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Research &
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BED TIME STORIES

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A networking newsletter for Australian Bed Farmers

Feb 2005

“Raised Beds A-Z” attracts a wide awake crowd

Raised beds and controlled traffic cropping continues to gain interest from many Western District farmers. Our “Raised Beds A-Z” field day last March was attended by over 300 hundred farmers who enthusiastically shared in the day’s activities. Millions of dollars worth of cropping equipment was demonstrated by various contractors who have played a large part in the development of raised bed farming in our district.

Our next “Raised Beds A-Z” day will be held on March 9th 2005 at the same excellent venue donated by Brian and Sandra Wilson at Mingay. Sowing technologies and soil health will feature on the day, which is being kindly supported by the Grains Research & Development Corporation.



Part of the 300 plus crowd at the “Bedworks” day with the demonstrations of machinery in the background.

Photo – Brad Collis, Coretext.

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BED TIME STORIES

From the Editor – Bruce Wightman



Welcome to the fourth edition of Bed Time Stories. It's been over 12 months since the third edition. Although a lot has happened I think a specialist publication like this one only needs publishing when we have lots to talk about.

One of the most significant events has been the appointment of Andrew Whitlock to the DPI in Geelong. Andrew is our Precision Agriculture/Controlled Traffic Farming Agronomist. "Enthusiastic" is his middle name and he would love to hear from any of you contemplating a controlled traffic operation. We can see a place for controlled traffic for any well-drained soils where raised beds are not required or are unsuitable.

Last winter many crops in south western Victoria were waterlogged. In some areas over 50% of the crops grown on the flat were not worth harvesting, yet raised bed paddocks generally performed very well. I must admit, I cannot understand why, on suitable land, any cropping farmer has not at least tried raised beds. It is a totally exciting experience filled with endless rewards.

The machinery manufacturers in Geelong have now sold 6 "Southern Seeders" and all have performed well. I have observed that many farmers have purchased 8m wide air seeders for raised beds. These are very heavy machines and I can't help thinking that a 6m machine with small boxes like the "Southern Seeder" will give a lot less headaches over time.

At the moment the press wheel assemblies that go under the "Southern Seeder" are selling well in their own right and are being fitted to many different styles of sowing machines.

What a great turnout at the 'Raised Beds A-Z' field day at Lismore last March! Approximately 350 people attended what was one of the largest field days ever held in south western Victoria. Another day will be held on March 9th 2005, commencing at 11:00am. This day will concentrate on sowing. Sowing is one area that causes difficulties for many farmer. We hope to demonstrate some good techniques to help get the job right. See you there!

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Want to be the boss? Then bed farm under a broad banner.

Although some people regard raised beds as just a method to reduce risk, I believe they provide a cropping system where the grower can have more control over a broad banner of variables.

Rainfall use, water movement, soil health, crop health, crop growth and yield are all variables that the raised bed program can have a significant impact over.

The whole process of development of raised beds has been a team effort including farmers, machinery manufacturers, agronomists and researchers, with the GRDC and Southern Farming Systems helping to sponsor the project along the way.

The following pictorial story concentrates on the control farmers can now have in water use and movement in a raised bed environment.



▲ 2 If slopes and soil types are suitable, then follow-up with a full contour survey. At \$20-\$25 per hectare, a 10cm contour survey is almost always worthwhile.



◀ 5 Water sitting in the furrows between the beds is very hard to avoid. Vehicles travelling through these puddles deepen the furrows, worsening the problem.

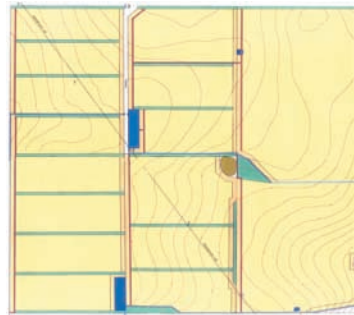
Land Planing helps ▶ level the surface of a 6 paddock to facilitate better water movement down the furrows.

