Title	Irrigated canola - Management for high yields
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Author	Don McCaffery, Technical Specialist (Oils and Pulses), NSW DPI, Orange Ph: 02 6391 3648, Email: don.mccaffery@agric.nsw.gov.au
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Take home message

- Good forward planning and a commitment to high inputs are the keys to achieving high yielding, profitable irrigated canola crops.
- High input, high yielding crops can be very profitable and water use efficient.
- Paddock selection, soil type, crop nutrition, and irrigation layout and irrigation management, are more important than other factors in achieving high yields.
- Moving to raised beds may not be the best solution for managing difficult soil types.
- Inputs should be matched to the expected yield of the crop.

Background

Canola was first grown under irrigation in the late 1970's with variable and unimpressive results. Attractive prices, new varieties, and the adoption of raised beds saw renewed interest in the early-mid 1990's in the Murrumbidgee Valley, where numerous growers were able to achieve yields ranging from 3.4-4.4 t/ha. Since the late 1990's yields above 3.0 t/ha have become rare and 2.5 t/ha is common. This apparent decline in canola yield has also been observed in the high rainfall zones of southern NSW, but the causes appear to be somewhat different in the irrigated situation.

Why have canola yields declined?

Many of the big canola yields that were achieved in the mid 1990's were grown on specialist row-crop farms by growers with high level management skills. Growers sowed shallow into the better soils in the valley, watered the crop up on raised beds, did not skimp on nutritional inputs and paid attention to the spring irrigation needs of the crop. Many of these growers are not current canola growers, so it would appear that part of the reason as to why yields have generally declined is due to the crop being more widely grown, on less suitable soils (presence of hard pans, poorer surface structure, low soil pH), with less inputs and on layouts less conducive to high yields. Diseases such as blackleg and sclerotinia may also be playing a role. Other factors not yet identified could also be impacting on yield

potential.

Many of the following comments relate to experiences with irrigated canola in the Murrumbidgee Valley over a 13 year period (1989-2002). Over the years 1994-1996 high input growers identified and reinforced the key factors for achieving high and profitable irrigated canola yields. Ten years on and these key factors are still relevant. This paper discusses the key factors identified for high yields, challenging irrigators to better manage canola for higher profit per hectare and per megalitre of irrigation water applied.

Currently winter cereals (wheat) dominate the winter crop area. Canola and faba beans are the main two break crops essential for high sustainable wheat yields.

Some of the challenges facing irrigators in the foreseeable future are:

- Reduced water availability
- Greater focus on winter crop profitability
- Winter crops not achieving their yield potential.

High input canola and risk?

Many would argue that growers of high input crops are simply buying yield and crops are not profitable and are too risky. Economic information on 19 crops in the 1994 data set is graphed below. It clearly shows that high input crops which are also high yielding are very profitable. Also the top eight yielding crops watered with up to 5 ML/ha had an estimated Water Use Efficiency (WUE) of 10.6 kg/mm of water (range 8.3-13.6) assuming 80% irrigation efficiency. Over all 19 crops the average WUE was 8.9 kg/mm of water (range 5.7-13.6).

Yield / Gross margin comparison for the Murrumbidgee Valley - 1994

When water allocations are low whole farm profitability could be maximised by strategically applying less irrigations over a greater crop area grown with moderate inputs.

Paddock selection/cropping history

Paddock history did not appear to play a major part in the yield of the following canola crop in the mid 1990's. However, the better crops were mostly grown following a fallow or following maize (hint of residual N). Occasionally a good crop would be grown following wheat. The highest yielding crop in 1995 was grown following faba beans. Paddocks with a faba bean history were superior to other crop and fallow histories in supplying nitrogen to following crops. However I believe soil structure plays a bigger role than paddock history in achieving high yields.

Beds are the best irrigation layout

Beds have the highest yield potential provided the soil is suitable for beds i.e. good subbing ability/friable structure. Constructing beds on difficult soils could lead to disappointing results if the underlying problem(s) is not ameliorated beforehand i.e. improving organic matter, removing hard pans by deep tillage and applying gypsum where necessary.

Farmer results show that canola grown on beds will yield about 20% higher than bordercheck layouts. A three year study at Deniliquin with barley showed that beds can yield around 26% more than bordercheck layouts on average.

Terraced contour layouts incorporating bankless channels have been widely adopted in recent years but there is no yield comparison data from this system. Many growers believe it to be better than bordercheck for spring watering. Overhead sprinkler irrigation offers advantages over other systems including timely sowing and more efficient water application at sowing and in spring time.

