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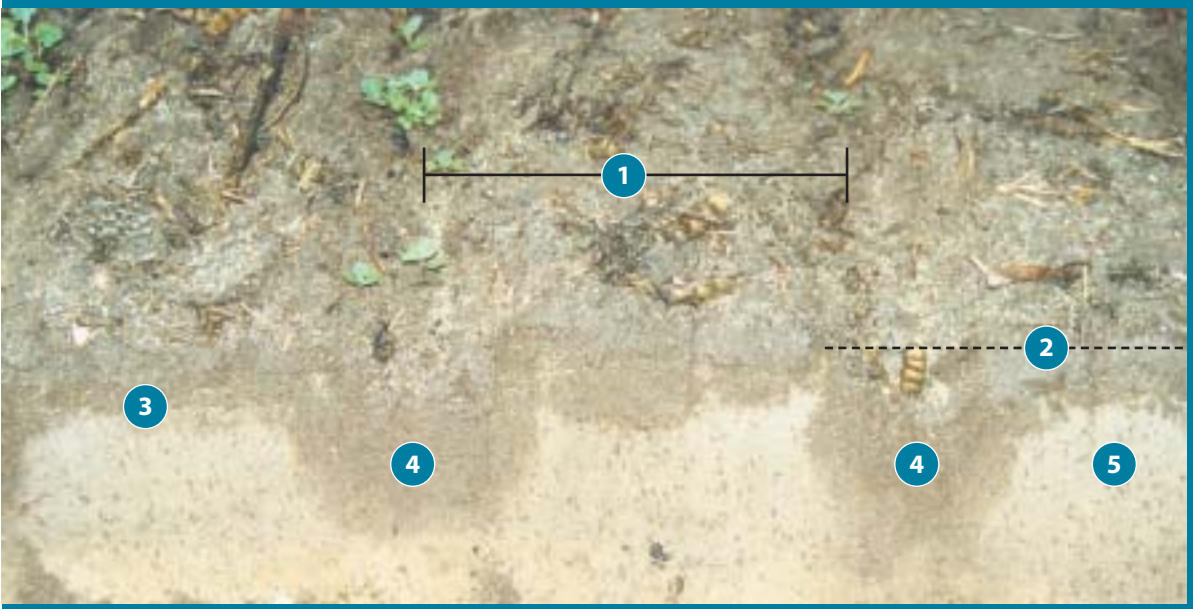
The power of furrows in dry starts



Just 12 hours after 4 mm of rain, this canola at Meckering shows how well the furrows have captured the water—on wettable soil.

1. 25 cm row spacing between furrows.
2. Original soil surface.
3. Wet top 1 cm of soil.
4. Wet soil in furrow (away from evaporation).
5. Rain drop on dry cut-away soil.

Despite the dry season in 2001 farmers in WA delivered 11 million tonnes of grain—only 2 million short of the record. With an estimated 70% of the WA crop being sown with no-tillage, no-tilled crops contributed enormously to our production. No-tilled crops, with press wheels, can be established on minimal moisture—and this photo shows one reason why.

But how much rain is needed to establish crops and keep them alive in our cool winters? The last three years have shown that April rains, of greater than 20 mm, can reliably establish no-tilled crops in most soil types—provided full stubble is retained, even without stored sub-soil moisture. Young crops can stay alive for perhaps 8 weeks with minimal follow-up rain because the small crop plants use little water when they are young.

Even small rain events of 3–5 mm effectively become bigger rainfall events—by the power of the water harvesting furrows. This has been observed regularly by no-tillers, on all soil types, and means more moisture is located near the crop roots and close to the fertiliser which is in the furrow and away from the inter-row crop weeds. The inter-row environment is also more subject to evaporation—while furrow water is below the surface and less subject to drying factors.

Dense pastures struggle with dry starts

In contrast to crops sown at low plant densities, regenerating pastures often have a high competition among themselves on the first rain.

A grass-dominated pasture droughts in late May in Northam—too much competition between plants and limited moisture.

This competition means that pastures often drought themselves—regularly causing a false break. Newly established pastures, sown after applying a knockdown have a greater chance of survival. This is because pasture growth is delayed by about 10 days which slows transpiration losses in the warm weather—with fewer plants competing for the limited moisture.

The new deep-rooted pasture species, like Casbah and Cadiz, have shown good drought tolerance. The other good thing about these species is that they are

continued over…

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aerially seeded. This means the erosion-promoting clover-harvesting technique is not needed to harvest the seeds.

Compared to thick regenerating pastures, no-tilled wheat crops rarely drought.

Usually, if there is enough rain to germinate wheat with no-tillage—the wheat will rarely die. Will the same happen with pulse crops sown on wide rows into thick wheat stubbles? Will this make them more drought tolerant?

At Esperance, a thick vine of Cadiz serradella, with its deep roots and full ground cover, persists well into January.

Stubble holds fragile soil together!

Good wheat crops mean lots of stubble—then comes the challenge of seeding through it!

Many farmers (and WANTFA at the Meckering site this year) are experimenting with wide row lupins, beans, peas and canola. Wide rows help overcome the "stubble-problem", and so too do disc seeders. Although hairpinning canola into wheat stubble as you seed might not be the best option.

There were many good wheat crops between Hyden and Ravensthorpe last year and it appears many farmers were not confident in their ability to seed through them. Or, they wanted to grow wheat on wheat. Either way they figured that burning was the best option. The results were devastating! See below photos.

Research from Meckering has shown that the addition of fungicides to wheat on wheat crops gives reliable wheat yields of 3.9 t/ha in 2001 when the stubble was retained. Other options are: to sow some barley after wheat, sow pulse crops after wheat, explore the residue manager option, or consider hands-free steering. The new WANTFA GRDC project will focus on farming systems that retain stubble—for more see the President's Report.

A lot of wheat stubble was burnt this year, particularly south of the central wheatbelt. The relentless pre-seeding winds gave the paddocks little rest from sand-blasting.

Field days—Hyden, Lake King, Lake Grace and Ongerup

In conjunction with the Department of Agriculture and the Kondinin Group, WANTFA will co-host a series of field walks and a workshop from 6–8th August .

The theme is "Tread a tramline to profit." Technical information will be provided by several experts and there will be a dynamic sharing of farmer experiences on how the systems have worked for them in their paddocks.

Owen Brownley's lines in the stubble show how accurate the John Deere row crop has been.

The details are:

- Tuesday 6th August at 8:00 am at the Hyden Hall, then on to Geoffrey Marshall's and Glen Fretwell's.
- Wednesday 7th August at 9:00 am to 12:00 noon at Owen Brownley's (about 18 km SE of Lake King), then to Steve King's (about 25 km SE of Lake Grace) from 2:00–5:00 pm.
- Thursday 8th August at 9:30 am starting at Darren Baum's, Wellstead, then to Ongerup and Colin Pithers.

The major Hyden day includes a sit down start, a bus ride, morning and afternoon tea and lunch. Registration is recommended. The cost is $33.00 before 26th July and an extra $31.50 is for an evening meal.

To register, call or fax Bindi Webb, fax 9921 8016 or phone 9956 8530. Other organisers include Jeremy Lemon (Esperance Dept on 9083 1111), Peter Walsh (Kondinin Group) myself (Bill at WANTFA on 9622 3395), Owen Brownley (Lake King farmer on 9838 0010) and Colin Pither (Ongerup farmer on 9828 7030).

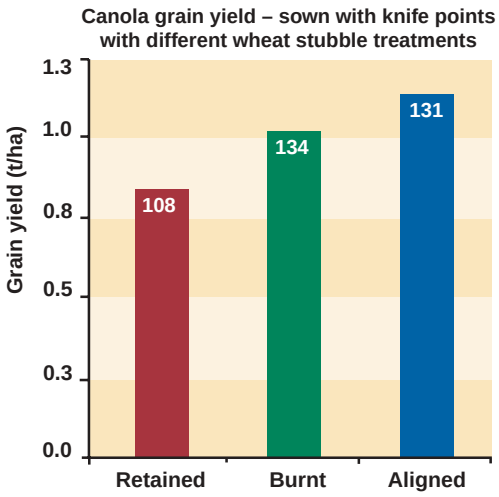
Agronomic potential benefits of hands free steering

Sowing canola into wheat has often caused canola emergence and growth problems. A WANTFA trial in 2001 showed that stubble from a 3.1 t/ha wheat crop reduced canola emergence and growth. Karoo was sown at 5 kg/ha with knife-points on 25th May.

Burning the wheat stubble (in small plots) increased canola emergence from 108 to 134 plants/m^2 and increased grain yield from 0.82 to 1.01 t/ha and probably would have resulted in paddock erosion. However, by pulling and aligning the stubble by hand out of the furrows and placing it in the inter-row, the grain yield increased to 1.13 t/ha (see graph below left).

Therefore, keeping the wheat out of the furrow, or aligned, gave the best result, by 120 kg/ha over stubble burning. This benefit is perhaps worth $40/ha. A residue manager might provide this benefit, but so too might a hands-free tractor outfit.

After driving a CAT fitted with a 20 cm BEELINE unit, worth $55,000 this April at Meckering, I think it is possible to seed between last year's wheat stubble rows. [Thanks to Colin Steddy for the loan and Colin Pearse for his time to help.] I was surprised that the 20 cm unit could be so accurate—it was usually within 2–4 cm. Witness this yourself at the Meckering field day—main event is 18th September.



Numbers refer to canola plants measured 4 wks after seeding (pl/m^2). [Note: this trial was sown across the direction of sowing of the previous years' wheat crop.]

Above: Clark Plastics hoods are quite solid and can be used for shielded spraying for $86. They are 800 x 400 x 300 mm in size. Call Wally on (07) 4669 8040.
Below: Lupins sown on 60 cm row spacings at Meckering with the BEELINE sub-20 cm unit.

Press wheel design for dry soils!

For good crop establishment in dry soil conditions—like in WA in 2000, 2001 and 2002—not just any press wheels will do!

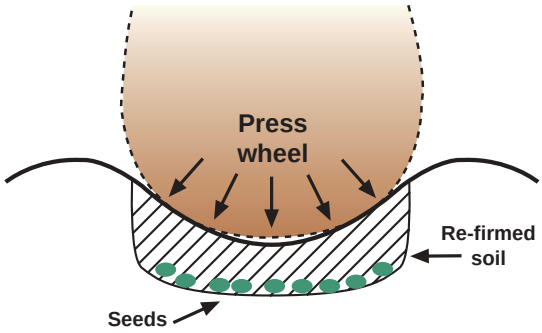
At several meetings I have heard the comment, "We used one of those new fancy seeders, with wide press wheel on our football club crop in dry conditions, and it didn't germinate as well as the knife point seeder without press wheels but with harrows, sown lap for lap."

