



Western Australian No Tillage Farmers Association (Inc) WANTFA

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"NO TILLAGE—LEARN THIS CONSERVATION CROPPING SYSTEM" NEWSLETTER VOL 3 NO 1

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Topical Section

RIISING TO THE CHALLENGE

Ken de Grussa, President, Esperance (090 782026 p&f)

By the time this newsletter reaches you 1994 will be over, farmers will be reaping the benefits of their labours for the past year, or licking their wounds in those areas where the season was less kind than it might have been!

Adversity, however, creates challenges, and there is much we can learn from the more difficult seasons, lessons

that may help us perform better in any year. Moisture lost to the atmosphere with each cultivation is not given much thought in wetter seasons. However, in this dry 1994 season the No-Tilled crops had the advantage not only in the form of a better emergence but also at the end of the season. For us an October rainfall of 60 mm is normally considered an excellent finish to a cropping season but it was still not enough for some crops sown with cultivation.

Does this mean there was some stored soil moisture

under No-Tilled paddocks despite the low winter rainfall, or is there some other explanation? I should add that a good finish could not make up for the lack of tillers and lost potential and our yields are well below normal, but then, there's always next year.

With our Annual General Meeting approaching and WANTFA growing, it is important that you as members have your say in the directions taken by this organisation. A good attendance at the AGM will help us more appropriately formulate our directions. For those not familiar with our WANTFA's objectives, as decided at our first meeting in 1992, here they are:

- (i) To facilitate the exchange of ideas
- (ii) To encourage No-Tillage research.
- (iii) To disseminate No-Tillage information.

These objectives are constitutional and must be kept in mind when any future directions are discussed. Some ideas presented by members are listed here for others to think about and discuss at our AGM.

Suggestions for WANTFA to consider:

WANTFA could take on the role of setting the **Strategic Direction** for No-Till in WA. This could be achieved by setting **tight objectives** within the framework of an overall **mission** and developing a **plan of action** to implement these objectives.

We could develop strong links with organisations that can advance No-Till, such as WA Dept of Agriculture, Kondinin Group, overseas organisations, etc. To some degree this is already happening simply as a natural progression.

WANTFA could be restructured to reflect regional requirements. A decentralised organisation is more likely to better represent its members interests, however this may not require much change from the present structure.

WANTFA could be directly responsible for the establishment of perhaps three, No-Till development officers. One in each of the 3 cereal regions: northern, central, and southern and we should take a greater role in research in conjunction with the Department of Agriculture. Outside funding would be necessary for this; WANTFA is unlikely to ever have sufficient resources of its own for such a project.

WANTFA could operate as a "brokering house" for ideas with a directory of names and machines. This suggestion was in the September newsletter and has been put forward in various forms by a number of others, since it fits very comfortably with our first objective there is no problem other than to make it happen!

Other suggestions, but with research include, how we address; long term potential weed problems, how No-Till affects nitrogen release in dry areas, accuracy of seed placement, development of viable stubble management systems and monitoring the conservation value of No-Till. With these suggestions some action may have already been taken.

Feedback that I have received suggests that a many members are interested in ideas and information and to that end, perhaps, we need a register of such ideas and systems, not just of equipment but covering weed management, rotations, etc.

The proposed No-Tillage Manual would have provided for this to some degree but perhaps a manual runs the risk of becoming out-dated too soon. Could we produce a less elaborate form of manual with the intention of printing an update at reasonable intervals? I look forward to seeing you at the Annual General Meeting, hope you can make it. To all members I wish a safe and happy festive season and a very successful year to follow.

ANNUAL CONFERENCE & AGM AT DARKAN 21-22 FEB '95

Kevin Bligh, WANTFA Secretary

WANTFA's Annual Conference and AGM will again be held at the Darkan Sporting Complex. Billeting for accommodation for the night of Tuesday 21 February can be requested through Ray Harrington (Phone/Fax 097 363030). Hotel/Motel accommodation is available at Darkan, Colliie, Williams and other towns. The Conference Program is:

Tuesday 21 February

9.30 am	Morning Tea will be available
10.00 am	Welcome. Ken de Grussa (President)
10.05 am	Soils and Soil Structure. Professor Bob Gilkes (University of WA)
11.00 am	No-till wide-furrow sowing in water repellent sands. Dr Paul Blackwell (Department of Agriculture, Geraldton).
11.30 am	Nineteen years of No-Tillage sowing at Narrogin. Mike Brown (farmer).
11.45 am	(ditto) at McAlinden (south of Colliie). Ray Honey (farmer).
12 noon	Lunch (provided) and viewing of No-Tillage seeder openers on display outside.
2.00 pm	No-till farmers from Northern and Central Regions describe their systems: Graeme Malcolm (Morawa), Don Stanley (Kalannie), David Adams (Beverley), Trevor Wilkins (Kondinin) and Geoff Marshall (Hyden).
3.00 pm	Afternoon Tea.
3.30 pm	No-Till farmers from Southern Regions describe their systems: Steven King (Lake Grace), Rowan Spittle (Esperance), Knud Nyman (Gnowangerup) and Greg Ricetti (Darkan).
4.30 pm	"Your Input on No-Till Needs".
5.00 pm	Refreshments. Barbeque follows.

Wednesday 22 February

7.30 am	Annual General Meeting, with the Agenda to:
	1. Receive Committee's report,
	2. Receive Treasurer's report,
	3. Elect or re-elect the President, Vice President and retiring Committee members, Tim Trethowan (Kojonup), Jim Baily (Wellstead) and Ken de Grussa (Esperance) and
	4. Conduct any other business placed on the agenda before the commencement of the meeting.
9.30 am	Morning Tea.
10.00 am	Machinery exhibitors and representatives address the meeting.
12.30 pm	Lunch (provided). Ongoing discussions around No-Tillage seeder openers displayed outside.

AN EASTERN STATES TOUR

Kevin Bligh, WANTFA Secretary

Some members have expressed interest in a No-till Study Tour in the Eastern States, particularly following the National Workshop on Narrow Sowing Points attended by Committee member John Hicks and Newsletter Editor Bill Crabtree in Adelaide last September.

The Taxation Department advise that the cost of such a study tour "...would be an allowable tax-deduction if the subject of self education, being in this case No-Till, is directly relevant to the activities by which assessable income is currently derived".

Mike Collins from New Zealand commences a three-

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year Grains Research and Development Corporation funded project. Mike will be investigating several WANTFA priority areas in No-Till systems, as of January 1995, and will be based at the Northern Department of Agriculture. Mike invites WANTFA members to join him on a study-tour to Victoria, NSW and South Australia from Monday 20-29 March 1995.

