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Western Australian No Tillage Farmers Association (Inc)

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Raised beds in southern Victoria

I recently attended a field day near Geelong by a very successful sister farmer organisation. Called "Southern Farming Systems (SFS)", this group are prepared to make radical changes to stay profitable. Raised beds in their wet country have enabled them to grow crops that are more profitable than sheep – without the devastation of waterlogging.

Farmers enthusiastically look at opener options within raised bed seeders – this one is for corn.

Local work by Greg Hamilton (AgWA, Perth) has also demonstrated this and I know several farmers are adopting the system. Combined with no-till, the raised beds method has a lot going for it, particularly in areas where annual rainfall exceeds 500 mm. The Executive Officer for SFS is Colin Hacking and his phone number is (03) 5229 0566 or 019 432 562.

WA's own Gairdner, grown in raised beds near Geelong.

Claying will turn the West-Midlands around!

After visiting claying legend Clem Obst (Mundulla, SA) and seeing the exciting residual benefits of two claying trials established in 1991 at Badgingarra Research Station (BRS), it's hard not to be over-excited about the future farming prospects of the West Midlands. One of these BRS trials was established by Paul Blackwell and the other one by me, after we visited Clem in early 1990.

Last month I spoke to Clem Obst and Jennifer Trott (Primary Industries and Resources SA – see her 'Clay Spreading Pays' inside) about some of their observations across time. On deep repellent sands high rates of clay (200 t/ha) have been needed to turn non-wheat and non-canola soils into very profitable canola and wheat soils. The higher rates always perform better than the low rates, and it also makes for 'wind erosion safe' mixing of the full 10 cm of topsoil – which Clem believes is important.

Note the clay is not quite worked to 10 cm depth. Clem Obst believes best results occur when it is fully mixed.

A vibrant and open

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WANTFA, Box 1731,
Esperance 6450
W. Australia
Editor: Bill Crabtree,
fax: (08) 9622 3395 or
crabtree@muresk.curtin.edu.au

Bill Crabtree, WANTFA's Scientific Officer is funded by:

GRDC

Grains Research & Development Corporation

Thorough incorporation of the clay while dry is essential, says Clem.

farmer discussion during Clem's visit in July at Wellstead made me conclude that wind erosion with claying may not occur, as clay mixed into the topsoil has the ability to suck moisture out of the air, in the right conditions. This moisture can then dry, allowing a thin crust to form and, without sheep, this is a great erosion suppressor.

The long-term benefits of claying are so exciting, particularly for farmers in high rainfall areas on gutless sands of the west-Midland and the south coast. Provided a source of clay is available within an economical haul-distance, they can be highly productive again! The timing is right to make this newsletter a focus on claying repellent soils. For more insights, see articles inside by Jennifer Trott, Rob Hetherington, Peter King and Matthew Jones.

Area clayed at BRS in 1991 shows much better growth.

Frustration with old no-till furrows

I know several Esperance farmers with water repellent soils who have been caught with previous year's furrows that wet more easily on the opening rains and this frustrates weed control. Even worse, these old furrows are often relocated to now be on a rise and the new furrow is difficult to wet as water penetrates in the ridge.

Why is this happening? Perhaps several mechanisms are involved. You may recall that in Margaret Roper's story in the last *WANTFA Newsletter* (November 1998) she talked about irrigating a repellent paddock over summer. The irrigation kept the soil moist and allowed bacteria called *Rhodococcus* to build up, which enabled them to eat more repellent waxy material and the repellence dropped dramatically. Perhaps the furrows are keeping the soil wet for longer and allowing the bacteria to work more on the wax.

Another possible reason is that rain falls into last year's furrows before, or on, the break, and the furrows wet up. Seeding then creates furrows in a different place but the wetter soil of the old furrow still absorbs the water at the expense of the new furrow.

So what can be done? Obviously the answer is to apply clay, but that takes time and money. Another option is to band some wetting agent in the new furrows as John Luberda (Dalyup), Ivan Gerschwitz

These wettable furrows from Esperance make next year's crop establishment and weed control difficult.

(Esperance) and John Cook (Dandaragan) have done. It can be done cheaply with plastic garden reticulation pipes and nozzles – but this does not fix the weed problem. Another option is full-cut tillage!

Tillage will physically mix the wet, or more wettable, sand in with the dry sand. This creates an erosion risk, but it may be what is required as a short-term measure until claying can be afforded. This is an old remedy that works best during a rain, as it enables a better mixing and wetting but it's not a fantastic solution. I wonder if running the Claymate® or multispreader over the soil after the cultivation, applying an extremely low rate of clay, might be affordable? It should help to stabilise the soil somewhat.

No-Till = Drought resistance

"A double "0" year..."was the lead story in the Canadian *Grain News* newspaper in October 1998. It went on to say that "0-till worked with 0 rain". The story is from farmer John Bennett, from Biggar, Saskatchewan. John says that from the 81 mm of summer rainfall, with the stored moisture from winter snow melt, he was able to grow 0.93 t/ha of wheat, while a neighbouring field which was worked and then sown was not worth harvesting.

This is similar to our Australian experience since no-till began in earnest only 6 years ago. Many farmers have grown 1–2 t/ha crops when, with tillage, even full-cut direct drill, they would have struggled to make a decent crop. Cultivation dries the soil!

Earthworms incorporate lime!

Excellent work by Dr Geoff Baker (CSIRO, now Canberra) over the last 8 years has regularly shown that earthworms incorporate lime to at least 10 cm soil depth. At a depth of 5 cm the soil pH is usually increased by 0.3–0.8 of a unit in one growing season with 4 t/ha of lime and earthworms. This work has been done all over southern Australia, including Jennacubbine (NE of Northam) and Kojonup with Dr Bill Porter and Perry Dolling.

Many farmers in dry areas, of less than 375 mm rainfall, have been surprised to find lots of earthworm activity after only 1–2 years of no-till. The package of applied fertilisers, herbicides, no-till and stubble retention does wonders to earthworm activity – compared to the bash, burn, bury and abstain from pesticide approach. More northern farmers are seeing fantastic termite activity – do they do the same thing?

Are sheep really a part of IWM?

Some will consider me foolish to try and challenge the notion that sheep are a part of Integrated Weed Management (IWM). But I know many excellent farmers that tell me that it was not until they had had no sheep for 5–10 years, combined with sensibly hitting weeds from other different angles, that they were able to pull weed numbers down. I realise that sheep and 2,4-D are powerful tools on some tough weeds and that there are other sheep benefits. Sheep, however, stir up weeds that may otherwise remain inert.

Sheep make weed sanitation almost an impossibility. Fences, dams, verges, rock-heaps, yards, tree lines, lightly grazed paddocks and sheep-faeces all make it easy for weeds to re-invade paddocks. Or should I say fields? Note the Canadians took most of their fences out in the 1930's. Canadian farm borders have no fences, and their road verges get cut for hay and the weeds do not set seed.

Even wide rows are no problem with excellent weed control. This paddock has had no sheep for at least 3 years.

We must make more use of many other IWM techniques. Many farmers have not yet started to crop top (come to the Annual Conference and hear Peter Burgess talk on this). Many are learning, for the first time, the joys and sorrows of the powerful chaff collection systems. Some farmers have not yet explored the 'SpraySeed after seeding' trick. And many are relying too heavily on the miracle of no-till and trifluralin– which has a limited life!

Earthworms incorporate lime into soil.

Lupins:Canola:Wheat: Yes – if no sheep!

The above statement came from a conversation with a well-respected south coast farmer. When I asked him why, he said; "they loosen the already soft soil up more, they bash the stubble up and down, they make you compromise on the autumn spraying program and they spread weeds from one end of the farm to the other."

He added, "I wished I'd have got rid of them ages ago!"

"No thanks to sheep but our crop yields have doubled in the last 5 years and we now have no-erosion and heaps of management flexibility and no-till can be credited with much of this change."

…I'm sure if he knew I was writing this he would get me to tone it down, but I often hear farmers talking like this! However, I have seen other farmers get rid of sheep, not manage weeds well and put enormous herbicide-resistance pressure on all herbicides.

Barley for diversity and ryegrass suppression!

While it does not bring big dollar returns, barley has some advantages – particularly with managing resistance ryegrass. Barley also provides useful leaf disease diversity. Sowing barley after wheat can cause some pinning problems and stubble reduction may be needed for some when sowing into thick stubbles. Alternatively, the adoption of a residue manager that works on our narrow (220–300 mm) row spacings, and maybe trash tubes from Primary Sales (see opposite), or Pigs Tail from Weldalloy (07 3271 4630), will help with trash flow (see November 1998 *WANTFA newsletter*).

The new barley, Unicorn, has an impressive ability to mature quickly. Its weak straw strength also means that it must be swathed, and it can be done before ryegrass seed has set. I have heard of variable yield results. However, its tool as a resistance fighter is powerful. Other barleys do compete very well with ryegrass and swathing them will also be of significant benefit.