Two important aspects of seeding that aid crop emergence are:

1. Seeds need to be pressed into firm undisturbed soil, and
2. Loose soil needs to be placed over the firmed seed.

Prof Dwayne Beck calls these 'buffalo one' and 'buffalo two' (B1 and B2), being like the natural action of buffaloes running across the US plains. Achieving B1 or B2 is not possible with wide press wheels. As they do not push the seed into firm,

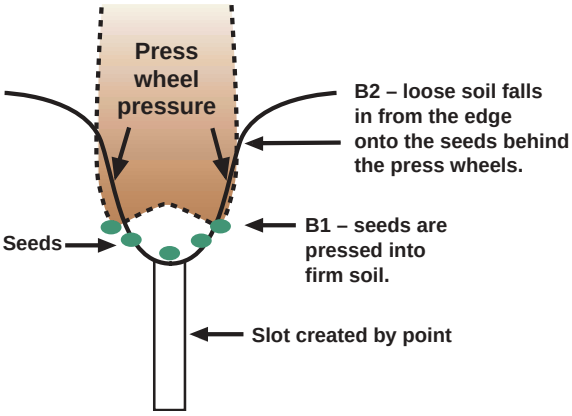
undisturbed soil, and they can't place loose soil over the seed. Wide press wheels firm a large area of soil over the seed. This causes more evaporation in the furrow than is possible with loose soil because of stronger capillary rise (see diagram below).



Openers compared

So let's compare some more common systems for their effectiveness at B1 and B2. Knife-point sowing, with harrows, does not push seed into firm soil (B1), but at least it puts loose soil over the seed (B2). Perhaps the best opener, in drying conditions, is the ConservaPak. This opener has an excellent B1, though its B2 ability is not always perfect. Canola establishment in dry soil at Meckering this year has been excellent with the ConservaPak.

The DBS opener, and knife-point openers with narrow press wheels, have a reasonably effective B1. They also often create a quite good B2. This is where the soil falls in from the sides of the vertical trench created by the press wheels (see diagram below). 'V' shaped press wheels are not as effective as more vertical ones. This is because their weight is taken by the sides of the furrow—making it hard for them to press the seed, and they tend to firm the sides of the furrow—not allowing loose soil to fall in.

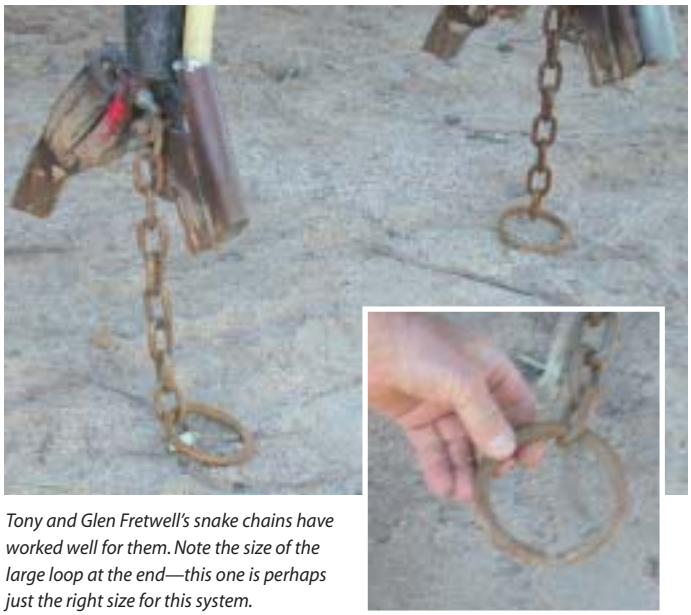


Double discs have an excellent B1, and in WA, often have stubble as an effective B2. Although, in some conditions, such as with grazed and wet stubble, there can be some emergence problems from hair-pinning. In fact, in wet conditions, it would be desirable to not use press wheels at all—or at least be able to back their pressure off. This is a problem with flat and wide press wheels where the whole weight of the seeder is taken by the press wheels.

Snake chains—for poor B2 seeders

If you have a system that gives no loose soil over the press wheels then 'snake chains' (as Amjad of Esperance Dept calls them) will help.

They are a chain that drags behind each opener that is about 40 cm long with a large loop on the end. Farmers have been using them with good effect for many years. Their main purpose is to tickle the sides of the press wheeled furrows to bring loose soil back into the furrow (B2). They also may help pull some trifluralin into the furrow without the extra weed stimulation that might occur with harrows.



Tony and Glen Fretwell's snake chains have worked well for them. Note the size of the large loop at the end—this one is perhaps just the right size for this system.

Herbicide-resistant crops and weeds symposium

On the 13th September Professor Steve Powles from the WA Herbicide Resistance Initiative will host a one-day symposium on herbicide-resistant crops and weeds.

The line-up of Australian and international speakers will provide insights into what lies around the corner as WA faces the introduction of genetically-modified crops and increasing herbicide resistance problems. Two of the speakers are from the USA and have forthright views on the benefits and risks associated with GM herbicide-resistant crops.

The event is part of the '13th Australian Weeds Conference' at the Sheraton Hotel in Perth. Registration is $210 plus GST. For more details call Robert Barrett-Lennard on 9380 7870 or see http://members.iinet.net.au/~weeds.

Straw has nutrients and energy!

'Monuments of stupidity' is what Carlos Crovetto calls large stacks of straw in the corner of paddock. Carlos says farmers do not know what they are doing by exporting all this energy and nutrients that are meant for the soil. Carlos has written a very thoughtful and useful book called *Stubble over the Soil.*

Below: There is a lot of vitality in straw that does good things for the soil—perhaps we need to find ways of getting the best out of it on the paddocks.

12 years of continuous no-tilled crop looks healthy in May this year (left), while green manuring with a plough (right) has damaged the soils structure—for several years afterwards.

Ploughing every so often—a mistake?

I have often heard agriculturists say, "No-tillers need to plough the soil perhaps every 5 years".

But how do they know unless they have the data to prove it? *Ed: WANTFA invites such data.* Alan Jones is a long-term no-tiller from north of Esperance (Mt Ridley) and he was challenged by a consultant to do some trials on green manuring with a plough.

The results are not in favour of ploughing. The subsoil clay, which is hostile, was brought to the surface by the plough. Five years later, this area continues to upset emerging crops and makes spraying conditions dusty, compared to the unploughed surface. The no-tilled soil just continues to improve.

In another case—Alan ploughed around his whole farm for boundary weed control purposes. Again this has proved to be a mistake as the weeds are harder to control in this ploughed strip and are more staggered in their emergence pattern, compared to 12 years of continuous no-till cropping. Alan was also exhorted to try low seeding rates—so again he did an experiment and the high seeding rates won.

He wagered a carton on this—not yet seen!

Ants and ryegrass —again!

In several trials, at Meckering this year, we have topdressed ryegrass out for herbicide trials. On lupin stubble the ants have been very active throughout autumn, collecting and eating lots of seeds.

This is common with long-term no-tilled paddocks and has implications for integrated weed management (IWM). Cultivating paddocks with a full cut does a lot of damage to ant populations.

One proposed purpose of the seed collections is as food for fungi on which young ants can feed on later. It is amazing how active the ants have been. It will be interesting to see how many ryegrass plants come through the crop.

Above right: A thick mat of ryegrass at Owen Brownley's. These plants drought each other after ants put the seeds in their nests.

Right: Ants carrying ryegrass seed (left) and putting it in their nests.

WANTFA wishes to acknowledge the generous assistance of:

Above: Cadiz's aerial seeding gives it an advantage in emerging in the more moist hollows. Also, its full ground cover is likely to not let the ground get too hot in summer, where waxes can distil and then coat sand grains, making them repellent.

Cadiz and repellent soils

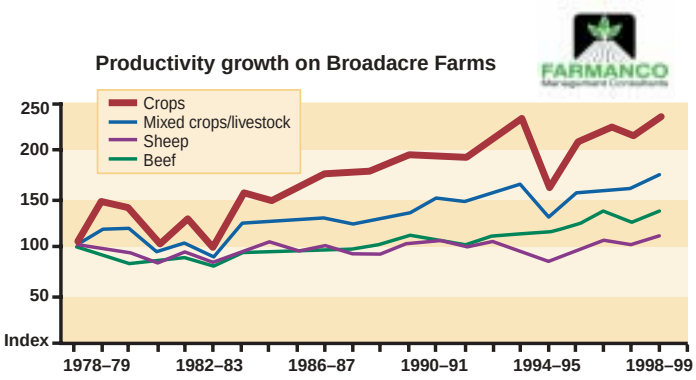
Could Cadiz be the perfect match for water repellent soils?

There is plenty of farmer experience that would suggest so—as discussed in previous *WANTFA Farming Systems* issues (see Rohan Ford article, June 2001). Ross Whittal at Esperance has found that Cadiz is regenerating well on soil that was previously very non-wetting. This idea will be tested at the Esperance claying trial on John Luberda's farm this year.

All crop is more profitable than some pasture

It was a surprise to me to learn from Ken Sevensen's talk, at the February WANTFA Conference, that the most profitable farming operations were all-crop.

I have heard many economists, agronomists and other consultants say that the most profitable farmers have a mix of sheep and crop. The graph below from an independent Australian study that Ken quoted shows the long-term pattern.



Roundup Ready canola—how risky?

In the last *WANTFA Farming Systems* magazine (April 2002) there was an article by Robert Stevensen outlining his problems with rogue RR canola.

It is an interesting read! I have since confirmed with Robert that RR canola is no harder to kill with 2,4-D than normal canola.

Since publishing that article I have come across an article called: *Relax: volunteer Roundup Ready canola is no superweed*. Written by another Canadian, David Wreford, editor of the popular farming magazine, *Country Guide*. David also says that 2,4-D and many other herbicides are very effective at controlling RR canola.

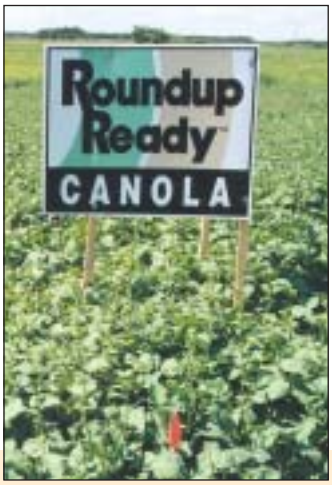
RR canola in seasons like this would be nice

I can see many advantages of Roundup Ready canola in our WA environments.

First, there is the increased yield potential that comes from no TT yield penalty. This would make canola more profitable in the dryer regions and would increase crop diversity. Second, the crop could more easily be kept weed free. And third is the possibility of growing it with less drought risk.

The last three starts to the season have been dry—for most of the state. In these seasons, dry sowing of canola into stubble, on slightly wider row spacings, could result in a clean crop and might give some drought tolerance. In addition, a clean crop means that there are less plants (weeds) using the limited available soil moisture.

Or, consider a slightly wetter start—of say 30 mm in mid April—which some farmers had in the Great Southern this year.



Right: RR canola has been widely used and rapidly adopted by Canadian farmers since 1996 and with no market penalties." said Dr Neil Harker—keynote speaker at the Crop Updates in February this year.