The proposed tour would start from Adelaide, driving overland to visit Wimmera Conservation Farming Association (WCFA) members centred around Horsham in Victoria. WCFA have their Annual Seminar at Longerenong Agricultural College on Thursday 9 March and WANTFA members are welcomed to attend. Phone Peter Berg for more details on 053 811255 (or Fax 053 829388) then you could join the tour later at Horsham, on Tuesday 21 March.

After several days in Victoria, the party will visit No-Till trials at the Agricultural Research Station at Cowra, NSW on Fri 24 March, returning overland to South Australia over the weekend. Visits arranged with Research Officer - Rohan Rainbow of the South Australian Research and Development Institute around Clare and Adelaide would then complete the tour by Wednesday 29 March. So far, two WANTFA farmer members have expressed a desire to join the tour. If you are interested, please phone me on 09 368 3893 (w), 09 332 7003 (h) or 097 524 215 or fax on (09) 368 3355.

NO-TILL & ZERO-TILL—A NEW DEFINITION

David Rees, Consultant Albany (098 422 770)

The last issue of the WANTFA Newsletter took some trouble to define what is meant by tillage, these being:

Conventional = two or more workings before seeding,
Minimum or reduced till = one working before seeding,
Direct drill = seeding only but with full cut of soil and
No-till = seeding without full cut of soil.

I propose another definition, named "**Zero-Till**" which would be a form of sowing that would give least possible soil disturbance. Arguably this Zero-Till could only be achieved by discing seeders, and the extra name would have real value in conveying other factors to readers. Zero-Till gives much less soil disturbance compared to narrow points and probably has implications for soil structure, non wetting soils and germination of weeds. The narrow points do disturb the soil, especially at speed, and this may or may not be desirable.

During our trip to Esperance earlier this year looking at seeding developments, it was obvious that Esperance farmers are favouring narrow point seeders. It appeared that many of the farms we inspected would have benefited from discing seeders, rather than the narrow points. The CrossSlot* seeder probably warrants a definition of its own as it can provide vigorous sub-soil shattering, but with minimal surface soil disturbance in some soils.

TILLAGE DEFINITIONS

Kevin Bligh, Development Officer,
South Perth (09 368 3893)

As more farmers sow with less tillage, it would be helpful if WANTFA could firm up on definitions as Bill Crabtree suggested in the Sep '94 Newsletter. Perhaps we could discuss the following at the Annual Conference and AGM at Darkan on 21-22 February next.

NO-TILL = Sowing without rearranging the entire topsoil structure.

MINIMUM TILL = Sowing in a single pass with full cut-out points (direct drilling) or discs.

REDUCED TILL = One working with full cut-out points or discs, before sowing with full cut-out points or discs.

TRADITIONAL TILL = Two or more workings with full cut-out points or discs, before similar sowing.

I believe the above definitions reflect the Australian definition of tillage, published in the "Glossary of Terms Used in Soil Conservation" by P.D. Houghton and P.E.V. Chairman of the NSW Soil Conservation Service in 1986. Soil Science Society of America, American Society of Agricultural Engineers and Manitoba-North Dakota Zero Tillage Farmers Association definitions are all consistent, also, that tillage "involves the rearrangement of the entire topsoil structure".

The term "conventional tillage" might best be reconsidered because conventions change; minimum tillage or No-Tillage sowing may become conventional, for example. Perhaps the term "traditional tillage" could be used to describe the multiple weed-control tillage operations that were necessary in the days before herbicides became available.

For convenience, single-pass sowing with full cut-out points or discs on any seeder, could logically be called "minimum tillage". No-tillage sowing is then less than full cut-out.

1994 USA STUDY TOUR

Eight Learnt Lots Kevin Bligh, Development Officer, South Perth (09 368 3893)

Eight WANTFA members and I returned before harvest from a month looking into No-Tillage sowing in the USA and Canada. Vice-President Graeme Malcolm and John Cunningham of Morawa, Tony White of Milking and I drove from Kansas to Tennessee. We were joined by Garry and Darryl Hine of Wellstead near Chicago. Then we crossed Illinois and Iowa. Immediate Past-President Ray Harrington of Darkan, Ray Honey of McAlinden and Bruce Hobbs of Brookton joined us as we headed for Canada.

We were extremely well looked after by members of the Manitoba-North Dakota Zero Tillage Farmers Association, visiting Research Stations and machinery manufacturers in Saskatchewan as well before heading back to Kansas through the Dakotas and Nebraska. Those in the earlier party also visited farmers in California on the way home.

Discussion tended to centre on No-Tillage systems and rotations at each of the stops. Healthy crop rotations are considered essential for a disease break and other benefits with No-Till showing \$60/ha more profit for corn, soy beans and cotton in Tennessee. Safflower was suggested as a possible crop in WA rotations, though being related to saffron thistle, you don't want to get your header blocked!

Moisture conservation, improved soil structure, frequently less run-off and **always** less erosion follow No-Till in America, as in Australia. And higher priced corn crops can be grown instead of wheat almost out to the Rockies with No-Till.

Many US growers seemed happy with the available seeders. Discs seem to be coming back in Canada. We saw BioMax* (Forward) No-Till-type discs leaned over at an angle of about 30° by a farmer to cut into hard soil. Flexicoil* reportedly will make them in 1995.

Robust looking single disc openers are available from Bourgault* - but not yet in Australia - and double discs from K-Hart*. I was also impressed with the professionalism evident in the Great Plains Manufacturing Inc. factory.

Narrow points are also being developed for sowing in paired rows about 75 mm apart by Haybuster* - not yet available in Australia - and Morris*, Harmon* pass fertiliser down a hollow vertical tine and seed down a tube behind it. The Valcon Conserve Pak* has a sowing tine on an arm to the press wheel. The latter two have been brought into WA, by ROM Industries, Perth and Burando-Hill, Katanning, respectively.

A narrow point within 1-2 mm of a rippled disc seems to serve Yetter* well. Stubbles don't seem to be such a problem in North America, because most are ungrazed or

anchored by roots preserved frozen over the winter.

It was a fun trip - though there was consensus that Sundays should be rest days on future study tours! Bruce and Graeme's stories are well worth the read.

No-Till Does Work!

Bruce Hobbs,
Brookton (096 421075)

Everybody asks, "what did you learn?" and I have some trouble being specific, but here are a few thoughts about the trip and the No-Till method of farming.

No-Till does work over there too. Crops can be grown without total soil disturbance. And they even look like conventionally sown crops, only they will probably stay greener for longer, because No-Till conserves moisture and this was stated many times by researchers and farmers during the trip.

