Newsletter of

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Western Australian No-Tillage Farmers Association (Inc)

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Haste makes waste at break

Again several farmers say that they should have waited for that magic 8-10 days after the break before applying pre-seeding knockdowns. Some who didn't wait had to go back with a plough to kill the vigorous weeds and crop that emerged. Even with late breaks many say its well worth the wait.

Broadstrike® for marshmallow

Marshmallows have always been hard to kill with knockdowns. The most cost effective tool is some Goal® mixed with the Roundup® knockdown. But it was in short supply this year as only Monsanto have been bringing it in. The good news is, better late than never, but even 10 g/ha of Broadstrike® has worked well at controlling mallow, though it took a while to see it work. Data is soon to follow, ask Brent Pritchard from Elders, Katanning or John Dadd for it. It has long been known that diflufenican has good activity on marshmallow also, but this is at a price. In pastures, sheep will eat it and 2,4-D helps.

Narrow rows and herbicide resistance

I was just talking to Allen Postlethwaite about his recent row spacing experience. Allen is more confident than ever, in his environment, that wider than 360 mm (14") rows for his cereals could be a real possibility to help get the chemical to the weeds. Allen also said that wide rows means less soil disturbance and that means less weeds will germinate.

Narrow rows and trifluralin damage

Constant publicity, by a minority, who know little about the big farming picture, have encouraged farmers to keep row spacings at 180 mm (7") with cereals and canola. Keeping narrow rows works against stubble retention and can lead to some big mistakes with soil-active herbicides.

The most commonly used herbicide in no-till, trifluralin, requires a 230-300 mm row spacing to avoid toxicity in the crop. Narrow row spacings mean that too much herbicide gets thrown into the previous furrow unless you want to travel at 5 kph. Other soil-active herbicides being used may also fit in this category.

Turbo coulter may incorporate

Great Plains have invented a new type of leading disc that is likely to incorporate herbicides. The nearby photo, as it shows the rooster tail thrown into the air. This tail of soil seems to spread the soil over the surface. I have two trials testing this idea this year at Muresk and Dowerin. Also Stuart McAlpine tells me that he got his Great Plains wavy disc hardened with "Tung-Tuff" (Brisbane) this year and it has stopped wear almost completely.

Agrotain® for urea looks exciting

I have sown some Agrotain® trials this year and it appears to be repeating the good experience the Canadians have found. Agrotain® is a urease inhibitor which, when added to urea, greatly reduces seedling toxicity. Urea conversion to the toxic ammonia and ammonium is slowed from the current one day release to over 14 days and may allow 2-3 times more urea to be put with the seed. One of these trials is at Muresk on the Northam-York road, which we will see after the WANTFA Weeds Seminar at Muresk starting at 1 pm on the 8th August.

Greenhouse gas winners

You probably already know but, because you, Mr No-Tiller, are now using 20-40% of the fuel you used to, you are contributing wonderfully to reducing the greenhouse gas build-up. Not only that, but because you are keeping your stubble, you are grabbing carbon from the air with crops and leaving it in the soil.

Interestingly, in Canada numerous agronomists are funded full time by an energy company that burns carbon. The agronomists are there to promote stubble retention, and it is considered an environmentally responsible company that is doing its bit to be close to carbon neutral.

Armyworm down south

According to Mike Grimm, entomologist at AgWA Albany, this could be a classic for bad armyworm year. "All the symptoms are there, so be warned" said Mike at a WANTFA Boxwood Hills meeting in late July. Sadly also, the best and thickest barley crops are most at risk of head lopping near harvest time.

Experience on the south coast before shows that misters are useless, and planes should hopefully do a better job if the pilot does it on a cross wind and gets enough turbulence to wave the crop around. Alternatively, I have noticed a few tall (Canadian type) dedicated sprayers have moved into the State. These could well do a good job at penetrating the canopy and may be useful for those experimenting with summer crops also.

Aphids in good crops

If you have a high-potential-yield cereal crop (2.5 t/ha), then aphids are likely to be invading it now. Suppressing their feeding desire by using a SP has been successful in trials early in the year. But high aphid numbers can knock off up to 40% of cereal yields so aphicides should be seriously considered.

Mice Lookout

Crops east of Geraldton are having mice nip-off lupin and canola pods. Also worth noting is that several years back, some Esperance farmers saw maturing wheat being nipped-off at the node below the head at flowering time. So keep your eyes open. Note also that mice damage is seen with all crop establishment techniques. Matthew Young from Geraldton AgWA (08 9921 0555) is monitoring the mice and AgWA have a Limited Registration Use of zinc phosphide bate which is to be applied by plane.

The bate costs $5.60/kg and at a rate of 1 kg/ha with $5/ha to apply, it will cost $10.60/ha. Only Pilots with a specific certificate can apply it. Currently these are Dumas Aviation and some pilots from Wubin and Mullewa. The bates are unlikely to give the fantastic results they gave over east earlier this year (May-July). This is because the mice now have healthy pods to eat and the bate may get caught in the branches of bolting lupin and canola crops.

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997-98 EXECUTIVE

TOPICAL SECTION

REGIONAL FIELD DAYS

Kevin Bligh , VP (08) 9755 7589, fax 90

Each day will start with talks from local farmers, WANTFA members and Scientific Officer Bill Crabtree. The touring party will include our Foundation President Ray Harrington, President Graeme Malcolm, Vice President Kevin Bligh and committee members Tony White and Geoffrey Marshall. Bill will relate his no-till experiences in Canada in 1996 to local conditions.

Also local no-till farmers will talk on their joys and sorrows with no-till. The interaction and discussion at these days is valuable, so come along and share your thoughts. There will be a minimum charge of $5/head admittance fee, depending on local arrangements.

Date	Region	Time	Meeting place	Co-ordinator	Phone (08)
Mon 11th	Broomehill	1 pm	Rob Ladyman's shed, 19 km from Katanning on Kojonup Rd.	Neil Young	9821 0026
Tue 12th	Bodallin	1 pm	Hall	Mick Christiansen	9847 5018
Wed 13th	Corrigin	1 pm	Cyril Box Pavilion	Richard Barrett	9062 9018
Thu 14th	Wyalkatchem	1 pm	Town Hall	David Rogers	9681 1133
Fri 15th	Buntine	10 am	Sports Club	Stuart McAlpine	9664 2082
Sat 16th	Ajana	1 pm	"Riverside" farm, 5 km east on Coolcalalya Rd, 5 km south of M. River.	Bob Porter	9936 1021

MURESK WEEDS SEMINAR THIS FRIDAY!

Bill Crabtree, Scientific Officer (08) 9690 1456, fax 46

This WANTFA Seminar (8th August) will focus on weed management strategies particularly with no-till. Prominent World authority in weed resistance, Professor Jonny Gressel from Israel, will speak on the subject of "are low knockdown rates encouraging resistance". We are thankful to IAMA who have sponsored his travel to WA.

Jonny is President of the International Weed Science Society, he has written 190 papers, many on herbicide resistance, and he is an enthusiastic and easily understood speaker. Jonny is a great believer in learning from farmers to help understand the complex nature of farming systems. This is a timely topic by a most valuable and appropriate speaker. All welcome!

The Seminar begins at 1.00 pm in the Hall (just north of the main car park) and will finish at 5.15 pm with an optional one hour tour of no-till trials at Muresk. For more info call me (Bill Crabtree) on 0417 22 33 95.

Time (talk time)	Speaker	Topic
Session one	Bill Crabtree	= Chair
1.00 (15 mins)	Bill Crabtree	Background to NT issues
1.20 (45 mins)	Jonny Gressel	Low rates and resistance
2.20 (15 mins)	Chris Henderson & Steve Lamond	Herbicide resistance managment and less tillage by weed issues
2.40 (15 mins)	Tony White	weed mgmnt. in my system
3.00 (20 mins)	Panel Session	Invite, Burgess, Fosbery etc.
3.20 Coffee Break		
Session two	Graeme Malcolm	= Chair
3.40 (15 mins)	Peter Burgess	NT by herbicide thoughts
4.00 (15 mins)	Steve King	3-4 years of no-till weed mngmnt.
4.20 (15 mins)	Bill Roy	Integrated Crop Management
4.40 (15 mins)	Steve Curtin	NT tricks and tools
5.00 (15 mins)	Panel Session	
5.15 (60 mins)	Trial visit	

NEWSLETTER SURVEY

Ken deGrussa, Past President
Tel (08) 9078 2026, fax 07

The survey of members earlier this year has been a valuable exercise. The response to the survey was excellent. With almost 80% of members responding, we feel the knowledge gleaned from the survey is very useful. The committee sincerely appreciates your willingness to answer the questions - thank you!

