

Legumes in the Rotation

GRAEME JENNINGS

Brendan Ramsey has some of the best-performing cropping paddocks in Australia; he just doesn't know why.

In the National Paddock Survey conducted from 2015 to 2018, three paddocks on Brendan's 1,400ha property at Thomas Plains, on upper Yorke Peninsula between Paskeville, Bute and Kadina, performed better than any of the other 247 paddocks in the survey.

The GRDC-supported initiative saw agronomists and researchers monitor soils and crops on 500 soil-type zones in 250 paddocks from WA to Victoria and up into NSW and Queensland over four years to determine whether or not crops achieved their water-limited yield potential and if not, why not.

The project was prompted by data showing that, on average, Australia's wheat growers achieve about half the water-limited potential yield, notionally 22kg/mm/ha of available rainfall. Its aim was to identify how growers could reduce the gap between potential and actual yields.

Insufficient nitrogen was identified as a common reason for the 'yield gap' on the other YP paddocks in the national survey, with frost and heat shock imposing significant yield penalties and disease, weeds and insects having lesser impacts.

According to Harm van Rees, who presented aspects of the survey at this year's GRDC Grains Research Update in Adelaide, the Ramseys' paddocks 'achieved significantly higher yields than could be explained by either simulation modelling or water use efficiency'.

In other words, the yields on the monitored areas of the Ramsey property were higher than could be explained by standard 'water use efficiency' calculations and greater than Agricultural Production Systems Simulator (APSIM) yield simulations, which take account of factors such as soil type, that were an integral part of the survey project.

APSIM simulations done in an effort to identify reasons for the unusually high yields in the Ramsey paddocks indicated an additional 80mm of plant-available water was required to achieve the yields produced.



BRENDAN (LEFT) AND BRIAN RAMSEY'S FARMING SYSTEM IS ACHIEVING WATER USE EFFICIENCIES IN SOME PADDOCKS THAT ARE PROVING DIFFICULT TO EXPLAIN.

Australia's wheat growers, on average, achieve about half the water-limited potential yield, notionally 22kg/mm/ha of available rainfall.

The researchers heading the Paddock Survey are, like Brendan, struggling to find reasons for what they measured but have suggested 'access to deep soil water' as a possibility, which from a farmer's perspective would appear to point to greater than usual root depth.

Brendan is inclined to attribute the results to the fact that his property is usually unaffected by frost and he has machinery that, while probably bigger than he really needs for his 1,400ha, enables him to get his crops in 'on time', usually between May 5 and May 25, and the grain harvested and into storage as soon as it is ready.

His regular use of poultry litter may also be a factor, as could the fact that he monitors his crops closely and is set up to react quickly if it becomes evident he needs to

spray to address a problem, particularly with fungus disease in his lentils.

The long-term average annual rainfall on Brendan's property is 380mm and the average wheat yield over the past 10 years is about 3.5t/ha, with wheat yields on some sandy rises as high as 7t/ha in some seasons since he began spreading poultry litter.

His 10-year barley average is about 3.5t/ha and lentils generally produce around 1.6 t/ha.

Land prices on upper Yorke Peninsula mean Brendan, a member and former president of the Paskeville Agricultural Bureau, needs to 'squeeze all I can' out of the area he has and, in addition to his continuous cropping program, he buys in and finishes lambs on an opportunistic basis, using a combination of lot feeding and stubble grazing to grow them on to market weight.

While he has a clear focus on the agronomic 'basics', including timely seeding and harvesting, and the economics of what he does, Brendan is always on the lookout for ways to improve his cropping performance, as was his father Brian, who

is still involved full-time with the business.

Until the 'arrival' of lentils as a viable SA crop about 20 years ago they were using a flexible rotation of two years of cereal followed by one of legume but with lentils now an established part of the cropping program Brendan has settled into a cereal/legume/cereal/legume cropping sequence that he varies as needed to address factors including market demand and prices, seasonal and paddock conditions, weeds and diseases.

"There are different issues every year but things tend to work themselves out."

Growing lentils on each paddock every second year means he can use clethodim in crop to control grass weeds, particularly annual ryegrass, as needed and having 'Clearfield' varieties in his cereal repertoire opens the way for in-crop control of broad-leaf weeds and some grasses in the cereal phase if necessary.

His sprayer is a self-propelled John Deere 4940.

Brendan and his father tried beans and chickpeas in their search for a legume break crop but have settled on lentils as the best pulse fit for their conditions and farming system. And the economics are right too.

"The returns from lentils make them simply too good to ignore and they are a good agronomic fit," Brendan said.

"Back in 1996 or '97 dad was one of the first in this area to grow lentils and now they are main-stream.

"In those early days we didn't do a lot to them; just sowed them and let them go. Then we worked out they would perform and yield much better with a bit more attention.

"These days we continuously monitor them, mainly for disease, and in good year when they grow a big canopy we can apply three or four fungicides. However, with our set up there is still money to be made from them.