We saw "dozens" of different soil openers but I don't believe that any one of them will guarantee the desired result, but every one of them would give the desired result in the right situation. It's a case of horses for courses, so it is up to the individual to decide what type of machine they require and can afford, be it, tined, double or single disc. In the right package they all work.

Almost all the people that we talked to, who had been in No-Till for several years were using less chemicals than before and growing crops of equal yield or better. The farmers who were having trouble with weeds hadn't used the right rotations, for with No-Till and continuous cropping, last year's crop can become this year's major weed. We saw examples of wheat badly contaminated with barley, which highlights the importance of rotation, for had a non-cereal been grown after the barley then the volunteers from the previous crop can be easily handled.

In Canada, where resistance is a problem the No-Tillers were having far less trouble with wild oats, as there isn't any cultivation to bury the seeds and stimulate germination. With disc openers high levels of trash can be handled leaving the wild oat seeds still in the trash or lying on top of the soil, which inhibits germination. Generally, Western Australians appear more conscious of the importance of having a legume in the rotation than are our North American counterparts.

An Amazing Trip!

Graeme Malcolm, Vice President, WANTFA (099 715035 p&f)

After a brief visit to Alberta Canada, I made contact with John Cunningham, Kevin Bligh and Tony White at Kansas City. We headed south in a hire vehicle, through Missouri and corn country towards the Ozark Mountains into Arkansas, with an overnight stop in Jonesboro with a visit to a cotton gin. From there onto Tennessee to the Milan Research Institute where No-Till corn-soy rotations have been practised for 20 years. We saw yield maps being generated as they harvested with the yield and moisture content being calculated and conveyed from the header to an on-board computer, and the map is then generated onto farm scale maps. No-Till corn crops were yielding up to 220 bushels/acre and surface trash had completely blanketed weeds, and very little sprays were used once the No-Till system had been established (no seeds buried).

We visited a 580 acre fish farm whose turnover is in excess of \$1 million a year with 10,000 lbs of minnows and catfish a week. The farm used 13 million gallons of water a day. From Milan we crossed the corner of Kentucky and headed north up the Mississippi Basin and looked at rice, cotton, corn, soy, flax etc being grown under irrigation.

At St Louis we left the mighty Mississippi River and struck out across Illinois towards Chicago. We stayed in Naperville just out of Chicago and caught up with Garry and Darryl Hine and a Laundromat - I eventually caught up with my luggage! Illinois State grows more corn than Australia grows

wheat, and the State average appears to be about 150+ bushels per acre in some areas - the majority is No-Tilled and the gains are substantial. Vacant housing blocks around Chicago are sown to corn. We visited the Yetter factory in Colchester and several farm visits including "Mr No-Till" Jim Kinsella at Bloomington.

We then visited Kinze Manufacturing at Williamsburg, Iowa where their years production was booked out in the first week of the financial year. Another small town business producing equipment for American agriculture. We visited several farms where site specific yield monitoring was practiced at farm level. Lunch with the Adams family demonstrated typical American country hospitality. Next morning we visited the ADM Ethanol Plant at Cedar Rapids where 250,000 bushels of corn are consumed per day - this company manufactures 65% of America's ethanol from corn - we unsuccessfully tried to visit Rockwell Collins at Cedar Rapids to see their research on yield mapping with GPS (Global Positioning Satellite) - they needed security checks on us first, as this was also their military manufacturing site.

By the time we left Iowa State we were sick of the sight of corn and soy; it was either corn on corn, or corn on soy beans. At one point we turned right at a sign pointing to the Interstate freeway and promptly ended up in a corn crop ten feet from the intersection!

North of Sioux city on the South Dakota/Iowa border, we visited Jack Borchers chemical outlet at Hawarden. Then after the long drive through the mid west, north to Fargo in North Dakota where we joined up with Ray Honey, Ray Harrington and Bruce Hobbs. We visited Concord Manufacturing in Fargo where the factory runs 3 shifts.

At Jamestown, we visited Haybuster Manufacturing and viewed their impressive disc and tine equipment, another small town, building for their country. We moved up to Carrington Research Station North Dakota where we had a Seminar with a bus load of Russians; listening to their interpreters was interesting. Traditionally, North Dakota has all the Missile cells under their farm lands and Russians were not well received in the area for many years. We weren't allowed to visit a missile control post either but we did try!

Hannaford in North Dakota was where we met the most informal characters of the tour. The locals were involved in No-Till in a big way - Dennis Haugen owns two Yielder* drills (\$120,000 US new each). We saw a Shellbourne Stripper Head here. The locals invited us to a celebration and a feast of 7 turkeys and 2 pork legs which was mixed with plenty of talk - I ended up learning how to cook turkeys. It was a long, late drive back to Carrington that night with many new friends made. The Canadian border had a couple of surprises - the International Peace Gardens and Scotch at \$10/L and beer at \$8 a carton.

The drive to Brandon in Manitoba gave us an insight into Canadian agriculture. Agriculture Canada and the Prairie Farmers Rehabilitation Administration held a day-long seminar with local farmers and us. Bob Bradley and his wife hosted us to dinner at their home and we "test drove" some border scotch and beer. The next day we visited many farmers in the area and Zero-tillage seemed to be well and thriving in Manitoba. The BBQ tea at the Brandon Zero-till farm the next evening was lit with the oxy torch - no mallee roots to stand around, and was it cold!

We reluctantly left Brandon and the North Dakota/Manitoba Zero Till Farmers Association - undoubtedly the most active No-Till area in the world. We left with promises of regular inter visits between WA to share our knowledge.

On the way to Indian Head in Saskatchewan we visited local farmers and the United Grain Growers silos at Virden and the Manufacturer of the ConservePak*. Jim Halford is a normal farmer with a factory in a large shed on the farm. Consultant Keith Head had visited our group last year when in W.A. The Agriculture Canada Research Station at Indian

Head had extensive tillage trials side by side with No-Till, and blind Freddy could have seen the advantage of No-till systems and rotations. At this stage we were joined by my wife Dianne who tidied up a few loose ends.

We moved north to Yorkton where Morris Industries showed us their range of No-Till equipment. Their R and D had some interesting new developments on the way. We set out for St Brieux, in the north of Saskatchewan and were surprised to find a factory (Bourgault) that employs 600 people in a town that houses only 400 total population. Bourgault was the most progressive factory I have seen - it has doubled its capacity in 2 years and was building more extensions. Their disced No-Till drills were the best I have seen - they have more orders than they can build, so we may not see any exported here. We turned south on the homeward run down to Saskatoon where we visited Flexicoil who have done a lot of development work with points. Harmon industries hollow eagle beak point and tine assembly are certainly the most promising as suitable for our heavy soils that we had seen so far. The weather still wasn't getting any warmer.