We want to know what you want in the newsletter, it is important that we make it interesting and relevant to members' needs. You may recall, we asked for your thoughts on the newsletter style, format and content from farmers, scientists and overseas. We also asked about your no-till approach.

The questions on newsletter style and presentation all received a strong yes vote! Some 77% want it divided into sections, with some comments that it was not particularly important, 87% want more scientific information and a plea to the scientific community to "catch-up", 81% want stories from Interstate and Overseas but sometimes cautioned with "don't overdo it", and a resounding 98% want more farmer stories. Many of you also requested more information on weed management and other agronomic issues.

Clearly, you want practical experience to help develop your systems, but stories from farmers have been hard to get. There is a wealth of information out there! Knowledge gained the hard way, by the "suck-it-and-see" approach is very useful to WANTFA members. However, modesty prevents many from believing that what they know

CHAIR'S NOTE

Graeme Malcolm, Morawa
Tel (08) 9971 5002, fax 35

The last few months have been extremely busy for the committee who have undertaken the responsibility of change within WANTFA to take us into the 21st century. We have grown from an enthusiastic group of interested farmers to an organisation with one full-time and one part-time employee.

As industry's demands grow, WANTFA is endeavouring to service and supply the best available research information to members through newsletters and manuals. Bill Crabtree's appointment as WANTFA Scientific Officer in May has since snowballed with a lot of interaction with our members. August is our busiest month yet, starting with Muresk on the 8th, spending a week on the road at no-till field days and finishing up with Dowerin and the rest of the field days.

The Committee look forward to meeting members new and old at the many field days around the state over the next month. Look for the WANTFA banner at Dowerin in lot 241b (NE corner) and drop in and look at the latest no-till equipment and information over a cuppa. Our August regional field days show what we can afford to do for our members. So if you received this newsletter complimentary, you are invited to fill in the membership application to assist with next years research and promotion of no-till systems.

If you have any ideas or suggestions to improve no-till systems please contact a committee member or Bill Crabtree to make up a newsletter article, or even add to the display at Dowerin. Hoping rain comes your way soon.

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is worth talking about. This is a challenge for us and our editor would appreciate more farmer contributions.

The questions relating to types of seeding equipment produced some interesting responses. Predicably perhaps, tines are the most common form of opener. However, disc openers are used by about 20% of those who replied and the highest proportion are used in the southern regions. Seed covering methods were many and varied, but the most popular is the presswheel. Next is the prickle chain and then various other chains and finger harrows.

Hopefully, this newsletter approach reflects the desire of most members. We hope you like it, but we look forward to any other comments you may have. We need feedback to ensure we give what you require and present it in the way you want it! Other comments regarding newsletter presentation have been taken on board to be considered on an ongoing basis as the newsletter develops.

INDUSTRY NEEDS

This is a new column designed to alert industry of some farming needs, please send in your suggestion or your answer to the need.

- Seeders that clearly indicate when outlets are blocked - Flexicoil do have such an electronic tool, but at a cost!
- Better blob dobbers that can be seen in the dark in thick stubbles (blue foam day-time is excellent!)
- Closing systems that bring some herbicide into the furrows without too much disturbance,
- More robust legume crops to al low increased diversity in rotations,
- Fertiliser blockages are too common - need more uniform granules or warm air blowers.

SCIENCE SECTION

ROW SPACINGS - ISSUE OR OPPORTUNITY?

Guy Lafond, B Irvine, G Clayton, D Derksen, E Johnson, A Johnston and D Rourke.

Introduction

This review summarises all known studies dealing with row spacing effects on various crops in western Canada over 30 years. All studies have been drawn from where clear comparisons can be made. This includes data favouring both narrow and wide row spacings. Most data has been generated for spring wheat and canola.

Although one could argue that for certain crops the risk of reduced yields with 10-12 inch row spacings is frequent enough to cause concern, we must remember the absolute yield differences and the overall farm benefits. There were enough positive studies to show that in absolute terms, high yields can be obtained with 12 inch spacings without compromising yield. If the yield potential is compromised, then in most cases it can be explained on the basis of confounding effects due to seeding rates, experimental design and methodology. In some cases fertilizer placement and availability resulted in biases against the wide row spacings.

In order to establish the full potential of wide row spacings, it is necessary to evaluate this concept in the context of a zero tillage production system because it can use the benefits of standing stubble and the mulch effect of crop residues. Research is required comparing spacings under conventional and zero tillage production systems. These tudies have not been done and until they are, the true benefits of wider row spacings will not be fully known.

Historically

It is useful to reflect on the early 1980's with all the excitement about European intensive cereal production techniques which promoted narrow row spacings, high seeding rates, high rates of fertilizer, split applications of N, plant growth regulators to control lodging and fungicides to control plant diseases. However, this approach led to severe problems with heat and drought with low yields and/or crop failures on the prairies. This prompted us to develop crop systems that protect the soil from degradation and conserve water which lead to least tillage systems being adopted.

Less tillage created an important dilemma. Tall stubble for trapping snow can create trash flow problems, because the rule of thumb is that the height of stubble should generally not exceed the spacing between the rows. However, the widely accepted view has been that narrow row spacings produce highest yields. Farmers then had to find a balance between stubble height for conserving moisture, and the need to maintain a narrow row spacing for best grain yield.

This dilemma led us to evaluate wide spacings under zero tillage or low disturbance direct seeding systems. We needed to find out if the yield penalty suffered from using 12 inch row spacings could be offset by the benefits of tall stubble for trapping snow, low soil disturbance, draft power requirements and cost of purchasing new equipment, ease of seeding and whether changes could be made to avoid the yield penalty when using a 12 inch spacing. This paper is a result of such thinking.

Table; Effect of row spacings on grain yield in western Canada (t/ha).

Row (")	Lentil	Pea	Flax	Canola *(%)	Winter wheat	Durum wheat	Spring wheat	Canary seed	Barley	Oats
4-6	1.60	2.47	1.41	100	3.29	2.72	2.98		2.52	3.90
8-9	1.47	2.49	1.45	98	3.38	2.79	2.97	1.60	2.41	
12	1.48	2.18	1.40	96	3.37	2.83	2.97	1.59	2.34	3.93
16	1.57	2.02		92					2.23	

* Editor's note: lots of variability in canola results, this is an incomplete presentation (see full paper).

Legumes

With lentils, some studies show yield reductions with wide rows others show no yield penalty even with rows as wide as 16 inches. With peas one trial with conventional tillage had less yield at wide spacings and one direct seeded trial showed no yield penalty even out to 16 inches. Farmers have had very high field pea yields on 12 inch spacings, without having to use narrow spacings. The increase in concentration of seed-placed fertilizer at wide row spacings may be affecting not only plant populations but the vigour of the plants, as a result of sub-lethal damage to the root system and nitrogen fixation.

Oilseeds

For flax (linseed), only one of eight studies showed a lower yield with 12 inch spacings with no differences between the other studies. High flax yields do occur with 12 inch row spacings provding fertilzer is placed away from seed. Flax is not a competitive crop so careful weed control is needed, and possibly more so if wide row spacing is combined with high soil disturbance.

For canola, as with many other crops, it is generally accepted worl-wide that higher seeding rates and narrow row spacings give greater weed competition. However they also increase lodging potential and incidences of disease and have generally not improved Western Canadian canola yields greatly. When the same amount of seed is planted in narrow rows, a greater number of plants establish and survive giving a more faster crop canopy. A large canopy improves the crop's competitive ability with weeds.

A uniform stand, which emerges quickly, is more important than maintaining narrow row spacings. When good seed to soil contact allows rapid and uniform plant emergence, the value of narrow row spacings is reduced providing weeds are adequately controlled and fertilizer toxicity avoided.