"They really do require a lot more work than cereals and I know of a couple of growers who have decided they are just too much trouble, but they work well for us."

Brendan moved away from barley for several years after he began using poultry litter because it made the soil too 'rich' for the varieties he was growing, resulting in serious lodging because of excessive growth early in the season, which also led to several crops with high levels of

pinched grain because the strong early growth used up too much water early in the season.

The combination of crops lying on the ground and poor-quality grain meant barley simply wasn't profitable. However, the attributes of some recently released barley varieties are putting barley back on the Ramseys' cropping agenda.

Brendan initially tried Compass but found that he needs to apply a growth regulator to control its early vegetative growth and even then it still has a tendency to lodge. He is still growing some Compass but is finding that Spartacus, a shorter-strawed, early-maturing Clearfield variety, seems better able to handle his nutrient levels and growing conditions and is producing yields that are making barley production profitable again.

Brendan finds the 'birds-eye view' images very revealing and of more value than yield maps to pinpoint where to rip.

While Spartacus and Compass are both malting varieties Brendan is not pursuing that market, preferring to focus on maximising yield and protein and delivering his grain for feed price to Wallaroo, his closest receival point. If he wanted to have his grain considered for malting he would have to truck it further to a receival point with segregation capability and the extra transport cost would be greater than the malting premium

he might receive.

Brendan and Brian began exploring the potential of poultry litter as a manure in 2006, initially spreading some on a sandy rise to see if it would improve the performance of crops on that soil type, which was not producing as much as their heavier flats country.

They had some left over after applying the planned rate on the trial area so they used GPS-linked yield data to spread the left-over litter on several areas of heavier soil the yield maps indicated were yielding below the paddock average.

Two years later Brendan noticed some 'crazy' yields from apparently random patches in paddocks he was harvesting and after an initial 'what's going on?' reaction, tracked the phenomenon back to the litter application two years earlier. Yields from areas where the litter had been spread were well over the paddock average and way up on what they had been producing previously.

It was at that stage they realised the litter, which is now applied with a 24m³ capacity Brochard Dragon spreader, was providing a clear benefit and decided to begin using it over the whole property, not just on the sandy rises.

They have settled on a standard rate of 3t/ha that is applied a month or so ahead of seeding to the 700ha to be sown to cereal that year. If there is any surplus remaining after the scheduled application program it usually goes onto one of the sandy rises, with some of their sandy country receiving up to 9t/ha in some years.



**MANUTEC PRESS WHEEL AND COULTER SYSTEMS
AT THE CUTTING EDGE OF AUSTRALIAN FARMING**

Manutec
AGRICULTURAL PRODUCTS

Ph: (08) 8260 2277 E: manutec@manutec.com.au
F: (08) 8260 2399 www.manutec.com.au

The combination of nutrients from the litter plus nitrogen fixed by the lentils in the previous year provides most of the cereals' nitrogen requirements and means Brendan doesn't usually need to apply any 'starter' fertiliser at seeding.

That appears to have little effect other than his crops getting a little slower start than some of his neighbours', he said, but that changes once they start to develop their secondary roots and can access more of the nutrient available throughout the topsoil.

However, he did apply a 'starter' rate of DAP with the seed this season to compensate for the low rate of nutrient mineralisation due to the dry conditions that limited activity of the soil organisms over summer and autumn.

Brendan is aware that consistent application of poultry litter is likely to improve soil organic matter levels and soil health but at this stage he is more interested in its nutrient content and ability to directly improve crop performance and has seen a clear increase in grain protein levels and a less consistent rise in grain yields since he began spreading poultry litter annually.

The litter is delivered to the property by the company that has a contract to clean out nearby poultry sheds. The company provides an indicative nutrient analysis of the litter each year and, since the product is usually quite consistent, Brendan uses that analysis, in conjunction with soil test results and in consultation with agronomist Stefan Schmidt, to work out whether or not he needs to apply any additional nutrient.



BRENDAN RAMSEY USES A COMBINATION OF 'VISUALS AND SCIENCE' INCLUDING CURRENT JOHN DEERE PRECISION AGRICULTURE TECHNOLOGY TO MAKE AND IMPLEMENT AGRONOMIC DECISIONS.

He has a comprehensive soil testing regime that includes annual deep soil tests for nitrogen and precision tests for a range of nutrients at 10 sites across the property to check that he is not 'mining' his soil and running down basic soil nutrient levels.

Results from the latest series of tests suggest he is 'on track' and not adversely impacting his soils, with his nutrient levels holding OK, but he has so far not seen any clear evidence of an upward

trend in soil organic matter levels. He is, however, finding that his lentil crops seem to be healthier, less susceptible to attack by fungus and other diseases and to be producing bigger canopies than was the case before he started using the poultry litter; although that is based on field observation, not hard data.

