Newsletter of
WANTFA
Western Australian No.Tillage Farmers Association (Inc)

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GRDC

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JULY 1998 *"Sustainable high production agriculture - now!"* Vol 6 No. 3 pp 176-195

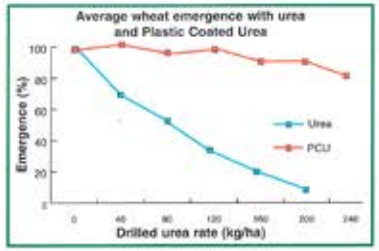
A tip for failed lupins or Karoo

Any paddock that does not get sown to a winter crop, or fails due to insects or waterlogging, or some other reason, must be contributing to salinity! Why not be creative - and plant a summer crop in September in these patches. It may just be in a seep, a valley floor, or even on a blown-out hill top. Failed TT canola's or lupins make a perfect site, as the warm season generally are very happy with Simazine or Atrazine.

You will get encouragement to do this as you read Tony Seymour's and Peter Norris's February WANTFA Annual Seminar talks printed in this issue. Both researchers found that with virtually no summer rainfall, and very little spring rainfall in very dry areas of the state, that it was possible to grow profitable summer crops on wide row spacings.

If we want to slow or stop the very threatening salinity battle that we have on our hands, then this is a cheap and practical option, and who knows how powerful it will be? (See Kevin Bligh's story in this issue). Think of the extra stock feed and the impact that this will have on the ryegrass population, which is often worse is wet, low-lying areas, where there is greater frequency of resistance genes.

Neil Young inspects the Victorian Postlethwaite's sorghum crop in February. It went 1.6 t/ha, after relatively little winter-spring-summer rainfall.



Plastic coated urea looks exciting!

Seven trials statewide are showing some exciting results (see below). Agrotain has also decreased urea toxicity when drilled with the seed. These sites are available for you to view at your leisure. At each site there is a trial layout inside a poly tube for you to walk up and down the plots.

Many of the sites will be used at various field days this year. Feel free to get a group together and I will happily give you a guided tour of the desired sites. The site at Maisey's is south of Dowerin ~12 kms and will be open to viewing at the Dowerin field days (25-27th Aug) - ask Tony White or Paul Maisey at the WANTFA stand for more details. The Avondale site will be viewed during their field day (22nd Sep).

Urea damage on wheat seeds and seedlings

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

GRDC

Grains Research & Development Corporation

The trials are located at the following farms: Parker's from north of Northampton, Maisey's from SE of Dowerin, Gibson's from south of Kelleberin, Marshall's from east of Hyden, Keding's from Gairdner and at the Avondale Research Station, Beverley.

WA Farmland on the move in May 1998 - is it yours?

Remove excess water!

Water lying in large puddles, throughout a paddock, is costing you yield and contributing to salinity. Especially if it stays there for more than a week. Young crops may be able to tolerate short waterlogging periods, but several days of waterlogging will greatly reduce yield, once the soil oxygen level drops.

WANTFA committee member, and farmer, Jim Baily from Wellstead (Ph 9847 1036) has made a neat machine that easily and cheaply helps solve this problem. A spinning disc, with blades on the end, is fitted to a PTO and it throws a small amount of soil a long way. The spinning disc creates a shallow trough, without edges which allows the water to flow freely into it, which then can drain across the paddock to a desirable outlet.

A shallow drain made by a spinning disc

Jim Baily's spinning disc

Wind erosion Statewide in 1998

If you were flying a plane over the northern agricultural areas on May 25th you would have noticed more soil in the air than even occurred during cyclone Alby 20 years ago. This is what a pilot told me who flew his plane on both days over the same area. He told me that dust made it hard to see the wing-tips of his light plane from 0 to 8,500 feet.

I can't help but ask myself "Can we afford this loss?" Much of the erosion, as I understand it, was due to massive stubble burning which was done to manage herbicide resistant weeds and ensure seeders don't get blocked.

The burning stripped the land of protective cover. While integrated weed managers will say burning is an essential tool, they must also agree that soil loss is not replacable. How many events like this can we afford - 10 or 100? How deep is our soil? How much did we lose? Indiscriminate or widespread burning is just not very clever! Continued soil loss frequently is followed by mass poverty (See Canadian farmer Bob McNabb's full story in this issue).

I realise the problem is complex and we need some creative farmers and agriculturalists to help solve the problem. Catching weed seeds will obviously help (see Danny Roberts story in this issue). Grinding weed seeds is being done in parts of Canada, then spreading them back over the paddock would return nutrients to the paddock. Channeling weed seeds, in canola crops, into narrow rows and burning the rows seems to be erosion-safe. The new short season barley and swathing are powerful tools to fight weeds.

Wider rows, with low soil throw, will have positive impacts on weeds and will ensure easier stubble handling. You could say that narrow seeding rows (7 inches) causes wind erosion with multiple cropping, if the stubble ends up getting burnt to ensure trash flow. Growing summer crops on 1.0 m row spacings with plenty of surface stubble will confuse ryegrass, although September germintions of ryegrass, on the south coast, can complicate this nice idea.

Min-till is confusing - can we drop it?

Minimum tillage is a most confusing term? Some people think that min-till is seeding with inverted T or knife points, and it obviously is not. Narrow points (<50 mm) have always been no-till. Many speakers compound the confusion by not conforming to the commonly understood terminology. This inconsistancy makes for confusing interpretation of data.

In 1985, while I was working for AgWA on a "Minimum Tillage for Erosion Prone Sandplain Soils" through a Landcare Project at Jerramungup, minimum tillage meant one working then seeding. It is still commonly understood to be the same now - all across Australia. Worldwide scientific literature uses no-till seeding as seeding without full cultivation. That is why WANTFA adopted no-till.

At dozens of seminars over the last year, farmers have always agreed with the WANTFA definitions, as presented in the February 1998 newsletter. Encouragingly, over east, and in North America, there has been widespread agreement with the usefulness of the terms that we have adopted.

Stubble must be managed soon!

In 4 months time, stubble will need to be either removed, modified or left alone (if you have a disc seeder). My preference is for the latter two, for many reasons. Choppers, spreaders and second cutter bars will all improve trash flow. Which harvester and seeder you own will affect your choice.

Headers that already chop the straw up could be fitted with full-width spreaders, like the Kirby Straw Spreader (see advertisement in this issue). Those without choppers inside the header would do well to purchase the Redekop chopper and spreader (see advertisement in this issue).

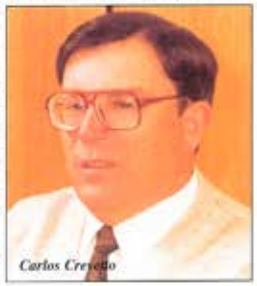
You could always make you own!

A home-made spreader that is completely adjustable

"Stubble over the soil"

An exciting book has just been translated from Spanish to English called "stubble over the soil". At about $80, it would want to be good. And it is! Perhaps the most powerful book yet written on no-till farming systems. The author; Carlos Crevetto Lamarca from Chile, has learnt no-till the hard way, like many, and his 240-page book is full of excellent photos and good science, which is a bit heavy at times.

Carlos is openly excited about the positive impact no-till can have on preserving the earth's soil and making high yield agriculture a sustainable reality. You only need see his dramatic photos of soil loss from his farm before he adopted no-till, to make you want to listen to his story and insights. Carlos makes many fascinating comments, including: "stubble is to the soil what grain is to man". The sub-heading of the book is "The vital role of plant residue in soil management to improve soil quality".



Carlos Crevetto

The book is published by the American Society of Agronomy, 677 South Segoe Rd, Madison, WI 53711 USA. It can also be purchased from a Victorian bookshop that specialises in agricultural books, called "THE RURAL STORE" at Kilmore West, on phone (03) 5782 1118 or fax 5782 2283.

Thank You

1. GRDC for funding a large range of WANTFA trials in 1998,
2. Muresk for continued support of WANTFA,
3. Fernz Agrow for sponsoring our urea additives trials,
4. Kwinana Fertilisers and Packaging for providing us with technical assistance by Russell Alexander (Thanks Russell - good job!),
5. Griff Griffith of Plant Polymer for flying in 850 kg of plastic coated urea from North America,
6. CSBP and SBS Rural IAMA for trial cooperation,
7. UWA for technical input into copper trials (Zed Rengel and Lorainne Osborne),
8. Agriculture WA staff for their research partnership (Ross Brennan, Paul Carmody, Ross Ramm, Peter Jenkin, Dave Minkey, Tim Wiley, Andrea Hills),
9. Community Landcare Officers (Rebecca Carter, Carole Daniel),
10. PLANFARM consultants for help with trials and field days (Caroline Peek and Neil Mortimer),
11. Consultants who wrote articles for WANTFA (Wayne Smith, Geoff Fosbery, and agronomists Graham Laslett, Tony Seymour and Peter Norris),
12. Farmers who made their farms available, and helped seed WANTFA trials.

Mice are a challenge for no-till

In the Jerramungup region this year mice were a problem at seeding and, it is said more so with no-till farmers. All the publicity over the Geraldton mice problem last year must make you want to get out the matches and plow. Alan Postlethwaite told me that publicity about no-till, stubble and mice, during their recent protracted plagues in Victoria, put no-till and stubble retention back about 5 years! Yet, Alan is confident that food, and not the stubble, was what drove the plague.

"if you fail to plan, you plan to fail"
"you can not manage what you do not monitor"
"people who neglect the land destroy themselves"

There is no doubt that people have observed mice to be bad in stubble retained no-till paddocks. But Caroline Peek, consultant from Geraldton says that she has seen cases where stubble removal and ploughing has not had much effect on mice damage. Obviously effective seed removal at harvest is a most powerful tool, especially if you have few sheep. Swathing crops and collecting weed and crop seeds are a powerful tool against mice - and herbicide resistance.