Harvest peas when warm for even cover

It is a challenge to harvest peas and leave the residue evenly on the surface.

Congratulations to Owen Brownley who has set his header up properly and managed to achieve an even mat of stubble over the whole soil surface. Owen farms at Lake King—where he receives his fare share of wind. Owen does not graze his pea stubble.

Below: Even pea stubble is possible (left). While harvesting in the cool moist evening air makes it impossible to get even ground cover in the same paddock (right).

The plan might be; wait 7–9 days for a good germination and kill it with a solid rate of SpraySeed and sow. Then take subsequent weeds out with Roundup. Too easy!

Perhaps the only concerns we have are the chance of the RR gene escaping to related species, and an over-use of glyphosate without a sensible rotation with SpraySeed. Professor Steve Powles, from UWA, has submitted a letter on the gene-flow issue in this *WANTFA Farming Systems*.

Goucho and Gassen!

As a follow-up to the thoughtful article by Brazilian entomologist, Dirceu Gassen, is the thought that Goucho is a long lasting effective seed dressing that might give a desirable result. Dirceu suggested, in the last *WANTFA Farming Systems*, that we should not broadly apply pesticides as this often kills everything, and leaves no soil life to protect the "space" created.

Meckering on 23rd July and 18th September

There will be a post-seeding field walk at 9:00 am on Tuesday 23rd July, 4 km west of Meckering.

Come and see the early stages of some exciting and innovative trial work. The visit will take 2–3 hours, as one group, and will be jointly chaired by Geoff Fosbery and myself (Bill).

Some trials include; wide row lupins and peas, PR-70 for wheat, trifluralin granules, autumn tickle, trifluralin alternatives, cover crops, seeding through stubble with discs, deep nutrient placement, rates of K and N, effect of tillage depth, topsoil slotting, crop physiology affecting products, Flexi-N placement, Cu forms, canola seed size, herbicide tolerance of pastures and crops, lucerne sown alternate row with barley, fumigation and more!

Please mark the Meckering Field Day, Wednesday 18th September in your diary. Last year's event attracted 550 and this year the site has more trials that were sown early. The presence of the highly respected Prof Tim Reeves will add something special to the day—he will give the keynote address.

In one innovative trial at Meckering, topsoil has been removed and 20 cm subsoil trenches have been dug and filled up with topsoil—will this prove useful? Come and see the effect on wheat growth

Ten years of WANTFA

Bill Crabtree, WANTFA Scientific Officer (08) 9622 3395 p/f

WANTFA would like to say a big thanks to the many people who have served WANTFA by their involvement on the committee.

Volunteers often go unnoticed but their work is essential for this not-for-profit farmer group. Since the association was formed in 1992, the adoption of no-till in WA has risen from 2% to 70% today. It is clear that WANTFA has had a big impact on no-till adoption in WA.

Presidents

The WANTFA Presidents have been at the fore of many challenges, both practical and political, in helping to shape sustainable agriculture in Western Australia. To these we are especially thankful.

They are (pictured below from left to right):

- Ray Harrington (Darkan)
- Ken de Grussa (Esperance)
- Graham Malcolm (Morawa)
- Geoffrey Marshall (Hyden)
- Neil Young (Kojonup).

Special thanks

Special thanks should go to Kevin Bligh (ex-Dept of Agriculture Engineer, now Busselton) who was instrumental in the formation of WANTFA. Kevin also conducted no-till research and showed how no-till can almost completely stop water erosion. David Rees also provided a great spark for no-tillage on the south coast in the late 1980's and so too did the magnificent network of farmers statewide.

Staff issues:

Bill receives Masters of Science in Agriculture

Bill Crabtree graduates in the company of Monique and two of their four children (Jonathan and Brianna).

After a long part-time enrollment at UWA I have now completed a M.Sc. on "The effect of water repellence on plant establishment and Mn uptake and growth of lupin in a dry soil." I managed to publish five scientific papers and am grateful to Professors Bob Gilkes and Alan Robson for their thoughtful supervision of my work.

Matt Beckett moves on

Congratulations to Matt who was sought out by Nufarm in mid-May to work for them as their Territory Manager in the Northam district. It has been a privilege to work with Matt for his 20 months as a WANTFA Scientific Officer. Matt's computer skills, bright mind and diligent work ethic will be greatly missed—all the best for the future Matt!

Zoe Fulwood fills the gap

Welcome Zoe Fulwood who is currently acting in Matt's position as Scientific Officer. Zoe is from Northam where her father farms. She recently completed a Bachelor in Natural Resource Management through UWA. Zoe will mostly be responsible for managing the Meckering site.

Zoe Fulwood is helping to manage WANTFA's Meckering site.

Year	President	Vice President	Secretary	Treasurer	Committee
1992	Ray Harrington	Ian Edwards	Kevin Bligh	Kevin Bligh	Darren Baum, Ken de Grussa, Ray Honey, Lyndsay Chapel
1993	Ken de Grussa	Graeme Malcolm	Kevin Bligh	Kevin Bligh	Ray Harrington, Jim Baily, Tim Trethowan, John Hicks, Geoffrey Marshall
1994	Ken de Grussa	Graeme Malcolm	Kevin Bligh	Kevin Bligh	Ray Harrington, Jim Baily, Tim Trethowan, John Hicks, Geoffrey Marshall
1995	Ken de Grussa	Graeme Malcolm	Kevin Bligh	Greg Ricetti	Ray Harrington, Jim Baily, Tim Trethowan, John Hicks, Geoffrey Marshall
1996	Ken de Grussa	Graeme Malcolm	Kevin Bligh	Greg Ricetti	Jim Baily, Tim Trethowan, John Hicks, Geoffrey Marshall
1997	Graeme Malcolm	Kevin Bligh	Tony White	Tony White	John Hicks, Geoffrey Marshall, Ric Swarbrick, Neil Young
1998	Geoffrey Marshall	Neil Young	Tony White	Chris Gilmour	Graeme Malcolm, Ric Swarbrick, Colin Pither, Jim Baily, Kevin Bligh, Colin Green, Paul Maisey
1999	Geoffrey Marshall	Neil Young	Tony White	Chris Gilmour	Graeme Malcolm, Ric Swarbrick, Derek Chisolm, Owen Brownley, Kevin Bligh, Colin Green, Colin Steddy, Jim Baily, Matthew Jones
2000	Geoffrey Marshall	Neil Young	Ric Swarbrick	Tony White	Graeme Malcolm, John Stone, Kevin Bligh, Colin Pearse, Toll Temby, Richard McKenna, Colin Steddy, Matthew Jones
2001	Neil Young	Ric Swarbrick	Richard McKenna	Tony White	Geoffrey Marshall, John Stone, Kevin Bligh, Colin Pearse, Toll Temby, Tim Braslin, Owen Brownley, Matthew Jones, Paul O'Meehan
2002	Neil Young	Ric Swarbrick	Richard McKenna	Tony White	Geoffrey Marshall, Kellie Shields, Matthew Jones, Kit Leake, Toll Temby, Tim Braslin

From the President

Neil Young, Kojonup (08) 9821 0026, fax 01

Autumn is always a reminder about the fragility of our land, and a chance to see which farming systems work.

In my area we started the winter with heavy rains. Water sheeted off the dry country very rapidly, taking dry soil and vegetation with it wherever there was no attached ground cover. Sheet erosion occurred, gullies increased and roads were covered with silt downstream from overgrazed paddocks. Dams were filled with grass and sheep manure.

In contrast hillsides with good stubble cover lost no soil and much less water ran off—in fact dams collected very little water. The water which did run was clear, not muddy. Many of those paddocks which had suffered erosion then had a poor germination, meaning they stayed relatively bare. They then suffered wind erosion when the usual dry fronts came through in the following weeks. So little moisture had been absorbed that these paddocks were too dry to plant whilst well protected paddocks nearby had been seeded and the crops were established.

Why am I repeating the obvious? Because no system is sustainable if its base resource is disappearing over the horizon each year. With the support of GRDC, we are now going to focus on successful crop establishment in a high residue farming system. We will encourage and support members to overcome

the recognised difficulties and limitations that presently exist. Much of the work done by WANTFA people to date will underpin this, and quite possibly the various bits of the jigsaw already exist. Our job is to assist the sharing of knowledge to speed up the process. In time we hope it will be possible to farm profitably without having the terrible erosion that so many people accept as unavoidable. It will not be easy, but the prospect is both challenging and exciting.

Carbon in the soil

The issue of soil organic matter levels under no-till is being looked at all over the world. In Central Spain, after 12 years of no-tilling with continuous crop and full residue retention along with 400 mm of rainfall, Organic Carbon levels in the top 75 mm increased from 0.8% to 1.4%. However, when cultivation was included, the organic matter levels did not improve (reported by C. Lopez-Fando and M.T. Pardo at the World Congress on Conservation Agriculture in Madrid). This is of a similar order to that reported in the last *WANTFA Farming Systems* at Ray Harrington's—and to my mind supports the validity of those observations. With the advent of carbon rights trading legislation in WA, no-tillers may now be in a position to get additional returns for the carbon being stored in their paddocks.

State Salinity Council

I recently attended the final meeting of the State Salinity Council. WANTFA's position on this council has created the opportunity to have input into the difficult question of grappling with salinity. The Council has now been replaced with The Natural Resource Management Council.

Our staff news

Bill Crabtree is going to South Africa in August by invitation to speak at what is hoped to be the launch of a No-Till group there. He has recently been granted his Master of Science from UWA, something he has been working at this since he commenced with WANTFA—well done Bill. Matt Beckett unexpectedly resigned in June to take up a position with Nufarm, in which we wish him well, and recent graduate Zoe Fulwood has filled his position.

Your committee is presently considering responses to a recent advertisement for the supply of administrative and management services, presently supplied by John Duff and Assoc. under a contract which expires in September. Rick Swarbrick is leading the subcommittee that has responsibility for this important task, and I look forward to a clear decision being made very soon.

WANTFA's website traffic

Graham Langley, Stylus Design—WANTFA's graphic designers and webmasters. (08) 9279 4847

During the last year 18,000 visitors went to the website, peaking in September/October with the most traffic ever. These sessions averaged 1,500 visits per month from the USA, UK, Japan, France, Germany, South Africa and NZ as well as from Australia.

The website receives regular visits from Colorado and Virginia and an increasing amount of interest from the UK—from less than 20 visitors this time last year, to about 100 a month in May 2002.

News in Brief is popular

Not only is this area most often visited, it is where people spend the most time. The *News in Brief* and *President's Report* sections of *WANTFA Farming Systems* are available to all visitors. This gives everyone a good look at the breadth of WANTFA's activities. Non-members can also view the latest *Soils are Alive* article, see coming events like field days, trials and conferences, and read the latest press releases. Another well-used facility provides links to other websites relevant to no-till farmers.