Controlling water on Raised beds

By Bruce Wightman



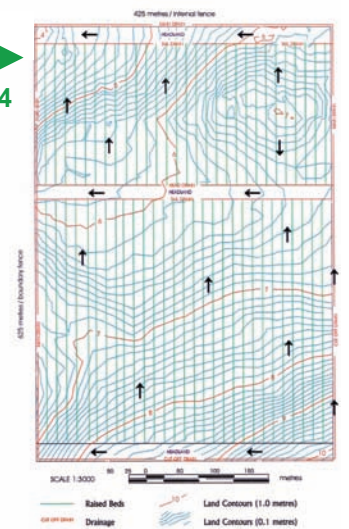
▲ 1 Before embarking on a raised bed program, it is a good idea to see if the paddock/farm falls within the guidelines of slope and soil type. A simple dumpy level survey is an ideal way to start. If raised beds do become a program then the dumpy level is an invaluable ongoing tool. Share the \$650 cost with a couple of neighbours — it's not a tool you will use every day.



◀ 3 With a contour survey, a whole farm plan is simplified. Paddocks suitable for beds can now be identified, water movement planned, vegetated waterways and buffer dams located. The really wet areas unsuitable for beds or perhaps even pasture may be suitable for trees, etc.

For paddocks suitable for beds, the contour survey can identify the direction of bedding and the direction of all collector drains, diversion drains and vegetated waterways. ▶ 4

In particular, those areas that can be "difficult" can be identified and processes such as land planing and laser levelling can be carried out before the beds are installed. In addition, bed lengths, headland design and buffer dam locations become easier to identify.



Controlling water on Raised Beds

Control over drainage in the bed starts with paddock slope and the choice of bed height to suit the slope, district rainfall and soil type.



▲ 8

In contrast, this paddock is very susceptible to waterlogging in a 600mm rainfall district. Soil is clay to clay loam and in this situation the height should be around 20-25cm even though the slope averages about 1%. A bed height of 25cm would probably be required if the paddock was uneven. If land planing was used to smooth the paddock surface then 20cm beds would be satisfactory.

Bed height also controls water flow through the bed soil and into the furrow. For good internal soil drainage there must be a height difference between the top of the bed (sowing height) and the furrow.

Once the bed height suits local conditions, then I believe the idea is to make the water move "through the bed soil" and any excess drain out into the furrows. I believe we should be avoiding, as much as possible, run-off directly from the top of the bed and into the furrows. This is another area over which we now have wider control.

Press wheels not only help in sowing depth control but they leave water harvesting grooves, which I believe should be around 5cm deep.



▲ 9

Narrow press wheels leaving a 5cm deep groove in a loam soil. Perhaps these grooves are slightly narrow. Heavy rainfall following canola may cause the edges to cave in and bury the small seeds. However these are ideal for cereals.

This picture shows 2m beds approximately 15cm high. The soil is a loam in a district of around 500mm rainfall. Slope averages around 0.5% and the paddock was regarded as reasonably well drained.

▼ 7



▲ 10

Water harvesting and accumulation in press wheel grooves at Willaura. Note the extra moisture in the grooves. Water can be concentrated by a factor of 2 or 3. Therefore at sowing, a 5mm rainfall event can equate to a 10mm or even a 15mm event around the seed – generally enough for germination. Excess water around the seed causing bursting is generally not a problem because of the improved infiltration and the reduced free water sitting around the seed due to the firming by the press wheels and elimination of air spaces. Also because the excess water drains out of the bed.

Controlling water on Raised Beds



▲ 11

Is this height differential enough for good drainage? Bed height is approx. 15cm but the press wheel grooves are 7.5cm. I don't think these beds would drain well in wet conditions.



◀ The speed and quality of water running down the furrows is also under our control. Sowing the furrows is usually recommended to slow

water movement. Sown furrows run less water because the growing plants dry out the soil. Matching sprayers and fertiliser widths limits the number of furrows being travelled down during the winter/spring period, which also aids in reduced run-off.



◀ Issue 3 of Bed Time Stories outlined the underground collector drainage system being developed by the SFS. This

photo shows the once flat and wet collector drain replaced with a slotted underground 100mm plastic pipe backfilled with coarse gravel. The system is working perfectly up to date, but we would like more experience with the filter medium to help decide which is the best gravel.

The above system has been extended to include a buffer dam. On a flat headland, an underground collector pipe has been installed with a predetermined fall to the dam. For this system to work, the level of the dam must be kept below the inlet pipe.

After a run-off event, the dam level is then reduced at a controlled rate via pump or gravity with the water being fed into the general drainage system.

The next area we would like to gain control over is the amount of water stored under a bed and the amount of water available for plant growth. Our aim is to increase the depth of the topsoil from 10-20cm down to 50cm. (see article: Taming Subsoils.)