Earlier scientific trial work was done by hand seeding and since no mention is made of weed control, we assume hand weeding was done. Hand weeding would favour narrow row spacings since hand weeding can not be done until the crop is well established, by which time significant competition may have occurred. These trials have been included in this (full) review.

Cereals

For durum wheat, results from 3 separate studies, at 3 locations, over a range of yields (0.8-5.0 t/ha) showed yields were not affected by row spacing. All studies were done under zero tillage, ranging from solid seeding to 12 inches.

Row spacing trials with winter wheat have been done from 1985-94. Again there is a range of row spacing responses, from no effect to decreased grain yield with wider spacings. What is the best approach, given that you

want to do what gives you the greatest probability of successfully attaining the highest yield possible?

There are many row spacing studies in barley which mostly showed no grain yield difference due to row spacing. High barley yields occur even when using row spacings as wide as 12 inch. The range in yields reported are 0.9-7.0 t/ha. A combined analysis of barley yields across years and locations resulted in no significant difference between row spacings ranging from 6-12 inch. A drop in yield was only observed at 16 inches and at one site (20%). However, without herbicides, with organic production, barley yields are higher with higher seeding rates and narrow spacings.

Spring wheat has by far the largest data set with respect to effects of row spacings on grain yield. Some studies, show no difference due to row spacing among 4, 8 and 12 inch over a yield range of 0.5-5.4 t/ha involving many years and locations. Others show a yield reduction from 6-9 inch but no differences between 6 and 12 inch and in others, yield differences in certain years favour narrow spacings but not in others, even though the yield levels are the same.

Although a very clear and precise statement to the effect that row spacing in the range of 4-12 inch has no effect on grain yield in spring wheat is not possible, we can nonetheless state that providing proper crop production practises are used with wide row spacings, a yield reduction should not occur.

Advantages of wide rows under zero-tillage?

1. Wide row spacings under zero-tillage allows farmer to seed through very heavy residues, especially when combined with wet soil conditions, as it allows less soil and residue disturbance.
2. In the drier parts of the prairies, tall stubble traps more snow and therefore increases soil moisture. However, the rule of thumb is that stubble height should be similar to row spacing. Therefore wider spacings, allow taller stubble to trap more snow. Stubble cut at 10-16 inches can reduce wind speed at the soil surface by 60% relative to a tilled surface. This can be critical in drier areas.
3. Wider row spacings reduces the costs and draft requirements because of the fewer number of openers present on the tool bar. However, the benefits are far reaching. By going to 9 to 12 inch spacing, you are effectively increasing the width of the machine and reducing seeding time and tractor hours by 33%. This gives greater timeliness in seeding, especially with poor weather. Changing row spacing can improve the timeliness of your seeding operation and lower your long term machinery costs at the same time.

Wider rows and conventional tillage?

Only a few studies have examined row spacing as a function of tillage systems for barley, spring wheat and canola. The response did not change with tillage system. Therefore all the arguments used previously with respect to equipment considerations also apply to conventional systems. The only important consideration would be the implication for weed management.

Are weeds a worry with wide rows?

No studies in the past have tried to quantify the impact of row spacing on weeds, whether it pertains to weed communities, densities or control. One new study with leader Dr Doug Derksen at Brandon in Manitoba, being conducted across western Canada, is investigating the effects of row spacing and fertilizer management on weed communities and densities.

Problems with weeds on wide rows have been reported in the past, however, we postulate that high soil disturbance encourages weed growth. Therefore zero tillage systems and wide row spacings combined with narrow openers may reduce weed growth due to less soil disturbance, and weed problems will likely not change with the use of wider row spacings. There are many good farmers currently seeding on wide spacings and if weeds were a problem with wide rows, it would have been noted, but it is not the case.

Should seeding rates be changed with row spacing changes

Most of the studies reported in this paper were done at different seeding rates and no statistical interactions between row spacing and seeding rate were reported. Therefore no changes in seeding rates are required when row spacing changes are made.

Are changes in harvest management required?

If your operation is set-up with aeration bins and a grain dryer and straight harvesting is used then no adjustments are required when widening row spacings. However, with swathing, switching to wider rows will require some adjustments. It will not be a problem for crops like field pea, lentil, canola or flax. But it becomes an important concern with cereals, especially if the crop is thin.

Some practical ways to minimise swathing problems is to swath at a different angle to the direction of seeding. This can easily be done with a self-propelled swather. With a pull-type swather, you will have to seed at an angle. Farmers who use wide spacings and regularly swath their crops have observed that with moderate to heavy cereal crops, it is not a big concern, even if when swathing in the same direction as seeding.

Does row spacing have an effect on plant diseases?

Work at Outlook, Saskatchewan on canola showed that row spacing had very little influence on sclerotinia infection levels. Other work on wheat and barley at Indian Head and Brandon showed that root diseases actually decreased at the wide row spacings. Work at Minto on wheat showed that at high levels, the increase in grain yield using narrow rows was only obtained when a foliar fungicide was used. Although very few studies examined the impact of row spacing on plant diseases, the few that have would indicate that there could be some potential benefits in terms of disease reduction with wide row spacings. We argue that using wider rows will not necessarily increase plant diseases.

Are fertiliser changes needed with wide rows?

Fertiliser placement does require special attention. Going from 9-12 inches will increase the concentration of the fertiliser near or with the seed by 30%. Even with crops like field pea, where only phosphorus is sometimes used, reductions in plant stands of 10-15% can occur when placed with the seed. Therefore make every effort to separate the seed and fertiliser to minimise the risk of crop damage.

Row spacing in wetter parts of the prairies

When heavy crop residues are combined with heavy textured soils, using wide row spacings won't resolve all the problems because of the soil remaining wet for too long and delaying the seeding operation, not to mention making it very challenging. However, the other advantages of wide row spacings in terms of equipment, timeliness of operation, reduced field time and tractor hours still apply. There may also be some advantages in terms of reduction in fouler and root diseases.

Why the conflicting data in the last 25-30 years?

All field experiments have some inherent biases built into them. In some cases, these biases can have a significant influence on the results. Examples of biases in the context of row spacing studies might involve:

(1) confounding effects with seeding rates,

(2) error in the calculation of effective harvested area,

(3) border effects which become magnified when only a few rows are used per plot and

(4) fertiliser placement favouring one spacing over another due to avail ability or damage.

We therefore contend that the major reason why there are so many conflicting results with the effects of row spacing on grain yields has to do with unplanned biases introduced into the studies and having an effect on the results. The fact that high yields can be maintained with spacings as wide as 12 inch is a clear indication that the high yield potential of crops will not be compromised. As long as plant populations are maintained and fertiliser is managed properly, producers should not experience reduced yields because of the use of wide row spacings. However, it is possible that under certain circumstances, yields on wide row spacings may be lower and it is important, through appropriate research, to try and define what these conditions might be.

PRESS WHEEL FOR LUPINS

Mohammad Amjad, AgWA, Merredin (08) 9081 3111 fax (08) 9041 1138

It is generally believed that press wheels improve crop emergence, growth and yield of all crops. But in several experiments in 1995 (Moora, Wongan Hills, Corrigin and Bencubbin), press wheels generally reduced lupin establishment (by 4-28%) and usually yield (from 10-23%). This work shows that pressures used for lupins probably should be less than for wheat on many soil types. Lupins cotyledons are more sensitive to firm or sealed-over soil than cereal colyoptiles. Inadequate pre-seeding herbicide incorporation by press wheels probably also reduced the lupin yields compared to harrows.

No-till is planting seeds without disturbing the whole topsoil. If not properly managed, the narrow points followed by heavy press wheels on some soils can increase soil strength above the seed, and form a crust after drying.

During 1996, we looked into better systems of creating good seed-soil contact with uniform depth control, by avoiding compaction above the seed and developing a non-crusting environment. This was achieved by varying press wheel loadings from 0-8 kg/cm of press wheel width, using seed-side pressing, using harrows before press wheels and testing these with and without tillage below the seed.