Warm season crops

This is another popular area. Follow the "Warm Season" button on the home page to see an informative article called, *Crops to consider after summer rain* made up of contributions by Angie Roe, Wayne Smith, Professor Dwayne Beck and the Dept of Agric. This section also contains a set of management packages for growing warm season crops in dryland WA conditions kindly provided by Angie Roe.

No-till Essentials

If you are looking for an introduction to no-till crop systems, look no further. Follow the "Intro to No-till" button to find an article that answers the essential "What", "Why" and "How" questions. No-till Essentials is growing in popularity (particularly on weekends) and is an ideal way to introduce a newcomer to no-till systems.

Trial results

During September 2001 and May 2002, this area was very busy. Here you can find a comprehensive booklet in Acrobat® pdf format detailing the results of WANTFA's Meckering trials as well as any additional trial information.

For members

Members can access more pages, in the password-protected section of the website, including *Farming Systems* newsletters past and present and the entire proceedings of WANTFA Conferences. Many 'potential members' have unsuccessfully attempted to access this information, so we must conclude that being a WANTFA member represents good value.

From what we can see, the WANTFA website is serving as a window for the rest of the world into no-till farming in Western Australia. ■

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May 27th 2002

Mr. Bill Crabtree, WANTFA

Gene flow and Canola. Do genes jump the fence?

Australian grain growers and the wider Australian community are engaged in considerable debate on so-called GM crops. GM crops are defined as having a genetic modification due to the addition (or deletion) of one or more genes using recombinant DNA technology. Such GM crops are therefore very, very similar to non GM crops, usually the sole difference being that they possess an extra gene from some other organism that has been introduced by DNA technology. In the USA, Canada and Argentina most soybean now grown is GM in that it contains a gene, originally from a bacteria, that endows resistance to the herbicide glyphosate. Similarly, much of the N American canola crop is GM herbicide resistant. These GM herbicide resistant crops have been enthusiastically adopted by growers in the America's but cannot yet be grown commercially in Europe or Australia.

In Australia GM cotton is now being grown commercially. For broadacre the first likely GM crop is canola with a bacterial gene giving resistance to a herbicide.

There are some who oppose GM crops. Amongst other objections opponents claim that the resistance genes will flow to weeds to create superweeds and will flow to non GM crops. To address this concern the CRC Australian Weed Management commenced research five years ago using canola as the first likely GM broadacre crop for Australia and the weed wild radish which is related to canola. In the first part of this work the potential for canola to cross with wild radish was examined in the glasshouse and the field. The outcome of this study shows that it is a very rare event for canola to cross with wild radish, and even more rare that this would result in fertile, healthy offspring. This work has now been published (Rieger, Potter, Preston, Powles, *Theoretical & Applied Genetics*, Vol. 103, 2001) and joins a list of other studies around the world that show that there will NOT be the production of superweeds from growing GM herbicide resistant canola.

It is well known that there is a certain degree of cross pollination between canola crops because canola has about 30% cross pollination (compared to zero in wheat). Some opponents of GM canola have said that the resistance genes will flow to non GM canola. Studies overseas and our own studies in WA, SA, Vic & NSW by Rieger, Lamond, Powles, Preston, Roush (published in *Science*, June 28th, 2002) have examined the amount of gene flow occurring between canola crops growing in different paddocks. All of these studies establish that there is, as expected, a very small amount of gene flow. The amount of gene flow occurring between different paddocks is very low. We measured only 0.07%, however, this very low amount of gene flow can occur to considerable distance, up to 3 kilometres.

These Australian conducted studies, when combined with the international studies, provide facts that will help the Australian community and the gene technology regulatory authority in Canberra (OGTR) in deciding whether, when and how GM canola will be introduced to Australian agriculture. What WANTFA readers can be certain of is that these issues are receiving very serious attention in Australia. While the issue of GM crops is now politicised ultimately decisions should be made on factual evidence including the type abovementioned.

Professor Stephen Powles,
Director WAHRI, University of Western Australia
And
CRC Australian Weed Management.
THE UNIVERSITY OF WESTERN AUSTRALIA
A Leading University
Sustainable Solutions for a Growing World

Dates to Remember

Event	Day	Date
Post Seeding Meckering Field Walk	Tuesday	23 July
Meckering R&D Field Day	Wednesday	18 September
Pre Harvest Meckering Field Walk	Thursday	17 October
WANTFA Conference 2003	Tues–Friday	Katanning 4 March, Perth 6–7 March, 2003

Field Day details
…later in this issue!

Maize and sorghum encourage Fusarium head blight in cereals

Greg Shea, S Kumar and R. Loughman, GrainGuard Initiative, Dept of Agric. South Perth.

Fusarium head blight is the common name for the disease *Fusarium graminearum* and *Gibberella zeae* as it affects mainly wheat and barley. The pathogen has worldwide distribution. Recently it has re-emerged worldwide as a disease of economic importance.

In North America, the appearance of the disease in the 1990's has caused epidemics of varying severity on barley and on all wheats. According to the USDA it is their worst plant disease since the stem rust epidemics of the 1950's. Parts of northern NSW have had serious Fusarium head blight damage in recent years due to the combination of increasing maize plantings, minimum tillage and the sowing of susceptible winter cereal varieties.

The fungus produces toxins which contaminate affected grain and render it unsuitable for marketing and consumption. Strict international standards exist on toxin contamination. At present the freedom from this risk for WA grain is a significant marketing advantage.

Hosts and symptoms

The main host of this disease is corn. Sorghum, pearl millet, wheat and barley are also hosts. The main symptom displayed on corn and sorghum is gibberella stalk rot and ear rot.

On corn the leaves on early-infected plants suddenly turn a dull greyish-green while the lower internodes soften and turn tan to dark-brown (see photo). Diseased tissues within the stalks often show a pink to reddish discolouration. The fungus causes shredding of the pith and may produce small, round, black perithecia superficially on the stalks.

The characteristic sign of Gibberella ear rot is a reddish mould, often at the ear tip.

With ear rot, a reddish mould develops, often at the ear tips. Early infected ears may rot completely, with the husks adhering tightly to the ear and a pinkish to reddish mould growing between the husks and ear.

On sorghum

Gibberella zeae can affect sorghum at all growth stages. Lesions vary in size from small, circular spots to elongated streaks. They may be light-red to dark-purple. Lesions may be found both in the interior and on exterior tissues of roots, stalks, seeds and peduncles. Dark red discoloration of the cortex of seedling roots is often observed, and the fungus may spread to other root and stalk tissue during the growing season.

In older plants, the pathogen invades the vascular bundles and inner tissues of the stalk which then become reddish. Early-infected flowers or young grain may be destroyed; mature grains may become covered with mycelium, but are not destroyed. It has been reported that infected maize and sorghum may not show any symptoms.

Fusarium head blight on wheat and barley

During warm, humid weather, spores of the fungus develop abundantly in the infected head. The infected spikelets show a pink or salmon-pink cast, especially at the base and in the crease of the kernel. Infection may spread to adjacent spikelets or through the entire spike. The infected kernels become shrivelled, with a scabby appearance due to the tufty mycelial outgrowths. Infected kernels range in colour from white to pink to light-brown, depending upon the time of infection and environmental conditions during disease development.

Infected spikelets change colour to light straw even though the healthy spikelets on the same ear remain green.

Barley

Spikes are dwarfed and compressed with infected spikes closed rather than spread. All or part of the spike can be infected. Hulls (lemma and palea) are light to dark-brown with a dead, lustreless surface. Spore masses commonly develop on the surface, especially during moist weather. Kernels are shrunken and light brown in colour. The surface of the grain is rough or scabby in appearance.

Relevance to WA and no-tillage

The pathogen that causes this disease will potentially survive in all cropping areas of WA. However, we expect the disease will only be observed in wheat and barley that is grown in areas of high rainfall and warm temperatures between flowering and soft dough.

There also needs to be sufficient inoculum from alternative hosts such as corn, sorghum and millet from summer cropping. No-tillage is likely to encourage the disease, as stubble's will host the disease. Durum wheat is very susceptible to the disease, so sowing durum on maize, sorghum and millet stubbles is not recommended. The serious outbreaks in northern NSW were with durum.

Graincare——on farm quality assurance

Charles Willoughby, Grains Council Australia
(02) 6273 3000 or charles@grainscouncil.com

Quality assurance is different to quality control

Quality assurance focuses on the process of grain production, rather than on assessing end-point traits and removing defective product. QA is developing procedures that prevent production of poor quality products, documenting standardised procedures and auditing the system to ensure the desired outcome. If the process of grain production is safe then the grain will be safe.

By growers, for growers

With the support of GRDC, the development of *Graincare* has been led by growers, through the Grains Council of Australia (GCA), in partnership with

the grains industry. *Graincare* is an auditable Code of Practice covering cereals, pulses and oilseeds. In order to become accredited, growers need to have an external audit.

Eight months of consultation

The GCA consulted widely with industry to develop *Graincare*. Its scope, principles and objectives are derived from a project paper circulated in mid-1999 and was followed by a national workshop, where recommendations were reviewed and finalised. A Drafting Group, consisting of growers, marketers, grain end-users, bulk handling companies, other quality assurance programs and government developed the framework for *Graincare*. This was refined through consultation during workshops in all States and enabled the refining of *Graincare*, which was finalised in mid-March 2000.

The scope of Graincare

Graincare focuses on food and feed safety—as required by customers. The scope of *Graincare* may change over time in order to meet industry changes. Some end-users may have additional quality assurance needs that may be unrelated to food safety, so optional *Graincare* elements will be developed for this. *Graincare* is based on HACCP (Hazard Analysis Critical Control Point) principles, being the internationally recognised way of managing food safety risks. *Graincare* asks growers to: identify hazards that could compromise the food or feed safety of their grain; to determine where the best place is for controlling grain safety hazards; when a safety hazard has occurred, and to record any control measures taken and note their effectiveness.

The program emphasises Good Agricultural Practice (GAP), which minimises and manages food and feed safety risks on-farm. It consists of commonsense practices that most farmers perform regularly anyway. Most farmers will not find the program requirements unusual or difficult to do. The program leaves on-farm management decisions with farmers—as they have the grain experience and can seek advice to manage a safety risk if required.

The objectives of Graincare

Graincare was developed to contribute to the development of growers' management skills—maximising marketing opportunities, as such growers will be preferred—and enabling growers to understand and satisfy customer requirements.

Links with Cattlecare, Flockcare and Freshcare

Most grain growers also produce other goods. Therefore to overcome potential overlap with programs *Graincare* has a modular approach. Different modules can be adopted. *Cattlecare* and *Flockcare* have the same three modules: Management, Chemicals and Livestock. The Management and Chemicals Modules are largely applicable to all farm enterprises so, after some amendments, *Graincare* utilises these two modules and adds a Grain Module to complete the *Graincare* program. The National Feedlot Accreditation Scheme and *Freshcare*, for fresh fruit and vegetables, also form part of this modular system. A wool and a goat program are likely to link into this system in future.