Moisture transfer from depth

While at a no-till meeting at Mullewa in August we had a most fascinating spontaneous discussion for an hour. The issue was "why, when dry no-tilling at 6 cm depth, with moisture at 10-12 cm depth, are the furrows and seed wet the next day - and without rain, and why the inter-row stays dry at the same depth?" Of the 90 farmers in the crowd, perhaps 30 had experienced this phenomenon. How strange! And yet, it's obviously widespread!

Is the reason for this possibly, as Paul Blackwell speculated on the day, "perhaps heat transferring from depth to the surface, draws water with it through a path of least resistance - which is the disturbed slots?" It would be useful to know the exact mechanisms involved, for we then could use this tool with confidence. If someone knows more about this, then Paul Blackwell or I would be pleased to hear from you.

We did not determine on which soil types this occurs, nor did we investigate humidities, soil temperate at depth and surface, or precise soil moisture at depth and surface. Although we do know it was during the early part of seeding, the soil temperatures are likely to have been warmer at depth. It was on soils with a fair amount of sand and loam and the reports are from a warmer part of the state. A great student project, I'd suggest!

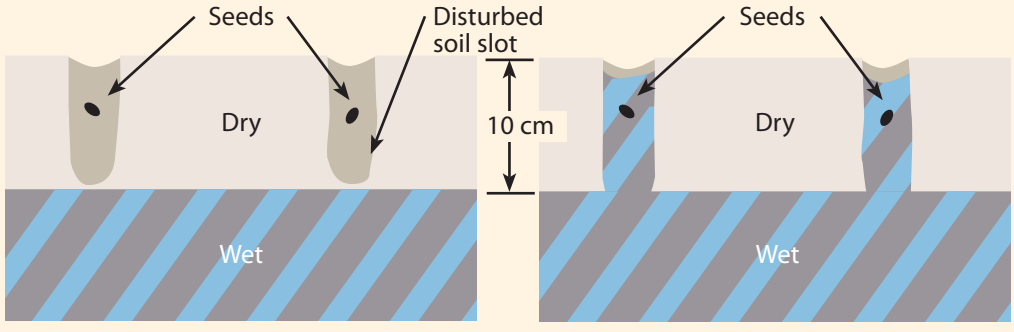
Soil loss in South Africa

Fellow no-till enthusiast friend from Primary Sales - Alan Fischer – sent me the adjacent photo of sad soil loss. This photo is a stark reminder of how terrible and permanent soil erosion is. Alan estimates that the soil lost from the base of the tree root would have to be near 40 cm depth. We too share in creating such disasters in our own patch.

Wheat after chickpeas – poor or good?

Both things have happened in the last few years. If you have had a poor wheat crop after chickpeas then perhaps you should send some soil off to AgWA's Entomolology Services or CSBP soil testing service (they are linked up with a SA laboratory) over the summer to have it tested for Root Lesion Nematode or *Pratylenchus*.

Pratylenchus is a tiny, yet aggressive, nematode or worm-like parasite, which loves chickpeas, wheat and medics. They eat other crops too (see Sharyn Taylor's report in the April 1998 *WANTFA newsletter*), and there have been only two main types that have grieved us in the past. But now four



WANTFA AGM
7.45 am
Tuesday 16th Feb
at Muresk Institute of Agriculture

Rhadopholus and another nematode (yet to be identified) have now been detected. We know little of these other parasitic nematodes and their host preferences.

Chickpeas on wide rows have less Ascochyta

While in Victoria in November a blind man could have seen the devastated chickpea crops. There is now lots of pressure on no-till and stubble retention farmers in Victoria (though there are not many) to burn and cultivate the residues to reduce the *Ascochyta rabiei*.

Above: 28 row spacing chickpeas without Ascochyta.
Left: 14 row spacing chickpeas with Ascochyta.

A discussion paper from the Birchip Cropping Group suggests that there needs to be "an extensive communications campaign to make everyone aware of the implications if people do not contribute [to burning and/or cultivating]". This is pretty heavy stuff, especially when the farmers who have retained more trash than others and have wide row spacings (28 inches) have little, if any, *Ascochyta*.

PRESIDENT'S REPORT

Geoffrey Marshall, Hyden (08) 9880 0018, fax 38

Harvest is in full swing at the moment but, by the time this reaches your mailbox, most will be completed. For grain growers harvest should be the most exciting time of the year. For many this is true, however frost has hit us, and many of you, hard. In a low commodity price period this will make financial management a real challenge in the short-term.

One of the joys of my role is that I continue to meet exciting people who extract the positive from negative situations. There is now the need to assess each paddock carefully, focusing on 1999, but still realising the impact of rotations on future seasons.

On a different issue: what's your opinion of the change to colour in the *Newsletter?* Please offer your opinion to Bill or the committee. The committee is receiving favourable feedback, however it has increased publication and printing costs, which will be passed on to you through increased annual subscription fees - now $75.

On the topic of colour, to have paddocks intentionally greening up as we approach summer is unusual. Congratulations to those people who have accepted this challenge of warm season crops that appear to be growing well, principally on stored moisture. Much more information will be available highlighting the potential of these crops by the end of summer.

Those considering these crops for next summer will need to set aside a suitable paddock situation. Many thanks to AgWA Albany, particularly Deborah O'Connell, for their combined effort with WANTFA to monitor three warm season crops in the Albany region.

At this stage there looks to be available a limited amount of a very exciting urea product. PCU (Plastic Coated Urea) is urea coated in a biodegradable polymer layer. This technology is new and as it develops will have huge potential for many applications to agriculture. The first shipment of 2.5% coated urea will also be available in bulka bags this April will allow farmers to test the potential of a slow release urea. If interested, please fill in the enclosed slip and post or fax it off.

Water repellence is a problem to an estimated 4 million hectares of WA soils. WANTFA is excited by the potential for claying – which includes cultivation! This January *Newsletter* has a claying focus, for summer is the time to do this work. Earlier this year WANTFA brought Clem Obst over from South Australia (thank you Clem) and he answered many questions from his 30 years of experience, during a series of field days.

Memberships are now due for 1999 and there is a renewal slip enclosed with this newsletter (Please note that 1999 membership can also be achieved through completing the Muresk Annual Conference application form). Please encourage non-members to join.

I look forward to seeing all of you at the February meetings (details inside). My best wishes to you all, and your families, for the festive season and for the coming year.

WANTFA 1999 ANNUAL CONFERENCE

John Duff, Conference Co-ordinator (08) 9386 4404,
fax 9386 4677, mobile 0417 183 330

"Heaps of Technology, thumbs up for the catering, cut out the waffle and no commercials!"

This statement crudely sums up the feedback we received on the '98 conference which we've used to design an even better event for February 1999. We read the feedback sheets and listened to comments made by anyone at the event (including the committee members and organisers) to guide us in designing the '99 Conference **(Muresk 15 & 16 February).**

As a result we are very excited about the program that we have lined up for you in '99. We've tripled the time that the Keynote speaker has with participants both in formal and informal sessions and we've arranged concurrent sessions on managing the no-tillage system, one for farmers who have been no-tilling for several years and another for those who have just changed to the system.

In addition to these advances there will be two one-day seminars at the further away venues of **Dongara (10th Feb) and Esperance (11–12th Feb)**. These days will include the visiting international speaker Dr Doug Derksen, Professor Steve Powles (UWA) and Allen and Yvonne Postlethwaite (St Arnaud, Victoria). We plan for these one-day seminars to be great value for those that can't make it to Muresk for the main two-day event. We do, however, recommend that people who are able to come to one of the one-day seminars, and Muresk as well, do so. In this way you can get much further into the important issues on weeds and resistance that will be debated.

When deciding on the theme for the conference, Vice President Neil Young said, "Controlling weeds in crops is costing us collectively millions of dollars every year. Herbicide resistance by weeds is looming as the challenge of the next decade for cropping farmers. Therefore it is critical that we now provide an opportunity to inform, discuss, analyse and debate the important issues related to weed ecology and resistance."

Geoffrey Marshall confirmed that, "The emphasis is to provide useable practical advice based on leading edge research that has been tested in the paddock. I am really looking forward to meeting many other members at the conference specifically designed for them."

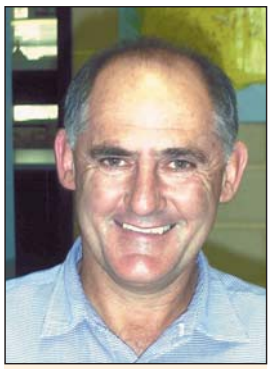
Keynote speaker, Dr Doug Derksen is a Research Scientist, based at the Research Station, Brandon, Manitoba, who specialises in the impact of agronomic practices on weed communities. Doug has worked on weed ecology in cropping systems since 1984. He has written over 100 articles and papers. He is currently managing a project on "Weed Management and Ecology in Conservation-Tillage Systems".

Left to right: Allen Postlethwaite, Yvonne Postlethwaite, Dave Minkey and Peter Burgess, all speakers at the Conference.

Bill Crabtree, who knows Doug personally, says, "Canadian farmers hold Doug in very high regard. In 1998, Dr Derksen was presented with the Manitoba North Dakota Zero Tillage Farmers Association Award for contributions made to integrated pest management in conservation tillage systems. I'm sure that Western Australians will also react very favourably to his message."

