



THE GROWER

PHOTO: NICOLE BAXTER

Bernard Hart checks a canola crop at his family's property near Junee, New South Wales.

A MATCH MADE in canola heaven

Ground Cover begins a new periodic 'matchmaker' series through which we will look at the experiences and extraordinary outcomes of direct collaborations between researchers and growers. In the first series we look at how growers and researchers teamed up to turn canola into one of the mainstays of today's cropping system

By Melissa Marino



The scientist

When Dr John Kirkegaard was "a young upstart" agronomist from Queensland it was growers like Bernard Hart who taught him a thing or two about New South Wales cropping. "We called it forensic agronomy," Dr Kirkegaard says. "Just follow the best growers around and make yourself look good by working out why what they do works."

Mr Hart's Junee property was one of the first test sites Dr Kirkegaard used, under the guidance of CSIRO senior agronomist Dr John Angus, as he began his trail-blazing research career that has helped keep canola a secure feature on the Australian grain-growing map.

It was 1990 and promising canola crops, first grown on farms in the 1970s and all but wiped out by blackleg disease, were making a return. Many growers, who had in the interim been sowing cereals in rotation with grassy pasture, were facing a soil-borne root disease epidemic and declining wheat yields.

Their break came in the form of Dr Angus and Dr Kirkegaard's work on canola. They began testing new canola varieties bred by Australian scientists with increased blackleg resistance for potential as rotation crops on farms including the Harts'. Benefits to wheat yields were observed and Dr Kirkegaard investigated the mechanisms behind canola's effectiveness as a break crop so it could be understood and built on.

He found that canola cleaned up fungal

diseases that had built up in cereal systems and he believed its roots not only did not host the diseases, but that chemicals released from the roots also actively suppressed them.

This vastly improved soil conditions for wheat crops and enhanced their responsiveness to inputs such as nitrogen. The lime applied to acid-sensitive canola also improved wheat performance and the whole rotation, including lucerne pastures, gained a boost.

"Over a decade of experiments, our team demonstrated the rotational benefit of canola, and growers saw that while it could be expensive and tricky to grow, it was profitable if you took a two-year view," he says.

Growers did see the benefits and voted with their seeders, and through the 1990s the area cropped with canola grew from 50,000 hectares

to two million hectares nationwide. Buoyed by significant agricultural advances, which also included the rise of minimum-till cropping, national wheat yields doubled during this time.

But it was not all smooth sailing. Growers and consultants in wetter areas identified canola yield decline in the late 1990s as a major problem and Dr Kirkegaard's research showed that canola's enthusiastic uptake had resulted in the re-emergence of blackleg and other diseases such as sclerotinia. He demonstrated that good control was possible with fungicides and varieties with greater resistance.

Concerns over the impact of subsoil constraints were also alleviated by a later study, with canola proving surprisingly resilient to acidity. In other research, Dr Kirkegaard

found that canola struggling to grow in wheat stubbles had nothing to do with wheat straw chemicals as feared, and could be addressed by simply adjusting row spacings, avoiding any need to abandon either crop.

A data review undertaken with Dr Angus suggested the average benefit of canola on wheat was a flat half a tonne, irrespective of the wheat yield. This makes canola a lot more important to wheat yields in drier seasons than was first thought.

Indeed, in the dry years that accompanied the Millennium Drought, many growers removed canola from their rotations and this increased the risk of herbicide-resistant grass weeds. To help growers manage risk in canola in dry years, Dr Kirkegaard developed a simple yield calculator based on rainfall to determine a particular crop's yield potential so inputs were not wasted. His data also helped develop Yield Prophet® for canola – a more sophisticated computer-based yield predictor.

As he thought of ways to encourage growers to manage risk and keep canola in their systems, Dr Kirkegaard hit upon an idea of which he says he is most proud – dual-purpose canola. What started as a proof-of-concept experiment in CSIRO's "back paddock" near Canberra led to GRDC-funded research with colleague Dr Susan Sprague. Their work produced comprehensive agronomic advice and the subsequent successful uptake of dual-purpose canola on-farm.

"I couldn't quite believe it was yielding the same as the ungrazed plots and it's still remarkable to see," he says. "But there are still a few rules to refine in new areas of adoption."