Out at a little town called Rosetown that night the satellite TV dish at the pub was turned around and we saw the AFL Grand Final live on Friday night. The 2.30 am finish delayed the start the next morning but we dragged ourselves out to Eloose and K-Hart Manufacturing demonstrated their disced No-till drill, a very neat machine indeed. The Hines boys stayed the night with the K-Hart team and missed the Grand Final.

Traditional wheat country rolled by as we struck out for Swift Current Research Centre, where we saw twenty years work in the development of better No-Till equipment. **Ben Dyck** has a lifetime of experience in No-Till development, and is one of the most remarkable thinkers of the No-Till systems. There was nothing he hadn't tried in the development of better equipment.

Back on the road south across the border into Montana we crossed a lot of strip farming and as we crossed the Missouri river broadacre irrigation, centre pivots that covered 160 acres was normal. We spent a day talking with farmers and USDA people at Beach in Western North Dakota before setting out for the Bismark/Mandan Research Centre, where they had many new grasses and trees being developed. They could simulate rainfall and droughts.

Onto Pierre in South Dakota where we met one of No-Till's most convincing characters, **Dwayne Beck** who assured us that we were lucky it had rained and he couldn't continue harvesting his thousands of trials. We toured the research farm and saw every conceivable variety, rotation, chemical, timing, etc. that could be done No-Till.

We visited Dick Cone's Fertiliser works, and saw how many different blends of liquid fertiliser was made. Dick also has the bulk chemical storage in town and imports most chemical in bulk semi loads. While in Pierre we found a decent steak, about a kilo fills up a large plate and if you can eat it you can have another one free. The steak would feed a family of four easily!

We travelled south to a little town called Ideal where we

met the **Jorgensen family**, who farm in 8" rainfall. Traditionally they used to grow wheat, then fallow. Since going No-Till they are growing wheat, soy or millet without fallow, every year, and with the trash cover, believe they can grow corn to about 60 bushels/acre. They grow all their grain for 1,250 sow piggeries and are turning off 30,000 hogs a year. They also run 2,000 cattle both on pasture and feedlots. A very dedicated family to the maximum value adding, on-farm of all their products, and all their stock are performance selected. The hospitality of this family also was second to none.

The drive through Nebraska saw soil turn from familiar black silty loams to undulating sand hills, with extensive under-ground water for irrigation. Here we found that nitrate and Atrazine contamination of groundwater was of extreme environmental concern, and variable rate fertilising technology was being tested to reduce nitrate leaching. Atrazine is now rigidly controlled in the US grain belt.

The next major stop was at Salina in Kansas to visit the Great Plains factory, and their automatic powder paint system and their six robot welders were interesting to watch. From Salina we drove our little Plymouth 7 seater back to Kansas City to complete the 10,000 km circuit of the American and Canadian mid west grain belt.

Bruce and the two Ray's left the group to fly home, and the rest of us took a flight across the Kansas-Colorado border, where we saw a centre-pivot irrigation system that covered a mile diameter circle, then a birds eye view of the Grand Canyon and the snow covered Rocky Mountains. The brown smog over Los Angeles greeted us as we landed, and we appreciated the US governments legislation to have 30% ethanol in petrol by 1996.

The nine lane (one way) freeway took us to the south of California towards San Diego where we visited a farmer at Sun City who was using a Harmon Tine No-Till drill in abrasive clays and loams, similar to our soils. His only complaint was that the drill side slipped on steep slopes and the press wheels did not line up with the tines.

We pushed on up North through the Central Valley which is regarded as the "Bread Basket" of North America during their winter freeze. Salinity is creating big problems in this area and Australian Eucalypts have been planted in their millions to reduce critical water tables. We went through several oil fields, and at one stop we counted 150 poppet heads pumping.

Into the high country at Paso Robles we stayed with the most remarkable family who practice Holistic Resource Management. Holistic Resource Management is "dedicated to restoring the vitality of communities and the Natural resources upon which they depend".

We had a lot to learn here, from **George** and **Elaine Work** in their approach to preserving nature and their environment. They are No-Till farming on up to 42° slope without erosion. After spending two days with the Work family in their "heaven", we set off along the coastal highway toward Los Angeles through San Miguel, Santa Barbara, Malibu and Santa Monica, towards our 14 hours non-stop flight to Sydney and then home.

the Department of Agriculture in 1994. Two trials were at Corrigin, two at SE Hyden and two at Lake Varley investigating trifluralin's efficacy and crop safety, when used in No-Till sown crops.

The theory behind the technique is that by using knife points and rotary harrows to cover, the following is achieved:

1. An undisturbed inter-row between seed rows is preserved, and the rotary harrows are forced to operate shallow.
2. The knife points are operated deep (at least 75 mm) and fast enough to throw soil on top of the inter-row,

and cover any pre-seeding applied chemical.

3. Covering rotary harrows are important to bring chemically-treated soil back over the sown row, plus fine up the soil surface to prevent volatilisation of chemical between the clods of thrown soil.
4. The net result is that at any given rate of trifluralin, better weed control is achieved, due to the chemical being mixed in a lesser volume of soil. Crop safety should be improved because the chemically treated band of soil is physically separated from the seed, which is placed deeper beneath it.
5. The aggressiveness of the harrows is important. If they are too heavy they will break down the inter-row and deep-incorporate the trifluralin, reducing separation with the crop seed.

Results & Discussion From Trials

Rates of up to 3.5 L/ha of trifluralin EC where used pre-seeding or post-plant pre-emergent (now called pre-emergent) incorporated in crop sown with both Super Seeder³ and Harrington¹ knife points. Generally, no significant reductions in wheat emergence were detected with increasing rates of products across all sites. The pre-emergent timings didn't appear to offer any additional crop safety over the pre-seeding timings. Unfortunately no conventionally sown treatments were included in the trial. However, the results indicate the potential for improved safety with shallow incorporation.

The standard procedure in No-Till seeding is to effectively control early germinations of weeds with glyphosate, plus a spike (of Glean, Ally, Lontrel, 24D etc) and then burn off the dying weeds with SpraySeed[®] immediately before sowing. SpraySeed and trifluralin should be able to be tank mixed and applied immediately before sowing, with minimal crop damage using knife points for seeding.

In comparison, the pre-emergent, incorporated applications as being promoted in conventionally sown crops, means another boom pass plus the operation expense and loss in soil structure by rotary harrowing in. The other conflict is that to provide enough soil disturbance to incorporate any pre-emergent applied trifluralin would probably break down the inter-row and deep-incorporate chemical, negating some of the benefits of No-Till.