Pilot Program

A Pilot Program, funded by GRDC, was conducted to determine potential problems with *Graincare*. A facilitator covered each group of growers and took them to the point of external audit. Feedback from this helped refine the Code of Practice. The program was introduced last year.

Market demand

Consultations with grains marketers have shown a continuing trend for buyers to demand increasing levels of food security from their suppliers. Quality assured grain is being actively promoted in Asian markets, so it is becoming more urgent for crops to be grown on quality assured farms so that the industry can compete in Europe and retain market share in Japan. It is therefore important that growers adopt *Graincare* so that they are able to take advantage of the premiums being offered for segregations such as the 'shochu' market and to ensure that their options to sell into other markets remain open.

The *Graincare* program is acceptable for all major markets in the coming season. In particular, *Graincare* will be acceptable for delivery into the 'shochu' segregation for the 2002–2003 season and it meets the GMP+ requirements for lupins into the Netherlands. For growers who need to have full on-farm HACCP systems, *Graincare+* is available to satisfy those requirements.

Training

Accredited trainers are available to assist growers in their adoption of the *Graincare* QA system and training is eligible for FarmBis rebates. For further information on the program, including training, pleases give me a call or Mr Colin Mann, CORREH Consultancies (0409 295 396).

Zero-Tillage in Pakistan: farmer-to-farmer advocacy

A CIMMYT report

Pakistan food crisis

Pakistan is working through a quiet crisis that has probably affected daily lives more than even the war on terrorism. Harvests of wheat—the country's main food crop-fell 10% in 2001 due to a prolonged drought. Rice output dropped 22%. Livestock and fruit trees were decimated. In a nation where nearly half of the people are farmers and GDP growth hinges on crop performance, these figures were ruinous.

Disaster was averted only through use of government grain stocks and drought relief programs. Farm output is also expected to rebound this year, but the future for farmers is highly uncertain. Projections foretell less reliable rainfall in South Asia, and studies show that aquifers in many zones are being sucked dry, among other things from excessive pumping for irrigation.

Zero-Tillage has exciting potential

To cut the risk and cost of grain cropping and save water, for several years Punjab Province's On-farm Water Management Directorate (OFWM) has been helping thousands of farmers to test and adopt zero-tillage into stubble immediately following rice harvest, or after growing cereals on raised soil beds.

"Zero-tillage", one farmer said "...has woken us to the potential in our lands."

"We must learn to grow more rice and wheat with less water, less energy and less land. The simple answer is zero-tillage," says Mushtaq Ahmad Gill, leader of OFWM. "In 2000–01, more than 4,000 Punjab farmers in about 200 villages used zero-tillage for wheat on 30,000 ha, averaging 17% higher yields than peers who tilled the traditional way." Zero-tillage farmers also used about US$50/ha less in diesel, labour, and herbicides, according to OFWM extension agronomist, Hafiz Mujeeb ur Rehman. "Most significantly, they reduced water use by 30–50% in the first irrigation and 15–20% in subsequent applications—saving 200–400 thousand L/ha of water." says ur Rehman.

Field days and seminars—success!

To share enthusiasm and knowledge about zero-tillage more widely in Pakistan, in early 2002 Gill and ur Rehman worked with the Lahore-based Conservation Agriculture Farmers Association of Pakistan (CAFAP) to organise a travelling seminar. They took more than 30 progressive farmers, agronomists, agriculture experts, and agricultural machinery manufacturers through Baluchistan, Punjab, and Sindh provinces—Pakistan's bread-basket.

The seminar, held 8–12 March, was a resounding success, according to Sajjad Sulaiman Malik, CAFAP Secretary General. "Participants saw zero-tillage and bed planted wheat (which saves even more water than zero-tillage) in farmers' fields around Lahore," says Malik. "We also organised a field day in Sheikhupura for local farmers to share experiences with participants, and an open discussion held at Joyanwala village was televised."

Support promised

On closing, the Governor of Punjab, promised support for Sindh farmers interested in adopting zero-tillage. One farmer said the seminar "...has woken us to the potential in our lands. We'll now practice and spread zero-tillage and other modern technologies." This farmer, who had used zero-tillage for the first time, says he needs to improve his zero-tillage management, but he still harvested 40% more wheat than with traditional methods and had reduced land preparation time and costs. For now, Sindh farmers have decided to open a CAFAP chapter in their province. [*Editor: Sounds exciting—like WANTFA's beginning*].

The seminar was funded through the New Zealand Overseas Development Agency (NZODA) with the International Maize and Wheat Improvement Center (CIMMYT). The Australian Center for International Agricultural Research is also involved, as are many other countries.

OFWM extension agronomist, Hafiz Mujeeb ur Rehman

Seeding into raised beds.

Flowering wheat.

Zero-tilling into rice stubble.

Wider row spacing in lupins is an advantage

Geoff Fosbery and Angie Roe, Farm Focus Consultants,
Northam WA (08) 9622 5095

Client trials over the past two seasons have shown a consistent advantage in sowing lupins on wide row spacings. Even where the difference has not been significant, the trend has always been towards higher yields at wider spacings. As a result, we feel that wide rows are a better or a more reliable option for lupins than our traditional narrow row spacings.

In 2000 and 2001, we monitored seven paddocks that had lupins sown on 9" and 10" row spacings as a standard, and 18" and 20" as a double, or wide spacing. With the help of our clients, we measured plant density, plant height, pod height and grain yield (with a weigh trailer).

The fertilisers and pesticides used, and the time of sowing were consistent with good agronomic practice in each area. To create the wide row effect, the farmers put two hoses down the same opener, and sowed at least one strip down the paddock adjacent to the normal row spacing. In most cases, this was repeated three times across each paddock, and then grain yield was collected from the three replicated strips. We also monitored narrower spacings (7" and 14") and other configurations of skip and double skip, however, this data is not presented here.

17% yield advantage!

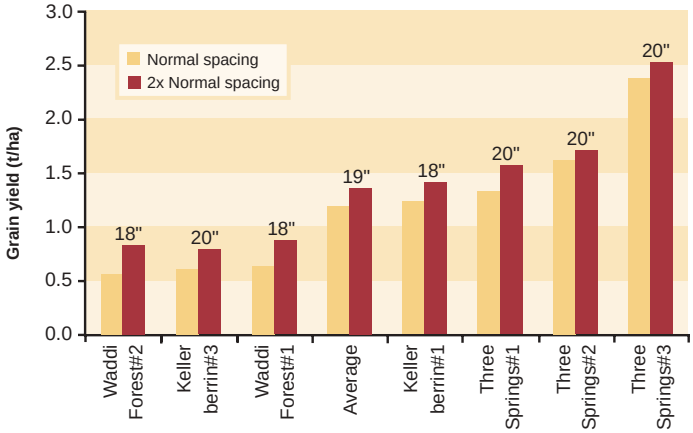
On average, we found a surprising 17% grain yield advantage when we doubled the row spacing and sowed with a no-tillage seeding system (see graph below). Interestingly, the best grain yield responses came from sites that gave the least grain yield (see graph below), providing some economic insurance in low yielding situations or environments.

There appears to be more advantage in sowing with wide row spacings in a low yield potential situation than there is in a high yield potential situation. Examples of low yield potential situations include where lupins are sown on heavy country, or when there is a late break to the season, or a dry winter. Both row spacings will perform well in a good year, but lupins sown on wide row spacings are more likely to yield well than those sown on narrow spacings when the season is tough. Wide rows may therefore be a means of 'drought proofing' your lupin crop.

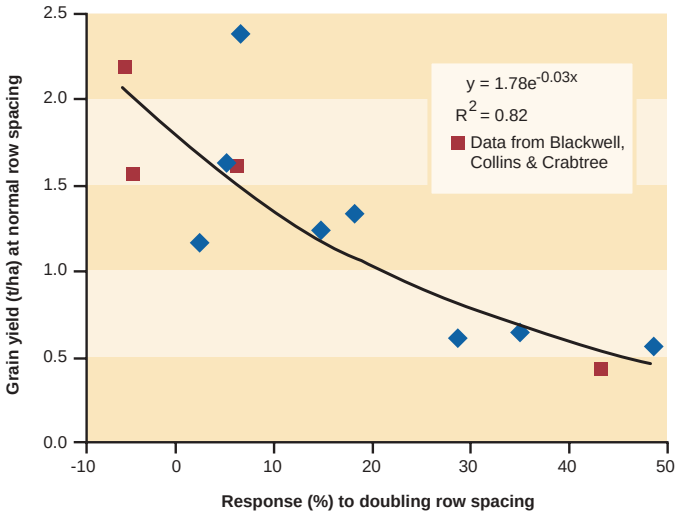
Other advantages!

Pod height was generally about 3–5 cm higher on the wide row spacings, which made harvesting easier. Wide rows also allow for easier stubble management and less soil disturbance, which means less weed stimulation (although the extra tines were not removed for the purpose of these trials). Weed control was improved with the weeds exposed in the inter-row for a longer period throughout the season.

Lupin grain yield with doubling row spacings in 2000 and 2001 in WA - FarmFocus consultant client data.



Lupin grain yield response from 2000-01 to doubling row spacings



For the real innovators!

Wide rows also assist in controlled traffic, enable cheaper knockdown herbicide application in the inter-row, and allow selective and more expensive pesticides to be banded in the crop row. These things are all being practiced in wide row pulse crops in NSW and Victoria as we speak.

Conclusions

Our trials suggest that there is an advantage in sowing lupins on wide row spacings. We feel that wide rows are a better, or safer, option for lupins than narrow rows.

The reason we feel that the wide rows are resulting in better, or more consistent yields, is due to improved light penetration into the canopy, which allows the pods to fill the seeds as they form. Wider rows also allow access to weeds for longer (the canopy takes longer to close over) and are easier to harvest, because the pods tend to set higher in the canopy. When the plant density is similar at different row spacings, the pod height tends to be higher at the wider spacing, as the plants compete more aggressively for light and nutrients.

If we assume that lupins were worth $224/t (port equivalent—Grain Pool and ProFarmer 22/12/2001–19/01/2002) then, on average, the extra 0.19 t/ha of grain produced from the wider rows was worth an extra $43/ha to the farmer—at no extra cost! We will be doing more trials on this in the 2002 year—so too is WANTFA at Meckering and Mingenew.

Tissue tests relate to soil test data

HF de Wet, MEAG Soil Consultancy - Northam Ph/Fax (08) 9621 2770/1

A plant analysis reliably shows what nutrients the plant is picking up from the soil. This often, but not always, correlates well with a soil test analysis. Plant analysis data can also show how well other soil factors or ratios are related. This article presents some background on these issues and provides some WA data collected in 2001 that helps to show some new concepts in soil science in Western Australia.

Factors effecting uptake

We can assume that higher levels of a plant-measured nutrient suggest that it is more available in the soil. However, plant uptake depends on more factors than soil nutrient availability alone. Additional factors include, antagonistic and synergistic nutritional plant and soil relationships (more on this later).