A friend tells me that mice were real bad in Wongan Hills in the early 1970's and he says "they sure weren't no-tilling then!"

TOPICAL SECTION

CHAIRS CORNER

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

Welcome to all members and also to any non-members who may have the pleasure of reading this newsletter. Special thoughts go out to those farmers who have had a late and very difficult start to the season, especially when some areas have had a wonderful early break - the contrasts are stark!

Generally the no-tillers have again found establishing crops early and in difficult conditions, far superior to conventional systems. There is always the luck of rainfall at the start of the season, but remove this factor and coupled with good management, the no-till type of crop establishment offers reliable early options for crop establishment, even with limited moisture.

For many there have been two major wind events, many farmers, including myself, had some with bare and exposed surfaces which suffered substantial soil loss creating uncertainty about the present crops potential. For no-till paddocks the risk is very small. We have experienced a very mild and gentle wind period through April and into May and the recent events are a real reminder of how harsh wind and rain can be to worked and burnt paddocks. Crop residues retained on the soil surface, combined with well thought out rotations, have once more proved to be great insulators - the dual effect of protecting the soil surface and substantially reducing evaporation of limited moisture.

There are many exciting things happening to WANTFA as an organisation and to the no-till scene. Your committee had a productive meeting on 22nd June at the Grain Pool in Perth. I am greatly impressed with the dedication and intelligence of the committee that I am working with. Some of the issues dealt with that you might want to know, follow.

We have kindly received, from GRDC, a trials grant of $50,000. The main focus for our research is on weed control in no-till systems, which is being conducted through Lamond and Burgess and Associates, and reducing fertiliser toxicity with plastic coated urea and Agrotain. Please take the time to see a trial if one is near you. A minor aspect of this research money, for this year, will be on warm season crops.

A National No-Till/Conservation Farming Group has now been formed, called ASF for Australian Sustainable Farmers. This group will share knowledge and speakers and provide encouragement to each group. It will also help develop a common understanding between the States and co-operation with issues of mutual interest.

The Salinity Council and the Salinity Action Plan are important issue for WANTFA. Rising water tables and the salinity debate, are uncovering a lot of common ground and quite naturally bringing our two groups together in recent months for very healthy discussions on joint approaches to a state-wide problem. Warm season crops are likely to form part of this, with a lot of work to be done to demonstrate their potential in our environment.

The North American Study Tour is being organised by Bill and Monique plus Wayne Smith from Albany from mid-August until early-September. These three have worked hard to make this an exciting tour. Vivienne and I are really look forward to sharing with the 43 other people from all over the State. The experiences and fun of the three weeks we will spend together. The value to WANTFA and the potential impact in general, to our state's agriculture, from a group of this size could be large indeed. The experience and local knowledge of Bill, Monique and Wayne will he invaluable.

A Business Plan is being worked on, thanks to consultant John Duff who assisted in gaining funding from RAFCOR as part of a complete review and direction setting process.

This issue of the Newsletter is a Dowerin Special with lota of colour thanks to Snap Printing Midland. We would appreciate your comments! New members are important to WANTFA, as a larger membership increases our ability to do things for you and influence agronomic agricultural issues, in particular research into limitations in our production systems. Please join WANTFA and become involved.

Since February we have had an agreement with BankWest, whereby, if anyone seeking machinery finance makes BankWest contact via 1800 686 399, a commission is paid to a RESEARCH account for WANTFA. Please refer to WANTFA Equipment Finance to ensure some benefits go to us. Appartently it is competative loan.

A big "THANK YOU" to all our sponsors, see them listed in this newsletter. Both big and small sponsors are appreciated. Enjoy the Newsletter and, until next time, I hope your season unfolds kindly for you.

AUGUST 1998 FIELD DAYS

Bill Crabtree, Scientific Officer (0417 223395)

The first week of August will be our Statewide travelling field days. At least 3 WANTFA committee members and myself will be present at each site we visit. Ray Harrington, Neil Young and Kevin Bligh will be present at most, if not all sites. The field days are open to everyone and there may be a small charge at some of the venues - check local advertising.

The field days this year will mostly be out kicking tyres and listening to local farmers experiences. At Narrogin, Miling and Mullewa there will be a seminar segment.

On Tuesday and Wednesday it will be a "bring-your-own bus two-day event". These two days will flow into each other and you can book your own one star through me (perhaps at a local footy club rooms) or book your own ***** Accommodation through the Hyden or Lake Grace Motel.

These days are designed for farmers who want to see how things are done away from their own patch. We will be visiting some neat expensive machines (the CrossSlot seeder, ConservaPak, DBS, Flexicoils, Walkers, Great Plains) and some cheapies. We will talk to many farmers who have been no-tilling for 5-7 years down south. So come along with your local group in a bus.

Date	Time	Area	Location	Contact Phone
Mon 3rd	1.00pm	Narrogin	Croucher's	Doug Harrington
Tues 4th	8.00 am	Borden	Richard Souness's	Colin Pither
Wed 5th	9.00 am	Karlgarin	TBC	Bill Crabtree
Thur 6th	1.00 pm	Miling	Sports Pavillion	Tony White
Fri 7th	9.00 am	Mullewa	Hall	Caroline Pesk

Dowerin helpers are needed! If you are able to help attend the WANTFA stand can you please fax Tony White on 9654 1054 - Thanks.

In late June and early July we were privelidged to have Clem Obst from South Australia visit to share his Claying of water repellent soils experience at Dandaragan and the south coast. (See April '98 newsletter for his written story). Thanks to Clem, Margaret Roper and Grant Morrow for their generous involvement also.

FEEDING THE WORLD SUSTAINABLY

Robert McNabb, Minnedosa, Manitoba, Canada

The role of soil conservation in feeding the world is dramatically exemplified by analysing the historical evolution of our past civilisations. History, as Thucydides, the world's first scientific historian noted in 400 B.C. provides knowledge of the past as an aid to the interpretation of the Future. If we understand the past reasons for the rise and fall of previous civilisations then surely we can predict and change our ways to prevent a similar fate.

For the past few years the word sustainable has been a common theme of agricultural and environmental conferences.

Sustainable agriculture has been defined in lengthy format by academics, bureaucrats and politicians for many

Some soils are too shallow to afford any loss

years. As a farmer, I have an appreciation for the following definition: "Sustainable agriculture is a system of agricultural production that depletes neither soil nor man."

In order to develop an appreciation for sustainable agriculture and consequently the role of soil conservation in feeding the world, it is necessary to look back in history to determine past interactions between soil and man.

The formation of soil that had the capability of supporting life commenced (*Ed: apparently*) 350,000,000 years ago. Through the millennia, climate, the laws of natural selection, plants and animals supported the soil building process. Topsoil, the upper layer of the earth, rich in organic matter and mineral, plant and animal life, was created.

Primitive Man came on the scene one million years ago. He did not upset the natural process of soil, plant and animal growth because like other animals, he was forced to adapt to his natural environment in order to survive.

Civilised man came on the scene 6,000 years ago. He became civilised enough to master other animals and plants and attempted to master "nature" itself. This was the end of the soil building process. The quality and quantity of soil and the amount of life the soil supported began to decline. Civilised man attempted to be the master of his environment, at least temporarily.

Problems started when man thought of himself as "master of the world". Man, whether civilised or savage, is a child of nature and not the master of nature. When man tries to circumvent the laws of nature, he destroys the natural environment that supports him and his environment and his civilisation declines rapidly.

All trends in history show that civilised man has despoiled most of the land on which he has lived for long. This is the main reason for the movement and decline of civilisations and has been the dominant factor in determining all trends in history. Wars between civilisations started because man wanted more land after he had mined his own. The historical records for the last 6,000 years clearly indicate that civilised man was unable to continue a progressive civilisation in one location for more than an average lifespan of 40-60 generations (1000-1500 years).

Think about it! North America civilisation has really only been developed for less than five centuries. It is possible that we are on a collision course leading to extinction, comparable to past civilisations.

Looking back in history, how did civilised man ruin his environment bringing collapse to his civilisation.

1. He depleted or destroyed his natural resources.
2. He cut down or burnt most of the valuable timber.
3. He overgrazed the grasslands that fed livestock.
4. He killed most of the wildlife and fish.
5. He permitted erosion to rob his farmland of its productive topsoil.
6. He allowed eroded soil to clog the streams and fill his reservoirs, irrigation canals and harbours with silt and
7. He used or wasted most of the available metals and minerals.

Obviously, our present civilisation over the past 500 years in North America has simply carried on with the destruction. It is quite likely that we are on a similar course of extinction as the Phoenicians of Lebanon.

Past and present civilisations work with five renewable natural resources: Soils, Forests, Grasslands, Water and Wildlife. These resources have all decreased in areas occupied by civilised man and this has always produced a decline in a civilisation.

The fate of our civilisation is sealed, unless we develop a strong conservation ethic. First and foremost, the depletion of soil must be stopped in the system of agricultural production, and the soil building process must be allowed to operate naturally. Our objective must aim for a zero erosion rate.

It is therefore obvious that farmers, as primary producers, have a very important role to play in the development of truly sustainable agriculture. Farmers are the innovators, and when given the opportunity, will develop an appropriate system. In Canada, over 1/2 of the productive land loses in excess of 5 t/yr of productive topsoil to erosion. In Zimbabwe, which has a development period of similar length to North America, present losses of topsoil are 25 t/acre/yr, due to erosion.

The primary reason for this loss is the lack of protection on the soil surface, which is identical to the prime reason for the demise of past civilisations. Soil losses in excess of 3 t/ac/yr are simply unacceptable.