Diuron mixed with trifluralin and applied pre-seeding, or separately pre-emergent after trifluralin pre-seeding, or mixed and applied pre-emergent incorporated, didn't appear to have an effect on the wheat emergence in all trials. This may mean there is potential for mixing say SpraySeed, Diuron and trifluralin, applying it pre-seeding, and achieving broad spectrum weed control. For those using trifluralin and knife points next year, it may pay to try a test area with Diuron mixed pre-seeding in a situation where capeweed and waterweed germinations are anticipated.

Hypothetically, if Diuron is incorporated in any way its activity on the very surface-germinating weeds (capeweed and waterweed) may be affected. In general, Diuron rates need to be modified in No-Till situations. Firstly, because better activity would be anticipated due to no deep-burial of weed seeds, and secondly, greater crop damage has been observed due to the Diuron being funnelled at both the soil surface and on top of the inter-row into the seed row causing crop damage. Normal Diuron rates for wheat are 600-800 ml/ha, with 400 ml/ha on sandy surfaced soils to minimise crop damage in No-Till situations.

Ryegrass emergence was reduced by about 80% with the application of trifluralin. Pre-seeding applications giving similar control with pre-emergent incorporation. Theoretically, by applying the chemical directly to the ryegrass seed, as in the pre-seeding applications, better control may have been achieved. At the SE Hyden site two passes were made with the single Woolford chain to incorporate the pre-emergent

applied treatments. The ryegrass assessments clearly indicated that about 70% of the trifluralin's activity had been lost, presumably due to volatilisation as a result of insufficient incorporation.

There was not a clear trend of reducing ryegrass population with increasing trifluralin rate. This tends to support the theory that, because the chemical is shallowly incorporated, it is in the relatively high concentration with the ryegrass seeds, and high chemical rates are not required.

It was suspected, however, that by using a high trifluralin rate the activity period was extended, reducing the ryegrass seed production. This would be beneficial to next year's crop. No clear reduction in seed production with increasing chemical rates was observed.

Best Bet For 1995

The farmer at the SE Hyden site seeded around the trial area with Harrington knife points and a single Woolford covering chain. Trifluralin was used at 2 L/ha pre-seeding giving good ryegrass control and no obvious crop effect.

As a guide for next year, for people making the change to knife points, higher trifluralin rates should be explored. The optimal rate is probably around the 1.5 - 2.0 L/ha mark, with 2 L/ha for higher clay content soils in situations where the ryegrass pressure is low to medium say 50- 400 plants/m².

Equally important is being aware of other contributory factors that may predispose the crop to chemical damage:

1. Seed quality - large sized seed of a high germination percentage should be used. Be conscious of the emergence delay that seed dressings will cause.
2. Seed depth - should be maintained at 2-3 cm. Higher seed rates (10-20% more than normal) should be used when using trifluralin.
3. Soil is well structured and not prone to sealing over.
4. Points should be operating at least at 75 mm depth, giving 45-50 mm of cultivation beneath the seed. This is necessary to reduce Rhizoctonia and provide disturbed soil for the crop roots to grow into.

The information in this article is intended as a guide only. Due to variations in the circumstances in which the strategies discussed may be applied, no responsibility can be taken for the outcome.

NO-TILL CONTOUR SOWING

*Kevin Bligh, Development Officer,
South Perth (09 368 3893)*

No-tillage sowing reduces water erosion. However, if the seeding direction is up-and-down a slope then run-off can still erode down the seed furrows, possibly washing out seed and fertiliser. It is therefore desirable to work approximately on the contour, where contour banks have not yet been constructed.

Ian Edwards at Beverley and Ray Harrington at Darkan, seeded approximately on the contour using narrow points last year. Ian used a combine seed drill, and Ray, an air seeder.

First they did 2-3 rounds of the paddock, round-and-round. Then they steered roughly on the contour, by eye. They then seeded the rest of the paddock up-and-back, lifting the machine out of the ground for turning on the already seeded ends. More accurate contour lines can be surveyed if required, by Community Landcare Technicians, for example.

Seeding up-and-back, and lifting the machine out of the ground at the ends, minimises wasteful double-sowing and eliminates corner headlands. Most farmers in America work up-and-back. Working round-and-round really dates from the days before hydraulics for lifting implements.

Seeders should also be lifted out of the ground when crossing waterway depressions, which are likely to erode. Little crop yield will be lost, because depressions are likely to become waterlogged and yield poorly in most seasons,

anyway.

Contour banks are still necessary with No-Tillage sowing, because water erosion occurs mostly in a few storms, when soil profiles may be saturated, towards the end of a wet winter, for example. Contour grade banks are therefore needed at intervals downslope, to divert erosive flows to permanently grassed waterways.

NO-TILL AND RHIZOCTONIA

Bill Crabtree, Development Officer, Esperance (090 761333)

We all know that rhizoctonia bare patch is worse in some No-Till cropping systems, but by how much and with what machines? The below table shows the percentage of ground with rhizoctonia patch in two trials on Esperance Downs Research Station. The '93 trial also has a vigour rating (1 = worst and 5 = best, vigour at 6 weeks after sowing). The area was calculated by recording the number and size of patches in each plot.

Machine used	EDRS 1993 (%)	'93 vigour (1-5)	EDRS 1994 (%)
CrossSlot	2.4	3.8	2.4
4 cm deep tine	5.4	2.2	2.8
4 cm Super Seeder	3.7	3.0	-
Great Plains (double disc)	6.6	2.5	3.6
Great Plains, wavy at 7 cm	4.2	3.0	-
Great Plains, wavy at 10 cm	3.9	2.3	2.7
10 cm deep Harrington pt	2.3	3.3	2.6
10 cm deep knife + weeder	3.3	3.0	-
10 cm deep 2" point	1.9	4.0	2.0
10 cm deep 2" point + PW	2.4	3.5	-
10 cm deep 6" point	2.3	3.2	2.4
10 cm deep 2" + Deep Rip	1.7	4.5	0.9
Great Plains + Deep Rip	2.0	4.3	-
F value (Probability)	0.06	-	0.84
LSD at 10%	2.46	-	2.32
cv%	54%	-	81%

Both trials had a huge variation. However, we have some confidence in the 1993 trial data with differences greater than 2.46 % (at 10 % level of probability) being probable real differences. The 1994 data is only useful for trends, so don't stake thousands of \$'s worth of machinery investment on this data alone. As expected, both trials had more rhizoctonia with least tillage and conversely, least

rhizoctonia with most tillage. However, grain yield benefits from deep ripping to 30 cm depth were negative (for 1993 see March 1994 Newsletter) or small in these Esperance trials.

