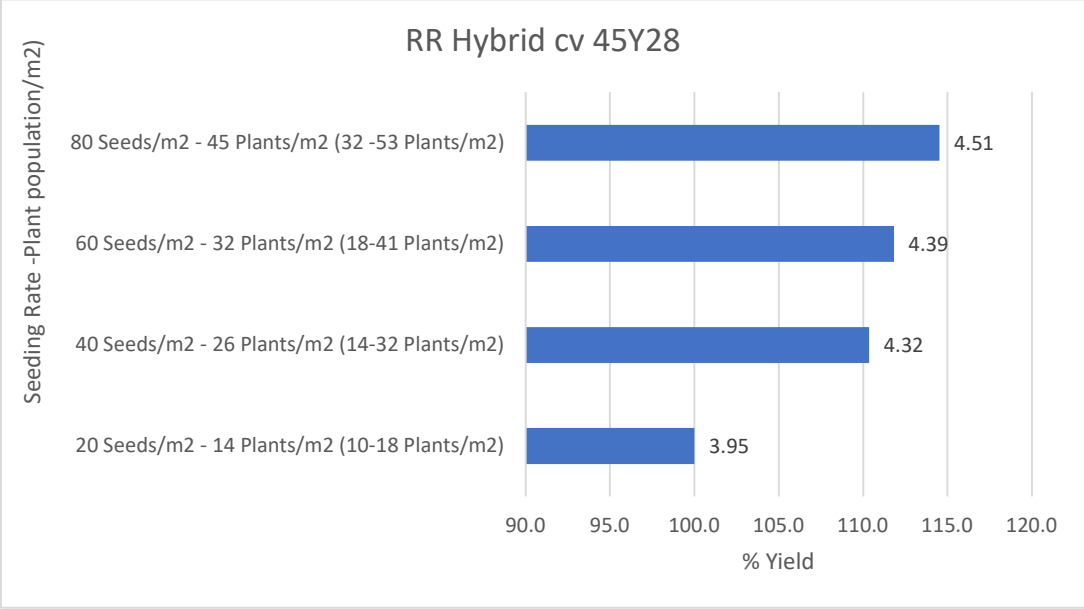

Figure 1. *Influence of plant population on seed yield (t/ha) using the RR hybrid 45Y28 in 6 irrigated trials conducted at Finley and Kerang – 2020 and 2021.*

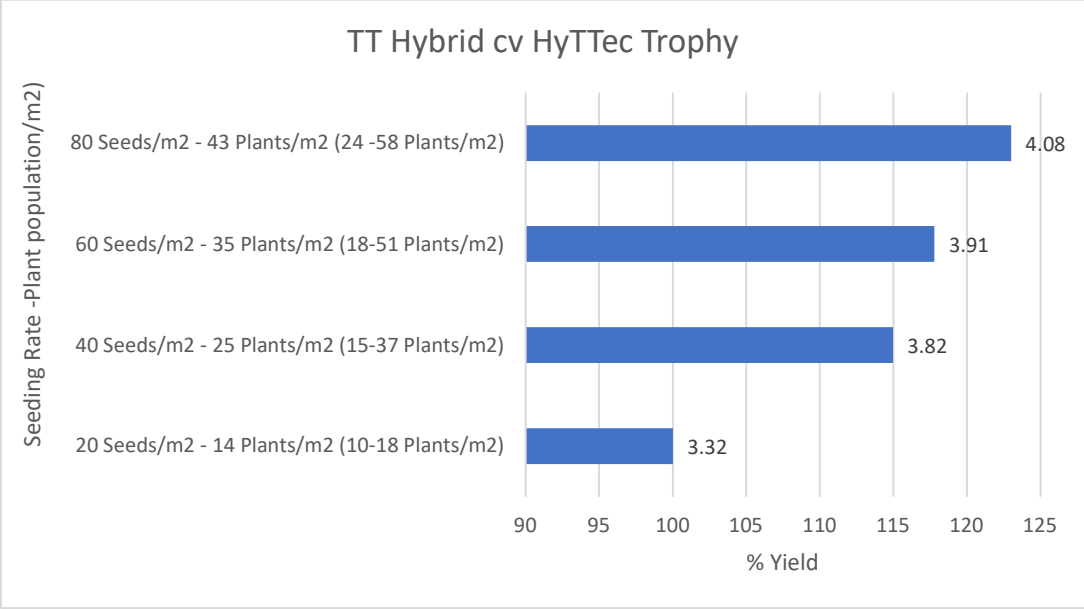

Figure 2. *Influence of plant population on seed yield (t/ha) using the TT hybrid HyTTec Trophy in 6 irrigated trials conducted at Finley and Kerang – 2020 and 2021.*