As primary producers, we have the opportunity, and the responsibility to take the lead role in developing sustainable agriculture. If the world is to be fed, the primary producers must find a method of production which depletes neither soil nor man.

If Moses returned to the location of view when he unveiled the Promised Land, as the land of milk and honey, in Biblical scripture, unquestionably his view today would inspire an Eleventh Commandment which may be as follows. "Thou Shalt Preserve our Agricultural Soil Resource for Future Generations by Promoting a System of Crop Production which Drastically Reduces Soil Erosion and Builds Up Organic Matter."

The fate of our civilisation depends on our understanding and knowledge of the lessons of history. We have access to technical and practical knowledge along with superior communication capabilities. Will we effectively utilise these resources?

The interest shown by those attending no-till seminars is evidence of the awareness for sustainability. An understanding of ecology and learning to farm with residue are undoubtedly the cornerstones for the development of a truly sustainable agriculture.

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SALINISATION MUST BE SLOWED

Alex Campbell, summarised by Kevin Bligh

Narrikup farmer and former WAFF President, Alex Campbell, chairs both the (Australia-wide) Land and Water Resources Research and Development Corporation (LWRRDC) and the (WA) State Salinity Council. Alex described administrative structures for the salinity problem at WANTFA's Annual Conference at Muresk in February.

Western Australia's Salinity Action Plan was announced in November, 1996. The State Salinity Council with thirteen representatives was appointed in 1997, and is carrying out a review of the Plan, for the release next November. Alex suggested that too much emphasis has been placed so far on public funding, and not enough on incentives of private funding.

He gave an Australia-wide perspective on the extent of likely salinity, from a report prepared for the National Dryland Salinity Program set up by LWRRDC. Some 1.8 million hectares have already become saline in WA, 0.4 million ha in SA, and a total of some 2.4 million hectares Australia-wide. WA is likely to lose about 6 million hectares and NSW about 5 million hectares, out of over 12 million hectares Nationally, if nothing is done.

Because salinisation generally occurs in the lower parts of catchments, caused by surplus rainfall draining below the root depth of crops on, frequently, other farmer's properties in the upper parts, Alex considers that market forces, alone, are unlikely to work. The LWRRDC report referred to "socially optimum rates of salinity", for example.

And once land goes salty, the process is essentially irreversible in reasonable time scales. The institutions of government may be considered to have failed, to some extent, the report suggests. Measures such as the recently-introduced, 34 cents in the dollar tax rebate will go some way to help, but the rate should be higher to achieve National objectives.

Alex suggests that local government could play a larger part, and technologies such as satellite mapping will be of great benefit in the future. For 5-15 c/ha, satellite mapping could indicate areas at hazard of becoming saline, with on-going monitoring costing about 1 c/ha.

Alex also referred to the complementarity of solutions, applauding developments in no-till, warm-season crops, and perennials such as lucerne, tagaste and oil mallee in low-rainfall areas, maritime pine (for timber) in medium-rainfall, and blue gums in high-rainfall areas. The full text of his talk is available from Bill Crabtree, if required on 9622 3395 (P/F).

NO-TILL CAN SLOW SALINISATION

Kevin Bligh, Committee (08) 97557589, fax 90

Higher crop yields through more timely sowing are one reason no-till is increasingly taking on. Having had the pleasure of talking to farmers about no-till throughout the Western world, deep-down one motivation comes out; that we know we are doing the right thing by the soil.

Water erosion is reduced with no-till sowing on the contour, to about estimated soil formation rates in WA. Wind erosion is also minimised with full stubble retention, while the structure of most Western Australia soils is improved. Sustainable agriculture is therefore possible in the long-term.

Salinisation is undoubtedly the most immediate technical threat to sustainable cropping in WA. Official estimates suggest that about 30% of formerly-productive cropland is likely to be lost to production in the next 30 years. About 9% has already been lost, with saline areas currently increasing at a rate of about 200 ha/day.

Surplus rainfall going below the root zones of crops and pastures increases groundwater levels. Salts stored in subsoils are then mobilised, eventually rising to the surface with the water. The process has been going on since clearing, with groundwater levels silently rising, frequently unbeknown to us!

Using as much of the surplus rainfall as we can, to produce higher-yielding - and more profitable - crops may be a key to reducing the rate of salinisation. How ironic it would be if we were to lose one-third of our cropland because of surplus rainfall, in one of the lowest-rainfall agricultural areas on earth!

Bob Nulsen of Agriculture WA pointed out last year (Resource Management Technical Report No. 169) that most groundwater recharge - rainfall going below root zones - occurs under most of the landscape. In cropping areas, therefore, treatments need to be applied to the cropland.

Higher-yielding crops use more water. Less surplus rainfall is therefore available to go through to the watertable. No-till sowing has already made soil conservation profitable. Perhaps no-till sowing can also reduce the rate of salinisation, as well!

Crop yields have increased with improved crop rotations, because of disease-break, nitrogen-fixation under legumes, and other reasons. For example, State average wheat yields have doubled in the last ten years, from about 1 to 2 t/ha with improved varieties, rotations including legumes and canola, improved weed control, timeliness of sowing and fertiliser application.

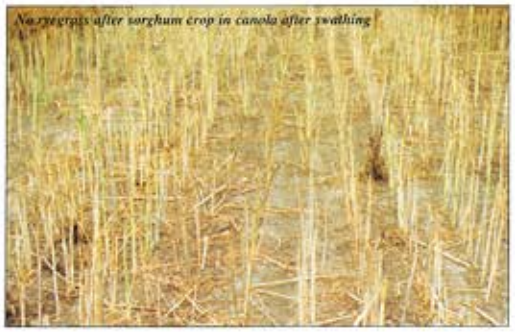
Further improvement is possible with the minimal disturbance, stubble-retention and accurate seed-depth control of no-till. Professor Dwayne Beck of South Dakota State University told us during his 1996 visit, that no-till wheat yields averaged 0.5 t/ha more in their three-year rotations, including a warm-season crop, than in two-year rotations.

Four-year rotations, including both a warm-season grass crop, such as sorghum, and a warm-season broad-leaf crop, such as safflower, averaged of 1.0 t/ha higher wheat yields, because of the healthier crop rotation, alone.

While conditions in South Dakota are different, particularly with their rainfall typically continuing into the equivalent of our December, Dwayne's results show that greatly-increased crop yields can be obtained through including warm-season crops in rotations. Dwayne recommended sowing warm-season grasses immediately soils warm up sufficiently for germination, in about September.

Previous WANTFA President, Ken de Grussa, farming in 500 mm average annual rainfall at Esperance, reported a similar experience, averaging 1 t/ha higher canola yield - and no waterlogging, while lupin and wheat crops suffered badly in adjacent paddocks - following sorghum (WANTFA Newsletter April 1998).

Ryegrass in canola crop after swathing



No ryegrass after sorghum crop in canola after swathing

Farmers as far north as Geraldton, and companies such as SBS Rural IAMA, have put in warm-season crop trials since Dwayne's visit. A concensus seems to be emerging that warm-season fodder crops are likely to be more profitable than warm-season grain crops. And Ken de Grussa observes that we still have much to learn about grazing fodder sorghum, because it is not always palatable to sheep.

Little is known about water use under warm-season crops in Western Australia. Lucerne reduced drainage below root zones in a CSIRO trial at Katanning, to 20 mm in the first year, from 50 mm under subclover pasture (Phil Ward, WANTFA Newsletter, April 1998. And farmer Geoff Bee reports lucerne lowering a watertable about 3 m in five years at Jerramungup.

Sorghum roots were reportedly observed at 2.4 m-depth in a back-hoe pit at Morawa. Wheat normally only roots to about 1.8 m-depth, at most. Therefore sorghum may also dry out a greater depth of soil than wheat, allowing more soil moisture storage for the following season's rainfall.

Warm-season crops can also use irregular summer rainfall. In Phil Ward's trial, for example, the first-year lucerne stand used all the 40 mm of rain in two summer storms, while soil moisture storage increased under the dead subclover pasture.

Less surplus rainfall is therefore likely to go through to the watertable under rotations including warm-season crops than current rotations of cool-season crops alone, thereby further reducing the rate of increase in the area of land lost to crop production through salinity.

While more productive crop rotations can potentially reduce the rate of salinisation, high-recharge areas such as deep sands will still need to be revegetated to perennials. Lucerne, tagasaste or oil mallee may all prove potentially profitable in low-rainfall areas, and tree plantations such as maritime pine or blue gums in high-rainfall.

Revegetating already-saline areas with salt-tolerant shrubs and grasses for grazing, and continuing to plant trees along creeks and fence-lines, also helps to further reduce groundwater recharge, as well as beautifying the landscape.

Wider no-till crop rotations are therefore part of a suite of land treatments necessary to reduce salinisation, while increasing crop production, profitability and aesthetics. With any sort of luck, we'll be able to at least reduce the 30% of our land likely to be lost to salinity in the next 30 years, to create a landscape that we're proud to pass on to future generations, to farm profitably, in perpetuity!

SCIENCE SECTION

A CONSULTANT'S PERSPECTIVE

Wayne Smith, Agronomic Acumen 9842 1949, fax 64

I have been asked to comment on my no-till perceptions. I have no affiliation with any manufacturer or importer of the seeders mentioned below. Any "bias" is based on what I see with my clients (*Editor: this is a good fast read - Wayne is "up-front" with his views, many will find this refreshing and some may even find it a touch insulting!*).

Brief WA history and observations

My introduction to no-till was in 1989 in Pullman, Washington State USA. I was on a 4 month study tour of America and Europe and at Pullman University I was fortunate to see a machine called a Cross-Slot (Agrisystems) seeder that was seeding through 10 t/ha of wheat crop (stubble). The seeder not only seeded through such a large amount of stubble but it also placed the seed and fertiliser within 5 mm of the desired depth. However, the emerging crop had a lot of difficulty getting through the stubble.