Bill will also be speaking on his very exciting Australia-wide GRDC trial results including plastic-coated urea and Agrotain® and herbicides with no-till.

Dr Derksen will attend both days of the conference. He will participate in a less formal discussion session after the BBQ dinner on the first day. Speakers will be joined by leading farmers in two concurrent sessions; one aimed at farmers who have been no-tilling for some time and the other for those new to no-tillage cropping. For farmers who have just changed over to no-tillage, this session will not only give you tips and advice unattainable elsewhere it will also give you a network of farmers and researchers interested in your enterprises that you can call on at a later date. Information sharing is what WANTFA is all about and is "an essential component of today's farming business".



Professor Stephen Powles.

Steve Powles the newly appointed Professor of Weed Science at the CRC for Weeds at UWA and leading researcher on herbicide resistance issues will compliment Dr Derksen's presentation. Professor Powles is a world authority on herbicide resistance who has excellent insights into southern Australian farming systems and is keen to "get out there" and speak to our members to further understand your farming systems. He was recently awarded a medal of excellence for his research into herbicide resistance at the World Weeds Conference in Florida in 1997.

Also speaking at the conference are Allen and Yvonne Postlethwaite who are leading no-tillage farmers from St Arnaud, Victoria. Allen will address the question "Fighting weeds no-till" This session is a 'must-hear' for all no-till farmers. The Postlethwaites were pioneers of no-till in Victoria and will be speaking from experience. They operate an all-crop farm.

Yvonne Postlethwaite will add to the weed debate when she talks on farming systems for sustainability. Yvonne's very business-like approach to farming is very stimulating. The Postlethwaite's change to conservation tillage systems allowed them to develop an economically sustainable family farm in the Victorian Wimmera that is now the subject of many visits by others. Yvonne and Allen are also looking forward to meeting you.

We are very pleased that BankWest Business, CSBP and Farm Weekly have again agreed to sponsor the conference. Crop Care are also key sponsors. This sponsorship is essential in order for the association to bring in for you international and national speakers whose outside views of our systems are so important in moving us forward in our endeavours to be more sustainable and profitable.

We will again erect the highly successful "CSBP marquee" for our industry suppliers to display their latest products for your information. Already Hardi Spray Equipment, Primary Sales, and Agmaster Harrington No-Till have booked sites. Only a few sites remain in the marquee that is the "eating and chin-wagging centre" of the conference.

Details of the event are included in the registration form and program in this edition of the newsletter. They will also be published in the Farm Weekly. The cost is $110 for WANTFA members and $195 for non-members (including a complimentary membership of WANTFA for 1999) for the two days. Lunch is provided on both days and a BBQ dinner on the first evening. Registration cost for the Dongara and Esperance events is $60 for members and $85 for non-members. Registrations received by the 3 February will attract a $10 discount.

Demand is expected to be high and therefore you are urged to register early. For registration inquiries phone Yvonne Powell on 08 9386 4404 or fax 08 9386 4677.

Low cost overnight accommodation will be available at Spring Hill Rural Retreat (about 1 km from Muresk) contact Joy and Barry Rose, Spencers Brook Road, Northam 08 9622 5568 for bookings. Muresk will make available "swag sites" serviced by showers nearby, etc. Motels and Hotels can be accessed by calling Don or Ann at the Northam Tourist Bureau on 08 9622 2100 who will obtain the best price available for you.

We would like you to consider staying close by so that you can join in the evening discussions, get a good night's sleep and be ready for the highly stimulating program on day two. We will put on a shuttle bus to the Spring Hill Retreat ~ 1 km from Muresk.

The conference commences at 9.50 am on the 15th February. Nametags will be available at 9 am and it is recommended that you arrive early to avoid the rush. You can contact my assistant Yvonne Powell or myself our Conference Registrar at 9386 4404. Or you can also talk to WANTFA Vice President Neil Young from Kojonup who is the Conference Director on 9821 0026 or fax 01.

RESISTANCE - IS IT HERE TO STAY?

John Matthews, University of Adelaide (08) 8303 7734
or fax 7979

Can you help? I am currently researching the management of herbicide resistance in annual ryegrass at the Roseworthy campus. I am investigating the regression, or loss of resistance, in some populations of ryegrass after several years of no herbicide treatment. I am a research fellow with the CRC for Weed Management and it is worth mentioning that I am not advocating that we stop being concerned with resistance management.

However, I am keen to hear from farmers who have stopped applying herbicides to resistant ryegrass for more than a couple of years. If this is you, then please give me a call. I am interested in all types of resistance and am keen to talk to anyone with paddocks of resistant ryegrass that have been continuously cropped but have not had herbicides applied.

NO-TILL AND SYSTEMS

Kevin Bligh, Committee-member. (08) 97557589, fax 90

No-till is a system, as people like WANTFA Foundation President Ray Harrington of Darkan – who probably has more rubber on the road than any other farmer, popularising no-till – have always said.

For years I have written about no-till systems as WANTFA Secretary for the first five years, without realising the full depth of what systems thinking meant. It just felt right! Now, systems thinking developed over the past century is, I believe, poised to contribute to our wider community living.

As farmers, we have always had to think of the big picture, in managing natural systems. Thinking systems prevents us thinking in isolated compartments, as though these compartments don't affect anything else.

Take the millennium bug, for example. The end of the century was thirty-something years away, when some programmers saved time and money by allowing only two digits for dates in the rapid expansion of computers in the 1960's.

The worrying thing now, according to Robert Theobald, widely considered one of the top ten futurists in the world, is that those who know the most about the millennium bug, are the most worried about its effects!

The millennium bug is considered likely to take one-and-a-half percentage points off growth. The worldwide cost is suggested to be some three trillion dollars. (Australia is thought to be about in the middle of the range of countries in preparedness for January 1, 2000.)

Was this really cost saving in the 1960s, or sweeping the problem under the carpet? Thinking in terms of systems, rather than the blinkered 1960's only, would have avoided the worst effects of the problem!

The big picture is considered as nested systems. And systems are affected by constant feedback of results so far. As farmers we naturally modify our management, depending on previous results, and get ideas for next year based on those results.

There is nothing very strange about such a common-sense approach, except that it has basically not been followed by many of society's institutions since about the Industrial Revolution!

Systems thinking is a very different way of thinking than following a set prescription or formula. Let's never forget that each paddock is a system in the larger farm system, and plan accordingly!

EARTHWORMS TO DO EVEN MORE!

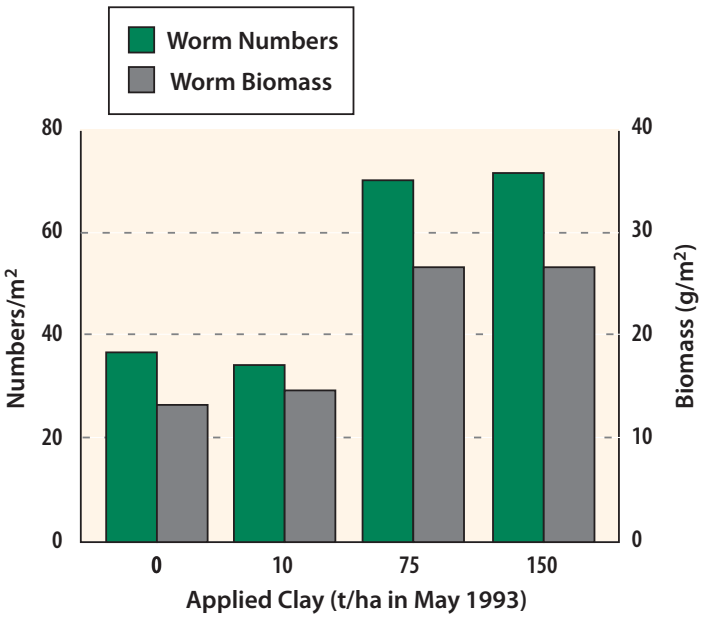
Edited by Bill Crabtree from Geoff Baker, CSIRO, Canberra, (02) 6246 4406

Five recently completed scientific papers by Geoff Baker, along with others, have demonstrated some great benefits from earthworms. Did you know that, as well as the worms opening up the soil and allowing lime to be washed in, the earthworms also mix and bury both organic and inorganic fertilisers? This can greatly increase plant uptake of fertilisers.

Geoff Baker has also published a fascinating and easy to read review called "The ecology, management, and benefits of earthworms in agricultural soils, with particular reference to southern Australia." (See details below.)

In some pot trials by Geoff, the incorporation benefits of earthworms have given an extra 35% wheat grain yield. Geoff refers to work by McCreedie and Parker in WA showing a 60% increase in grain yield. The addition of superphosphate, at rates used in WA, will increase earthworm numbers due to more plant growth and food created by the phosphorus addition. In one study, Curry and Baker showed that earthworms were able to excrete, or cast-deposit, half of their body weight each day over a 24-day period.

Earthworm numbers correlate with rainfall – more rain equals more worms! Likewise, the more no-till with stubble retention, the more earthworms! In an Australian survey, Baker showed permanent pastures averaged 141 versus 40 worms/m2 in the pasture:cereal rotation (where cultivation is involved). The same survey showed that soils with higher clay content generally have more worms.