Most interesting is the decrease in bare patch due to the wavy coulters. The decrease is only significant at the 10% level (5% is preferred, being 2.7) between the no-wavy and the wavy coulters at 10 cm. This must caution our enthusiasm for the benefit and needs further testing, although the trend was similar in 1994. South Australian research has shown that cultivating 3-5 cm below the seed usually provides adequate rhizoctonia control. Wavy-disc machines have not yet been experimented with in SA. The big question is, does the wavy coulters shatter the soil enough? Narrow points equal wider ones for rhizoctonia control (both in WA and SA) without the increased risk of wind erosion. However, points, unlike discs, throw some soil which encourages more weed emergence!

How important is rhizoctonia to you? The severity of rhizoctonia might depend on; soil type, tillage depth, number of years of No-Till, sulphurea use, nutrition and perhaps other soil diseases. Some farmers see only small rhizoctonia damage even after 4 years of No-Tillage, while others see huge patches in their first year. I have yet to meet a farmer, in the southern part of the state, who knows what rhizoctonia is and has No-Tilled for at least two years, who has not experienced rhizoctonia in his crops. On the south coast usually the gravels and shallow duplex soils are worst affected, although clays and loams are not exempt. Many conventional-croppers experienced rhizoctonia in 1991 for the first time, where shallow full cut cultivations were done.

Interestingly, despite looking for severe rhizoctonia patches for research purposes we often miss the patches. Soils with more than 10% patch are usually favoured for research, but are not common. Lupins rarely recover from rhizoctonia damage, though cereals can. At Jones' this year, similar to last year, some rhizoctonia patches did very well. An interesting irony occurred after the early October rain which allowed some patches to outyield non-patch areas. Perhaps half of the patch areas caught up to the non-patch areas, although the one shown in the table below did better than that, in fact, three times better.

Rep	Inside Rhizo patch		Outside patch	
	grain yield (t/ha)	seed size (mg)	grain yield (t/ha)	seed size (mg)
1	1.91	44	0.75	39
2	2.67	45	1.14	28
3	2.66	50	0.56	30
Avg	2.42	46	0.80	32

probably dried the soil out whereas the no-disturbance BioMax sown soil was moist and germinated better. We also had a couple of wind blows and the BioMax rows hardly moved. On the down side, we've experienced a lot of 'hair pinning', and it is therefore not good for seeding lupins into thick wheat straw.

In 1993, I used the BioMax to sow some trials on the clay soils at Dalwallinu. This time the yield was not as good as that achieved by direct drilling with tines. The reason may have been that the flat disc glazed the wall of the trench, making it hard for the seed to get its roots through. All of the wheat at the Miling block was put in with the BioMax. There were patches of Rhizoctonia and research indicates that No-Till increases its incidence.

In 1994, apart from using the BioMax on our Miling property for wheat, I used it alongside tines for seeding peas

in the clay country at Dalwallinu. The BioMax appears to have germinated better and looks greener, which was similar to our wheat experience out west in 1992. This could have been because the seed had better access to moisture or fertiliser, or both.

The machine worked well in North Miling sands but not so well in the Dalwallinu clays, although this year's peas do look good. The machine and the principle seem to improve the seedbed moisture retention, lessen wind erosion, give a uniform germination and therefore a better plant density. However, I have noticed more Rhizoctonia with No-Till, the weeds must be killed with herbicides and the machine is not real user friendly.

The down sides of the BioMax machine are several fold. It requires a lot of maintenance, with 140 grease nipples on 28 runs; the 11 mm increment adjustments for seeding depth are too coarse; the cast-iron boot has a high wear rate allowing water easy entry and blocking; and it does not handle wet clay at all well (the clay is pushed between depth wheel and disc, which bends the depth wheel).

Even with these troubles, subject to normal budgetary considerations, I may purchase another BioMax in 1995. The benefits to be gained from using it on our sandy soils far outweigh its problems. Besides, with a few modifications, some of the faults could be overcome; and I hope the new manufacturers will do just that.

The above is what I presented at the August No-Till day Kalannie. I have now just finished the 1994 harvest and can reflect further.

The No-Till benefits were less spectacular this year than 1992 or 1993, though our finish was dry this year. All yields, in particular lupins and peas were down and therefore the same percentage differences that we had previously observed would have been harder to detect. I also had a much bigger program and had less time during harvest to measure yield differences, though I saw none visually.

In 1995 I intend to continue seeding part of my program with No-Till. I also now plan to seed some of my crop with narrow points. I am still learning what are the best No-Till systems and it certainly works better under some conditions, but I cannot yet say what these are.

NO-TILL IN A DRY YEAR

Jim Baily, Wellstead (098 471036 or fax 12)

In 1994, we seeded 1,600 hectares of crop plus 240 hectares of pasture with knife points (from Primary Sales). We again used the adaptor boots that I designed which gives good seed depth control. We also used press wheels and, in heavy stubbles, the angled coulters.

Rainfall for the growing season was 240 mm, with cereals yielding 2.6 t/ha, canola 2.0 t/ha and lupins 1.7 t/ha. The crop grew very well in general, despite a very dry June and July, where our Franklin barley and canola were close to wilting point.

We had a problem with penetration and lack of breakout pressure with the tines in heavy clay, however, the crop still grew in these areas. Rhizoctonia was a problem and it didn't seem to matter what type of machine was used. Although the narrow points working to 10 cm depth seemed to have less rhizoctonia than the shallower yet full cut workings.

No-Till was an enormous benefit in this dry season. It is my opinion, and also that of several other nearby farmers, who practise No-Till, that the No-Till technique enabled much better crop yields. We think that if we had cultivated prior to seeding then much of our program would not have been sown and our yields would have been much less 2 t/ha.

MINIMAL STUBBLE MANAGEMENT

Ric Swarbrick, Gairdner (098 361038)

I have been asked to give my view on managing stubbles. On our farm we direct-head our crops with a contract harvester, hard graze our stubbles, and No-Till our crop with a double disc machine after a knockdown.

Our soil is sand over gravel, with 425 mm rainfall, and we have continuously cropped for about 6 years on 350-550 ha. Sheep are an important part of our farming operation. Our stubble management techniques are still evolving.

Our current preferences have come from trial and error and a concerted effort to avoid working the country and to reduce wind erosion. In the late 80's we commonly spraytopped, then sowed with a one pass combine, using a 6 row Shearer, with Flexicoil land packers behind. We then hoped for a kind rain with no wind. The adoption of lupins in a rotation improved our yields and stubble management problems.