There were many other no-till disc seeders I saw in America at that time and I brought back as much information as possible. Farmers on the South Coast had been complaining about not being able to handle stubble now that they were approaching the 4 t/ha mark for cereals. (*Editor: Wayne made an enormous positive impact on high yield cropping systems on the south coast in the late 1980's, which led to the dilemma of what to do with so much stubble, with burning not being an exciting option*).

After showing the farmers the information I brought back from America, farmers began calling the USA manufacturers and local machinery dealers/manufacturers. Soon, some people began bringing in machines for demonstrations (like the Great Plains disc seeders). John Baker (Agrisystems) also gave us a visit and with the likes of David Rees and Bill Crabtree, the rolling snowball became unstoppable.

Seeing what was possible with the Agrisystems (or Cross-Slot) seeder made it very clear that wind erosion could almost be eliminated. There was no longer any excuse for having wind erosion because there were management tools available to us to keep the stubble and seed a crop. Since that time, no-till seeding has made the implementation of the high yield package for cereals just so much easier and safer. There have also been knife point machines becoming available and some of these are very impressive.

I am impressed with the Conserva-Pak, although adding some coulters in front of the leading tine would probably help make it an ideal unit. I have come around to seeing the great advantages of slightly wider row spacings. I am increasingly suggesting that my clients widen their rows to around the 9-10" mark. The main advantage for this is that weed control is easier and there does not appear to be any significant yield loss. What minor yield loss there might be from wider row spacings is made up by having earlier sowing times, better weed control and easier trash flow.

I have seen Treflan go from a useless chemical to one that is really useful. Other exciting developments with herbicides are: Diuron/Treflan in front of wheat can both be used at high rates with excellent broad-spectrum weed control, Metribuzin/Treflan is performing well and giving excellent control of silver, barley and brome grasses in barley and Metribuzin/Treflan may also be an option on wheat crops under knife points in wide row spacing and it is being tested on several paddocks by my clients this year.

is being tested on several paddocks by my clients this year.

My clients and I are often disappointed with crop establishment when using disc machines in very thick stubbles. However, I constantly need to remind myself with the question: "But what is the other easy option?" The other easy option is raking and burning and having wind erosion. Wind erosion is never an option! Cutting low at harvest, spreading wide with a spreader (I have yet to see anything as good as a Kirby {*Editor: some say the Redekop is as good*}) and using wide rows helps but cutting thick crops low at harvest is often not easy. Consequently, disc zero-tiller clients often increase seeding rates to compensate for the hair-pinning - though we would rather not have the problem.

I think further developments on angled coulters and better stubble handling in front of disc seeders will help the situation. (Editor: would someone please develop a residue handler that works in our conditions?) Also, perhaps coulters that throw dirt more in situations, like pulse stubbles, will make Treflan a possibility with disc seeders as well, at about a 9-10 inch row spacing?

Knockdown rates

Knockdown rates are certainly higher in no-till systems, but it must be remembered that Roundup is now cheap and an extra 0.5 L/ha is only $3/ha. That is usually cheaper than the old 'spikes' we used to use like Dicamba and Ester. Roundup at 1.5-2.0 L/ha is really not that big an expense. It is about the cost we used to spend 5-10 years ago on knockdowns. But with the advent of vastly improved control with residual chemicals like Diuron, Treflan, and Metribuzin, overall we are not relying so much on grass selectives. However, we are still using them for clean ups here and there, particularly on wild oats, which are one weed that still seems to get through the brews quite easily.

While on knockdowns, it really is a "no-no" to use only Roundup. Most of my clients use a SpraySeed brew just before sowing, and occasionally after sowing and just as the crop emerges. Roundup resistance is a "certainty" and making sure all weeds are dead with a SpraySeed after an earlier Roundup brew is very wise, and helps clean up weeds like geranium that are hard to kill with Roundup.

Seeders

I am not very impressed with the seeding results from things like Harrington points, DBS modules and points along a similar vein. The biggest problem here is that I am constantly frustrated that clients are unable to seed a crop at a desired depth. For example, if lupins need to be seeded at 2 inches depth on a loamy soil, this proves to be extremely difficult. If faba beans need to be seeded at 4 inches depth, this is impossible with such seeders but it is okay with a Conserva-Pak.

With the Conserva-Pak it is possible to virtually dial up any depth you want the fertiliser at, and any depth you want the seed at. This agronomically is ideal. I believe we need to develop seeders that follow the Conserva-Pak system, unlike the DBS types that rely on a covering plate to fill in the trench from the knife point, then drop the seed and follow it with a press wheel, hoping that some soil falls on top. This is not ideal and is often giving very poor results. We must have machines that place seed and place fertiliser, not drop the seed and hope for the best.

Also, waterlogging is worse with furrow sowing because the seed is placed in a wetter environment, and between rows is drier - extra water runs into the furrows. Furrow seed placement is good for non-wetting soils and in dry starts, but overall I am usually disappointed with the results in wetter regions of the State (*Editor: furrow sowing is great in my experience in dryer regions or years*). I expect "claying" non-wetting soils will make it even less desirable to seed precisely in the bottom of the furrow.

Disc seeders like the K-Hart have been quite good as it can separate seed and fertiliser and handle stubble, but more robustness is desired. The Great Plains, particularly with the wavy coulter in front, have their place on sandplain soils, though hair-pinning can still be a problem. The Bio-Max would have to be the best machine for getting hair-pinning and I actively discourage clients from getting one. Woolford disc seeders are OK, but only just. They do not separate seed and fertiliser, and can seed canola too deep and pulses are often not deep enough.

If you only ever want to seed at 2-3 cm depth with 50 kg/ha of Agflow in to a pulse stubble, then any of the no-till seeders will do an admirable job. It is for any different situation that many machines have their limitations. Without being practical, and from an agronomic point of view, the Agri-Systems seeder is the best I have seen so far. The Conserva-Pak comes a close second, though it still needs better engineering in design and strength.

Fertilisers

Agras was the most common fertiliser in WA for years, but for the past six years, I have been discouraging clients from using it. Firstly, agronomically it has the wrong mix of nutrients with too little phosphate and too much nitrogen and sulphur.

In no-till, we want low nitrogen (usually less than 10 kg N/ha at seeding), high phosphate, some sulphur and increasingly, a good dose of copper and/or zinc. We are growing higher yielding crops and are not mixing phosphate or trace elements through the soil, and so we need more of these nutrients than we are removing from the soil to help compensate.

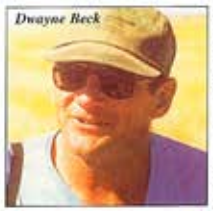
Trace element deficiency is becoming more common and I would like to see Agflow type fertilisers with the option of 2% copper and/or zinc. This does not support past trials (which said we didn't need another trace element application after 1kg zinc or copper for another 10-20 years), but would seem to fit in with what I am seeing on clients paddock's now that we are up to eight years into a no-till system.

Nitrogen poisoning of the sown crop is far more prevalent in no-till and so low nitrogen near or with the seed is desired. There is no yield loss from top-dressing urea later on compared to it all being on at seeding time. We used to apply nitrogen at sowing in case it got too wet after sowing. That argument I believe is now less valid, because trafficability is so much better with no-till. There are far more days available when we can drive over a paddock, compared to years ago when we wouldn't have had a chance!

Summary

No-till has allowed huge benefit to profits and conservation and has allowed the safe implementation of high yield cropping packages. The future is one of increasing change and no machine can be said to be "it" as there will always be "horses for courses". Also, weeds will, and are, becoming resistant to no-till. However, summer crops and lucerne growing would greatly reduce this risk. Otherwise, expect to use a strategic tickle, hot burn or even a full cultivation at some stage, on some soils, to stop weeds getting too used to nil disturbance.

I eagerly await the study tour in August to North America to gather more knowledge on no-till, and I hope others on the tour have a fantastic time networking and gaining knowledge. (*Editor: Wayne is co-leading the study tour with myself and my wife Monique - 46 of us will spend 3 exciting weeks studying no-till and crop rotations throughout North America. We will spend two days with Dwayne Beck (see photo) - we'll keep you informed!*)


Dwayne Beck

DISC SEEDERS FOR LONGER TERM

Paul Blackwell, AgWA Geraldton (08) 9956 8555

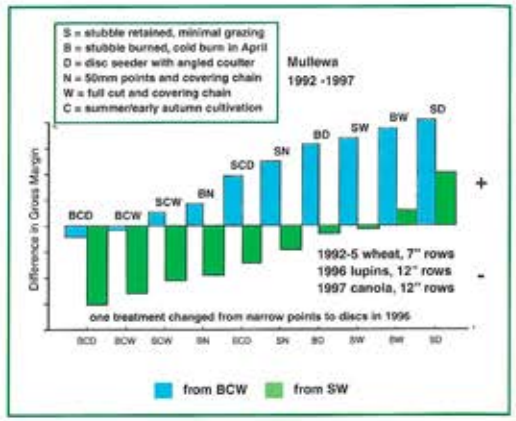
My long-term trials provide more confidence in using disc seeders, with occasional burning and summer cultivation on loam soils in low rainfall zones. A transfer to disc seeders, for improved hardsetting loams in the northern low rainfall zone is a long-term possibility.

When these soils soften after 2-5 years of no-till, stubble retention and sowing with narrow points, even less tillage can then be adopted. Crop productivity and profitability can be improved by changing from blade (or knife) points to using heavy duty disc seeders with heavy duty coulters.

At my long-term soil management trial at Mullewa, narrow point history followed by discs resulted in the least waterlogging of lupins, due to maximum preservation of old root channels (biopores) in 1996. In 1997 canola was sown in a dryer than average autumn resulting in the best crop establishment and some of the highest yields from a similar disc seeder, due to improved soil moisture conservation by least soil disturbance.