Even Canadian No-Till farmers experience similar earthworm benefits to those of WA farmers.

On a claying trial in Clem Obst's area, Baker found twice the number of earthworms where the soil had been clayed (see graph).

Baker refers to some interesting work by Stevens et al (1995) which partly explains why *rhizoctonia* fades away with no-till and stubble retention systems. These workers showed less *rhizoctonia* damage with more earthworms. The worms eat the *rhizoctonia* fungi for lunch!

Choo and Baker (1998) also showed that some pesticides can knock earthworms around. They found endosulfan particularly hard on worms, while damage to worms from fenamiphos (nematicide) was hard to repeat in the field. They found methiocarb and ridomil had little effect on worms grown either in the glasshouse or the field.

The good news is that Baker found several types of introduced earthworms throughout our agricultural areas – they just need feeding (stubble) and looking after (legumes and no-till). However, Baker argues that in the wetter areas of the WA cropping zone, we would do well to introduce *Aporrectodea longa*. This worm is plentiful in Tasmania and has a terrific surface feeding ability.

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MURESK – SCHOLARSHIPS FOR 1999

Bill Crabtree, Scientific Officer,
p/f (08) 9622 3395 or crabtree@muresk.curtin.edu.au

The Minister for Primary Industries, Monty House, has kindly allocated $12,000 to WANTFA for Muresk students to research specific activities that are of benefit to WANTFA members. Three projects of $4,000 ($1,000 stipend and $3,000 research) will be offered to the three most appropriate candidates.

Muresk students are invited to submit an A4 page outlining which of the five topics below they wish to research and why. Submissions are due in the second week in February and students should also attach a CV. Please fax or email me your application.

The hypotheses that need testing are:

1. The marketing prospect for a commercial WA company to manufacture plastic coated urea for broadacre WA.
2. Residue managers need to be modified for WA conditions and are vital for sustainable no-till cropping.
3. Farmers and farming are more sustainable for adopting good no-tillage farming systems.
4. Nitrogen uptake and efficacy are improved with plastic coated urea, while leaching and seedling toxicity are reduced.
5. Any no-tillage issue that interests you and benefits WANTFA.

WIDE ROWS FOSTER TERMITES

Bernard Doube, CSIRO Scientist, Adelaide,
(08) 8303 8475, fax 550

While visiting Geraldton in August, Paul Blackwell took me to his long-term tillage comparison trial where large differences in termite activity have been observed. There were many more termites in the un-tilled soil compared to the cultivated or even the direct-drilled treatments. However, within these plots there were patches of soils which had not been cultivated and there termites were in abundance. These wide rows allowed the termite colonies to persist and be abundant. Only occasionally were we able to find colonies within the cultivated and direct-drill plots.

Termites are widespread and often abundant throughout the dryer (< 375 mm annually) regions of continental southern Australia. Some termites form branching tunnels and chambers immediately beneath the soil surface, have multiple queens per colony and feed upon surface and buried organic residues. These characteristics make them well suited to survival in agricultural soils where they might play an important role in the removal and mineralisation of surface organic residues.

Preliminary observations indicate that termites can be extremely abundant in undisturbed soil – perhaps thousands per square metre. The termite species observed produce ramifying galleries in surface soil and plant roots and fungal mats have been observed in abandoned galleries. Some abandoned galleries are backfilled with organic debris.

Studies by Perth CSIRO scientists at Moora have shown that nitrogen mineralised from plant tissue during summer could provide a substantial proportion of the nitrogen required for a following cereal crop. However, much of the mineralised nitrogen is lost through leaching into the groundwater. If this nitrogen could be bound in soil-organic complexes by the lining of termite galleries, then it could become available for release during the following growing season in synchrony with plant nutrient demands.

This suggests that increased row spacings may also increase termite numbers and so reduce nitrogen loss through leaching.

CLAYING WATER REPELLENT SOILS

Rob Hetherington and Dan Carter, AgWA, Albany,
(08) 9892 8444

Rob Hetherington

So you're thinking about spreading some clay subsoil on those non-wetting paddocks or blow-outs? Great idea! Here are some things to consider so you can get the best results and value for your money. First up, on which paddocks should you spread the clay?

Your better paddocks that are becoming non-wetting would produce the better return. Your worst paddocks or blow-out areas will need higher input cost on top of the claying (fertilisers and trace elements) to get them up to the return that you would get from your better paddocks. *(Editor: this is a different view to Clem Obst, who believes that healing small blow-out parts of a paddock has terrific management ramifications for the whole paddock.)*

The gains you make in production will help to fund the claying of those poorer paddocks later. This is not to say that treating blow-outs with clay is not worthwhile. They can be treated to stop wind erosion at any time and then brought back into production at a later date.

Finding suitable clays

The greatest cost in clay spreading is transportation. If you can find a suitable clay in the centre of the paddock you intend to treat, then that is the cheapest option. In large rectangular paddocks. the use of two pits, depending on their location, is cheaper than using one large pit. We have developed a spread-sheet to help you select the best options for pit locations. We can send you one – just give us a call.

Increasing the catchment on an existing dam in the paddock might be an option for a place to extract clay. Even building a dam and using the batter clay can be a good way of treating one large paddock, or, by locating a dam in the corner of four adjoining paddocks, you are treating and securing another water supply. But there are other considerations as well.

You will need to drill for a suitable clay near your desired clay spreading locations. The location of suitable clay will determine the location of a dam or catchment and/or pits. Sites with greater than one metre of overburden, or mostly gravel in the profile, are expensive to develop and should be avoided if possible. At promising sites, a texture and dispersion test should be done for clay quality.

Texturing requires a palmful of subsoil excluding stones, moistened with water and kneaded for 2 minutes to form a bolus that just fails to stick to your fingers. It is then made into a sausage and sheared ("ribboned") through the thumb and fore-finger. Minimum requirement is a 50 mm long ribbon. The longer the ribbon – the higher the clay content (refer to *Crop Check* soil field texture card).

Subsoils that pass the texture test should then be tested for dispersion. This requires two pieces of subsoil, the size of a thumb-nail, placed into a glass jar which is full of rain-water

and left for 24 hours. The more dispersive the subsoil, the greater the 'halo' around the collapsed pieces of subsoil. The more dispersive the better (see *Farmnotes* 57/90, 14/97).

Once these criteria have been met, the amount of subsoil at the site should be determined. The paddock size determines the pit size. Most claying machines and scrapers need at least 60 m of pit length to fill the bowl.

The drilling is done as you would a dam site, to be sure you have enough subsoil of a consistent nature and convince you that you won't get any unpleasant surprises such as sand seams and rock floaters when actually excavating the pit. For treating a paddock at 100 t/ha for a 100 ha paddock you will need a pit that is 60 m long by 30 m wide by 4 m deep, this equals 7,200 cubic m at 1.4 (bulk density clay) = 10,000 tonnes of subsoil.

Once you have found the suitable sites, now is the time to have the subsoil checked for the actual clay content to determine the actual rate at which it should be spread.

Most non-wetting sands have a clay content of between 0–1.5 %. Sands with a clay content of 4–5% do not usually show up as being non-wetting.

Our research has shown that 100 t/ha of clay subsoil, with an actual clay content of 30% gives the best yield results when compared to lower rates. This increases the initial clay content of the non-wetting topsoil sand to between 4–5% clay.

Subsoils with a clay content higher than 30% can be spread at lower rates. A 40% clay content from a subsoil would give the same clay at 83 t/ha. This can save carting and spreading costs. Reducing the cost by putting on lower amounts of subsoil will not give the same results. Do it right the first time!

Spreading Clay

Having the clay spread in summer through autumn is the most desired option. This allows the clay to weather, which helps break down the larger clay lumps. Stock trampling also aids in the breakdown.

Paddocks cropped the previous year or pasture paddocks with low dry matter levels provide the best surface for incorporating the clay. Large amounts of dry matter hinder the contact between the clay and non-wetting soil and slow the clay mixing process. This optimum timing is not always possible due the current small number of contractors.

Paddocks also need some preparing. Spreading clay after the season breaks, on green pasture makes incorporation difficult as the roots hold the soil together. When cultivated, the soil comes up like turf and can invert the clay.

Moisture content of the subsoil is also important. High moisture levels can mean the clay compacts in the spreading machine as it travels to the spreading point and makes it difficult to get out. Stock-piling clay could be an option, as it dries faster above the ground.

The spreading rate of the subsoil is determined by the clay content and should be verified on the ground with the use of catching trays. The fully loaded machine whether; scraper, Claymate® or landplaner should be run over the trays at a speed that will deliver the correct amount of clay for the size of the catching tray (eg 1 m2 tray = 10 kg, if rate is 100 t/ha). Once the required speed and settings to deliver the correct amount is achieved, assess the distance the fully loaded machine can go to empty its load. This then becomes the measure with periodic tests using a tray to see if things have changed.

The Claymate®, scraper and landplaner have all been used to spread clay and can all do the job. The Claymate® does process the clay into a fine consistency and gives an even spread which will make incorporation faster. The scraper has a larger capacity that can reduce costs but does have some trouble in spreading its load evenly. The fitting of control valves and bypass to the floor hydraulics has shown some good results in making a more even spread possible.