Dr Kirkegaard is still collaborating with Mr Hart, recently sampling trials on his property run by his CSIRO colleague Dr James Hunt as part of the National Water Use Efficiency Initiative.

Looking at gaining efficiencies across the farming system and emphasising synergies of good management packages has involved the use of break crops such as canola and early sowing. "Once you've got a break crop in your system, you have to then get the rest of the package right, to capitalise, because one thing builds on the next," he says.

"You can sow earlier because the paddock is clean and, if the moisture is there, sowing the right variety in a timely way is really critical because early sowing is the secret to high yield potential."

The grower

It was the late 1980s and Riverina grain grower Bernard Hart was not waiting around for researchers to contact him. As the second person to grow canola in NSW some 20 years before, he was keen to see some progress on the new blackleg-tolerant canola varieties developed for Australian conditions.

"We said 'Get your butt off your seat in Canberra and help us grow these crops'," he remembers. It was the kind of approach that could only be bred through familiarity, and Mr Hart already had an established history of partnership with CSIRO agronomist Dr Angus and his colleagues.

This included, in the late 1960s, establishing some parameters around growing canola – "a funny looking crop" – which more than one neighbour told him plainly would never take off.

And so in 1990 Dr Angus returned to the Harts' farm with then junior agronomist Dr Kirkegaard and began years of research, stretching right through the decade, trialling the new canola varieties and developing a set of agronomic principles for growing the break crop.

Canola trials Mr Hart hosted included those on wheat stubble management, sowing times, nitrogen application and row spacings. One trial would lead to the next as issues arose and project priorities were

determined by on-farm needs, he says.

This level of consistency and collaboration was of great benefit because the information was released as a package that growers could use practically.

"When the researchers started talking about it publicly they had a nice package of advice, including what to do to overcome particular issues and that expanded the canola area dramatically and successfully," Mr Hart says.

Today, it is with a great sense of satisfaction that he sees the extent to which canola is grown throughout the Riverina, and the "little role" he played in it. "I'm tickled pink because I know the growers are going to get a hell of a benefit from their wheat and I know canola's going to do it for them," he says.

In his own enterprise, growing 1000ha of canola in a 2600ha broadacre system, the benefits to wheat have been significant. One of the biggest advantages is in weed control, he says, as weeds are easier to control in canola, providing the wheat with a very clean head start. His cereal crop is also boosted by reduced pathogens in the canola stubble and residual water left behind by the break crop. Tap-root systems created by canola are used by lazy wheat roots and the benefits of inputs applied to the canola

crop are also not lost on the wheat, he says.

The canola has also performed well in its own right. Monitoring its performance against wheat, it reached 52 per cent of the wheat yield before the Millennium Drought and got up to as much as 70 per cent of the wheat yield in drought years.

Mr Hart, who also founded a seed production company, Hart Bros Seeds, says there has not been any one key piece of information he has gleaned from Dr Kirkegaard and other researchers that has been more effective than another. Rather, it is the accumulation of knowledge over the years that has led to his success.

In the 1970s this included liming for aluminium toxicity; in the 1990s it was the importance of sulfur; and post-drought, in the 2000s, the role of double-break crops to build biota was explored. "Nothing in isolation caused a single jump," he says. "It was the combination of a lot of little things."

Mr Hart says being involved in 'white peg' research from the outset gives him an advantage because he can cherry pick from the most promising trials.

"Working alongside the researchers, as soon as they say something looks like a winner you go out and try it," he says.

His willingness to implement initiatives also helps the research progress on a larger scale, with yield mapping providing accurate and fast feedback at an on-farm scale. His involvement also ensures the research priorities are relevant to growers. "It usually starts with the proposition that 'We want to change this, so have you got any ideas of the pitfalls we are going to have?' It's about how the research will be practical when we finish, and a few red wines make a difference too."

Recently, Dr Kirkegaard's research into dual-purpose canola has inspired Mr Hart to consider reintroducing livestock to his enterprise to take advantage of grazing canola.

Mr Hart has himself advised colleagues with livestock to introduce dual-purpose canola into their systems for the advantages it brings, providing options for grazing as well as the canola yield benefit itself.

"Agriculture is exciting – there is always something and I love it," he says. "And to think these researchers are still there doing research that's going to improve things in other ways ... it just gives me great hope for agriculture." □

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THE SCIENTIST



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