Further arguments for adopting improved disc seeders from tines with 50 mm points or blades are;

- disc seeders allow easier seeding at narrow row spacings such as 7" for cereals and canola.
- disc seeders pass through stubble and vines easier than tines.
- improved designs of disc seeders (see later in this paper) allow soil disturbance below the seed and deep placement of fertiliser (*Editor: pleasingly, these 3 benefits have constantly been talked about by south coast farmers for 7 years, not to mention the weed benefits!*)
- These trials have also shown that pre-seeding cultivation, for lime incorporation, weed control and moisture storage is best followed by seeding with discs or knife points, to minimise moisture loss and has out-yielded wide point sowing.



Estimated long-term effects on cash flow is best with disc or blade seeders with no summer cultivation and residue retention; assuming no beneficial effects of summer fallow. The gross margins from the long-term soil management trial at Mullewa have been calculated, to date, from the discounted gross returns and the discounted variable costs. A discount rate of 6% is used and plant costs are not included. The disc seeders are angled coulters with double disc or undercut discs. A complementary trial at Morawa tells us that blade points would have similar or better yield than these heavy duty discs, therefore similar gross margins, due to extra fuel use to work deeper than discs (100 mm depth for all points/discs at Mullewa).

These results are compared to traditional methods of summer cultivation (BCW) or more recent, one pass methods sown with wide points (SW). The relative ranking of the differences is most important, not the absolute amount of the differences in gross margin, because the actual costs depend strongly on the individual farming operations. The ranking of the methods tells us:

- One pass seeding systems with improved discs or blade points are looking most profitable, as well as conserving soil moisture and structure. However the differences have been mainly due to the extreme seasons in '96 and '97 and the high value of the lupin and canola crop. Further seasons are needed to clarify the accumulative effect on cereals.
- One pass systems are generally better than two in these low rainfall environments, but there have been no cases in this trial of stored summer moisture effects from summer cultivation. The trial at Morawa has shown up to 300 kg/ha responses if the summer rainfall is greater than about 25 mm and the following season is dry. Such effects should be included in a general long-term analysis.
- Burning provided some benefits in the four seasons of wheat, by reducing leaf disease, and in the dry autumn for canola, by reducing interception of light

rains by stubble; if the burning also reduced weed seed levels, there could have been further benefit. Continued diversification of the rotation should reduce these benefits. But I believe there is still a role for occasional cold stubble burning to help control leaf diseases and weeds (Editor: diverse rotations would overcome these problems). This will have little effect on long-term improvements to soil structure.

- The higher ranking for wide point over narrow points comes from higher yields where wheat follows wheat.

This trial shows no time of sowing benefits. Summer and early autumn cultivation does not affect the time of sowing in low rainfall areas. Costs are less for cultivation systems and full-cut sowing because of higher herbicide costs, including summer weed control. Fuel costs to run discs are less than using tines, contributing to the higher gross margins for discs than narrow points.

Thus, from the arguments above there is some encouragement to transfer to disc seeders after a few years with tine seeders and narrow points on the hardsetting soils in northern low rainfall zones of WA.

Andrew Sandison is thanked for the ongoing financial analysis of the long-term trials. Mike Collins, Murchison Machinery and Flexicoil lent the undercut discs and the research was funded by GRDC and AgWA.

IAMA

SUMMER CROPS IN THE NORTHERN WA WHEATBELT

Peter Norris, SBS Rural IAMA, Geraldton.

In 1996 and 1997, I conducted two warm season crop trials at South Morawa. The trials were to test the yield potential and salinity tolerance of seven summer crop species. In 1996 two species were tested (Hisun 25 sunflowers and Jumbo Forage sorghum).

In 1997 the trials also included, New Nugget grain sorghum, Nutrifeed millet, Sironaria safflower, Hicorn 45, and in the later time of sowing Monosun 140 sunflowers. The plots ran from a non-saline area into a saline area and the crops were sown through both areas to assess their salinity tolerance.

The soil was a red clay loam of good fertility and a salt level of 0.09 EC dS/m, in the non-salty areas, and the soil pH of 5.8 (in CaCl2). The paddock was in wheat in 1995 and lupins in 1996. The 1997 rainfall total was 362 mm, with only 11 mm falling in the last 3 months of the year and 31 mm in September. All seeds were sown at 20-40 mm depth, at appropriate seeding rates (3.5-10 kg/ha) and at 23 or 100 cm row spacings on 17th June and 8th September. The trial was sown with 123 kg/ha of a 1:1 mix of Dapzsc and Urea.

Some plots yielded well (see below), while others were lower yielding. It is clear that wider row spacings are needed and none of these species showed any greater degree of salt tolerance over wheat.

Time of sowing

The grass crops (corn, sorghum and millet) sown in June, took a long time to emerge, had slow growth, were eventually destroyed by frosts and re-sown in September. The temperatures at this time of year in this environment were too cold for adequate growth of these crop types. The two broadleaf crops performed very well with June sowing.

All September sown crops did well given the dry conditions they had to endure. The grasses performed much better at this time of sowing. The sunflowers did perform well but were severely moisture stressed during flowering and grain fill. The safflower from this sowing had very poor growth and was not harvested.

Date sown	Crop and Variety	Yield (kg/ha)	*Price ($/t)	G Return ($/ha)
17 June	Sironaria safflower	506	530	$268
17 June	Hisun 25 sunflowers	463	530	$245
8 Sept	New Nugget grain sorghum	624	280	$174
8 Sept	Hisun 25 sunflowers	274	530	$145
8 Sept	Monosun 140 sunflowers	327	530	$173

**Price is based on machine dressed, bagged and landed in Perth. There are limited markets for these products in WA.*

Sironaria safflower

With June seeding, this crop performed quite well with excellent growth in the weed free areas of the plots. The September sowing suffered from a lack of moisture and seems much more suited to winter growing environments. Weed control is difficult in this crop so it may be a poor option in our environment for any sowing other than winter.

Hisun 25 sunflower

Grew well with June sowing, but yielded moderately, given the season. There is potential to improve the yield of sunflowers by late July and early August seeding. The June sowing in this trial was too early with cold conditions still prevalent allowing winter weeds to germinate. Sowing one month later in the season will allow control of an extra germination of weeds and should still allow a good performance. September sowing of sunflowers is probably too late in this environment with flowering and seed-set taking place in November and December when temperatures are high and soil moisture is scarce.

This variety of sunflowers is an oilseed and with stress to the plant during grain fill the oil content of the grain can be dramatically reduced. The seed from the September sowing was much smaller than seed from the June sowing - meaning lower oil content.

Monosun 140 sunflower

This variety was only sown in September and suffered similar problems to the Hisun 25 above. Yield was slightly higher than the Hisun 25 at the late sowing time.

New Nugget grain sorghum

The yield of 624 kg/ha was above expectations and could have been improved by mid-August sowing. The use of conventional seeding and harvesting machinery to grow this crop make it the top choice. The use of atrazine for weed control will make grain sorghum a good option. Observations of the growth of New Nugget showed that at reduced row spacing the plants had much lower growth than where they were at the full one metre row spacing.

Hicorn 45 corn

This crop failed at this site at both times of planting. Different varieties or time of seeding are needed to improve the performance of this variety in our area. The need for a corn head for harvesting this crop will make it a low priority for any further research.

Jumbo forage sorghum

Jumbo again performed well even with the late sowing time. If you want to use soil moisture to reduce recharge, then Jumbo is your choice. It has the ability to keep growing through the summer and its ability to penetrate deep into the soil to extract soil moisture is brilliant. If you have livestock and want to graze it, the option is there. Row spacing is not as critical, but I would keep the rows wider to allow the plants access to more soil moisture.

Nutrifeed millet

Nutrifeed does not produce as much growth as Jumbo, but would be more suited to grazing by sheep. Moisture stress induced unpalatability which will be a problem with millet grown in our environment.

Conclusions

Sow grain and forage sorghum in one metre wide rows to allow greater access to soil moisture, giving greater growth and yield. Summer cereals do not tolerate frost, so only seed after the last chance of frost. Broadleaf summer crops will tolerate severe frosts, so they can be sown much earlier and this type of cropping would be best suited to areas that gain moisture.

Winter weeds such as radish, double gee, wild oat, brome grass and barley grass will germinate at any time, which reduces the impact of this type of crop for the control of these problem weeds. These crops are not salt tolerant. Current corn varieties are not an option in our environment. The dollar returns from these crops are dependent on the high prices that we have in WA. Only small tonnages are consumed here and the price is likely do drop if high production occurs within WA.

Acknowledgments:

I would like to thank: Derek, Glen and Barbara Chisholm for their assistance in seeding and harvesting the trials. Ian Andrews for his help in harvesting the trial. Pacific seeds and SGB Australia for providing seed for these trials. Tim Officer for his conducting field walks at the site.

SUMMER CROPS AT NAREMBEEN

Tony Seymour, Consultant, Narembeen (08) 9064 7170

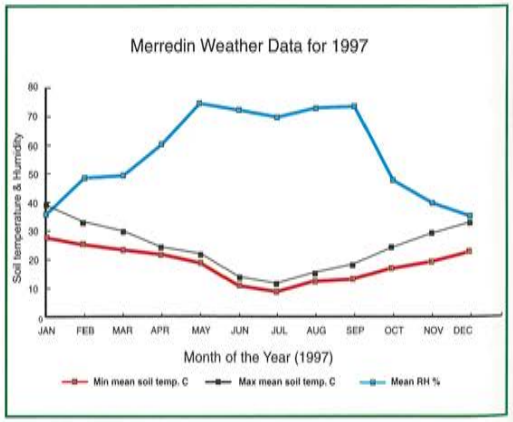
The Central Wheatbelt of WA is traditionally a wheat sheep farming area, although with the decline in the wool and sheep industry, farmers have turned to more intensive cropping systems to maintain returns.