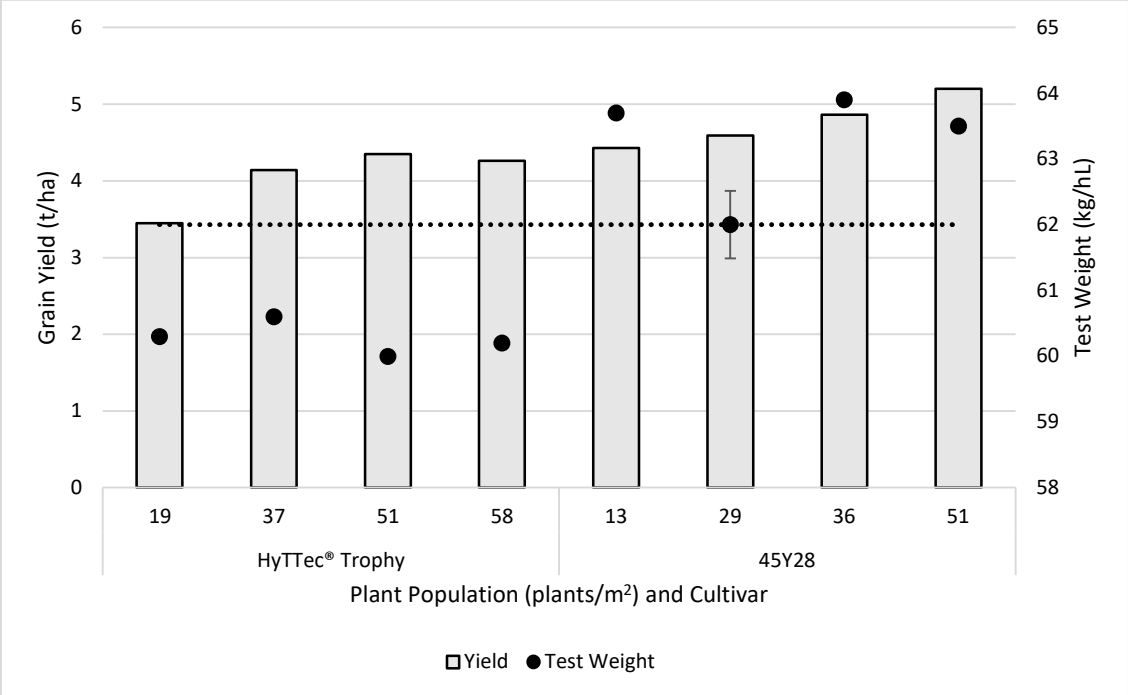

Figure 3. *Influence of plant population and cultivar on seed yield (t/ha) and test weight (kg/hL) using the TT hybrid HyTTec Trophy - Finley 2021.*

Nitrogen applications for 5t/ha irrigated canola

Key point summary

- ***Growing 5t/ha canola crops under irrigation does not require very large quantities of artificial nitrogen, it requires a fertile farming system that enables large crop canopies to draw down from a high soil N reserve in order to satisfy crop demand.***
- ***Optimum N rates in OIG project trials required to grow 4-5t/ha canola crops did not exceed 240kg N/ha applied as N fertiliser (urea 46% N).***
- ***At Finley 200kg N/ha would be an appropriate target with a range of 160-240kg N/ha (upper end of range with low soil fertility or lower rate of range with high fertility).***
- ***In trials conducted, there were few, if any differences in seed yield due to N timing with N rate being the most important. Timings of 6 leaf, green bud and yellow bud using split applications made little difference to yield or oil content.***
- ***When crops respond to higher levels of N input (above 240kg N/ha) it is often where crops cannot efficiently access the N fertiliser applied, a common occurrence in dryland scenarios. With irrigated crops the efficiency of N applied is improved considerably.***
- ***The highest yielding irrigated canola crops in the project were produced in paddocks where inherent fertility was high with applied artificial N rates typically no more than 160-240kg N/ha at Finley and 80-120kg N/ha at Kerang.***
- ***These fertile irrigated paddocks can often produce reasonable crops with little or no artificial N as soil N mineralisation provides a greater proportion of the N supply e.g. Finley and Kerang 2020 yields were in excess of 3t/ha achieved with only MAP at sowing.***