Seeding was with a 20 mm wide point, working 80 mm deep with the seed placed 40 mm deep with 50 mm wide points at 380 mm row spacing. Separate tillage and seed placing tines were used with a John Deere 746 type combine seed drill, followed by rotary harrows and press wheels. Press wheels that are 50 mm wide pressed the soil 50 mm away from the centre of the seed row rather than directly above the seed row. No, or least, press wheel pressure gave the best lupin establishment (46 plant/m2) when sown into firm no-tilled soils.

With deeper narrow points slight press wheel pressure was beneficial, and emergence varied from 38 plant/m2 without press wheels to 45 plant/m2 with press wheel pressure of 4 kg/cm. Deep-digging appears to need some pressure for better seed-soil contact compared to no deep-dig depending on the soil moisture conditions. No yield response to deep-dig was found this year. This work showed no reduction of lupin establishment by seed side-pressing combined with harrows for seed coverage and herbicide incorporation. Side-pressing may have improved seed-soil contact, avoided seed-row compaction, and left the top of the row loose enough (non-crusting) for easy emergence and early vigour.

Further work is in progress with funding from GRDC under a Reliable Lupin Seeding Systems project.

SIMPLE GRAIN SORGHUM STEPS FOR LOW RAINFALL IN NSW

Jon Wilkinson, Pioneer Hi-Bred Australia, Moree, NSW (02) 6752 9001, fax 02

NSW grain sorghum growing conditions are quite different from WA. I have talked with Bill Crabtree about our two different environments. Bill tells me that salinity concerns and creating diversity in your rotation for pest control are the main reason why you have experimented with summer crops like sorghum.

This article presents how we grow sorghum in NSW, particularly with the benefits of no-till. Sorghum is perhaps the most water efficient crop available, with 270 mm being needed to produce 1 kg of grain, whereas corn requires 370 mm, wheat 500 mm and oats 630 mm. At least 110 mm is needed for the crop to start producing grain. Then each subsequent 100 mm might grow 1.4 t/ha of grain on good soils or 1.0 t/ha on poorer sandy soils.

In NSW sorghum is grown on moisture stored for a winter by chemical fallowing. Typically planted in October the sorghum matures by mid February and glyphosate at 1.6 L/ha is usually used to help dry the crop for harvest. Typical drying rates for grain are 30% at the time of spraying, down to 16% at 7 days after spraying, then 13% at 14 days. This is dry enough to sell but 12% is needed for long-term storage. Maximum moisture is required 15 days either side of flowering at about 65 days after planting. Planting sorghum into wheat stubble, harvested 11 months earlier, is the most common approach in NSW. We use the stored winter rain to ensure we can grow a crop.

Fallow Management

The more marginal the rainfall in a sorghum growing area, the more important a fallow is. In north-western NSW no-till farming has extended the area of reliable summer and winter cropping further west of Moree, out to Walgett. The best sorghum crops in a harsh summer crop season always come from sorghum that is no-tilled into cereal stubble. Some growers claim a 25% long-term yield increase from this practice. The more stubble residue, the better the crop, so there is a trade-off with sorghum grain yield if the fallow stubble is grazed with livestock.

Sorghum is typically sown in October and post-emergent herbicides are applied as required from December through to September. Atrazine, typically at 3 L/ha, is not usually applied until March, to avoid excessive breakdown in mid-summer. Prior to sowing or post-sowing 1-2 L/ha of Atrazine can be applied. By late September the fallow ideally should have 1.0 m of sub-soil moisture for planting.

Planting Time and Depth

Most hybrids germinate and emerge satisfactorily when planted at 15°C provided soil temperatures is increasing and the frost risk is over. Soil temperature is measured at 9 am at the intended seeding depth. It is most important to sow the crops as early as possible in marginal areas, particularly to avoid the high temperatures during flowering, also a time of peak water use.

Best results are when seed is sown about 5 cm deep. Minimum is 2.5 cm and maximum is 7.5 cm, any deeper will only be successful in warm, friable soils.

Establishment, Density and Row Spacing

Press wheels are essential for quick, even establishment. Typical emergence improvements from press wheel use are from 40% without press wheels to 65% with press wheels.

In marginal areas where lower populations are required there is the risk of poor stands due to the low sowing rate. In northern NSW the precautions of using press wheels and using the appropriate seed treatment such as Semevin 500 to control certain soil insect pests like false wire worms helps ensure good emergence rates.

Many publications promote established populations much higher than that used successfully for sorghum growers in northern NSW. Typically 2.5 kg/ha of seed would be sown, with 25-28,000 seeds/kg. Yields of up to 7.5 t/ha have been obtained commercially in good seasons. This shows that sorghum can tiller well and compensate well at lower populations. In most marginal areas, with precision planters, sowing rates of 65,000 seeds/ha to establish 35-45,000 plants/ha would be adequate.

Wide rows (95 cm) out-yield narrow rows (60 cm) under harsh conditions and would probably be essential in WA. In NSW, as a guide, if crops are expected to yield around 2.5 t/ha then 1.0 m row spacings should be used. Under wetter conditions or with irrigation then narrow rows should be considered.

Nutrient Needs

As a rule of thumb 1.0 t/ha of grain removes 16 kg/ha of N and 3 kg of P. Wide rows with no-till which are needed with dry areas does limit fertilizer application. In practice, with a well-fertilised cereal crop fallowed through to sorghum, most growers find success by applying maximum rates of fertiliser such as MAP at 40 kg/ha sown with the seed. Recently increasingly ZincMAP blends are being used with significant results. Long-term fertiliser trials in marginal sorghum areas have proved inconclusive. But there are significant results in higher rainfall areas.

Weeds, Pests and Diseases

Good weed control is essential with the most commonly used chemicals being Atrazine, Primextra, as pre-plant pre-emergence and Atrazine and Starane post-crop emergence.

Sorghum midge and heliothis are the two major pests to consider in NSW, which may require spraying 1 in 3 years. Midge are a problem in NSW (not in WA) at flowering and heliothis during grain-fill. Cereal aphids can thrive in sorghum crops and would need to be monitored. The main problem they create is by making harvest a sticky operation.

Charcoal and Fusarium stalk rots can occur when good growing conditions are followed with severe stress during grain fill. This can result in pinched grain and lodging. Crops that remain green with some available soil moisture during grain fill usually do not lodge.

Variety, Harvest and Market

Selecting the right hybrid for a marginal area is extremely important. A quick hybrid with good cold tolerance and early vigour at establishment is desirable. A hybrid with better vigour helps when trying to sow the crop as early as possible. It also can avoid the heat of mid-summer during flowering. Sorghums such as the Pioneer® hybrids Western Red.MR and 534.MR are the two most consistent performers under marginal conditions in north-west NSW.

For long-term storage 12% moisture should be the maximum. Spraying the crop after physiological maturity with glyphosate 450 gai at 1.6-2.0 L/ha will speed up harvest, control late weeds, kill the crop and potentially save a lot of sub-soil moisture. This practice is increasing rapidly in northern NSW.

Prices for sorghum grain generally follow feed wheat fairly well, as it has similar uses as chook and bird feed and for feed-lotting. In NSW sorghum is preferred over feed wheat (although no better price) and is used domestically and a fair bit is exported to Japanese feedlots. The long-term (8 year) price has been about $135/t, with $200 occurring in 1995 and $135 in 1996. Like feed wheat, its price crashed in 1990. In WA some market investigations prior to sowing grain sorghum would be worthwhile.

More Information

Graeme Ralph, Product Manager, Pioneer Hi-Bred Australia, Moree, NSW will be in WA in mid-September (partly to visit Paramount seeds) and he has said that he would be happy to meet with WANTFA farmers, stay tuned! Graeme manages sorghum, corn and forage for NSW and Victoria and is an excellent vibrant speaker, who knows his stuff. He can be contacted on (02) 6889 2299 or (02) 6889 2292 (h) or fax (02) 6889 2490 or mobile 018 718272.

Also David Smyth of Paramount Seeds, Esperance 6450, WA, phone (08) 9071 1053 would be happy to discuss your seed needs.

SUMMER CROPS -DRY AREAS

Steve Curtin, ex-District Leader, Lake Grace AgWA (08) 9865 1122, fax 616

Visiting South Dakota Professor Dwayne Beck enthused farmers and researchers to investigate summer (warm season) crops to improve farm systems in WA. Dwayne believed that these crops, in our environments, could offered large benefits in rotation diversity for no-till systems. We chose two sites to test some summer crops.