Attention has been focused on the winter crop rotations of wheat, barley, lupins and peas, with the addition in recent years of faba beans, chickpeas, lentils and canola. This has created a slightly broader rotation however, soil types have restricted rotation diversity in some situations and the focus has remained on winter cropping. In the long-term these rotations will still come under pressure from disease buildup, chemical resistance and weed selection pressures.

Dr Dwayne Beck of Dakota Lakes Research Station in Pierre, South Dakota visited Australia in 1996 as a guest speaker at the WANTFA Annual Conference. Dr Beck's work in South Dakota points to the viability of a long diverse rotation as being economic and sustainable in the long-term. A short narrow rotation may be economic in the short-term, but not necessary sustainable. Some farmers have found the wheat: lupin rotation too limiting from a weed control aspect.

Dr Beck's experience in long diverse rotations as a way of sustaining farming practices raised a great amount of interest in WA. This interest has turned to experimentation of growing summer crops, in a traditional winter crop growing area. Having visited Dr Beck in the USA in 1996 on a Nuffield Scholarship and also having the opportunity to look at summer crop production in Argentina, South Africa and Zimbabwe, I have tried to incorporate technology, genetics and practical experience into finding a viable summer crop production system in the WA wheatbelt.

Our native flora has plants that flower in spring and others that flower in autumn. We should be able to develop a cropping system that works in a similar manner. By looking at our water use efficiencies we can see that this is possible. In a dry year we have higher water use efficiency than we have in wet years, which means that we have excess water in the system. Our traditional winter crops are relatively shallow rooted and by using summer



crops with deeper stronger root systems we will be able to recover this lost moisture.

The reason behind the trials is to discover which warm season crops will be viable and sustainable in the Central Wheatbelt. With the success of some warm season varieties, farmers will have the potential to increase the intensity of their rotation, reduce the selection pressure on weeds and minimise the occurrence of chemical weed resistance.

The 1997 results have been very encouraging, considering in the Narembeen area the total winter rainfall has been 222 mm and the growing season rainfall from April to September was only 165 mm.

Crops in the trials included corn (Pioneer 3751 3394), sorghum (Pioneer Western Red MR), forage sorghum (Pioneer Better Day), sunflower (Pioneer Advantage) and safflower. The deep tap rooted plants have shown the most promise on both the heavy and light soil types.

The warm season grasses (corn and sorghum) have done very well considering they were planted dry on the 1st October and have received only 4 mm of rain since seeding (until end of February '98). The soils physical limitations have not allowed the grasses' fibrous root system to explore to its fullest potential to find moisture. The hard pan in the soil appeared to be more of a barrier for t he fibrous root system than the tap root system varieties.

Corn at flowering suffered from moisture stress

The sunflower and safflower have shown the best results in the extremely dry year and the sunflower was harvested in mid-February. The safflower, which is a cool season broad leaf varty, was included in the trial to gain information on plant behaviour on a late sowing. This peformed as predicted and so with an earlier planting this year, it is expected to perform very well.

Corn at flowering suffered from moisture loss

Sunflowers growing at Narembeen

The most critical factor in the success of a summer crop is the establishment of the seedling. With the dry conditions, our seedling establishment on the heavy land site suffered badly from poor placement. One of the factors actors that influenced this were a very cloddy seedbed which prevented good seed to soil contact by the press wheel, resulting in having to roll the trial sites with a rubber tyred roller. This did improve results. With the Shearer/IH planter hybrid, there was evidence of both seed bounce and seed shooting problems. Seed bounce caused the seed to bounce off the bottom of the trench and land in a higher layer of dry soil. These seeds did not germinate. Seed shoot occurred when the soil did not close sufficiently behind the digging point, so the seed was then shot deep into the furrow preventing its emergence.

Trash handling problems on the light soil type also reduced establishment but not as significantly as on the heavy soil type. The problem occurred when straw caught on the closer plate and distorted the shape of the furrow so that the soil was moved away from the seed, and as a result it could not be covered. The use of residue managers will alleviate this problem.

1997 was a very unusual year with higher than normal frost occurrences. Soil temperature on field readings suddenly within about a 10 day period moved from 14(C to 23(C in late September. This sudden increase in temperature helped emergence and growth on the late sowing but left the crops vulnerable to the high temperature at flowering.

With the trials planted at optimum dates this year starting in July with Safflower and Sunflower the flowering dates will occur during cooler temperature periods. The temperature graphs indicate that a July-August planting will give an improvement in the growing conditions which will enable us to significantly increase yields in comparison with the October planting.

The benefit to farmers in the our Wheatbelt of having the option of growing between 2-4 summer crops, depending on rain and soil type, in a rotation would change the selection pressure on weeds, change the timing of spraying which would reduce the rate at which chemical resistance builds up. It would spread the work-load, use machinery capital more efficiently and also offer the opportunity to have a more diverse grain marketing plan, and increase water use efficiency.

With advances in genetic engineering, no-till farming systems, fertiliser technologies and management practices, I think that summer crops will become an achievable proposition in the WA Wheatbelt.

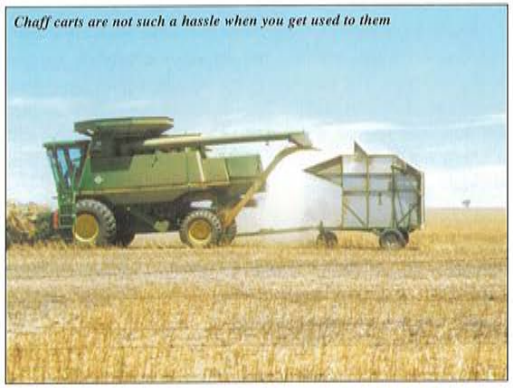
COLLECT WEED SEEDS FOR STOCK

Danny Roberts, AgWA, Katanning 9821 3321

More farmers are using weed collection systems at harvest to collect and dump material, because of herbicide resistance. These crop residues, or weed seeds, are also being used by some farmers as a valuable feed source for cattle and sheep. The seeds collected from 300 ha can potentially feed 100 cattle in a feedlot. The toxin content of harvested crop residues needs to be evaluated. Monitoring of sheep suggests harvested crop residues can increase the number of grazing days or allow higher grazing pressure on stubbles.

In 1997 and 1998, I looked closely at the material collected with these systems to determine their feed value. The crop residues were collected using cart systems by Redekop and Cole (see these data in below table) or the Rytec collection system which collects much less material (10-40%). The 'Rytec' system collects more seeds than the cart systems, much less straw and coarse material and much more fine material.

The fine material collected by the cart system was mostly crop plant material (mean 97%), with 3% being annual ryegrass seed (ranging from 0-12%). Whereas



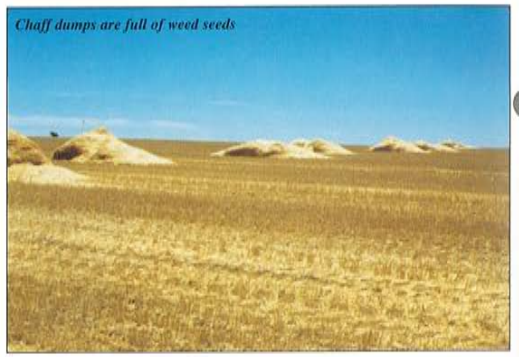
Chaff carts are not such a hassle when you get used to them

with the 'Rytec' system there was much more seed (annual ryegrass seed was 8-44%) and less fine or coarse material. Other weed seeds collected were barley grass, brome grass, wild turnip, radish, marshmallow and wild oats. There was not as much crushed grain or annual ryegrass seed as expected in the finer portion of the samples.

Crop residue with a digestable dry matter (DDM) value above 55 % and a crude protein (CP) value above 8% should maintain adult sheep. The nutritive value of lupin and wheat samples was better using the 'Rytec' collection system (lupins being 63% DDM and 12% CP and wheat 69% DDM and 11% CP). The harvested cereal residues from the carts were below the critical nitrogen level but were adequate for minerals under grazing conditions. Grain left after harvest and regrowth from weeds and cereal seeds after rain contributes significantly to the nutrients obtained by sheep when grazing crop stubbles. The carts collected an estimated 17% of the unharvested grain.

Toxin content

The phomospin concentration of lupin residues ranged from <5-1000 parts per billion. Samples from most lupin paddocks were relatively safe but two samples would probably only OK if making up to only 50% of the diet. The Clavibacter toxicus (ARGT) concentration of harvested lupin residues ranged from 0-200 bacterial galls per kilogram. The combination of corynetoxins and phomopsins is likely to have some additive effect given that both cause liver damage but it may be several weeks before animals consume a sufficient amount of corynetoxins to cause mild live damage.



Chaff dumps are full of weed seeds

ARGT organisms were detected in 13 out of 15 samples (1997) and 11 out of 32 samples (1998) including one from an area without a previous AGRT history. The bacterium concentration of harvested crop residues ranged from 0-800 bacterial galls per kg. Only one ergot gall was seen in one sample of harvested crop residues.

Use of Harvested Crop Residues

Approximately 500 kg/ha of harvested crop residues is available for livestock grazing stubbles on paddocks using the cart collection system with a 'maintenance' diet. Young merino sheep were monitored during January 1998. The sheep maintained liveweight while grazing barley stubble for 35 days. The stocking rate was 12 sheep/ha. The sheep consumed 80-90% of the estimated 10 t of harvested barley residues. About half of the estimated 100 kg/ha of barley grain/heads were still on the ground after the 35 days.