Incorporation

If the clay has been spread in the summer or early autumn, there is no need to rush and mix it into the soil, as weathering will help break down the large bits, and any summer rains will also help. Incorporation can be achieved with tines or rotary harrows. The clay only needs to be incorporated into the top 50 mm *(Editor: this is contrary to Clem Obst's view which is that "the clay must be incorporated to the full depth of the topsoil of 4–5" depth, otherwise there will be a yield penalty". Time will tell which is best.)*

We believe that 50% of the clay should be visible on the surface after incorporation. This will prevent wind erosion and will help with the wetting of the soil surface through dispersion and slaking. Clay that is completely buried will take longer to get wet and disperse into the soil. Clay spread late in the season, and close to or after the break, can be incorporated straight after spreading. Concentrated areas might need some extra treatment to thin them out as these can hinder plant growth through surface sealing.

Cropping the paddock for 2 years helps the incorporation and the use of covering harrows in those 2 years is recommended. Following the 2 years of cropping, the incorporation will be almost complete. The soil will have shown the reduction in water repellency, that would enable the soil to wet up and further incorporate the clay through dispersion.

The limiting factor in widespread adoption of claying is the availability of clay spreading machines – not the scepticism of farmers in the results.

Carry graders are commonly used for applying large amounts of clay.

A NEW FERTILISER FOR NO-TILL

Wayne Smith, Agronomy specialist, (08) 9842 1949, fax 64

Summit and CSBP have made a seeding fertiliser especially for no-till that I believe, for most no-till farmers, is the best seeding fertiliser to use for 1999. May I explain why I requested, a better no-till fertiliser from them…

Many years of frustration of advising clients how to fix up a deficient to marginal level of trace elements came to a head in August this year. As all farmers should know, trace elements are not to be ignored. The available levels must be, without doubt, high!

Marginal levels of trace elements (like copper, zinc and manganese) must be corrected immediately they are detected or you will lose many times the cost in lost yield and profit. It is not so bad to be marginal in phosphate, but not so for trace elements, especially in a high yield potential year.

Over the years I have advised clients to do all sorts of things to correct trace element deficiencies. These include using traditional products like Super Copper Zinc Moly, and Agras Copper Zinc Moly. We have also sprayed products like Coppox onto fertiliser and the soil, as well as spraying the leaves.

This year (1998), most clients used Agflow CuZnMo (CSBP) or products like DAPSCZ and Microrich (Summit). We all know these products only contain low levels of trace elements but combined with a full dose of trace elements used sometime in the last 10 years (and mixed into the soil), this should have been enough to avoid major trace element deficiencies. This is the situation of most farmers.

However, what traditionally worked does not now appear to be always valid. Traditional research said that 1–2 kg/ha of copper and zinc in many granules spread throughout the soil will last 10–20 years before reapplication is needed. I do not, however, see this working in the field.

An example: A farmer applied full trace elements (200 kg/ha of Super CZM) four years ago, scarified it in and then direct drilled using a full-cut. This year, he used about 80 kg/ha of DAPSCZ with knife-points and almost every wheat plant of Datatine (after canola) was still showing clear zinc deficient symptoms on the leaves, (No tissue test was done.)

Another example: A client has used 200 kg/ha of SuperCZM one year, then about 180 kg/ha of Agras #1 CZM the following year (4 years ago on all paddocks), and has since only used seeding fertilisers like DAPSZC and Microrich. He is still having trace element problems with zinc and copper. Tissue test levels are still only 2–3 ppm for copper and 15–18 ppm for zinc (in youngest emerged leaves).

There are still many more examples that confound old conventions. I am sure that nematodes are confusing things and may, in part, explain why the old research is not working in the field in a no-till system. It may not just be with no-till, but that is what most farmers in my region are using.

I recall a wheat crop that was in full-tillering and had, or was close to, covering the ground and looked very healthy. After inspection 3–4 weeks later, the crops were back in rows, many leaves were showing clear and severe zinc deficiency, and usually also manganese deficiency, and had gone backwards in growth. The roots also looked very much like they had a nematode problem.

I asked the clients to tissue test immediately, and then immediately spray with zinc and manganese (some clients just zinc and others just manganese) while waiting for the results (mainly to see if copper was also deficient). I also asked them to send off root samples to test for nematodes before spraying.

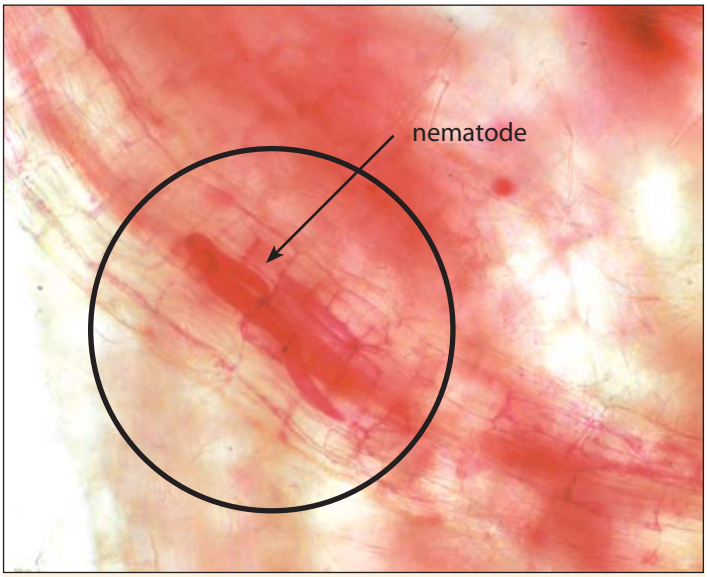
Leaves show zinc deficiency.

All crops responded very quickly to the trace element sprays, confirming to me that trace elements were indeed a problem. The most amazing thing was that the nematode results came back very high (90,000–120,000/g root), yet the trace element sprays had done a fantastic job in salvaging what crop remained. One paddock had lost many plants completely before spraying, but is now looking better than 3 t/ha.

Root lesion nematode damage at Circle Valley – the crop is severely thinned.

This is fantastic because it illustrates that as long as a plant is healthy and not deficient in anything, especially trace elements, it can tolerate extremely high nematode numbers. *(Editor: I intend to include a full story on the latest understanding of nematodes in WA agriculture in the next issue.)*

WANTFA's copper by zero-till and no-till trial at Newdegate Research Station. Done in conjunction with Ross Brennan (AgWA) and Frank Ripper (CSBP). See the results in the next newsletter.



Root lesion nematodes move in and out of the roots and along the roots throughout the season.

With this evidence, and considering that most clients had used a full dose of trace elements within the last 10 years, it was obvious that our levels of trace elements need to be much higher than we previously thought. This is especially so after canola and other nematode problem situations.

So I asked Summit and CSBP if they could make a better fertiliser for no-till and to include high levels of zinc and copper in each granule. It had to handle like Agras, be fully granulated (not blended) and contain about 10%N, 17%P, 10%S (sulphate sulphur) and about 1%Zn and 1%Cu. Summit made this exact formulation and using Optifert software, it is actually the cheapest product to use if you want ANY amount of copper and zinc. Plus it is ideal for a no-till situation. CSBP now also have a similar product for a similar cost.

I strongly disagree with arguments that such high levels of trace elements are not needed and that it will cause crop toxicity. I have eight years experience with no-till and know what should work with trace elements, but it is not working. Also, many farmers have used 2% copper on fertiliser and some eastern state farmers apparently use up to 5% zinc without any problems. I see far more crop toxicity problems with Agras type products (nitrogen poisoning).

Low levels of trace element fertilisers have not been working well enough and spraying every year is not wanted. Using the No-till fertiliser (Summit call it "No-till Special") supply's trace elements is cheaper than any other method and is available in an agronomically ideal form (in every granule and near the seed – ideal for a no-till seeding system). We can't fix a trace element problem any cheaper than by using this product.

I strongly disagree that we should be promoting mixing products like Super CZM into the soil. As cultivation for most paddocks is not an option – as erosion is never an option. Also, this would put back in all the weed seeds we have been trying to keep on the surface (which works even better with no sheep which push the seeds in, by the way!)

So be it if we still have to foliar spray after using a product like No-till Special. I believe that it is still the cheapest and best chance of avoiding a deficiency problem. Using a product like "No-till Special" will supply 3–4 granules every inch (in a 9–10" row spacing at about 100 kg/ha product), which should be good enough to be very close to every seed, and so you will have given the plant every opportunity to be high in zinc and copper.

I also point out that using a product with lower levels of trace elements is actually more expensive, which is a why I can't see a reason for using any other product in 1999. If you are growing a cereal after canola, I also think you really should be using this product as nematode numbers could be high after a canola crop, so you need your crop to be as healthy as possible. *(Editor: I smiled the last month when I heard on ABC radio an agronomist say that canola was a good break crop. It is not so; both for nematodes and, besides, every crop is a break crop for a different crop type.)*

I will be talking more about this at the Muresk WANTFA conference in February 1999, see you there!