Usually, if the nutrient concentration in the plant tissue is very low then the plant growth rate is also low. However, as the plant grows the nutrient content decreases slightly, at first. This is due to dilution from plant growth. In the next stage, the growth rate improves with little change in nutrient content. As the soil nutrient availability is increased, the growth rate and the nutrient content also increase until the so-called 'critical level' is attained. Further improvements in nutrient availability will not increase the growth rate, but will increase the nutrient content.

Critical levels

The nutrient content of a plant tissue not only reflects soil availability. It is also affected by the type of tissue sampled, the age of the plant, and the supply of other plant nutrients. For example, a nutrient content of 0.2% P in the dry matter of straw of cereals is a high P content, but the same level in a young plant would be too low for optimum growth. In contrast, a K content of 0.6% in the grain of cereals is considered high, but the same level, in the vegetative plant material, would be too low for good growth.

Generally the contents of N, P and K decrease with the age of the plant, whereas the contents of calcium, magnesium, manganese and boron often increase with age. Young leaves, therefore, show relatively high contents of N, P and K, while in older leaves, Ca can accumulate. For this reason leaf samples for tissue analysis should be done at the same physiological age and from the same tissue.

In contrast to soil analysis, leaf or tissue analysis accurately reflects actual plant nutrient uptake. For example, as the absorption of various plant nutrients depends on root respiration, low nutrient uptake can result from dry or waterlogged soil. Conversely, good soil moisture favours nutrient supply and uptake.

Given good soil moisture conditions, crops can take up enough soil nutrients from poor soil, thus masking poor soil fertility. Also, a high uptake of one plant nutrient may result from an inadequate supply of another nutrient. For example, where N is in short supply, growth may slow resulting in the accumulation of other nutrients—as N deficiency usually has a greater effect on growth rate than on nutrient uptake.

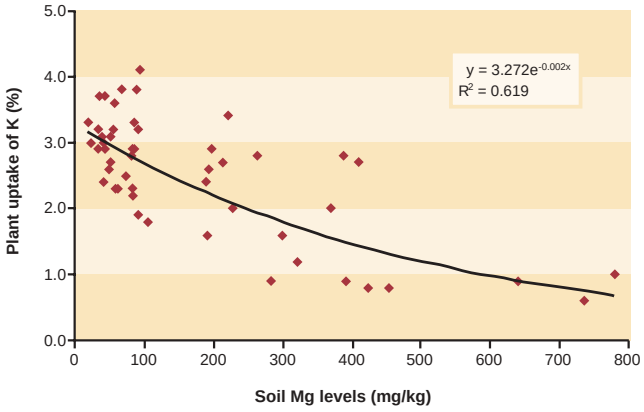
Antagonistic and synergistic nutritional relationships

In interpreting plant analytical data, antagonistic and synergistic relationships between plant nutrients must also be considered. An antagonistic effect is where the uptake of one plant nutrient is restricted by another plant nutrient. A synergistic relationship is the reverse, where one plant nutrient enhances the uptake of another plant nutrient.

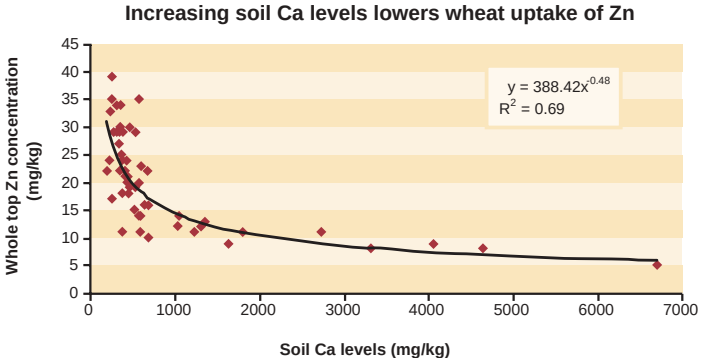
2001 soil and tissue data

I collected data from a number of farms throughout the central wheat belt during the 2001 growing season. By using multiple regression analysis I have tested for inter relations between independent variables. (This tests each independent soil and leaf tests for inter relations, by running an adjusted R-squared analysis against all other independent variables.)

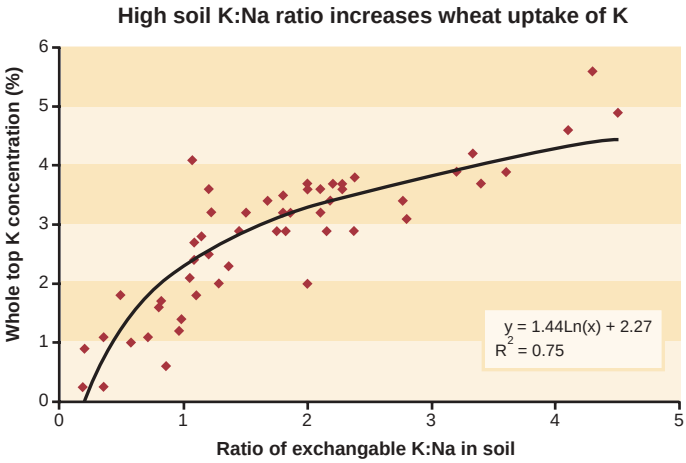
High Mg levels in the soil supress wheat K uptake in 2001 in the central WA wheatbelt



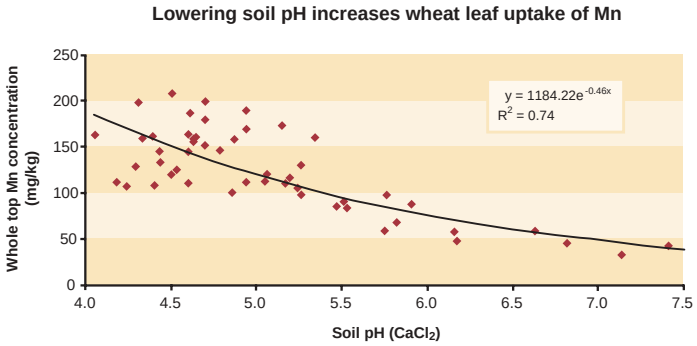
According to my schooling, excessive soil magnesium levels should cause K, P and N deficiencies. The graph on the previous page shows that high levels of soil Mg restricted K uptake and there is a similar relationship with P and N to Mg.



Similarly, excessive potassium, sodium and magnesium should cause calcium deficiency. Likewise, excessive calcium in the soil should cause magnesium, phosphate and zinc deficiencies—and again this is shown to be the case with zinc in the graph above.



According to the data collected in 2001, the availability of K in the soil depends on the levels of boron (R2 = 61%) and sodium (R2 = 46%). Calculating the K:Na ratio, from this data set and using it as a soil parameter, explained 75% of the change in the K content of the leaves (see below left).



Acid soils increase the reactivity of iron, manganese and aluminium. According to the soil and leaf analysis I did in 2001, soil pH is highly related to the availability of manganese (see above).

Conclusions

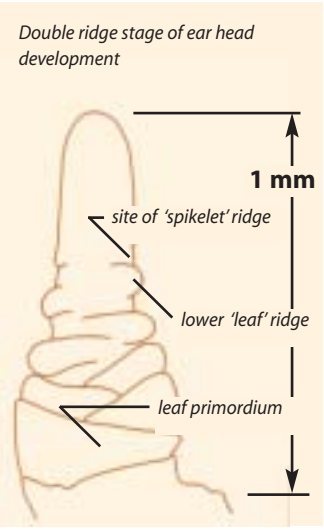
This work shows some interesting soil and plant relationships for WA central wheatbelt soils in 2001. The exercise needs repeating with different seasonal and sowing conditions—thus fine-tuning the interactions. Regular soil and leaf testing in combination with regular crop inspections are a vital management tool to ensure that optimum returns are achieved from a fertiliser program. ■

Dr Harmohinder Dhammu

Stirling and Gairdner can tolerate phenoxys

Dr Harmohinder Dhammu [hsdhammu@agric.wa.gov.au] and Dr Terry Piper, Dept of Agric, Northam (08) 9690 2000, and Chad Sayer, Nufarm.

In contrast to what we have previously believed, barley is quite tolerant to phenoxy herbicide application with regard to grain yield production. GRDC and Nufarm funded research from last year showed consistent head deformities from phenoxy use, but this rarely translated into grain yield penalties.



As previously reported, this work also showed less head deformities if the herbicide application was not at the double ridge stage of crop growth (see diagram).

One leaf after double ridge—to be safest!

Double ridge usually occurs at 4–6 weeks after sowing, depending on the variety and seasonal conditions. For Stirling barley the double ridge occurs when there are 4.5–4.9 leaves and for Gairdner when there are 5.0–5.6 leaves. While ear head deformities may not affect grain yield they may increase screenings and/or reduce grain quality. This is the subject of further research.

Best practice for rye and radish

Therefore, perhaps the best strategy is to use grass selectives at 1–2 leaf stage of ryegrass and then apply phenoxy at the variety specific safe growth stage. A mixture of 400 mL/ha of MCPA plus 350 mL/ha of diuron at the 3-leaf stage of barley can be used for early radish control. This is a registered mixture. Radish escapes can be removed later with Logran.

Another option is to use SUs early and then clean up with phenoxy herbicides later—at the 'milky dough' stage. We observed that Gairdner appears to be slightly more sensitive to phenoxy herbicides than Stirling.

What are the phenoxys?

They include 2,4-D, MCPA, Dicamba and 2,4-DB. They are an important chemical group (Group I) for broadleaf weed control. The phenoxys continue to be highly effective against wild radish, while other herbicides, particularly Group B's, have faltered. Phenoxys act like plant growth hormones and interfere with the process of cell division and cell differentiation.

The type of phenoxy can affect the level of head deformity. In general, MCPA appears to be less injurious to cereals than 2,4-D but it is also less effective on larger wild radish. MCPA is readily metabolised within plants while 2,4-D breakdown is much slower. Cereals are most sensitive to phenoxy herbicides if applied at, or before, the double ridge stage of ear head development (initiation). The double ridge is when the cells change from producing leaves and begin to form the ear. This is when cell growth and division are most active in the developing ear-head.

The safest timing

The recommended rates and times on the phenoxy labels are generally based on the number of leaves on the main stem. The table below shows the label rates and timing. Note, 2,4-D Ester (80%) is twice as effective as 2,4-D Amine (50%)—such that 500 mL/ha of Ester is equivalent to 1.0 L/ha of Amine 50%.

Phenoxy type	Timing	Zadock's scale
MCPA Amine & Ester	up to 0.5 L/ha	Z13-33
MCPA Amine & Ester	0.5-2.0 L/ha	Z15-33
2,4-D Amine 50%	up to 1.6 L/ha	Z15-33
2,4-D Amine 80%	up to 0.7 L/ha	Z15-33

The labels do not consider varietal differences in the timing of ear development. Long season, late maturing varieties, like Skiff, take longer and produce more leaves (5.3), before reaching the double ridge stage than shorter season varieties like Unicorn (4.5).