The light site was at Steve King's farm, SE of Lake Grace, and was on yellow sandy loam over gravel soil at 40 cm. The paddock was wheat in 1995 and kept sheep-free and fallowed in 1996, it was also deep ripped before sowing. The heavy site was at Geoffrey Marshall's farm, east of Hyden, and was on a heavy grey, sandy-clay-loam over yellow, sticky clay to 70 cm. The paddock was in a pea:wheat rotation.

Both trials were no-tilled with 4 kg/ha of seed using Agmaster Harrington deep banding boots and tines with trailing presswheels. Double Super at 50 kg/ha was banded below the seed with 100 kg/ha of urea topdressed at sowing.

We tested 4 types of summer crops (grain sorghum ["new nugget"], forage sorghum ["Jumbo"], forage millet ["Nutrifeed"] and sunflower) at two row spacings (310 mm and 620 mm) and with three sowing dates (2nd Sep [early] 20th Sep [mid] and 10th Oct [late]). The sites were sprayed before seeding with 1.0 L/ha of Roundup and 2.0 L/ha of Atrazine. The sunflower plots were sown on the ends on the trial, and all plots were harvested on 14-18th February 1997.

Steve King at Lake Grace Ag WA trial site

			Lake Grace (light)			East Hyden (heavy)		
Grain type	Seed date	Row space	Yield (kg/ha)	Plants per m2	DM (t/ha)	Yield kg/ha	Plants per m2	DM (t/ha)
Grain Sorghum	early	310	256	7.2	3.9	425	6.0	3.1
	early	620	224	3.7	1.0	358	4.6	2.7
	mid	310	140	9.2	2.5	378	3.9	1.8
	mid	620	231	6.0	2.2	304	2.1	1.2
	late	310	74	20.0	5.9	172	3.5	0.9
	late	620	26	6.5	1.6	200	2.1	0.6
Forage Sorghum	early	310		9.5	4.3		7.7	2.7
	early	620		7.7	1.5		5.9	2.1
	mid	310		11.6	4.6		5.0	1.3
	mid	620		8.5	4.5		5.0	1.7
	late	310		16.0	3.1		6.9	1.5
	late	620		9.0	2.0		3.5	0.8
Forage Millet	early	310		3.4	2.9		2.6	0.8
	early	620		2.5	1.2		1.9	0.6
	mid	310		14.4	5.0		1.6	0.4
	mid	620		4.8	1.8		0.8	0.2
	late	310		14.2	2.7		7.3	0.9
	late	620		12.3	2.2		4.2	0.5
Sunflower	early	310	171					
	early	620	116			52		

Sowing at 4 kg/ha was ample, with 6-9 plants/m2 (60-90,000 plants/ha) being probably twice what is required for dry environments. There was large variability in establishment across both sites with no clear relationship between time of sowing and plant density on the light site. On the heavy site, due to poor opener penetration and not enough press wheel pressure, the best germination was for the second time of sowing which was sown after a rain. The millet was damaged by the Atrazine at the first two times of sowing on the heavy site and at the first time of sowing on the light site.

The rainfall to the 2nd of September was 175 mm, on the light site, and 248 mm at the heavy site. The measurements of soil moisture at the first time of sowing indicate that to 70 cm there was approximately 82 mm (light) or 134 mm (heavy) stored. Not all of this was available to the crop but there has been no estimate of wilting point for this soil. Following planting there was 84 mm (light) or 109 mm (heavy) of rain to the middle of November and no following rain that would affect grain yield.

Higher plant numbers gave more dry matter and grain yield. The 310 mm row spacing had higher plant numbers and was higher yielding than 620 mm. This may indicate a P toxicity problem because at 620 mm spacing the fertiliser rate would be 172 kg/ha of double super in the sown row. This would need to be addressed with future row spacing work.

By December, plants on the light-land were twice as high and yielded twice as much dry matter as crops on the heavy-land. However, soon afterwards, all plant species at both sites, experienced severe moisture stress with their leaves burning off. Obviously, this reduced sorghum's potential grain yield.

Perhaps, in these lighter soils, there is not enough stored soil moisture to get the crop through to harvest when just relying on stored moisture. The crop is trying to mature during the highest evaporative time. The lighter soil may hold more water at depth than the heavy soil but there is not as much surface moisture stored. Growing summer grain crops in these dry environments will require follow-up rains. These crops grew well on stored soil moisture for 4-6 weeks, in a year when only half of the average November to January rain fell, and none fell from mid-November until harvest in mid-February.

Good dry matter production was achieved from the forages and requires further work. The earlier time of sowing was the most productive. The forage sorghum was not affected by the earlier sowing and cool conditions and gave dry matter yields up to 4.5 t/ha at the second time of sowing. The dry matter production on light-land was twice that on the heavy-land. The light-land crops hung on well, perhaps having access to deeper water and locating it in a low lying area, and deep ripping probably helped too.

SUMMER CROPS SURVEY

Bill Crabtree, Scientific Officer, Northam (08) 9690 1456, fax 46

Wow! Didn't Dwayne Beck get everyone thinking, and many even planting summer crops on one of our driest summers yet. Thanks to the 23 people who responded to the survey! I know of at least 8 other farmers who grew summer crops. From the survey, 70% of you had never grown summer crops before.

Most of you went with Sorghum (61%), while 35% of you tried sorghum and millet and one farmer threw corn in as well. The common area tested was 20-40 ha with some just filling in small empty crop areas due to blocked airseeder heads. Three growers went with 100 ha and more. Brian Keding from Gairdner (south coast on phone (08) 9836 1017) planted 300 ha and he made some neat comments that almost sums up most peoples thoughts, they are:

1. It gave excellent grass seed control in the spring,
2. Leaves a good cover on the ground,
3. Helps lower water tables,
4. Possibility of good stock feed and
5. Good way of ensuring a dry summer and good harvesting conditions on the south coast.

Several agreed with Maurice Fitzgibbon's (East Porongerups, phone (08) 9853 1066) thoughts that "the sorghum didn't grow as well as the millet, but the sorghum survived the dry conditions better and was slower to recover after a rain." Also "the sheep liked the millet better than the sorghum". Many said they got excellent grazing value. The 3 farmers who grew it on pH 4.7-5.0 had OK results, but this is probably on the low side for summer crops.

A common thought echoed was "it is amazing how well it hung in there with such a dry summer and how well it came back to life with the autumn rain". Some were amazed at how tall the sorghum grew (often 2 m). The seeding rates were 3-30 kg/ha for millet and 0.5-15 kg/ha for sorghum. But it would seem most thought 3-6 kg/ha was adequate for these two crops. Many experienced poor germination's, perhaps due to the cold when sown early. Some say should have got better seed:soil contact that they would have got with press wheels.

Interestingly, one farmer said he got a better germination where he had a full-cut cultivation before seeding. Although I think it best to try and get a good germination with no-till than to go to tillage and soil drying without stubble to trap moisture. I'm sure Dwayne Beck would agree with this.

ART OF NO-TILL (FARMER) SECTION

OUR SUDAX & NO-TILL STORY

Allan Faulkner, Ongerup (08) 9828 5033, fax 83

In November 1983 we had 75 mm (3") of rain, so I rang David Rees (Jerramungup OIC of AgWA) and asked what he thought about me planting some sudax. He suggested we try a couple of hundred acres. So we scratched in 200 acres (80 ha) with a yellow Chamberlain combine on some boggy and light land.

We then had another 75 mm in December which really gave the sudax a lift. By March the heavy land sudax had grown 1 m high and the light about 2 m high. One little patch on the heavy ground, carried 250 wether hoggets for 3 months that Autumn. Ever since then we have used sudax as an opportunity crop, mainly putting it in if we get a summer rain.

In 1990 we had a crop of one pass conventionally sown lupins blow very badly. So we borrowed a triple disc drill and 2 months after the Simazine had been applied, we planted oats which then died from the Simazine. So we waited another month with more wind erosion, then planted sudax, and it never looked back. We noticed that Sudax was tolerant to Simazine and Atrazine.