CLAY SPREADING PAYS

Jennifer Trott, PISA Keith, SA (08) 8755 3166, fax 1686

Water repellence in the upper South East of SA is a major concern, affecting nearly half a million hectares. Water repellence is caused by hydrophobic organic materials from decomposing vegetation materials that coat the sand grains. Non-wetting sands are typically low productive soils which have non-uniform crop and pasture establishment and are prone to wind erosion. On these soils, with limited moisture, weed management is exacerbated.

Congratulations to Clem Obst (pictured right) on receiving the "CLIMA and Elders" (SA section) award of excellence for innovation in the production, processing and marketing of legumes, from the claying initiative. Well done!

Clay spreading and mixing into these sands ("claying") has been widely practiced since the early 1990's. Mr Clem Obst of Mundulla pioneered the practice of claying in the 1960's. The clay is sourced from depth and spread, is spread on the surface and is incorporated into the full topsoil. How this is done is dependant on machinery available.

The benefits of "claying"

Claying 'masks' the effect of the non-wetting sand which could be an indefinite cure of the water repellent soil problem. Claying is a sustainable practice with long-term benefits for several major land degradation issues. There are many advantages of claying.

Dryland salinity can be reduced by claying as it will reduce groundwater recharge and surface water flows. Claying allows the reliable establishment of deep rooted perennial pastures and it improves water use efficiency of crops and pastures. Claying at The Telopea Downs Agricultural and Landcare Group in Victoria have demonstrated these benefits.

This is what 200 t/ha of surface applied looks like.

Acidic soils can be improved by applying neutral to alkaline, sodic clays. It will increase the pH of the topsoil and provide a buffering against rapid pH changes. This will address acid-soil-problems of reduced plant productivity from aluminium toxicity, calcium and magnesium deficiency and limited molybdenum availability with poor rhizobium performance and survival.

Wind erosion is a major degradation issue which causes nutrient losses and a reduction in water use efficiency. Non wetting sands are prone to erosion due to a lack of surface cover as a result of poor crop and pasture establishment and growth.

Claying increases ***soil nutrition*** levels and the efficacy of fertiliser retention and plant uptake. The organic carbon levels of these soils are very low, as a result of poor plant growth and losses through wind erosion. Claying increases the soil's cation exchange capacity (CEC) and improves soil texture. Data from the Telopea Downs (Ag Bureau) shows CEC increasing from 2.9, 4.1, 6.5 to 10.1 meq/100 g soil when clay rates increase from 0, 100, 240 and 400 t/ha. Organic matter in the topsoil will increase over time due to better productivity.

Poor quality ***weeds*** frequently predominantly pastures on non-wetting soils. Claying ensures the soil is uniformly wet, which increases the effectiveness and efficiency of herbicides. The combination of increased fertility, improved soil pH, and an increase in soil moisture brings about a positive change in pasture botanical composition.

Stock health will also improve as a result of increases in pasture quality and quantity. The wool cut will be cleaner due to reduced grass seeds from weeds, with less contamination and, hence, increased wool income. Less grass seeds in the pasture allows for diversification into a prime lamb enterprise.

An old repellent sand dune that is now rejuvenated by clay.

Diversification of enterprises

Country that was once classed as non-arable is now arable – as a result of claying. The long-term effect of claying in the Upper South East of SA is increased profitability due to increased grain yields and higher stocking rates. Another spin off is the contribution to the local economy through the employment of contractors and the general increase in farm income and expenditure.

The excavation of dams for sourcing clay provides an opportunity for diversification into yabbie production. These dams also provide additional watering points for stock use.

The 'Do Nothing' scenario

A large proportion of pastures in our northern region have not been improved since the mid 1970's – following the decimation of lucerne. The establishment and persistence of improved pastures in non-wetting soils is limited, making financial returns on a stock enterprise marginal.

These factors have seen few inputs to this country. Fertiliser applications are limited and the paddocks are degrading (both in pasture content and fertility) which in the longer term is a serious land degradation issue.

Many farmers are in the situation where the land has been degraded to the point where financially the cost of renovating this country is prohibitive. Claying these repellent sands can make them sustainable, and it will improve farm income and diversification.

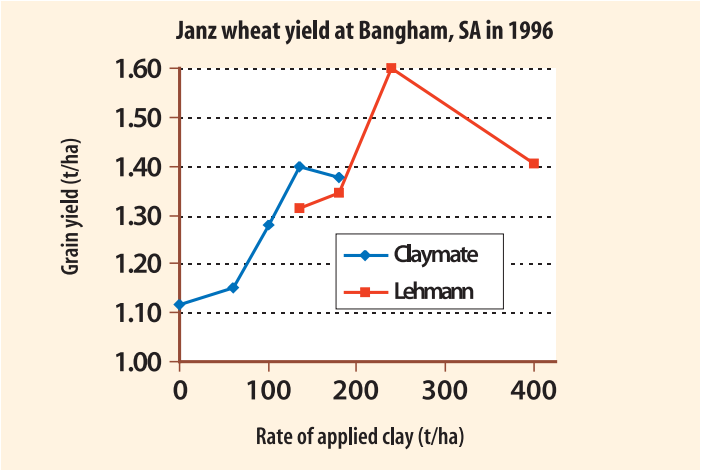
Economics of claying

The trial results (opposite) show an increasing benefit of applying clay on a deep sand hill to rates as high as 240 t/ha of clay. The marginally better result from the Claymate® is not significant, and is likely to persist for the first season only. The Claymate® is able to apply very low rates of clay and can break the clay down finely – but at some mechanical

expense. The Lehmann scraper, as with other scrapers, is unable to apply very low rates of clay.

Farmer trials, from Bordertown, have shown a doubling of barley yields from 1.4 to 2.7 t/ha by the application of 180 t/ha of clay. Farmers, including Clem Obst, have often more than doubled wheat yields in the first year of clay application. A number of trials have shown a tripling of pasture production by applying 100 t/ha of clay (from 1 to 3 t/ha) in the upper south east of SA.

A case study budget on a 40 ha paddock has shown that it takes 2–3 years to pay for the claying. Based on the cost of spreading clay being $250/ha (at 200 t/ha), incorporation being $37/ha and a rotation of barley:lupins:barley. *(Editor: Clem's recent thoughts were that it made good sense to apply clay to grazed lupin stubbles in early autumn. This was because the lupins fed the soil with nitrogen, their stubble could be broken down by sheep and would not cause blocking when the clay was being incorporated. This approach set the following wheat crop up for a good yield to help pay for the operation.)*



CLAYING DRIER AREAS

Peter King, Consultant, Adelaide, p/f (08) 8362 9953

Claying of non-wetting sands has taken off at a gallop on Eyre Peninsula (EP) in South Australia. This is despite little local research data to show that results from the south east of SA, which has higher rainfall, can be transferred to the lower rainfall area of new EP environment. Entrepreneurial zeal fired up the activity but there were some surprises in the difference in the two areas. Over all, the results are overwhelmingly in favour of the claying.

Several farmers and syndicates purchased scrapers and Claymates® and rapidly set about claying their farms. Farmers have been helped by interest rate subsidies applying on the Peninsula.

Clays on the EP contain lots of lime, often up to 35%. This has raised soil pH, often by 1–2 units, with the application of 250 t/ha of clay, which may include approximately 75 t/ha of lime. This has reduced the availability of copper, zinc, manganese and phosphorus. Some farmers have been aware of this potential problem and have applied nutrients to the topsoil before applying the clay.

Another effect is that soils may not grow lupins as well as they did before claying. Some of the clayed sands have lost

their ability to support lupins and farmers have changed to pea or vetch crops.

Having a loam over a sand, which is the result of claying, produces unusual effects. Water is drawn into the loam from the sand beneath because the suction forces are stronger in the loam (resulting from the smaller pores found in the clay). The water will not move easily from the topsoil to the sand beneath. The topsoil catches the rain and the lower horizons may be drier than usual.

Northern EP has about two-thirds of the rainfall of the south east of SA, approximately 325 mm versus 475 mm annually. Also, the EP is hotter and sunnier so the surface soil dries out faster than in the south east. In this drier environment, the light and infrequent rainfall tends to be trapped on the clayed surface where it is subjected to higher evaporation than in the south east. Instead of being funnelled by the repellent layers deeper into the subsoil, where it was previously safe from evaporation, it is more easily lost to the atmosphere.

This problem is best combated by incorporating the clay as deeply as possible in these dry areas. Incorporating the clay at 150 mm will develop a surface soil that will allow light rain to soak to this depth, without the texture change below being a problem.

Late in the first year after claying on the EP, strange patterns of healthy and dying plants developed towards maturity. This problem may be related to the large clods of clay that are yet to be broken down in the topsoil. Again, the clods can soak up water from sand lying horizontally to the clod. It seems that plants growing near large clods, but mainly in sand, may be deprived of moisture while the plant growing by or in the clod has a few extra days of moisture and consequently finishes better.

This has resulted in wheat not finishing evenly, with the 'dead plant-healthy plant' pattern being widespread across clayed areas. Yields may be lower on the clayed than unclayed areas in the first crop. This problem is expected to decline as the clods break down and are further incorporated through the soil.