Trial details

In 2001 at Avondale, we applied phenoxy herbicides to Stirling and Gairdner sown on 7th June 2001 with 60 kg/ha of seed. Herbicides were applied across varieties and at each spray timing five plants were sampled and the number of main stem leaves counted. Then the plants were dissected. The total number of deformed heads were also counted. Rainfall during the growing season was 163 mm.

Herbicide timing	Zadock's scale	Date
T1	Z11-12	25 June 01
T2	Z12-13	29 June 01
T3	Z13-14	5 July 01
T4	Z14-15	11 July 01
T5	Z15-16	18 July 01
T6	Z16-17	26 July 01
T7	Z17-18	2 Aug 01
T8	Z37	7 Sept 01

Results

Interestingly, none of the phenoxy applications decreased the grain yield of Stirling (significantly). While Gairdner barley had a 20% yield reduction from the application of MCPA amine at 0.5 L/ha at Z12-14, a 21% yield reduction from MCPA ester 1.0 L/ha at Z13-14 and a 20% yield reduction from 2,4-D ester at 0.75 L/ha at Z17-18. The fact that low rates Ester early caused less grain yield damage than low rates of Amine early is in contrast to accepted wisdom.

Applying phenoxy herbicides at, or before, the double ridge stage caused a small number of head deformities (%Def) in both the varieties (table below). MCPA amine sprayed at Z11-12 did not cause any head deformities, but MCPA Ester caused slight deformities in both the varieties.

Higher rates of both 2,4-D amine and ester applied to Stirling at Z15-16 gave more head deformities than lower rates. With Gairdner, both formulations of 2,4-D produced similar deformities. The application of phenoxys from 6 leaves onwards caused little or no head deformities.

Wheat is more sensitive

In contrast to the common view, our work has shown that barleys are less sensitive to phenoxys than wheat.

Barley head thinning from phenoxy use.

While head deformities for Unicorn barley were 14% with 2,4-D ester at 0.75 L/ha at Z15-16 (data not shown), Brookton wheat had 72% deformities with 2,4-D ester at 0.5 L/ha at Z14-15 at Wongan Hills in 2000. ■

Herbicide	Rate (L/ha)	Timing	Stirling		Gairdner	
			Yield	%Def	Yield	%Def
Untreated		0	3466	0	3909	0
MCPA Amine	0.5	T1	103	0	91	0
		T2	94	2	80	5
		T3	89	1	81	0
	1.25	T3	100	2	89	0
		T4	98	2	96	1
		T5	111	3	119	3
MCPA Ester	0.5	T1	97	1	97	1
		T2	95	1	100	1
		T3	98	1	107	1
	1.0	T3	89	7	79	1
		T4	103	6	112	2
		T5	87	1	96	3
2,4-D Amine	0.5	T3	96	2	93	2
		T4	104	5	108	1
	1.0	T5	100	2	99	3
		T6	95	1	92	0
		T7	101	0	96	1
		T8	97	0	90	0
	1.5	T5	107	5	105	3
		T6	104	1	101	1
		T7	86	1	91	0
		T8	99	1	95	1
2,4-D Ester	0.25	T4	101	1	103	1
	0.50	T5	94	4	96	2
		T6	103	1	90	3
		T7	89	0	80	2
		T8	95	0	94	0
	0.75	T5	100	8	88	2
		T6	100	1	99	1
		T7	100	1	104	0
		T8	96	0	85	0
	LSD (0.05) =		15		17	
	CV (%) =		11		13	

Yilgarn Shire-good country for hardy people!

Neil Dodge, North Bodallin (08) 9047 7057

A roadside sign on Great Eastern Highway at the start of the Yilgarn shire is a welcome and a warning. It's a great place to grow crops and rear livestock, but get your management wrong—or be on the wrong side of mother nature—and the banks will be on to you in a flash!

The farm

I manage a 7,000 ha property which grows wheat, sheep and cattle on behalf of Peter and Gracie Capito at North Bodallin. Annual rainfall is about 300 mm but with large variations. We have hot summers and mild to cold winters with night temperatures to –2°C being common from July through to September.

Peter and Gracie with hand-reared calf Choco

No-till history

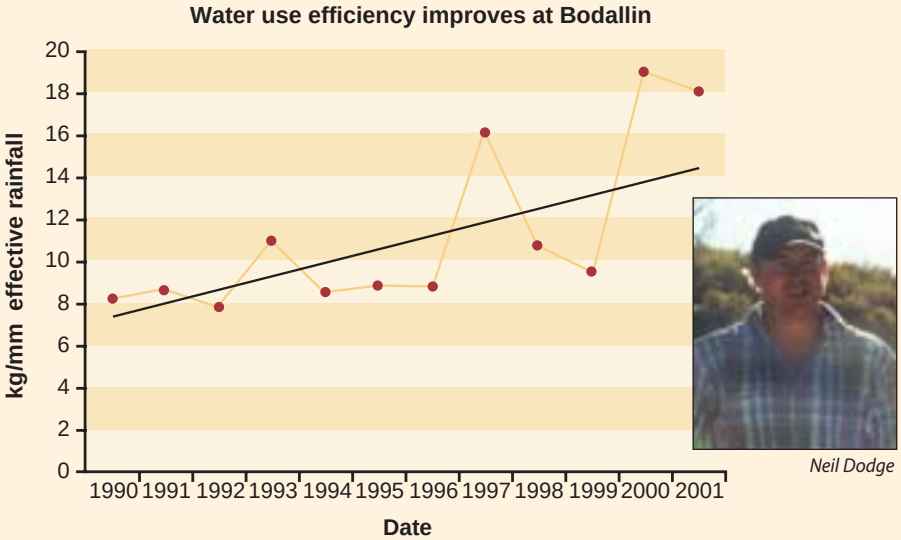
In 1982, we did something radical—we direct drilled wheat into fire harrowed wheat stubble. The result was a disaster—with barley grass and huge piles of straw overwhelming the crop. I think the yield was 0.4 t/ha. The next 10 years were a slow and painful experience.

We often had poor crops as a result of machinery not suited to the job. We had low tine break-out pressure, poor trash flow and uneven seed and fertiliser distribution and placement with older type Air Seeders. But there was light at the end of the tunnel.

Lupins had been growing better each year. Field Peas were introduced and yields were good. Weed control took a step forward once a 66% cereal and 33% pulse rotation was implemented. It was about this time that the real benefits of rotations started to shine through. Most farmers in the district started to realise that rainfall wasn't the only limiting factor to yield increases.

When we could see that yield increases were possible we had to match the increasing demand of nutrients for the higher potential crops. Wheat grain-yield averages rose from 0.8 t/ha in 1982 to 2.0 t/ha between 1997 and 2001.

With a better understanding of rotations and fertility implications our water use efficiency has greatly improved. The formula used to calculate this is; the amount of grain produced per hectare per mm of effective rainfall. Effective rainfall is calculated as May–October rainfall minus 110 mm, plus one-third of out of season rainfall (November to April). The below graph shows the general improvement in crop water use from effective rainfall, through time. Note that, in 1998, we had severe frosts and in 1999 we had severe flooding and waterlogging which masks how effective our water use was in these years.



Neil Dodge

Rotations have become W/L/W/P/P

At that stage all of our 4,000 ha cropping had been done using no-till, one Fastrac 185, one 100 foot boom spray, one Challenger 95E and one Flexi-coil Airseeder fitted with ConservaPak tines.

The Eastern Wheatbelt is notorious for its May droughts. Picture the year 2000 with summer rain of 100 mm, then from April through to mid-July there was not one rainfall event over 3.5 mm. We had damp sub-soil and all stubble paddocks were able to be sown. However, any paddocks that were left to pasture for two years were like concrete! The stubble paddocks grew well and went on to yield 2.5 t/ha, but we were unable to complete the seeding program because of the dry-hard soil.

Modified "No-Till"

Re-enter the plough—to rip up the hard pasture paddocks on some soil types (mainly grey clays) after some summer rain. This gave us more flexibility, but the cost of ploughing greatly exceeded the cost of no-till—but what is the cost of not getting the paddock in?

Agronomy

Rainfall is still our biggest yield limiting factor but only when we have done all the other things right. We know we must get good summer weed control, the right rotation, adequate fertiliser, good in-crop weed control, disease control for both soil and plant - and last, but not least, good advice from forward thinking agronomists.

Future developments at Bodallin

We will continue to improve our soil structure and health with lime, gypsum and dolomite—where needed.

Silage and hay are good insurance against chemical resistance developing

Unproductive salt land being prepared for Saltbush seeding in 2002. To revegetate land and possibly supplement stock grazing so land can once again produce an income.

Summer crop seeder - an old Allfarm bar setup with ConservaPak tines on 1m single skip rows used for opportunistic seeding of fodder and grain sorghum.

We will continue with no-till as much as possible. We'll fine-tune nutrition with both foliar and compound fertiliser rates, placements and timing, and we will continue to experiment with new pulse, and other crops and varieties. However, both canola and chickpeas have been unreliable in our area.

We will continue with sheep and cattle which help to diversify the income so that 'not all the eggs are in the one basket' in an area that is prone to frosts. We will keep experimenting with summer crops and we will try and appreciate that we have made good progress through time—and hope for more.

One pass operation!

Tyrone Henning, Hyden, phone (08) 9880 5092, fax 192

The Koorda district, like many other wheat growing regions in WA, has had some dry starts recently. Through these difficult seasons, the use of no-till has been prominent. No-till for the Henning and Son operation west of Koorda has been evolving since the early 1990's in response to resistant ryegrass and the need to increase productivity through dry seasons. Capital constraints, however, are a major consideration.

We started no-tilling with a couple of modified yellow Chamberlain combines, progressing to a modified Shearer 5 160 bar, and we are now employing an Auseeder bar with Nichols tines and a trifluralin boom attached.

The configuration (see photo overleaf) looks cumbersome, but was designed to give a constant seeding depth, reliable urea

and compound fertiliser placement, water harvesting, stubble retention and application of trifluralin on the go. Previously, we often had trifluralin hold-ups through the boomspray not getting back to the paddock in time, along with trifluralin been left out on the surface for more than 4 hours through unforeseen hold-ups.

Less urea and trifluralin loss

Topdressing urea has always been a problem in dry seasons. Urea has often been left on the surface for extended periods, up to two weeks, and is subject to volatilisation through dews and sunlight. It is difficult to time the urea application before rain—even worse than betting on a horse! Our current setup minimises the risk of urea and trifluralin loss.

Applying trifluralin and urea at sowing also releases labour and capital costs for the whole program. There is no need for a boom spray and spreading operation in front of the seeder and we don't have to worry about top-dressing urea during the post-em spray period. If the season has a favourable start and the yield potential for the crop is good, then we could top-dress more urea. However, the timing is not as critical as when there has been minimal nitrogen applied at seeding.

Having a seeder that can do it all in one pass frees up labour and reduces some risks.