The next year, in 1991, I thought that there must be a better way of cropping this light country. While at the "Ongerup Museum Mothers Day Picnic" in May, Tom Atterby told me about a double disc opener machine (Great Plains) that he was acquiring form the east. He suggested that I could hire it, which I did! It arrived in June and we were the first ones to use it. We fitted the 3 point linkage unit to our Belarus 1770 and seeded 240 ha of wheat in 3 days. One of the paddocks was the one that blew badly in 1990.

On the 23 May I sprayed 200 mL/ha of Roundup and 350 mL/ha of Ester over the paddock then seeded it on 2nd June to Corrigin wheat with 65 kg/ha DAP. While we were seeding many farmers came to look and some commented that it would never work. Especially since we were seeding into big turnip and capeweed that had not died from the Roundup and Ester mix. Two days after seeding I sprayed 400 mL/ha of SpraySeed with 100 mL/ha of Reglone and 10 g of Glean and 300 mL/ha of Diuron and killed all the weeds and the crop went 3 t/ha.

The next year we bought a yellow model Chamberlain 28 combine and some Great Plains row units and fitted them under the combine. We did half our program with it and, on good clean country, we were seeding up to 20 kph. I was pleased with the way it went and we never had any breakdowns.

In 1993 we bought a second 28 run combine and fitted more Great Plains row units and pulled them with a Holland twin-pull. In 1994 we fitted paired angle 2.5 degree coulters to both machines - this enabled us to sow the lupins into the wheat stubble more accurately.

On 23rd December 1995 one of our blocks had 125 mm (5") of rain in the afternoon. The lupins had been harvested before the rain, so on the 2 January 1996 we started sowing Sudax into the lupin stubble with the Great Plains - we didn't use any Super! We sowed one 60 ha paddock and one 40 ha paddock. By mid-February it was 60 cm tall and we put 330 ewes on the 60 ha piece and they started lambing on 1st March and at mulesing in mid-April we marked 335 lambs and they had no supplementary hand feeding. On the 40 ha piece we put 1,100 wethers on in mid-February and they stayed there until mid-May, also with no hand feeding.

In 1996, we seeded those two paddocks to wheat and they yielded 2.0 t/ha, only 10% less than our average that year. So we had 3 crops in 2 years. Because the wheat is no-tilled into the sudax, the sudax plants are still there growing during the winter, albeit very slowly. But they could be sprayed out. The sudax starts germinating in late spring and is often taller than the wheat at harvest time. The sudax does not worry the wheat sample because it is all flag and is blown out the back of the header.

We use sudax as an opportune crop and plant it only when we get summer rains. We find it very useful to keep 3-4 bags on hand because the soil dries out quickly during summer and it needs to be seeded quickly.

SORGHUM - WILL IT GROW AT MORAWA?

By Derek Chisholm, Morawa. (08) 99715060, fax 25

After Dwayne Beck's talk at the 1996 West Australian No-Till Farmers Association AGM at Darkan and his subsequent visit and talk at Morawa, we were very interested in what he had to say about Crop Rotations and Warm Season Grasses. While Dwayne was at Morawa, he said he could see no reason why Warm Season Grasses could not be grown in this area.

With our ongoing problems of a rising water table and also the undeniable benefits of introducing another crop into our overall cropping rotation, we thought that this was one of the most exciting and thought provoking ideas we had heard in a long time. With the help and expertise of Agronomist Peter Norris at SBS Geraldton, we obtained Jumbo forage sorghum and Sunflower through Pacific Seeds. Jumbo a cold tolerant variety.

The site we chose was red York Gum soil on a gently sloping hillside. Before seeding we sprayed out all winter weeds with glyphosate. Sorghum was sown on 28th August at 5 kg/ha. In hindsight, 3 kg/ha would have been better as it was too heavy.

The machine we used for seeding was a Flexicoil Air Seeder with a Frigstaad Chisel Plough with narrow points at 23cm (9") spacings. To get the one metre row spacings, we blocked off the majority of air seeder hoses. We applied 80 kg/ha of urea and 20 kg/ha of DAP which was deep branded. The only spray we used after seeding was aphicide twice.

The years rainfall to the end of August was 305 mm. From September to the first week in November we had 62 mm. No further rain fell until the 19th February, 1997. This was three months and one week of no rain. It amazed us that during this very hot summer, with many 40°days, the sorghum continued to grow and was a green oasis in the paddock. In December we cut back three rows of the sorghum. Also in the middle of January we cut back eight different rows. All rows came back with strong regrowth.

On the 10th March, backhoe pits were dug to 2.5 metres in the sorghum trial. There was 45 cm of soil over coffee rock and yet there was vigorous root development to the bottom of the pit. Soil moisture was far less in this pit, than in a comparable pit which was dug up slope from the sorghum trial. We were therefore very pleased with the Sorghum's ability to use deep moisture.

A small strip of sunflowers was grown and evaluated at this site at the same time and it also showed potential and needs further research.

This year, on the 17th June, 1997 we sowed two types of sorghum, millet, maize, safflower and sunflower, again with Peter Norris supervising and recording the trials. We are trying out two planting times. We will sow

the same varieties again in the middle of August. It was interesting to note that the June sowing of maize, safflower and sunflower are going well, but the sorghum and millet have been affected by frost. Also it is very noticeable that all the winter weeds, especially grass weeds, have germinated since sowing in June. So sowing in August would have more of a chance of taking out winter weeds.

From the trials done last year, we feel there is s place for warm summer grasses for two reasons, one, to take up excess water in the ground-water during summer months, two, taking out all winter weeds when seeding in August, could be advantageous in the control of resistant ryegrass, radish and maybe other weeds.

LUCERNE, SORGHUM AND MILLET AT MILING

Tony White, Miling (08) 9654 1025, fax 54

Our family farm is in a 350 mm rainfall area just north-west of Miling. We use a 36 tine Shearer trashworker with DBS points, golf buggy wheels for depth control and light pressing, following seed tubes with sowing tines mounted on the rear of the trashworker. We use an International 5700 airseeder with half of the fertiliser banded and rest is placed with the seed. We use a 21 m Hardi boomspray. We tried three crops new to us in 1996; lucerne, sorghum and millet.

Lucerne

We planted lucerne on a 4 ha paddock of shallow grey and red clay, over rock, and on top of the hill with a pH of 6.0. A pasture was sprayed with 1 L/ha of Roundup in mid-July followed by 1 L/ha of SpraySeed before seeding on 7th September. The variety was a winter active one, Trifecta, which was sown into damp soil on 250 mm (10") row spacings with DBS knife points with light pressing from the press wheels.

The next day we were lucky enough to receive 20 mm of rain. So with the warming spring soil the lucerne germinated very quickly. I sprayed it twice with 250 mL/ha of Imidan for red mite and lucerne flea control. The lucerne grew quite quickly and established a big root system. We had very little rain from then on but the lucerne kept on growing.

In Autumn 1997, it was the first pasture to become green. I have just sprayed it with 1 L/ha of Diuron and 500 mL/ha of SpraySeed for weed control. I think it will do very well in the lower rainfall areas as it taps into deeper reserves of moisture.

Sorghum and Millet

We planted Jumbo sorghum and Nutrifeed millet in the middle of September. The paddock chosen was left out of winter crop due to a high radish burden. The paddock was sprayed out with 1 L/ha of Roundup and 500 mL/ha of Atrazine, and then 1 L/ha of SpraySeed pre-seeding.

The Sorghum was planted at 4 kg/ha and the millet at 10 kg/ha. Every second tine was removed, giving a row spacing of 51 cm (20"). The soil was yellow sandplain which was damp at seeding. We had trouble with establishment due to the radish plants dragging in the tines. A double disk opener would have made the task a lot easier. We probably got a 65% establishment. We got 5 mm of rain a week after seeding. The soil temperature was rising so the plants that did germinate grew vigorously.

By 8 weeks we were grazing the paddock with 100 head of cattle. They did a very good job on the sorghum but due to moisture stress the millet seemed to become unpalatable. When we got 3 mm of rain in December the cattle then grazed it down very quickly. We got 4 grazings off this 60 ha paddock and it gave us valuable green feed in the middle of summer. It seemed to survive either off the moisture in the air because we had no summer rain, or more likely from deeper soil moisture. I think with an extra 20-30 mm of rain and better establishment we could have cut it for silage.

