IRRIGATION FACT SHEET

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

NATIONAL
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The cost–benefit of irrigating wheat under drought conditions

KEY POINTS

- Irrigating wheat can be profitable in drought years, with the top 10 per cent of growers surveyed producing returns of more than $1500 per hectare in 2018
- When deciding on spring irrigation and the water price (temporary as well as any allocation or carryover), grain price and crop potential are the key factors to consider
- Gross margin tools can be used to determine the minimum yield required to give a return on water investment and estimate financial returns to assist in decision making
- Assessment of crop potential is essential to determine if the minimum yield required is achievable. Head numbers per m^2 can be multiplied by 0.013 to estimate yield/ha
- Biomass, crop nutrition and timeliness of irrigation are drivers of cost–benefit of irrigating in drought years

PHOTO: DAMIAN JONES

Spray irrigated wheat at Moulamein.

Introduction

The volume of water available is reduced in drought years, resulting in irrigators having to make decisions on whether grain or water trading will be more profitable. Irrigators need to weigh up the cost of water against the potential return of the crop and compare this with the cost of sacrificing crop potential against the returns from selling water.

The main drivers for the decision to irrigate in the spring are water price, wheat price and estimated crop potential. Gross margin tools can be used to forecast the most profitable use of irrigation water; however, the value of the gross margin is only as reliable as the information entered. The key is to accurately assess crop potential to determine if minimum yields for profitable irrigation will be reached.

A recent harvest survey of irrigated wheat crops from the Murray and Murrumbidgee valleys was assessed for total biomass, grain yield and head numbers, as well as agronomic inputs such as fertilisers and irrigation. The results of this demonstrated that irrigating wheat can be profitable in drought years, with the top 10 per cent of irrigators producing returns of more than $1500 per hectare.

The three keys drivers to profitable irrigation in drought are:

- yield potential;
- commodity price; and
- cost of water.

Yield potential

It is essential to have an accurate assessment of the yield potential of the crop to determine if investment in irrigation water is justified. Assessing

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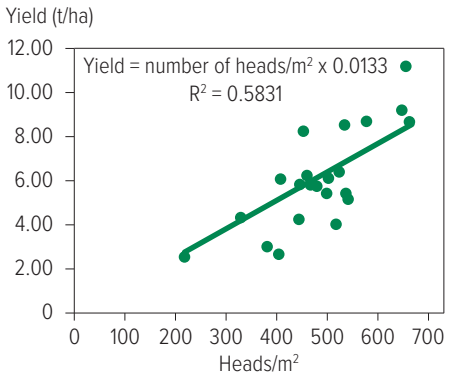
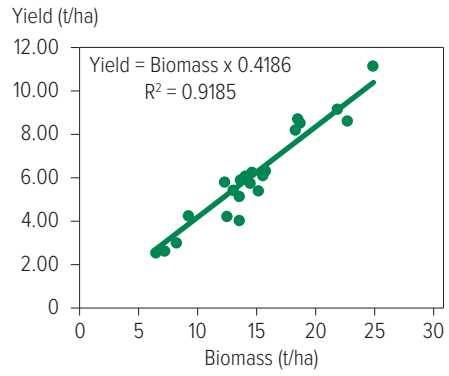
FIGURE 1 Wheat head numbers and final grain yield from the 2018 harvest survey.



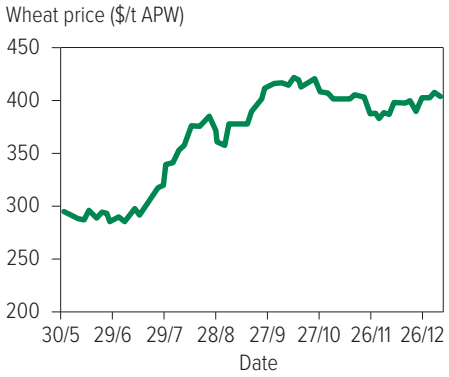
SOURCE: COST: BENEFIT OF IRRIGATING CROPS UNDER DROUGHT CONDITIONS FINAL REPORT

FIGURE 2 Wheat yield and total crop biomass from the 2018 harvest survey.



SOURCE: COST: BENEFIT OF IRRIGATING CROPS UNDER DROUGHT CONDITIONS FINAL REPORT

FIGURE 3 APW wheat price $/t (grain price delivered at Graincorp Boort 2018).



SOURCE: COST: BENEFIT OF IRRIGATING CROPS UNDER DROUGHT CONDITIONS FINAL REPORT

the yield potential of crops should be conducted after Growth Stage 35 (late stem elongation), prior to late August/early September scheduled irrigations. At this timing, the crop is still developing its head and yield potential. Moisture stress during late booting will result in the death of florets in heads, significantly reducing yield potential. Although this is applicable in most years, the decision to irrigate carries greater risk during drought and when the water price is high.

There is a firm relationship between head numbers and yield (Figure 1). Yield can be estimated based on head numbers by multiplying the number of tillers per square metre by 0.0133.

For example, if the wheat crop at booting has 500 tillers/m^2, then the estimated yield is 500 x 0.0133 = 6.65 t/ha. Another way of looking at the relationship is that the crops averaged 1.33t/ha per 100 heads/m^2.

Crops vary in performance and as a general observation, those that achieved greater than 1.33t/ha per 100 heads/m^2 were supplied with enough moisture to ensure grain fill and sufficient nitrogen available to match yield. Crops that failed to achieve 1.33t/ha per 100heads/m^2 had suffered a setback that had affected yield. Setbacks included late sowing, insufficient nitrogen, moisture stress or crop damage as a result of frost or lodging. A key driver in obtaining 1.33t/ha per 100 heads/m^2 is biomass (Figure 2).