Seeder details

This machine is comprised of two air-seeders, the bar and a trifluralin boom. Given that we could not afford a triple bin airseeder, and complementing equipment, we have used two air seeders. The small air seeder (3t) contains urea, while the larger air-seeder (8t) contains seed and fertiliser.

The Nichols tine configuration on the bar allows for the fertiliser and urea to be deep banded, while maintaining accurate seed placement. Due to its construction, the tine can be set to a probing depth, enabling deep ripping on hardpan soils.

The tines also place the phosphate into moist soil, so that P uptake is not limited by dry topsoil. Some P fertiliser is placed with the seed so that the plants can obtain their early P requirements before the root system is established.

Above: The large seeding rig can do a lot in one pass.

Left: The benefits of ripping hardpans are significant in our soils.

Below: The furrows reduce risk in dry regions—they catch water.

The tine configuration also allows seeding to continue through dry periods due to tines not breaking out. The tine assemblies are very versatile—doubling row spacings to 50 cm is easily achieved. We take the pressure off the tines and then lift and chock every second tine (as in photo).

The trifluralin tank is a Hardi trail-A-boom cart, which has had the control cables extended to the tractor cabin. The Tronic controller has an automatic adjustment system for constant spray rate (L/ha) regardless of ground speed, which improves the ease and accuracy of operation.

The boom allows for immediate incorporation of trifluralin, reducing volatilisation losses through unforeseen extended incorporation times, increasing the ease and accuracy of application, and avoiding hold-ups due to spray contractors. When the boom is turned off, there is no trifluralin lying in the paddock awaiting incorporation and, when in operation, the full strength is applied, resulting in limited chemical degeneration. Also, anecdotal evidence suggests that the freshly applied chemical is giving a good fumigation effect on dense ryegrass populations, which improves its efficacy.

We are considering improving the system by replacing the urea application with Flexi-N. We will also add a spray curtain to stop spray drift from the boom onto the bar.

Farming rules keep changing

Mike Thomas, Mullewa (08) 9962 3053 fax 10 Email tawarrieast@wn.com.au

The rules keep changing

Having agreed to write a short article for WANTFA I thought to myself, "What have I learnt about farming in the past 40 years that may be of interest to your readers?" I think one of the most important lessons in a farming career is flexibility. Being too dogmatic and rigid in an approach can backfire. I have learnt that for every positive move there is a negative—it is not an exact science and we are often handed a new set of rules to work with each year, with its own problems to manage and solve or skirt around.

Of the 40 years, the last 10 have been the most exciting, challenging and the years with the most change—especially in cropping. Looking at the approach to no-till and the machinery required to make it work, no-till has bought about large savings in time, costs and, more importantly, large benefits to our soil structure and the obvious benefits as a result. Unfortunately the biggest wild card; the weather, continues to be our greatest frustration, but the cycle of "too much, not enough or just right" is no different today than 40 years ago.

Background

I farm in a family partnership with my wife Barbara, son Glenn and daughter-in-law Eliza on "Tawarri Farms". Our annual cropping program is 6,000 ha in an area with 330 mm annual rainfall. Glenn is our chief organiser and motivator. We have two experienced and reliable permanent employees with casual employees engaged for seeding and harvesting—this makes up a top team for efficiency and a pleasant working environment.

Ninety percent of our cropping is done with no-tillage, using 2 Flexicoil bars on 9" spacings with press wheels. The remaining 10% of our country, mostly granite, is sown conventionally using a John Deere bar with 9" spacings and low tine pressure.

Press wheels and chains

Press wheels are proving a bonus in crop establishment during these dry years. However, on the negative side, they tend to seal or crust up on heavy soils if conditions are too wet during sowing. We try not to sow immediately after a rain event—but wait for 12–24 hours to allow the saturated surface to dissipate lower into the soil profile.

I also feel there is a need for a device like snake chains that can drag a small amount of loose soil back over the seed without damaging the water-harvesting furrow. The loose soil would overcome the crusting or drying effect.

Less lupins and more wheat in 2002

Our tactics this year to cope with a very light and difficult start, with no summer rains, were to greatly reduce our lupin production. Canola, or other pulse crops, are a "no-no" in recent years. We have increased our wheat production by using early varieties.

Nutrition plans

Our soil tests have shown good levels of nitrates on a large number of paddocks. On those paddocks with low levels, we have changed our normal seeding program of applying urea presowing to applying it post-seeding, giving us a more flexible choice of rates. Using urea post-seeding with press wheels and furrow sowing gives perhaps 80–90% of it in the bottom of the furrow for improved plant uptake, together with any potash used. Topdressing is timed 1–1$^1/_2$ days before a rain period—at the 3-leaf stage.

Weeds

Because of the season so far, the weed burden has been low and easier to manage. We purchased a new Hardi Boomspray, which will allow greater use of higher water rates when applying grass herbicides and trifluralin onto stubble paddocks.

Rotations

I strongly believe in good farming rotations with different crops or pastures but we don't believe in being inflexible with our rotations. Very few farms are

that fragile that they can't take a temporary change in direction. We don't make the rules in this game.

Our youth

I know farming has a great future ahead and I have a lot of faith in our young farmers who are today well educated, not only in modern technology and farming techniques, but are also very professional in their business skills and decision-making.

GM crops

My thoughts on GM crops are positive! I feel they have a lot to offer to combat problems like disease, salinity, frost, etc. However, I feel a bit nervous about the over-use of knock down herbicides because their greatest strength is that they are "non-selective". A much smarter way might be to exploit the way Mother Nature has evolved some plants to extrude a chemical to stop other plants growing beside it. Imagine a crop with that ability? No spraying!

All the best

I wish readers all the best and lots of rain and a good harvest. Here's a thought—don't be too hard on yourself if the decisions you make don't work out as planned. The top farm managers might get 80% right—the other 20% is pure luck—with all the variables to cope with. After 40 years I'm convinced it's an elusive dream to get it all right.

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Western Australian No-Tillage Farmers Association (Inc)

Field Day

All Welcome!

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4 km West of Meckering at R&D Site – Wednesday 18th September 2002

Cost: (incl. GST) **$25** members **$40** non-members

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8.15 am Registration

9.00 am Welcome and Opening Address by Professor Tim Reeves

5.00 pm Conclusion with BBQ and bonfire.

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Topsoil slotting for wheat

Topsoil has been placed neatly into 30 cm deep slots that are 8 cm wide to see if it might help to overcome possible subsoil constraints to wheat.

K and N for wheat and canola

High rates of K and N are compared in a full factorial trial in a high yielding situation—both wheat and canola grown side by side.

Cover crops for 2002

This trial has wheat, lupins and canola sown into 14 different cover crops that were grown last year and sprayed out before seed set.

Foliar boosting of wheat

Several timings of micro-nutrients (plus amino acids and hormones) are applied to see if they would reduce the level of antioxidants and possibly increase grain yield.

Agronomy for wide row lupins

Lupins have been sown in April or May on 25, 50, 75 and 100 cm row spacings at either 80 or 120 kg/ha.

Managing wheat residue

Canola, lupins and wheat were zero-tilled (using double discs) into wheat stubble that was either slashed, rolled or left standing—ungrazed.

Trifluralin alternatives

Compares three rates of trifluralin with Stomp, Dual Gold, Argold (cinmethylin) or triallate for ryegrass control.

Trifluralin granules in stubble

The efficacy of trifluralin is measured in thick stubbles with the carriers being 80 L/ha of water, 1 t/ha of river sand and 2.5% granules.

Granular rhizobial inoculants

In conjunction with Dr John Howieson granular innoculants are being tested in faba beans sown into dry conditions

Soil fumigation

There are two adjacent trials to test the effect of overcoming root diseases, by fumigation, with high and low background disease levels and with two levels of soil fertility.

Join us!

For the post-seeding field walk at 9:00 am on 23rd July with Fosbery and Crabtree.

Or, walk the site throughout the year.

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WANTFA Field Day – Wednesday 18th September 2002

…see over

N placement and weeds

we are testing the idea that banding Flexi-N might be better for canola growth compared to boomsprayed N in the presence of ryegrass competition.

Establishing lucerne cheaply

Barley is sown at two seeding rates with three lucerne row spacings to determine the most cost effective approach—in partnership with the WALGA.

Does PR-70 require P separation?

Last year the symbiotic fungi, Penecillim radicum, increased wheat dry matter when no P was applied. This year we have separated the P from the fungi to see if this is helpful.

Knifepoint depth in duplex soils

Three knifepoint depths are compared to determine tillage responses of wheat and canola.

Cu—liquid, granules or powder?

The Cu was applied while seeding wheat. The site was sown early and has a very high yield potential.

Deep nutrients for wheat

Inspired by SA work with deep nutrient placement, we have a range of nutrients at two depths.

Autumn tickle and trifluralin efficacy

Trifluralin is applied 0 and 6 weeks before sowing and an autumn tickle was employed to stimulate ryegrass emergence and "fluff" the soil. There are three trifluralin rates and two timings of pre-seeding tillage.

Ca:Mg long-term trial

Now in their third year, two trials have had their soil ratios changed from 6:1 to now range from 1:1 to 15:1 in Ca:Mg. Good, even emergence suggests this year will produce some useful data to test the hypothesis.

Long-term lime by tillage

Now in their fourth year, the three lime by tillage trials continue to provide useful data. Crop emergence with the disc treatments have been good this year.

Broadleaf variety and row spacing

Four pea and four lupin varieties have been compared at 25 and 50 cm spacings. There are also 10 canola varieties tested (2 IT's).

Canola seed size and rate

Good canola establishment is possible with no-till. How important is it to have the canola seed screened for >2.2 mm seed size compared to <1.8 mm?

Controlling ryegrass in wide row lupins

Shielded sprayers are able to be used with new chemistry to control ryegrass. This trial, in conjunction with Mike Collins, tests the various options with 60 cm wide lupin rows.

Broadleaf herbicide tolerance

Various broadleaf herbicides are trialed on 23 different broadleaf crops and pastures. This will create an interesting matrix of results.

New and old ryegrass herbicides

New and old herbicides will be compared in a lupin crop.

New innoculant methods

Different methods and types of bacteria are being tested to treat biserrula and other aerial seeding clovers.

Bulk sown wide rows lupins

45 ha of lupins have been sown around the Meckering trial site showing the different growth habit of the wide lupins.

Register early!

You can register early by going online to www.wantfa.com.au

or call WANTFA administration on 9277 9922

or fax your name, address and credit card details to 9475 0322

For an extra $10 the 2002 trial results can be posted to you after they're harvested.

Other contributors: Colin Pearse, Aglime, SoilTech, Delisle Engineering, WA Lucerne Growers Assoc., Western Australian College of Agriculture-Cunderdin, Farm Focus Consultants, Meckering Farmers, Canola Growers Assoc., Murdoch-Centre for Rhizobium Studies, Jan de Jager, Dowerin Events Management, Kevin Norrish, Omnia, Pacific Seeds, Pioneer, Phosyn, PlantTech, Australian Seed Innoculum.

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