We tried raking cereal stubble and burning the rows to let the combine, with seeding tines only, through. This failed though, as the fire often escaped out of the rows, causing wind erosion. A neighbour tried slashing cereal stubbles and grazing and consequently, our boundary fence was flattened and our tree lane received half a metre-depth of mulch in one afternoon.

We found that sowing cereals into lupin stubbles with a tined machine was a recipe for wind erosion. Even a 2 t/ha lupin crop with less than 2 weeks of careful grazing could easily blow. We also had summer weeds, like melons and wireweed, causing trash flow problems. So in 1991 we hired a Great Plains double-disc machine for \$7.50/ha and seeded 240 ha then in 1992 we purchased one.

With double-discs, we have grown over 4 t/ha of feed barley, and prior to the flood of 1993 and drought of 1994 our average lupin yield was 1.8 t/ha. In 1992, our barley averaged 3.7 (184 ha), wheat 3.1 (93 ha) and lupins 1.7 t/ha (165 ha), plus a further 93 ha of barley that was scarified before sowing, because of stumps and compaction.

We now have no stubble handling problems when sowing cereals into canola or lupin stubbles. Sadly poor lupin crops in '93 and '94 were grazed rather than using the contract harvesters. On the south coast, harvest is frequently delayed by summer drizzles, and harvesting hours are at a premium.

We tried harvesting shorter, but could not accept the extra cost, a legacy of paying a contract harvester. Straw spreaders that work properly are a must.

I think strong straw is important. My current preference is for varieties that stay standing and attached to the ground even after heavy grazing.

A wheat variety with tough straw is Cunningham. It seems much stronger than Machete and has good disease resistance giving high yields, even this year, considering only 200 mm (8") of rain for the year (apparently it can shed). Our observations on our soils are that the straw strength of Franklin is not as good as Moondyne barley.

With a combination of sheep, herbicides, different varieties and double discs we can now handle most of our stubble difficulties. The sheep graze the summer weeds and greatly reduce stubbles.

Feeding out lupins in cereal stubbles further decreases the stubble level and it also allows pastures in other paddocks to grow before being grazed.

NO-TILLING AT THE GUMS

Rory Graham, Salmon Gums (090 785013 - p&f)

We farm just south of Salmon Gums in a 325 mm (13") rainfall area, on both heavy and light soils. This year was our first with No-Till. We put 30% of our farm in with the Ausplow DBS machine which has 12 mm-wide points mounted under a 42 foot Leon Chisel Plow bar at 220 mm spacings. The No-Till performed relatively better on the heavy land than on the light land. There were more weeds in the light land. Our rainfall for the year was only 130 mm.

I did two wheat tillage trials plus some strips around the farm. The heavy soil was sown to wheat on 24 June and the light soil 7 June. Plowing was on 24 May for both sites and scarifying was done the same day as seeding.

The heavy soils did not wet up at all during seeding (11 mm over 3 days) which made tine penetration almost impossible. In fact, a 300 horse power tractor was stalled dead several times trying to get the Ausplow in! Consequently, the maximum depth of working was only about 70 mm, and it should have been working at 100 mm. Despite this, the Ausplow out yielding the conventional by 14% on the heavy soils (see table).

On the light soils, the No-Tilled wheat yielded 23% less than the conventional. However, at seeding there was obviously some barley grass that had just emerged which was killed by the full cut but not with the narrow points. It was not the pre-seeding cultivation but rather the full cut that gave the extra yield.

Treatment	Sown with	Heavy Soil			Light Soil			
		Grain Yield (kg/ha)	Rep 1	Rep 2	Avg	Grain Yield (t/ha)	Rep 1	Rep 2
Plow	Ausplow	563	-	-	1.54	-	-	1.54
Plow	Full cut tines	580	718	639	1.48	1.60	1.54	
-	NT Ausplow	664	790	727	1.15	1.20	1.18	
-	DD Full cut tines	-	766	-	1.49	-	-	
Scarify	Ausplow	540	-	-	-	-	-	
Scarify	Full cut tines	-	587	-	-	-	-	

Other strips around the farm on light soil where weed control was more equal, showed that the No-Tilled crops gave similar or slightly better yields than wheat conventionally sown. This was despite more rhizoctonia being present in the No-Tilled strips where penetration was poor. My observations reinforce the idea that No-Till must be adopted as a package, with weed control being done properly the year before. I do worry about the total dependence on chemicals for weed control with respect to herbicide resistance.

I hope to modify the Ausplow with leading coulters to assist penetration and reduce soil splatter. The bar was also too wide for my tractor and must be modified. I was encouraged to see the results show some potential for the system, even though the No-Tilled strips didn't look 'attractive'. My shallow duplex soils are still a concern for me. Here's praying for some good early rains next year to soak to at least 100 mm, and I might do some more trials!

LEADING PAIRED ANGLED COULTER EXPERIENCES

Bill Crabtree, Development Officer, Esperance (090 761333)

Leading paired and angled coulters (L-PAC) allow tine machines to seed through heavy stubbles. Consequently, there is enormous interest across southern Australia in the progress of the coulters set-up devised by the Marshall/Raszyk brothers. The team of brothers have patented the idea, but

are more than keen for farmers to copy what they have developed.

I believe that the amount of farmer interest in the L-PAC warrants feedback from those who have used it in 1994 (more than 12 farmers). I have requested frankness about the pros and cons of the coulters system, as it may save readers the risk of copying any problems the system may have. If you also have used this set-up and want to contribute in the next Newsletter, please fax me your experiences on 090 7612267.

Now Available Through ARP

Karl Raszyk, Coomalbidgup (090 786047 p&f)

We have been more than happy with the way the L-PAC set-up worked this year. Along with the Marshalls' we did a few experiments with the discs. We have made some modifications to the disc units, and we now have an agreement with ARP to manufacture and sell the units with adaptors to suite John Shearer, John Deere and Gason tines. For information on prices, please ring Nick Stone at ARP on 09 250 3777. We had our original adaptors made by Davies Engineering of Esperance for our Shearer tines. We have a patent out on the units, but are happy for farmers to copy the idea.

The changes we made were minor. We replaced the grub screw and collars on the pivoting post, with shaft control segments. This will make changing the depth of all discs on the whole machine a 5 minute job, thereby improving the flexibility of the L-PAC. We have put Neoprene wear washes on the pivot post, and at \$4 each they should last at least two seasons. This will also preserve the shaft control measures. Greasable nylon bushes have been put inside the hollow bar, being \$2 each and replaceable. The horizontal arm which supports the discs has been extended about 15 mm to enable discs up to 20" in diameter to be used.