His lentils, like the cereals, are sown on 250mm row spacing, which has been Brendan's standard spacing for the past 10 years or so.

Brendan has been direct drilling for more than a decade – his current seeder is a Bourgault 8910 five-row cultivator bar fitted with Atom Jet knife points – but is not afraid to work soil if necessary to address a specific issue and has begun deep ripping his sandy rises, something his father was exploring before Brendan took on responsibility for the property.

"The issue is a hard pan at depth, around 50cm in most areas but deeper in some places and shallower in others. It appears to be an inherent characteristic of the sandy loam soil on the rises rather than the result of machinery compaction.

"Dad was always experimenting and trying things and started ripping our 'sand hills', which are really only sandy rises, with a single-tine rabbit ripper years ago.

"A few years later, when I realised the

**Ground breaking
Tillage Radish & more.**

**You're covered for
cover cropping.**

Tillage Radish +

Monoculture of wheat

Wheat — Wheat

Multi-species cover crop

Sunflower — Turnips

Millet — Radish

Sorghum — Peas

Phacelia — Corn

More diverse systems have a higher number of interactions

* Diagram from SANIFA The Cutting Edge Summer 2014

www.agfseeds.com.au Ph 03 5345 6262

AGFseeds

Australian Grain and Forage

strips of better crop we were seeing in our sandy paddocks were growing along those rip-lines from years earlier, we bought a five-row sub-soil cultivator from an Adelaide Hills potato grower and started playing around with that.

“That was about the same time as we started spreading poultry litter.

“We found that, after a pass with the five-row and an application of poultry litter, we would get great crops for a year or two then the yields would start to tail off again, so about three years ago I bought a new AgrowPlow specifically for deep-ripping the sandy rises.

“The five-row was really impractical for our scale and application. The AgrowPlow is purpose-designed and considerably wider than the five-row so it does a good job when the soil conditions are right and its size means we can rip a larger area in the time available.

“The first year we had it we had lovely conditions with good soil moisture in February and March so we were able to open up an entire paddock and saw amazing benefits from that in the following crop, which has prompted us to really start to investigate what might be practical and whether or not we can safely push the system harder by increasing seeding rates, for example.

The attributes of some recently released barley varieties are putting barley back on the cropping agenda.

“This year the soil was so dry we couldn’t get the tines to penetrate to working depth, so it’s pretty clear that ripping will be opportunistic because we can do it only when the soil conditions are right, and at this stage it is too early to know how long the effect will last.”

While the AgrowPlow was bought specifically for use on the sandy rises Brendan did take it down onto a flatter paddock with heavier soil with the idea that there might be benefits from opening up those soil types too, but there were simply too many rocks for the machine to handle.

Agronomic decisions are based on a composite of data from measurements including yield maps and soil tests and

visual assessment, which has recently been augmented by ‘visual’ images – not infra-red or NDVI – from a drone-mounted camera.

“We use a combination of visuals and science,” Brendan said. “If I notice anything unusual, particularly in terms of crop performance, I always try to back up the observation with data by going back to measurements or test results from that area.”

He is finding the ‘birds-eye view’ images of what is happening in his paddocks very revealing and of more value than yield maps for targeting ripping, in particular.

Brian and Brendan have been yield mapping since the late 1990s and were among the first growers in the district to have a header with an integrated yield monitor. Their current header is a John Deere S680 fitted with the company’s current-generation precision agriculture and yield monitoring technology but Brendan finds yield maps are not quite accurate enough to pinpoint where to rip.

“By September you can clearly see differences in crop growth from the air and I can use those images to work out exactly where action is needed. I can see where I have improved the situation and areas I need to rip. If I see a distinct edge to ‘good’ crop where I have ripped I know I stopped too soon and didn’t work far enough down the slope.”

Brendan has recently begun using the AgWorld farm management platform to collect and collate data, which in addition to ensuring he has accurate, readily retrievable records of chemical usage and

similar, enables agronomist Stefan Schmidt, who is also linked into the AgWorld system, to access all the relevant farm and business and data when developing recommendations for the Ramseys’ enterprise.

His on-going search for ways to refine or improve what he is doing has also seen him sow some of his later crops this year with a liquid delivery system, which he used to apply trace elements with the seed at sowing.

Brendan finds his current method of applying Impact fungicide to the seed ahead of sowing time-consuming and messy.

While he used trace elements in his fluid application trial and sees potential to use it for application of ‘starter’ fertiliser if required, Brendan’s interest in the technology is being driven by his search for a better way of applying Impact fungicide.

He finds his current method of applying the chemical to the seed ahead of sowing time-consuming and messy and is hopeful that, if the economics and practicalities prove out, he will be able to use liquid application technology to deliver the fungicide direct to the furrow during the seeding pass; an approach that appeals as simpler, cleaner and more efficient. 🌱



This SANTFA production was supported with funding from the National Landcare Program, the SA Department of Environment and Water, the GRDC and the AgEx Alliance.