On the EP some great advantages are already evident. Weeds like brome and silver grass germinate faster after light rainfall, at the season's break, making weed kill easier. Wind erosion is reduced enormously – maybe by as mush as 90%. This is a massive advantage. Crop losses to wind sweep, costs of reseeding and the like are reduced. Crops emerge after a light rain, instead of getting just a few plants up – now most emerge! It's like planting the crop a month or so earlier. There are big yield advantages on offer in an early district like the EP by getting the crop up evenly and early.

Over all, the EP has benefited from claying these non-wetting sands. It has improved the land asset and alleviated a severe form of land degradation – non-wetting sand!

FARMER SECTION

CLAYING FIXES REPELLENCE

Matthew Jones, Esperance, p/f (08) 9076 7057

We farm 2,500 ha, of which 50% is non-wetting, and another 10% is showing signs of becoming that way. The worst of the non-wetting soil has been in a lupin:barley rotation for seven years and the rest is in a lupin:wheat:barley rotation. We have no sheep and few fences.

We believe non-wetting soil is one of the biggest causes of yield reduction on our farm. It has reduced germination rates as low as 40% and made soil conditions very hostile for plant growth. Non-wetting soils' most damaging aspect is that the top 100 mm of soil stays dry nearly all year round limiting root growth and nutrient uptake, top growth and reducing the yield of all crops.

We started clay spreading two years ago using scrapers on some small blown-out areas. They were unable to spread the clay evenly or thinly enough, averaging 300 t/ha which we had difficulty incorporating. Looking back we made a few mistakes and could have done a better job.

Last year we purchased a Claymate® with two other farmers after seeing it at the Dowerin Field Days and a few on-farm trials. The ability of the Claymate® to pick up and

Lehmann scraper works well in the wet.

break up the clay into small pieces saves a lot of work before incorporation.

I believe this breaking up of the clay before incorporation is essential as it would take a long time to break down in the soil and reduce the effectiveness of the clay. The Claymate® is also very efficient at spreading the clay out evenly and does not require levelling at a later stage.

This year we spread clay over about 190 ha at rates of 36-60 t/ha. The majority of clay was spread at 60 t/ha, although we were aiming for 75 t/ha. We had some difficulty in accurately working out the rate until we weighed the Claymate®'s load.

The area spreads were completed in 240 hours. This was longer than it could have been due to the distance between pits and the area being covered (up to 1.5 km). To be efficient, cycle times should be no longer than 5 minutes and 3 minutes is probably optimal.

It is useful to know the percent clay in the "clay" being used, as it can vary from pit to pit and it can affect the rate to be applied. The closest clay you can find will nearly always be the best. The more pits you have, the more efficiently you can spread the clay. The best clay is the most dispersive – it goes milky in water. But any clay is better than no clay!

This year we have sold the Claymate® due to its small size in comparison to our tractor (330 hp). Also our pits are too far apart for the Claymate® to efficiently cover the areas we have to spread.

We have now purchased a Lehmann scraper for many reasons including: it is a multi-purpose machine, holds the most clay of all the machines available (16.5 yards), breaks the clay up reasonably well and is better matched to our tractor.

Our clays are very hard to rip and break up which may mean that, with the Lehmann scraper, we may need to tow some railway line over the spread clay to break it up enough before incorporation. This was not needed with the Claymate®.

We have found that clay incorporation is best done when dry, although we did most of ours in misty rain and it has worked well. We used a fifty foot fusion bar on 150 mm spacings with Woolford prickle harrows at 100 mm deep. This worked reasonably well although a two-way disc would be better to work the clay in deeper.

Incorporating the clay.

We still have a lot to learn about what type and how much incorporation is necessary for the best results in our environment. The result of our clay spreading has varied with the rates we have applied. The lighter rates have only done a 50% job whereas the heavier rates have reduced non-wetting by up to 95%.

With the higher rates, the soil has stayed moist right throughout the profile all season and the topsoil has changed colour. We think that higher rates, of up to 150 t/ha, would be more desirable, although rates will depend on severity and depth of the non-wetting soil. More trials need to be done on rates as well as incorporation, although a general rule would be: the more clay you apply, the deeper you will need to incorporate it.

There are a number of different clay spreading machines on the market and they all have their pros and cons. The one that suits you will depend on the area to be covered, whether a farmer or contractor, the rate you wish to apply, the type of clay available and your tractor's horsepower.

This year we ploughed in couch grass with a two-way disc to a depth of 150 mm and have had a reduction in the effect of non-wetting which greatly improved germination. I believe this is a short-term solution that will not produce the increase yields that clay spreading will.

THE END OF WIND EROSION!

Colin Pither and Brad Smallwood, (08) 9828 7030, fax 32

Our farm is south-east of Ongerup, farming mainly light sandy duplex mallee soils. These soils are extremely fragile and susceptible to both wind and water erosion. Strong winds are constant along the south coast and falls of 150 mm in a 24-hour period have been recorded.

No-till on the South Coast really has put an end to wind erosion. Tillage reduction started in the late 70's when SpraySeed appeared as an option. That was direct drilling with a MF 80 Combine with standard points and you had to keep your head down or a rock would come past your ear and break the front windscreen of the tractor!

Since then the progression has been complex, as below:

- 1980–82: MF 80 Combine standard points
- 1983–93: A six Row Shearer combine with knife-points
- 1987–92: A 753 Chamberlain combine with super seeder points

- 1991 onwards: A 753 Chamberlain combine, super seeder points in front, double disc openers (Acra Plant) with which to seed
- 1992–98: Double disc openers on Morris chisel plough frame with a trailing air seeder
- 1993–97: Scarifier (Chamberlain Terramaster) with Harrington knife points, with a trailing air seeder
- 1998 onwards: DBS AusPlow bar with air seeder.

I now pass you over to Brad to fill you in on our most recent experiences…

For the seeding of 1998 I was working for Colin and Fiona Pither at Oakdale farms. Colin had purchased an Ausplow DBS bar for a one pass operation that was 36' wide and was to be pulled by a 8400 John Deere tractor. The box to be used was a 4 tonne trailing Simplicity.

Having used an earlier model DBS bar two years ago at Wayne Davis' property, I was already confident Colin had made the right decision but this was made even more evident within the first week of seeding.

To me, the bar offers all the things that are needed. Seed depth control, contrary to what had been said, was, in my opinion, as close to perfect as you would want. If you want to seed at 1 cm or 6 cm, in any soil type, then this machine can do it! Fertiliser was put through the profile of the soil by cutting the outlet poly pipe on an angle. We found the ideal angle was to cut from the top bolt on the knife-point to the bottom bolt. By cutting the pipe on the angle the fertiliser is released on top and it also goes to the bottom of the slot.

Changing seed placement depth was done by a simple one minute method of one bolt on the closing tool. This is slightly easier than the pin system on the earlier model and it is also stronger. The press wheels on earlier models had a tendency to roll off while turning sharply and the later model probably would as well. We found that we were much better off by lifting the machine, as we had 22 m of width for the headlands anyway. Parallelograms aren't meant to go sideways, and lifting it reduces the stress on the modules. Press wheel down pressure has three settings (with another 5-minute job to change the whole bar) and we used the lightest setting all this year, as seeding conditions were ideal.

The problems we had with the bar were minimal and one of these was our own fault. As we did not want to pull out too many rocks, we started with virtually no tine breakout pressure, which was causing them to come back at a huge rate and snap the springs on the tine down pressure. Once we increased breakout we had no more damage.

The only other thing to go wrong was two closing tools snapped (not bad for a 3,000 ha program). The knife-points are extremely strong and we only used two sets for the entire program and that was with the points at 4–6 inches deep. Maintenance is minimal. We greased the tines three times a year, start, middle and end of seeding. Check the modules every few hours or so – basic common sense applies.

We did have trouble going through high cut and wet 3–4 t/ha stubbles. Next year Colin plans to either mulch or swath the straw. Another option is to maybe cut a lot lower with the header.

The DBS is a basic easy-to-use machine that suits Colin's program but may not be for everyone. Very noticeable is the non-existence of wind or water erosion which has been a problem on this farm before no-till started. The DBS, along with the ConservaPak are, in my opinion, great machines in a one-pass operation.

NO-TILL IN THE FAR NORTH

Fleur Porter, Ajana (08) 9936 1110, fax 021

Fleur Porter

We have a property on the Murchison River in the Northern Agricultural region. It is one of the last farms before the station country begins, with a yearly average rainfall of 308 mm. After 88 years of sheep on the property, the last few will be gone by the end of 1998. I currently farm with my father (Thanks to Bob (dad) for all the information which is the basis for this article) who grew up on this farm and is currently harvesting his 42nd consecutive crop. I barely fit into the novice category of farming, but I also grew up on the farm. After a few years of high school and then University, I have been home on the farm (yeehah!) for two years and I'm actually really loving it.

I did an Environmental Science degree with majors in marine biology and human geography, which may seem fairly removed from farming, but gave me a good background in resource management and was definitely a great learning experience. Farming to me is an ever-changing business and sustainable land management is the most essential part of that. My misconception in my younger years was that it was always the same and I didn't really want to get into it.