I sprayed it out with 2 L/ha of Roundup pre-seeding and no-tilled Dagger wheat into it. To date the wheat looks as if it was on a lupin stubble. I put this down to the rotational benefits of the warm season grasses.

This season 99% of our 1,600 ha crop was no tilled. The other 1% was direct drilled. All crops are sown on 10 inch spacings. This year with the earlier break we tickled our pasture paddocks up with the knife points. This stimulated a germination and also roughened the surface up to help trap the follow up rain. I used a standard rate of 1 L/ha of Roundup as a knock-down and just prior to seeding 1 L/ha of SpraySeed. On the heavy country I had a mix of 500 and 750mL/ha of Diuron and SpraySeed. It helps reduce the need for post emergent sprays. This year 2.5 L/ha of Treflan and 700 mL/ha of Diuron have worked extremely well as a pre-emergent.

NO TILL IS PRODUCTIVE AND PROFITABLE

Allen Postlethwaite, Victoria (03) 5495 3228, fax 53 or "ypos@ruralnet.net.au"

Conventional cropping with the associated excessive cultivation over many decades, has caused untold damage to soil structure and fertility. Consequently, large areas of agricultural land are now no longer productive. No-till allows a much greater intensity of cropping without degradation of our greatest asset - the soil!

To be profitable, it is essential that no-till is part of a whole farm management package. No-till, together with stubble retention, creates an entirely new environment for crops, and it must never be considered in isolation.

Our farm "Cloverlea Farms" is 1,575 ha and is located between Donald and St. Arnaud in the Victorian Wimmera. Our soils are sodic and are predominantly self-mulching grey clays with a pH of 8.5. The balance are hard-setting red duplex soils and have a pH of 6. Annual rainfall is 400 mm, with 275 mm falling in the growing season, between April and October.

Our farm is managed as a business. My wife Yvonne and our two sons, Neale and Trevor, work in equal partnership. All members have specific areas of responsibility. I have professional wool classing qualifications (we now have no livestock!) and I oversee the operation and market the grain.

Yvonne is trained in business management and manages the finances and farm records. She is currently studying for a PhD degree in the sustainability of no-till farming systems at the University of Adelaide. Neale has a B.Sci. (Agric.) and is responsible for on-going research and does much of the crop monitoring. At present he is studying GPS and including it into our program. Trevor has training in sheet fabrication and welding - including plastics, aluminium, cast and steel. He also studied diesel service and maintenance and takes full responsibility for all machinery purchases, sales and maintenance.

Prior to 1982, we ran a traditional Wimmera farm, growing wheat in rotation with a long fallow and pasture. During the 1982 drought we sold all our livestock. Sheep are now only purchased for short-term grazing as a weed management tool but only in-crop, not pre-crop. We graze the sheep in the chickpeas that are sown on wide rows. The sheep selectively eat most of the weeds that the selective herbicides miss!

In 1983, all the machinery was changed. The scarifier, cultivator and combine were sold, and we bought a chisel plough, airseeder and bulk grain handling equipment for sowing. Since then, the entire farm has been continuously cropped every year. All residues have been retained and cultivation eliminated.

A range of crops are grown in rotation. These include; cereals (wheat and barley), oilseeds (canola, linola and safflower) and grain legumes (chickpeas, lupins and faba beans). Cropping begins at harvest when the straw is cut short (less than 450 mm) and the residue is evenly distributed with straw spreaders. This is important to ensure trouble-free seeding and an even distribution of nutrients.

The yearly cropping program is planned in February. This plan considers soil type, nutrient status, available soil moisture, crop rotation, balance of crops, machinery capability, finance and risk management. With soil type we need to watch soil pH and its effects of residual herbicides and consider what types of crops can be grown.

In April we draw up a "battle plan" which is a work schedule that allows us seasonal flexibility. We have a wet season and a dry season plan. All paddocks are tested for available nitrate every year and a complete test is done every 5 years. All paddocks also have a neutron moisture probe installed and are read at sowing and after harvest to determine the water use efficiency of the previous crop. This helps us decide how much stored water is available for the proposed crop.

We try to grow a balance of crops and not put "too many eggs in the one basket". We consider the seasonal outlook and long range weather forecasts. We may use contractors if needed. We plan to have available finance for inputs right through the season. We try to remain flexible and be able to change individual crops or paddocks right up until seeding.

Soil tests are taken in March to allow us time to buy appropriate fertilisers ready to begin sowing in mid April. Fertilisers are applied at sowing to provide adequate nutrients to grow average yielding crop. Further nitrogen may be added later if yield potential is above average.

Sowing begins in mid-April whether wet or dry as per the "battle plan". All crops are sown straight into the previous years stubble using a chisel plow fitted with narrow (15 mm) points. No cultivation has been used since 1984. No stubble treatment, other than herbicide application for weed control, takes place. Cereals and oilseeds are sown at 355 mm row spacings and rows aligned east and west. Grain legumes are sown at 710 mm centres, where there is adequate residue to keep evaporation to a minimum rows are aligned north and south. Fertiliser is applied at sowing and is banded below the seed.

In June crop monitoring is already underway and is continued right through the year. Some early weed control takes place at this time. In late July we make some yield predictions to determine any possible extra fertiliser needs. Tissue tests, rainfall decile trends, long-range weather forecasts, soil moisture readings, plant populations, disease and weed pressure, as well as gut feelings, are used to make this decision.

In September, aerial photographs are taken of all paddocks as part of the continuous monitoring program. These photographs show variations within paddocks that are not visible from regular on-site inspections. Insect control in oilseeds and grain legumes is done mainly in October. Swathing (windrowing) starts in November and harvest in December.

Advantages of No-Till and stubble retention

1. Better water infiltration with less run-off,
2. Less evaporation with more crop moisture available,
3. Surface sealing eliminated,
4. Less compaction and better root penetration,
5. More organic matter and recycling of nutrients,
6. Wind and water erosion virtually eliminated,
7. Less tractor hours,
8. Good environment for young seedlings,
9. More earthworm activity,
10. Yields equal to, or better, than conventional cropping,
11. Higher water use efficiency and
12. More production/ha/year without degrading the soil,

Disadvantages of No-Till

1. Unsuitability of most existing machinery,
2. Difficulty in finding worthwhile advice and
3. Higher management skills necessary.

Crop production using no-till farming can be very productive and profitable, if all facets are managed correctly. No-till, together with stubble retention, is vital for sustainability and profitability of our farm, and it is a vital part of the Profitable Landcare Revolution.

FARMING FOR THE FUTURE

Jeremy Exten, East Yuna, (08) 9931 1037, fax 48

Previously our farming practices have been anything but no-till. With the opening rains we would plough, back plough and possibly back plough again - all in the name of moisture conservation, making a seed-bed and for control of our most troublesome weed - brome grass! Our machinery would not allow us to no-till, our combines and early air-seeder had a very low tine break-out pressure. The past decade has seen us progress from multiple ploughing to direct drill and now no-till. This is our second year of no-till farming, after 8 years of direct drilling with stubble removal.

We have 7,760 ha of crop, split between three properties at east Yuna (4,854 ha), Naraling (1,793 ha) and Nolba (1,113 ha). Of the area in crop 3,800 ha is wheat 2,700 ha lupins, 500 ha chickpeas, 400 ha barley and 300 ha of oats. Our seeders are two Morris 9000 bars (16.2 m [53'] and 12.3 m [41']) and a 16.2 m (53') Morris Concept bar. Each has a row of coulters aligning to every second tine at the front, followed by tines at 230 mm (9") spacings with 180 kg (400 lbs) break-out strength. This break-out allows us to sow directly into our tightest country on minimal rainfall. Each tine has a 180 mm (7") knife point, a fertiliser tube running down the back of the tine which places the fertiliser at 50-150 mm (2-6") and a Yuna spring boot for accurate seed placement. At the rear of the bar is a row of press wheels.