We are pleased with several aspects of the discs. We estimate 50-100% more stubble can be sown-through with the use of the coulters. However, it doesn't solve all the stubble problems, and stubble still needs to be managed in other ways as well. Stubbles are easier to get through when short, and either lightly grazed or left ungrazed. The discs do ensure a much smoother and tidier seedbed. Clumps of stubble rarely come out the back, and the paddocks are much smoother to drive over.

The coulters also have improved sowing through pea, melon and clover vines. The stubbles limit the carpet pulling-up effect that can occur with rank sub-clover growth the year before. Melons are pulled through better where there are good stubble levels. Even though the coulters handle the odd melon well, we still plan to spray melons when small.

We are happy with the 5 degree angle of the discs. We experimented with 3, 5 and 7 degrees and found (in this our first year) that the 5 degree angle was the most versatile. However, an angle bigger than 3 degree did not improve stubble flow, and we had one unit set up at 3 degree all year and it didn't seem to make much difference.

We did throw a fair bit of soil with our set-up, though most of this was from the head of our Primary Sales knife points as we went deep. On our heavy soils, we would like to leave a more level soil profile, and therefore we think we'll go to a longer, narrow point.

As to which disc type to go for, I'm not sure, as both the plain and scalloped discs have advantages. Scalloped ones seem to clear slightly better in sticky clays. However, the plain ones are cheaper, thinner (3 mm) and therefore may cut straw a little better than the scalloped discs. Also the plain discs stay sharper. In a 1,000 ha of dry-ish soils varying from gravels to clays, we wore 1" off 18" discs on our 33 row Shearer at 10" row spacings, which now makes it a 22 row machine. In dry sandy soils where the stubble was laying over we had to put our plain discs in 12 cm-deep to ensure straw cutting.

A Comparatively Cheap Investment

Paul Spittle, Condingup (090 766011 - f&p)

We farm on sandplain soils east of Esperance in a 500 mm rainfall area. The drier-than-average season suited our cropping program. We fitted the LPAC's to our home built seeding bar to improve trash flow for sowing canola and lupin into cereal stubbles (460 ha). The coulters are scalloped with a 5 degree offset from straight, set up the same as the Marshall/Raszyk system.

The discs were mounted across the front row of a 7 row bar which sows over 6 rows with parallelogram press wheel and tine seeders with Super Seeder* points. Our row spacing is 190 mm, with 600 mm between tool bars and 620 mm underframe clearance. This configuration handled 3.5 t/ha barley stubbles quite successfully, and we only had a few minor problems.

Since 1994 was comparatively dry, the machine has not been robustly tested with wet straw. However, rain or heavy dew, limited the effectiveness of the discs. Melon vines were sometimes pushed into the ground and not cut by the discs, and they then wrapped around the tines. Stray fence wire wrapped around the stub axle on the coulters assembly, cutting out the seal on the inside of the hub. The dust cap on the outside of the hub was also knocked off by mallee roots or the adjacent coulters, which can be easily solved by welding a pipe protector onto the disc.

Despite these few minor problems, we have been very happy with the LPAC system. Although it is hard to quantify how much more stubble it enabled us to get through with a tined machine, it would appear to be significant, and well worth the relatively small investment. As far as stubble blockages are concerned, it only really blocked where the harvester stopped to wait for the chaser bin and left a large lump of trash. It is doubtful whether a double disc machine could achieve effective establishment through such a lump in any case.

The angled coulters has the added bonus of shifting dry soil out of the sowing row, allowing the seeder to sow to a greater depth into sub soil moisture without compromising sowing depth from the surface (fallow sowing). The 5 degree offset may appear too aggressive in some soil types. However, I feel that any less angle would compromise its effectiveness.

Overall it has been a worthwhile modification leading to an easier seeding program and an improved establishment with the coulters eliminating the need to rake and burn. However, we will make some changes for 1995. We will add deep working tines with knife-edge points in order to band fertiliser and improve rhizo control. We will also increase our row spacing to 270 mm in order to accommodate the extra tines.

More Refinement

Jim Baily, Wellstead (098 471036 or fax 12)

We built our own coulters using the Marshall Raszyk design. I believe that the angled coulters probably has its greatest benefit under a wide row spacing system. I found

that with the 7-8" (180-200 mm) row spacing there the coulters tended to throw trash over to the first tine that was diagonally opposite. This may not happen with a wider row spacing and hence the reported windrow effect between the rows may not occur.

This year I will use a slightly wider row spacing and try straight coulters with perhaps scalloped discs. With heavy trash and sowing with tines I believe the coulters are necessary. However, we need to experiment more with tine configuration and see how the coulters will behave in difficult soil types and under different conditions.

An Easy Modification

Trevor Spencer, Coomalbidgup (090 768526 or fax 50)

We fitted the leading angled coulters to a John Deere 753 combine. We did this because it was a cheap modification and reasonably simple to do, and we believed that it would improve stubble flow. We used the sowing tines with knife edge points to 10 cm-depth, and seeding shallow using a soil scraper to fill the slot in before the seed drops. We shifted the tines around so that they sowed on the 3rd, 4th and 6th ranks. This allowed us to use the first 2 ranks to spread our coulters on.

We decided to stay at the 7" spacing, as other people have opted for the wider rows. We think that the crop competes better with weeds at the closer spacings, and swathed crops may fall through the wider rows making them harder to pick up.

Speed of travel and size of the discs are two most important factors. Too much soil is thrown when you go faster than 9 km/hr with 16" discs. The wider the angle on the disc, the slower you have to travel. We opted for 5° angle, though we tried 7° and it threw too much soil at 9 km/hr. The size of disc affects the pressure needed to penetrate and cut or shift the stubble.

The bigger the diameter, the more pressure needed to get the discs in. We found that 16" discs, tensioned by a 753 tine spring assembly, screwed up to its maximum pressure, worked well.

Bigger discs can have less angle, as long as they penetrate the soil. We went for the smaller 16" discs as they penetrate more easily than the bigger discs. However, we had to use at least angle a 5° angle to shift the stubble. The idea is to try and leave a slot in the ground about an inch wide so that it leaves a path for the narrow point to pass along clear of stubble.

This system works a lot better in standing stubble than in stubble laying over. We found that in heavy stubbles you don't want to work the narrow point deeper than the working depth of the discs, as the discs can still allow some hair pinning to occur. This rule also applies when the stubble is wet, or very damp at night.

Overall, we are very happy with how it all works, and are currently modifying an airseeder bar to do the same thing for 1995. This means that our 753 combine is now up for sale, so please give me a ring if you're interested. In future years we'll probably cut the straw a bit shorter and graze it less too.