The contribution that no-till is making to soil health, along with a variety of other management techniques, has made the goal of sustainable agriculture a lot more achievable and made me keen to become more involved with the farm (of course, Dad is still the boss!).

What we did in 1998

This season we cropped 3,760 hectares, with another 3,000 ha share-farmed on an 80:20 basis. The fact that we use a no-till system makes this achievable with only two people, one rig and a six-wheeler truck. Dad and I put the entire crop in, from the 20th of April until the 15th of June, with a 50 foot Flexicoil 820 bar. We used a double shoot bin which deep bands half the fertiliser and places the rest with the seed, in the furrows made by DBS points. We usually start seeding dry and sow the canola, then lupins, then wheat, in a wheat:canola:wheat:lupins rotation (50% wheat, 25% canola, 25% lupins).

We used 80 kg/ha of DAPZ on the canola with Impact in furrow (although Bob would rather use Summit Cereal on the canola as it contain more N, but at this stage Summit will only coat Impact on DAPZ). Later the canola was top-dressed with 50 kg/ha of Urea. The lupins were sown with 50 kg/ha of

Summit Legume and the wheat with 120 kg/ha of Summit Cereal. This provides the wheat with about 20 kg/ha of N and enough phosphorus, sulfur and some trace elements. The wheat was later top dressed with 40-50 kg/ha of Urea.

To date, we have not been able to positively identify N toxicity in the 300 mm furrows in any crop, however the prospect is a worry when using 120 kg/ha Cereal and that is why we attempt to separate half the fertiliser. Experience has shown that deep banding is not efficient and shows some N deficiency. Extra N is needed with no-till and good tillering plants give higher yields for us on 300 mm rows. A poorly tillered crop of a variety such as Wilgoyne will produce 1 t/ha whilst a well tillered, properly fertilised crop of say, Perenjori, on 300 mm rows can yield 3 t/ha.

This year (1998), our lupins averaged 1.6 t/ha, the canola 750 kg/ha with 44% oil and the wheat over 2 t/ha so far. In the good rotations and after lupins we did yield 3 t/ha with wheat, but the averages are brought down by poorer cropping systems (wheat on wheat) and competition from brome grass. Brome is a big problem in northern areas and it must be controlled properly by good rotations, once this is achieved crops can go in regardless of late starts and so on.

We have a spraying contractor to spray the pre-emergence chemicals such as Simazine and Atrazine so that we can have a total commitment to putting the seed and the fertiliser in the ground . Bob believes in not being overcapitalised with machinery, but having good gear that is maintained well. We can still manage to get all the crop off with one 36-foot harvester and a chaser bin driver (two in the big paddocks). We only work during the day, and generally we can get 100 ha of seeding and 80-100 ha of harvesting done each day.

Bob admits that after 42 consecutive seasons he has still not yet got it perfect but is looking forward to the day (as I'm sure everyone is).

Controlled Traffic

For the last three years we have been collaborating with Paul Blackwell from Agriculture WA and doing some work on controlled traffic in one 250 ha paddock. The view is that no-till and controlled traffic can complement each other very well, and when you are trying to reduce the impact on your soil and maintain soil health, then driving all over it all the time is self-defeating. Controlled traffic will make cropping easier and reduce costs by reducing overlap as well as increasing returns through improved soil structure, and reducing crop loss from damage caused by the variety of wheels that drive over it after emergence.

Next year we are moving to controlled traffic for all our pre-harvest traffic (as yet it is too complicated to match up harvester tracks as well). We will have a 60-foot seeding rig and a 120-ft boomspray. To mark out the paddock we'll take out one tine behind the right-hand tractor track and leave one 600 mm permanent track. All machinery will travel clockwise and have permanent starting points in all paddocks. The boomspray will then travel on every second track left around the paddock.

By lowering some of the contour banks with the grader, removing some fences (possible now that the sheep are gone) and seeding across unnecessary tracks, the paddocks have been increased in size, with the largest paddock 400 ha (the chaser bin drivers nightmare!). All 'straggler' trees and rock heaps are removed to make life easier.

Ongoing work should be able to produce some results on the effect of controlled traffic on the property in the seasons to come.

Reducing Inputs

I would like to see a reduction in the amount of inputs that is needed on the farm, especially in terms of chemical fertiliser and pesticides. No-till addresses issues of soil structure but it still doesn't seem reasonable to be importing so much into the farm, and putting so many chemicals on our crops and therefore into our systems. I am interested in organic farming, but it has had a previous reliance on tillage for weed control especially, so I think the ultimate system lies somewhere between no-till and organic farming. *(Editor: I agree; it would be great to be able to farm organically with no-tillage. This view is also held by our Keynote speaker, Dr Doug Derksen for the February Annual WANTFA Seminar.).*

I went on the WANTFA tour of the US and Canada earlier this year and saw a lot of interesting stuff, especially where increased rotations can out-compete weeds, as can reducing row spacing and other mechanisms. My desire is not to appear uninformed which is why I don't propose to have any means of achieving a balance between these systems as yet because I haven't done an adequate amount of research. As well as this, I am currently learning so much about our existing farming system and this system is the one that my Dad understands and therefore is the best at teaching. The most exciting thing is that farming is still evolving and there is great potential for what more we can achieve in the future.

Harvesting patriotically! Garth Butcher's place, near Isabella, Manitoba, Canada.

COMMANDER S

The only weed control partner you need!

COMMANDER S TANK TRAILER

- Trailer suspension made for Australian conditions
- 5000 litre tank capacity

COMMANDER S FORCE BOOM

- Ability to cover large acreages with a 33 metre width

SUSPENSION SPECIFICATIONS

Application

Large single wheeled trailers minimise rolling friction and crop damage when turning and are particularly effective in sandy loam or rough terrain. Suspension improves trailer and boom stability and extends component life.

Construction

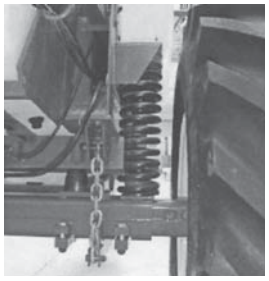
The new suspension is built from high quality steel including DOMEX® high tensile steel in key componentry. DOMEX® is a purer quality steel with a lower sulphur content to reduce slag grains, which can cause material defects. The resultant multi-directional bending properties decrease the chance of crack propagation. This gives higher strength, greater durability with lighter material.

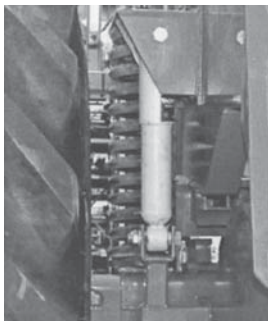
Design

The design was jointly developed by HARDI Australian and Danish engineers.

The Commander S suspension utilises rigid trailing arms and heavy duty coil springs with forward mounted dampeners to facilitate high speed towing over rough paddocks.

The wheel track is adjustable; the minimum distance measured from the inside of one tyre to the inside of the other is 1575 mm.





COMMANDER S FORCE BOOM

Application

This 33 metre (110 ft) boom is designed for heavy duty, high speed large broadacre application where reliability, accuracy and operator convenience are paramount.

Construction

Three-dimensional triangulated structure fabricated from large box section steel including 100 mm RHS in the centre frame. The pivoting point between the intermediate boom sections and outer boom sections are mechanically locked in the spraying position. This prevents horizontal movements between the individual boom sections, resulting in increased spray quality. Boom break-away section has a clawclutch with adjustable spring tension. The breakaway section can pivot backwards and forwards. The section can be adjusted to obtain a straight and horizontal boom.

Suspension / Self-Levelling

Trapeze suspension utilises dual coil springs with multi-directional dampeners. Combined with four adjustable self-centring link arms, this provides smooth self-levering ride to maintain accuracy and shockload absorption to minimise fatigue.

Boom Height Adjustment

The torsion stable HARDI PARALIFT mechanism for adjusting the boom height guarantees stability and smooth ride. The long distance between the parallelogram and the pivot point of the hydraulic rams allows a very large height range, and a smooth quick action. The hydraulic ram lifts the boom instead of pushing it up.

Electro-Hydraulic Operation

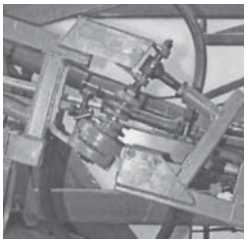
Flick-of-the-switch operation from the cab of boom height, simultaneous inner wing folding, simultaneous outer wing folding, slanting of the whole boom, individual left and right boom tilt from the horizontal up to 18˚.

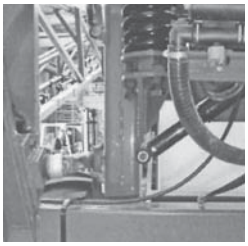
Nozzles

The boom comes with HARDI Snap-Fit Triplet nozzle holders with incorporated non-drip diaphragm check valves. This is compatible with HARDI's full nozzle range including ISO, Injet and Low Drift.

Foam Marker

The Elite II double sided foam marker system, with high visibility yellow droppers, has increased capacity from a 140 litre tank to minimise downtime.





HARDI SPRAYING EQUIPMENT

Ph: 9470 2778
Fx: 9470 2805
Email: hardi@omen.net.au