We have seen many advantages with our no-till system. Primarily it has extended our growing season by 2-5 weeks. This is paramount at East Yuna, where all rainfall is critical. Directly after the opening rains we wait for a weed germination, then spray and plant. This allows us to crop a larger area in a given amount of time compared to our conventional cropping system. This translates into less fuel used, less man-hours and hence less stress, wages and repair and maintenance.

We have been able to achieve more grain kg/mm of rainfall. We directly attribute this to earlier sowing combined with, no full-cut cultivation to dry the soil. The knife point and press wheel create a furrow with unique water harvesting properties. After rain we commonly see that the inter-row ridge is dry and the majority of the rain has penetrated around the seed in the furrow. This also ensures that weed seeds are further disadvantaged.

With the 180 mm (7") knife points ripping to 200 mm (8") deep it is possible to throw the top portion of soil into the inter row. This allows a concentration of various chemicals in the inter-row for greater chemical efficacy along with the removal of weed seeds from around the seed, and into the chemical band. We have various trials on the farm, to investigate different rates and combinations of different chemicals in the no-till system. The wheat:lupin or wheat:chickpea rotations along with spray topping in early spring with 1 L/ha of glyphosate or 800 mL/ha of gramoxone has resulted in a virtual elimination of our brome grass trouble.

With no-till farming we aim to improve soil health. This can he achieved initially through stubble conservation. With stubble conservation we aim to achieve greater water penetration, less evaporation, eliminate soil erosion and see the return of more soil animal and microbial life. The return of soil life should improve the nutrient cycle, reduce the C:N ratio and increase soil organic matter which should improve our yields for the long-term.

I consider no-till farming to be a system which will both ensure long-term success and profitability as well as being sustainable, so that future generations are able to live and work happily on the farm.

SPACED OUT COMBINE FOR TRASH FLOW

Greg Mengler, Tenterden (08) 9851 7212 fax 41

Tenterden is just north of Mt Barker which is real sheep country. This year we planted 800 ha of crop with a modified 10-row seeder. Last year we used a modified 28-run Massey Ferguson 80 combine and planted 600 ha but had lots of trash flow problems and I could not get accurate seeding depth.

Consequently we converted a second hand 27-run Shearer trash culti by removing the under carriage and raising the box 40 cm higher and bringing it forward by 45 cm. A Harvestaire blower and manifold are fitted across the front to blast seed and fertiliser into home-made seeding modules. A frame extends behind the combine with a 2.5 m frame to carry a lot of the seeding modules.

I've fitted press-wheel parallelograms which operate independently of seeding tines, though both share a common pivot point on the main frame. It is a bit similar to the DBS but it doesn't need the high breakout tine pressure. The seeding depth remains constant irrespective of tine position. This was obvious this year, even where we seeded on the inside, and outside, of contour drains.

The combine is on 23 cm row spacings and is fitted with double-spring

Shearer 620 tines with Maxi Ripper points. In rocky conditions 11 mm bolts tended to shear off so I increased the size to 12.7 mm. The combine width has been increased from 4.8 m to 6.0 m by placing the tines in front of, and behind, the tyres. The machine cost $32,000 and includes the Shearer combine cost and a $2,000 paint and sand-blasting job.

"Tine and parallelogram share common pivot point"

Seeding has to be "up and back" due to the length of the machine, which has encouraged me to work on the contour and eliminate headlands. I plan to increase tyre size from 18.4-30 to a 24.5. I have sown into heavy stubbles and across old unharvested, swath lines without affecting seed depth or creating trash handling problems.

NO-TILL GAINS GROUND AT KOJONUP

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

We farm 1,200 ha east of Kojonup in a traditionally wool growing area. However, poor wool prices and more farmers in the area have encouraged us to increased our cropping area at the same time as adopting no-till. Our property consists mostly of sandy loams, flooded gum and wandoo country, and is in a 450-500 mm rainfall area.

Increasing crop area has changed the way we crop. We discovered the devastating autumn winds that precede fronts. I remember a few years ago raking straw before seeding and a big wind came and dust was blowing everywhere. I thought "stuff this", either we stop cropping or we find a better way to do it. That was the catalyst for us to change our farming system so that we didn't have to remove straw. No-till just seemed the obvious thing to do! Previously, we were single pass direct drill but we couldn't handle the straw.

We have now had 2 seasons of no-till, which has become fairly typical for this area. Perhaps 33% of people in this area are no-tilling. Some have new machines, though most have put tines under a combine. Of our 1,200 ha, only 500 ha is good cropping country and another 550 ha is occasional cropping land. This year we cropped 550 ha (140 ha Karoo canola, 120 ha Dalyup oats, 80 ha Mortlock oats, 50 ha Merrit lupins, 80 ha Stirling barley, 65 ha Dalkeith clover seeded into paddocks coming out of crop and showing ryegrass, also 15 ha Balansa clover on wetter country).

Previously, we cropped 250-300 ha but we have found we can maintain sheep numbers despite the increase in crop. We shear about 9,000 Merinos, including 7,000 adult sheep, Merinotech bloodlines. Our farming system is driven by economics. Like most farmers around here, we have got into no-till cheaply.

We spent $3,500 on converting a 6 row Shearer trash culti which we have modified several times. We fitted Harrington Agmaster points and boots ($1,800) and new hoses ($400), we removed half of the tines and fitted an extra spring in the tine spring assembly ($700) and we had 2 metal supports pressed up to raise the box 40 cm and move it forward 20 cm. This allowed us to spread the sowing tines across 6 rows for trash flow ($500).

A small seeds box fitted across the back is used for sowing the Balansa clover with the seed dropped on the surface. Three banks of finger tine harrows follow. The spacing on the tines varies from 0.8-1.2 m within each row for an overall row spacing of 18.5 cm.

In going into no-till my biggest concern was could we grow a crop, or would we loose by not disturbing all the topsoil? I was not sure that we could control the weeds. Having a good rotation, I think, is critical for weed control. Our rotation is varied and depends on the paddock.

Last year, I got the weed control wrong with some poor canola areas where the weeds beat us. We cropped land that wasn't prepared properly. We got 10 inches of rain within 6 weeks of seeding on a late break (June 10) and I couldn't get near the paddock to spray the weeds until September. Consequently, we now use triazine resistant Karoo canola this year to enable early weed management and radish control.

Without cultivation we can't skimp on knockdowns. On some paddocks we have used a double knockdown with 800 mL/ha Roundup plus 400 g Diuron followed by 500 mL/ha of SpraySeed a day before seeding. On some areas that only had Roundup I went back as the crop was emerging and used SpraySeed at 300-500 mL/ha. This is a real handy no-till tool. It works because all the crop emerges at the same time. The cereals can tolerate some leaf loss, unlike the smaller seeded weeds. We have a 15 m wide Tas Wellcut boomspray, dual axle with 2,200 L tank, that stays hitched to the tractor for the season.

I am now confident we can grow crops with no-till. But I would like to get an air-seeder and bar. The combine seeds across 5 m but with an air-seeder we could spread the tines out more and get still better trash flow. At present we still have to rake our heaviest paddocks of Mortlock oats as the straw is too long to flow through the machine. We have also found the Agmaster boots block up in wet soils with a gravity fed combine. A wider machine would allow slower ground speed with more control of soil movement and seed depth.

If wool prices improve we could ease back on the cropping but I am now satisfied that on some paddocks we can continuously crop. We plan to improve yields through fine-tuning fertilisers, nutrients and rotations.

We know in this area that 6-7 t/ha trial crops are being grown and we need to find and overcome the current yield constraints. The Kojonup Crop Research Group, of which I am a member, have been trying to identify these constraints. Dip-well trials over 2 years measuring free water (saturation) in the top 40 cm across 180 sites on about 12 farms, have shown little correlation between yield and waterlogging - even last year! Only 18 % of sites showed waterlogging. The results surprised us.

We're also doing trials with N, S, K, Cu, Zn, Mo and Mn. A farmer trial last year showed no grain yield response to N at up to 500 kg/ha of urea. But it increased leaf matter in oats. So this year across 9 properties we are doing fully replicated trials with CSBP soil tests, helped by GRDC. I'd like to think that by being on the WANTFA committee I will be able to ensure that small croppers are not forgotten.

"I spent $3,500 to convert the combine to go no-till - it doesn't have to be expensive"