Timely sowing on beds

Timely sowing is important to avoid delays in establishment and to reduce the risk of winter waterlogging which will set the crop back. The best crops came from sowing 15 April-
10 May, with the majority of these crops sown 25 April-5 May using the varieties at that time (Hyola 42-early maturing; Oscar-mid maturing). All high yielding crops were sown shallow on beds and watered up.

Sowing rate and row spacing

The highest yielding crops were sown at 4-6 kg/ha and achieved a plant population of 40-80 plants/m^2. Since the mid 1990's some growers have experimented down to 1.5-2 kg/ha with no noticeable yield loss. However, this approach requires the right soil type, the right machinery, the right weather and the right management. Growers have also experimented with wider row spacings on bed systems - 4 x 35 cm rows, and twin rows (25 cm apart) with a 60 cm gap in the middle of the bed, also with no detectable yield loss. One crop in Coleambally yielded 3.9 t/ha on the latter row configuration in the late 1990's.

Varieties

Information and yield data on varieties best suited to irrigation and especially high input systems has been sadly lacking for many years. Variety selection has been based on trial performance under high rainfall dryland conditions and local commercial experiences under irrigation. Hybrids have been very popular with irrigators in the past and have been among the top performers. NSW Agriculture has recommenced variety testing under irrigation in the Murrumbidgee this season. Commercial agronomists conducted two unreplicated variety demonstration comparisons in 2003 at Whitton and at Coleambally.

Nutrition

Canola has a higher nitrogen (N), phosphorus (P) and sulfur (S) requirement compared to wheat. Canola needs 40-50 kg N, 8 kg P and 10 kg S per tonne of grain. The following Table shows the nutrient demand for different yield targets.

Crop nutrient requirement for four yield targets

Target Yield	2.5 t/ha	3.0 t/ha	3.5 t/ha	4.0 t/ha
Nitrogen kg N/ha	100-125	120-150	140-175	160-200
Phosphorus kg P/ha	20	24	28	32
Sulfur kg S/ha	25	30	35	47

The best crops received about 140-160 kg N/ha, 35-50 kg P/ha, and 40-50 kg S/ha. Poultry manure also played a role in some fertiliser programs. Applying all nitrogen pre-plant, mostly as banded anhydrous ammonia was employed successfully by some growers, even though split applications were advocated.

High pre-plant nitrogen rates (as urea) combined with early sowing (10-25 April) increase the risk of the crop becoming too vegetative and not yielding to expectations. As a general rule around 60% of total nitrogen requirements applied before or at sowing will ensure adequate cabbage growth by budding, when the remainder of the nitrogen can be topdressed. A Deep Soil Nitrogen Test is a useful tool in determining background nitrogen fertility. It is more accurate than paddock history guesstimates but is probably best used in conjunction with paddock history to determine nitrogen rates and timing strategies.

Spring irrigation

Canola crops require irrigating in spring earlier than wheat. The first spring irrigation should be timed at about 60% Plant Available Water (eg irrigating at 60 mm depletion if the nominal depletion is 75 mm for the paddock).

Best crops received 2-4 spring irrigations, in addition to a watering up in autumn. In 1994 (drought year) the best crops received 4-5.5 ML/ha, made up of an autumn and 3-4 spring irrigations. In 1995, the best crops were irrigated three times in spring. This number of irrigations was still one less than a mid-maturing wheat. In more normal seasons expect to irrigate 2-3 times in spring. A number of different soil moisture monitoring tools can be used to more accurately predict irrigations in very high yielding crops. The Water Watch system continues to be popular with irrigators as a reference for scheduling irrigations.

Blackleg

Blackleg was not generally considered a problem of any significance in the irrigation areas, until recently. The breakdown of resistance in varieties carrying the *sylvestris* gene is a reminder to the industry that blackleg remains the major disease challenge for breeders. Growers can minimise the impact of blackleg through sound management practices.

Four years ago a severe blackleg infection was observed in Coleambally in a variety with known weak blackleg resistance, showing the disease can hit when the conditions are right. The relatively small size of irrigation farms makes it difficult to locate crops far enough away from last season's stubble. Most spores come from the previous season's crop stubble so a minimum distance of 500 m preferably upwind is recommended.

Summary

High irrigated canola yields can be achieved profitably, but major changes to current management practices and irrigation layouts are needed. Profitable irrigated canola crops are the result of forward planning and attention to management detail. A high input system is generally more risky. Growers need to be confident in managing that risk before heading down the high input road, but you will never know if you never have a go.