The relationship between total biomass and grain yield was 0.42 or grain weight was 42 per cent of biomass. Conversely, biomass at harvest was 2.39 times the final grain yield. Given the samples were cut at ground level and care was taken to minimise losses, it does confirm the rule of thumb that a hay crop yield would be approximately double that of a grain crop. In drought years, the alternative market for an irrigated crop could be the hay market. Irrigation at the booting stage results in rapid growth in biomass. Previous work by the Irrigated Cropping Council has seen biomass double in the period from booting to the end of flowering in cereals. This may make hay an option as one spring irrigation is usually enough to get the crop sufficiently mature for cutting. Again, gross margin calculators can help determine if this option is the most profitable.

Commodity price

Calculating the gross margin relies on having accurate information on what anticipated grain prices will be at delivery. As seen in 2018, grain prices began to trend upwards during the growing season as dryland areas experienced poor winter rains and demand remained strong from the livestock industries. Prices had risen approximately $100/t from sowing but remained variable, falling as each rainfall event was forecast and then rising as the rain failed to arrive. However, the prices seen when irrigation decisions needed to be made in late August were not that far from harvest prices and offered a reasonably accurate value to use for the gross margin calculations.

Price of water

The price used for water will be dependent on whether it is allocation, carryover, purchased or how it should be valued by the irrigator. There are many arguments for the 'right' value to use, but the value is right for the individual case, as is the acceptable financial return for using irrigation water.

The temporary price of water in 2018 traded at approximately $340 per megalitre (ranging from $320–375/ML) during the spring irrigation period, with allocations in mid-August in the Victorian

Yield potential of crops can be estimated by counting Head No.s/m^2 or Biomass t/ha after Growth Stage 35 (late stem elongation), prior to late August/early September scheduled irrigations:

Yield t/ha = Biomass (t/ha) x 0.42

Yield t/ha = Head No/m^2 x 0.0133

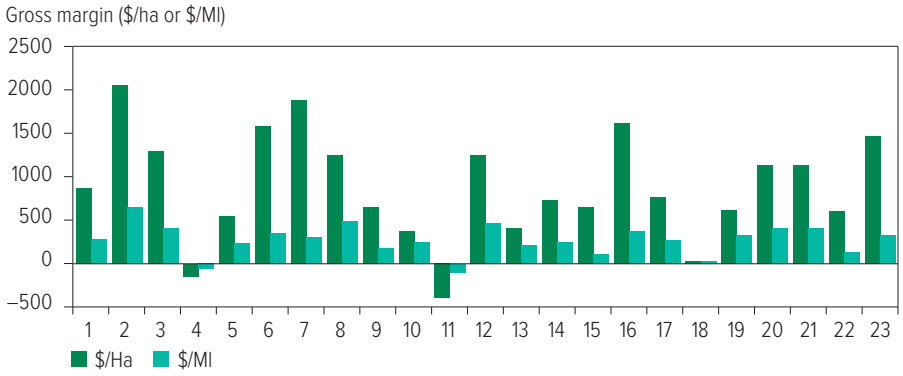
PHOTO: DAMIAN JONES

Harvesting irrigated wheat at the ICC Trial Block Kerang.

Harvesting an irrigated wheat crop at Kerang .

PHOTO: DAMIAN JONES

FIGURE 4 Wheat gross margins from crops included in the 2018 harvest survey.*



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Murray HRWS at 59 per cent, Goulburn HRWS 47 per cent, NSW Murray general security at 0 per cent and Murrumbidgee general security at 6 per cent.

Despite the drought conditions, irrigating wheat was profitable in all but three cases and for the top 10 per cent of growers produced returns of more than $1500/ha in 2018.

*Gross margins were based on the following assumptions:

- Yield, water used and fertiliser data were relevant to the sample.
- Input costs such as seed, herbicide and machinery operations were considered similar for all irrigators.
- Water cost used was $340/ML (the price of temporary transfer water at the time) and may not represent the actual cost to the irrigator (for example, water via allocation is approximately $60/ML to Victorian irrigators).
- Wheat valued at $400/t irrespective of delivery point or quality.
- Additional income from straw or agistment has not been considered.

SUMMARY

To make a decision on whether to irrigate, the crop needs to be inspected to ensure it has the potential to meet the minimum yield for profitable investment in irrigation. Irrigators can make realistic yield estimates by multiplying head numbers/m² by 0.013 or biomass t/ha x 0.42 once the crop is past Growth Stage 35. Along with estimates of commodity prices and variable costs (particularly price of water), a gross margin tool can be used to assess the return required to make a profitable return on investment.

Once the decision is made to irrigate, the need for timely application becomes even more important to ensure the crop is not stressed and potential returns jeopardised. Ensuring nutrients are available to plants before watering further increases the potential returns from irrigating.

Irrigated crops can generate large biomass if they receive adequate water and nutrition. An alternative to taking grain crops through to harvest is hay.

OTHER INFORMATION

Gross margin tools/sheets
ICC 'Irrigate or not' gross margin Excel spreadsheet. Contact damian.jones@irrigatedcroppingcouncil.com.au

NSW DPI gross margin tool
www.dpi.nsw.gov.au/agriculture/budgets/costs/cost-calculators/correct-crop-sequencing-decision-support-tool

NSW DPI irrigation guides and posters
www.dpi.nsw.gov.au/agriculture/irrigation/irrigation

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Irrigated Cropping Council

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