The 'Beefin' model was used to calculate the ration and economics of feedlotting cattle for carcase weight gain of 72 kg. The feedlot ration allows up to 75% inclusion rate of harvested crop residues for the cart collection system and 90% inclusion rate for the Rytec collection system. This ration increased the profit of feedlotting cattle by $30/steer compared with the traditional grain-based diet. Feedlot rations may need to be adjusted to ensure low levels of toxins.

SUMMER CROPS REDUCE WATER-LOGGING

Jim Baily, Committee, Wellstead (08) 9847 1036, fax 12

I have had experience with summer crops previously. While in the Kimberly, Northern Territory and Queensland, I had grown fodder crops and grain sorghum. My experience with summer crops on the south coast started in 1987.

At "Subasio Downs" (Wellstead) we had a very dry spring in 1987, and then we had 58 mm of rain in November, which ruined the dry pasture, so I decided to plant 50 ha of sudax in November, just before we started harvesting. We then had another 13 and 17 mm of rain in December and January, respectively. The site was shallow sand over clay. The sudax allowed us to graze the poorer sheep through the autumn and maintain their condition, whilst the balance of the flock were in the feedlot.

The following May (1988) the paddock was planted to lupins and during that month we received 114 mm of rain. I now wonder why I planted lupins on such shallow soil type, on the south coast. Interestingly, the lupins didn't waterlog. However, I didn't put the puzzle together until Dwayne Beck's visit to WA.

The following year (1989) wheat was planted in the paddock. The crop had a 5 t/ha yield potential, but had a bad aphid infestation and yielded only 4 t/ha. (How advice changes over time - being told then that aphids only had a small effect on grain yield!)

In 1990, lupins were again seeded and we had 98 mm of rain in May. This time the lupins waterlogged and yielded very little. Unfortunately, I missed Dwayne Beck's talk when he was here. However, he certainly impacted on all who heard him, and from the reports of his talk, the above experiences falls into place.

Generally speaking, I now look at a summer cropping as an opportunity crop. There will be a number of seasons like this past one (1997) which was too dry to plant a summer crop at the right time and for the crop to establish and continue to grow.

From my farming friends' evidence, October seems to be the right time to plant summer crops on the south coast, as our soil temperature is not at the 16-18 degree C. I think that, at least, 25 mm of rain in one fall, is needed prior to seeding, to ensure a reliable germination. When it gets to November or December, perhaps we need 40-50 mm. Having enough subsoil moisture is also required before planting.

The economics of growing a fodder crop for grazing is doubtful. However, the other benefits of an additional crop in the rotation, lowering the water table and stock health need to be in the equation. Growing current varieties of grain sorghum is probably not economic on the south coast. However, new varieties may give us that opportunity. Other nearby farmers, who have grown sunflowers, have found that parrots get them or they go mouldy before harvest.

Interesting, one farmer in the South Stirlings area, grew fodder rape through the summer, two years ago and he told me that this paddock has been one of his best cropping paddocks for the last couple of years.

My recent exposure to dryland lucerne growing makes me think is has significant value in our crop pasture rotations. I planted lucerne in August and September, 1997 and in spite of the dry summer, it stayed green and was productive and I grazed sheep on it several times. I see lucerne fitting nicely into the rotation, providing a highly productive pasture after the first year, lowering the water table and allowing me to manage resistant weeds. These are good things for a following cropping phase.

Perhaps a sensible long-term rotation for my farming system would involve 5 different crops, with a strategic summer crop thrown in. I envisage a rotation of lucerne/canola/wheat/barley/triticale or feed barley/TT canola/wheat or barley, then back to lucerne, as a likely option.

In summary, there are benefits in having a summer growing species in the rotation. However, there are risks and we should proceed with caution. No-till lends itself to the establishment of all these crops while at the same time it eliminates wind erosion and retains soil moisture. These factors allow sustainable farming in fragile environments.

STUBBLE - A SUSTAINABILITY FACTOR!

Steve King, Lake Grace 9871 9051, fax 54

I have been asked to write on how we see no-till cropping after five years. We have been continuous cropping and have been 100% no-till for five years using Agmaster knife points and seeding system.

Steve King's use of a Redekop ensures that he can seed through thick stubbles

Our philosophy has been to keep all the stubble using rotation of crops with concentration on improving soil structure. I think soil structure is the key to the next step in increased yields and we are pleased to see huge improvements over the past five years using knife-points. The next five years look exciting.

We have not burnt stubble at all, except where the chopper on the header had to be taken off for a couple of paddocks. The stubble in these paddocks was lightly raked and the rows burnt.

Stubble handling can be troublesome, but the answer seems to lie in handling the stubble properly at harvest time. To do this we fixed a Redekop chopper on the back of our 2188 Case harvester which takes all the straw and importantly all sieve material, cuts and throws it over the platform width evenly. The loose straw is short and all sieve material, including weed seeds, are distributed evenly. Hence, there are no header trails which, in my opinion, is good in the fight against chemical resistance, as a lot of resistance has come from excess spraying because of high weed population in the header rows.

The straw is cut off approximately 350 mm high and with no long loose straw lying on the ground, makes it easier to go through with a tined implement.

Virtually no stock are run on the stubble, since this total program has been adopted, and we are happy to say we have not had any wind erosion at all. This has been especially noticeable this year as we have experienced a lot of wind. I was told five years ago by a respected stubble farmer in Victoria that the first 5-6 years stubble retaining can be hard and after that it starts to work for you. Evidence of this is being seen already as yields are getting better and soils easier to work.

We started off with 7 inch row spacings, went to 8.5 inches for 97-98 and in the 1999 season we are going to 10 inch row spacings. This has probably been one of the changes in thinking I have had as if I was asked five years ago I would have said that our soils would not be good enough. I think now we have experienced huge gains in structure and organic matter and wider rows are not only sustainable but beneficial, also allowing for better trash flow.

The machine we have been using is a 5½ row configuration with tines shifted that were near wheels plus poly trash tubes. This has enabled us to seed through 3 t/ha and more barley and wheat crop stubbles with little problem. Going to 10 inch will help again. I think though that if you are starting out no-tilling, staying at 7" row spacings does give some comfort. Therefore my advice would be do what you are feel happy with and monitor your paddocks and crop yields.

The other change is from a single seeding system to a side banding system from Agmaster. This enables us to apply higher rates of nitrogen when seeding canola, as canola has become an important part of the rotation. Greater emphasis has been put on nutrition and disease control.

For ourselves, we needed to pay a lot more attention to detail with our crops, as a little more care in this area can increase yield. Crop rotation has played a large part in this. We grow wheat, barley, canola, lupins, chick peas, faba beans, field peas and have played with sorghum. All crops are not necessarily grown each year, but all have an important place in the rotation.

Trace elements are talked about a lot with no-till crops nowadays with less mineralisation due to reduced cultivation. The question I would ask is "with greater yields nowadays and tighter rotations are we putting the small amounts of trace elements under great pressure, and by cultivation are we just delaying the evil day when more needs to be applied."

We apply a zinc, manganese (Symcoat) seed dressing to all seeds now. Farm trials here shown yield increases using this alone. Fertiliser is generally DAP with copper, zinc and manganese added to suit paddock requirements. CAN or ASN is added to bring nitrogen levels up. We use no urea on the farm as CAN or ASN has given better results, especially in quality of grain. We do not go along with the idea that there are enough trace elements in our soil for the next 20-30 years as some would lead us to believe.

In summary, we are totally committed to complete stuble retention as the benefits are many and are prepared to work around any problems associated with this. No-till farming is the only long-term sustainable way to continuously crop. There are so many more options available to us, we can still seed a large stubble residue, putting the seed into a good seedbed - leaving the residue on top, many more chemical options and ways of applying them, less weed disturbance and best of all - conservation of moisture.

While there are still problems to be confronted, the last five years have been a big learning curve and we look forward to the future of no-till and stubble retention farming with great expectation.

NO-TILL EXPERIENCE AT "MUKKA"

Gordon Jones, Mukinbudin (08) 9047 1075 p/f

I first seriously considered no-till after listening to Ray Harrington talking on a "Triple A" tape, which was endorsed by the AWB and the Kondinin Group in March, 1994. Ray put a good case for no-till seeding systems, at a time when I had been reading, researching and thinking about how I might improve my farm system. A bad water erosion experience in 1989 was also a great catalyst for change.

Next consideration was how to make the plant do the job. Not knowing which was the best approach, I decided to "crawl before I walked". So in 1996, without much expense, I set the machine up by modifying existing machinery. I had a Shearer air seeder and a 45 tine scarifier, so I put these together and attached Agmaster points, closer plates and boot. I then used a Woolford chain harrows to cover the rip lines. All of the crop was sown this way since that first year.

This has worked well, but I'm not really happy with the narrow tine spacings. We are now considering wider spacings (possibly 10") and we are looking hard at our fertilizer distribution system. Wider row spacings will benefit our chemical applications. I am concerned about weed control and chemical application with 7" row spacings.

Having had our experience with no-till, I realise that really my experience fits what others from elsewhere have previously said. However, the benefits are significant for no-till and I would like to mention some of them. Quite clearly, the soil's structure is improving through time and clovers return really well after cropping. Lupins do much better in all soil types. And the paddocks are so much better for driving over.

I find with no-till that you have to be prepared to be a little more patient and really think through the considerations - particularly with chemical decisions. Fertilizer decisions also need to be thought out and planned priority.

During the strong and sustained winds in early June this year I have been further assured that no-till systems greatly

benefit land conservation in my area as well as elsewhere. Moisture retention last year with no-till was of great benefit. With low rainfall we lost less moisture due to minimal soil disturbance and our crops hung on really well. In this part of the State it is a real bonus as expressed by others.