During 2020 at Kerang on grey clay, canola yields varied from 3.00 – 3.63 t/ha based on 0 to 320kg N/ha applied with an optimum of 80kg N/ha. In 2021 from the same N range the canola yields were 2.74 – 4.36t/ha with an optimum of 120kg N/ha. In Finley during 2020, yields ranged from 3.91 – 4.71t/ha (Figure 4) with an optimum of 160-200kg N/ha and in 2021 from 2.21 – 4.22 t/ha with an optimum of 240kg N/ha from the same yield range.

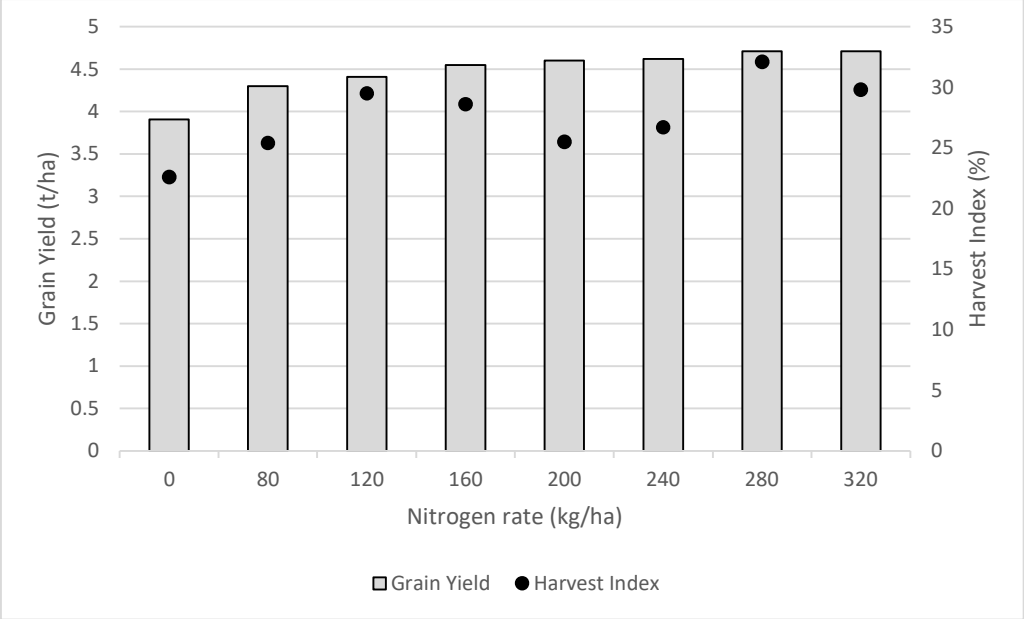

Figure 4. *Influence of applied N rate on seed yield (t/ha) and harvest index (%) – cv RR Hybrid 45Y28, Finley, NSW 2020.*

Disease management in irrigated canola

Key point summary

- ***In the project trials at Finley in 2020 and 2021, the maximum responses to disease management strategies were relatively small (0.13t/ha and 0.28t/ha) in irrigated canola crops of ATR Bonito.***
- ***The research work conducted on canola was subject to upper canopy blackleg and crown canker but not sclerotinia.***
- ***In these cases, flutriafol in furrow followed by Miravis at 4-6 leaf were the most effective treatments, although the yield increases were small in 2020 and 2021 (only statistically significant in 2021).***
- ***In 2022 the same treatment was amongst the most effective tested, but other yield increases were higher (cv Bonito for all three years).***

PGR management – controlling crop height and lodging

Experimental PGR applications (based on a gibberellin inhibitors) have been successfully employed to reduce crop height in irrigated canola, however the effects of the PGR which have been manifest at flowering have largely worn off by harvest. So far, these transient reductions in crop height have not been associated with any improvement in seed yield.

NOTES

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