Lastly I would like to say, for those considering no-till for the Eastern Wheatbelt, don't be afraid to give it a go, if you haven't already done so!

CONSERVA PAK IS SAFE

Greg McNee, Wyalkatchem (08) 9681 5012, fax 20

My father and I farm a property 28 km north east of Wyalkatchem. We have mixed soil types ranging from sand over clay to Wodjil to heavy red clay. Having farmed conventionally ever since the farm was developed we could see that we were running out of options with our chemical strategy.

Our previous bar was a 4-150 John Shearer, which didn't have the tine breakout or accurate seed placement to allow us to use trifluralin and other chemicals. So when looking for a new seeding machine we decided that no-till would be the way to go as it would give us chemical safety, erosion control and water harvesting benefits.

So we were left with a quest to find a machine which would do an acceptable job, or better, across our wide ranging soil types. We had been watching new developments for a few years and at last year's Dowerin Field days, we decided the Conserva Pak had a lot going for it. It had a high breakout pressure - allowing us to seed into marginal moisture in hard setting clays, we could side band high rates of fertilizer, the seed could be placed on a firm shoulder of soil - which guards against the seed collapsing into the furrow and reduces the risk of the seedlings waterlogging.

We have been able to apply high rates of P and N with good crop safety. Up to 100 kg/ha of urea has been put down the tube and in a small oat crop we have pushed the fertiliser rates really high with excellent crop safety. We chose the 12 inch row spacings machine mainly for increased chemical safety and we have the extra stubble handling benefits. We matched the bar with a Morris 7252 VRT 3 bin airseeder.

Having completed one seeding of 2,300 hectares, we are very pleased with the machine's performance. The bar is still on the original points with a fair bit of life left in them yet.

Seeding began on the 25th of April after an ideal break to the season. Throughout seeding we experienced varying conditions, from dry to wet. The bar performed very well in all conditions, with wheat emerging within 5-6 days, even when we thought there was not enough moisture for germination. The wheat seedlings came up broad, strong and evenly with very good colour. One downside to the system was a big attack from insects and grubs, that we had never experienced under our conventional system. We had more dramas with bugs and grubs early than we did with weeds.

Regarding the weed aspect, I am very happy with the 12 inch row spacings. I think maybe with the 12 inch spacings, less of the ground is being broken up, resulting in less viable seed able to germinate. We trialled one 140 ha paddock, spraying it with 750 mL/ha Simazine, 750 mL/ha Diuron and 1.5 L/ha Treflan with no ill effects on the crop. The paddock has never been cleaner as far as barley grass, wild oats, ryegrass and silvergrass are concerned. The rest of the crop was sown with rates of trifluralin from 1.5 L/ha to 2 L/ha with no problems. I am very happy with the trifluralin results, resulting in only spraying 45 ha of post-emergent grass herbicide so far. For crop establishment and crop safety the Conserva Pak gets my vote of confidence!

WIDE ROTATION THOUGHTS

Stuart McAlpine, Buntine (08) 9664 2082, fax 68

This is part two of my 1998 WANTFA annual conference talk. In an attempt to come up with a good rotation I have put together some principles for canola, lupins and wheat. I have also included some thoughts on weeds fertilisers and precision farming.

Canola

With canola I plan to seed early and use triazine tolerant canola when I think that weeds are going to be a problem in the normal or hybrid lines. The plan is to supply adequate nutrition, use a seed or soil application for red-legged earth mites and swath the crop. The future markets for canola looks excellent.

For herbicides, at least 1.0 L/ha of simazine with perhaps 1.0 L/ha of atrazine (or just 2 L/ha of atrazine) pre-seeding which may be followed with 2 L/ha of atrazine post. In 1997, ryegrass survived the atrazine at 2.0 + 2.0 L/ha and a grass selective was used as well. I thought the conditions were ideal for both atrazine applications. However, other farmers in the area had greater success. Triazine alone may not be the answer for ryegrass. There would be an advantage to apply up to 3 L/ha of trifluralin IBS and

Canola needs close monitoring of insects from planting through to swathing. These can be costly if not picked up. Experience in 1987 with damage from 'caterpillar weed web moth' proved extremely costly. Seedlings were taken out at emergence and large areas were re-seeded with yield penalties of 0.4 t/ha. Smaller areas within the paddock that were not re-seeded also had a large impact on yield also.

Our 1997 canola results were good with an average of 1.3 t/ha and an oil content around 43%. We started seeding on the 9th April, after good moisture. Yields ranged from 0.8 to 1.95 t/ha with the yield reaching 3 t/ha occasionally. Much of the crop was over 2 t/ha, suggesting that this is obtainable with better management. Canola performed particularly well on gravel compared to other crops.

With lupins we aim to seed them dry to make the most use of the full growing season and we apply apply 2-3 L/ha of simazine pre-seeding. We use a knockdown wherever possible and apply diuron up to 1 L/ha pre-seeding where double gees are likely to be a problem. We plant at 25-30 mm depth or we target the moisture with our precision Great Plains seeder and we use 100 kg/ha of seed. We time post emergent weed control effectively and are examining swathing to reduce seed loss.

With wheat we aim to get crops in at the earliest time moisture is available and weeds can be controlled and use high sowing rates with varieties that give the best chance of making grade and quality. Again we target moisture and make use of coleoptile and are considering swathing, collection and burning to reduce weed seed set. We only spray when yield loss from weeds is going to be greater than the crop effect. (*Editor: some farmers with advanced herbicide resistance are saying that dry seeding is risky, because it puts too much selection pressure on the triazines and trifluralin. Allowing some weeds to germinate on the opening rains and killing them with a knockdown is considered sensible*).

Weed management

With our precision seeding we often use post-seeding pre-emergent Spray.Seed. We ensure a good spread of materials from the header or if weeds out of control, we windrow and burn. We separate ryegrass with an extension sieve and collect, sterilise with trifluralin, or lay in small windrow to burn (no sheep to spread material). We need diverse herbicide rotations, good early establishment of crops to out compete weeds. We accept some weeds if they are not penalising yields. We like the concept of turning all residue passing through the header into powder fine enough that seeds become non viable. We spray all fence lines and target resistant blown out areas for crop topping and plan to reseed blown out patches if post-seeding pre-emergent knock down fails to get adequate control.

Yield Mapping and dGPS

It is important to be aware of new advances in technologies in both machinery and agronomic practises and the understanding of these. If you are frightened to try the new because of failure then you will never realise your full potential for success. It is also important to get advice wherever possible, then you can make your decision on how you interpret the advice relating to your system.

When going to continuous cropping we needed to know the areas that were not making a profit and try and address the problems. The potential exists to mark those areas and treat them separately. Things like acidity (lime application), hard setting areas (gypsum), or nutrient deficiencies are things that could be targeted off season once identified. The use that may have the greatest potential is the ability to map weeds at harvest time, especially areas of resistance.

In 1996 I purchased a yield monitor with a field marker which allowed me to log the positions of four different weed types. I found this information limiting as it did not give the ability to log the density of the patches. With close liaison with Rinex Technology and their FarmTrax system they were able to develop software that enabled me to map up to ten things, whether it be weeds, insect damage, water logging or salt, at zero, low, medium or high density visually as we were harvesting.

The data base that we are going to collect on weeds for each paddock is going to be fantastic and will enable us to closely monitor the history of paddocks. I am already starting to do research on the direct injection of chemicals and the prospect of better use of chemicals is very exciting. The ability to only apply chemicals where weeds are present and to apply different rates and different chemicals in one pass is possible now.

Even without variable rate there are advantages in knowing where the weeds are. If, for instance, we have a 100 ha paddock that has resistant ryegrass, and even though these patches add up to only 25 ha, as a management tool we may hit the crop at the 1 leaf stage with gramoxone to try and get the maximum amount of ryegrass seedlings.

This would set the crop back by at least 10 days, which has a yield penalty of 20 kg/ha/day, a total of 0.2 t/ha. The 75 ha that was not infested has lost 15 tonnes of grain, at $200/t this is a loss of $3,000 over the whole paddock or $30/ha. The patches we sprayed, however may in fact do better as the competition may have been removed. Let us assume the 75 ha will yield 2.0 t/ha or 1.8 t/ha if sprayed, the 25 ha would yield 1.2 t/ha if untreated or 1.5 t/ha if competition was removed. The chemical cost $3/ ha.

From these figures we can assume that, if we did nothing the paddock would have returned $360/ha, if we sprayed the whole paddock $327/ha or if we patched the bad areas $374/ha. The first option is not really viable as the resistant patches will increase in time. The total savings between the other two options are $374-$327 which is $47/ha or $4,666 for that paddock.

Fertilisers and crop nutrient supply

In 1983 we started top dressing all fertilisers on our soils (sandplain) and there has not been anything drilled since then. Our yields have held well and soil tests indicate good availability of all nutrients. I believe the whole soil profile needs to be healthy. Nitrogen is very mobile and I see little advantage in drilling or banding this product. Trial work so far has been fairly inconclusive in its advantages. The phosphorous levels seem to be holding well, and although it is less mobile than nitrogen, I think it is working its way through the profile fast enough.

The trace elements copper, zinc, molybdenum, and manganese are fairly immobile. With no-till not mixing the soil, these may have to be drilled (granular or liquid), or in some cases applied by foliar application. Potassium is very mobile so it should be able to be spread. The other advantages of not applying fertiliser at seeding is that there are less hold ups for filling both the seeding implements and the trucks. Also there is less corrosion of the farm machinery. I aim to examine the possibility of making my own liquid fertiliser for chemical injection. Trace elements are added to super or other granular compounds so I believe they could be applied by injection behind the coulters. The other way would be to apply your granular trace elements every so often, perhaps combined with a green manure and turn the lot in. I believe we still have so much to learn in understanding our soils.

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