From the top of the bed...

If my calculations are correct, then with 5cm deep grooves spaced at 15-17cm, a grooved bed top should be able to harvest a 25mm rainfall event (without taking deep infiltration into account). Infiltration is usually enhanced in a bedded/controlled traffic soil so I believe much more than 25mm would need to fall in one event before run-off would occur.

Plants growing in the press wheel grooves. Note the extra moisture and the extra protection the seedlings receive from the wind.



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Water that does run off, flows out of the furrows and into the collector drains. These collector drains can carry large quantities of water and must be engineered so erosion is zero. This generally means collector drains should be wide and flat. Pressure should be taken off these collectors by taking diversion drains across the headland and into permanently vegetated waterways and then into dams.



◀ Where required, furrow cleaning can enhance water movement and help keep the bed height ideal.

Our photo shows Andrew Whitlock giving the backhoe driver the correct levels to lay the pipe.

16 ▶



Controlled Traffic Farming

By Andrew Whitlock

There is a growing interest in controlled traffic farming (CTF) across all cropping regions in Australia. Many local farmers have captured the benefits of controlled traffic through raised beds but there is also the option to control wheel tracks on the non-bedded paddocks. You may like to think of them as flat beds!

A common response by a farmer asked why he uses CTF is ... "why wouldn't I do it? It makes life so simple! Sowing up and back with guidance will instantly give me 5-10% savings of inputs through less overlap. Driving on hard, permanent wheel tracks reduces my fuel bill by up to 40%. My soil is improving with each crop grown and I am producing more grain than normal, especially in the drier years".

CTF is a system where all tractor and machinery wheels stay on defined and marked wheel tracks. Wheel tracks can be set at 3m wide to match the harvester (more popular in drier regions), or 2m wide to match all machinery excluding the harvester (suitable for raised bed farmers). Low cost tractor modifications and guidance are available.



Bare wheel tracks for spraying and spreading is a simple and cheap way to increase your cropping gross margins.



Matching machinery requires matching wheel bases (2m or 3m) as well as matching the working widths of implements. Matching

machinery ensures a PERFECT JOB every operation. The permanent wheel tracks simplify operations within the paddock, similar to the furrows with raised beds.

Some research findings/experiences

Queensland

- First pass of a tractor causes 85% of the soil damage.
- Area trafficked can be reduced from 50% (zero till) to 16%.
- Yield improvements of 15% over wide range of soil types.
- Harvest damage can be significant if soil is moist and the machinery wheels can easily compact the soil.
- 30% improvement in soil water infiltration.
- Reduce tractor power requirements by 50%.
- Up to 15% reduction in inputs.

Western Australia

- First pass of a tractor causes 85% of the soil damage.
- 3% reduction in seeding overlap and 4% reduction in spray overlap.
- Inter-row spraying reduces herbicide use by 66%.



3m bare wheel tracks improves harvest efficiency.



Permanent wheel tracks are making life simple and delivering financial benefits to farmers all over Australia.



Elevate the tines and block hoses behind wheels to leave wheel tracks bare. Spray tracks in particular are best to be left bare to provide better in-crop guidance.

Australian farmers are world leaders in their continuing search for efficiencies and improvements in farming systems, and it is no surprise that Australia is leading the world in the development and adoption of CTF.

CTF is being adopted all across Australia. I'm yet to meet a farmer who has tried and then rejected any form of CTF.

It makes life simple!

Controlled Traffic Farming

The principle of CTF is to separate paddocks into two zones, one being the hard wheel tracks for machinery and the other being the cropping zone. Therefore by matching machinery we can minimise the area dedicated to wheel tracks.

Farmers who have raised beds are in an ideal situation to adopt CTF on the non-bedded country. Wheel bases are already matching so all you need to do is get guidance and try to match working widths. Guidance can be via GPS technology or simply marker arms.



Marker arms are a cheap form of guidance that could be used when farming non-bedded country.



A contractor with autosteering marked spray lines providing guidance for pre-emergent spraying and for sowing.



With raised beds the furrows provide the guidance for all operations.



A sowing pass every 24m with elevated tines achieves bare wheel tracks for spraying and spreading.



Doing your best to avoid causing compaction like this (left) will pay dividends.



Get out and have a look at a working CTF system. You might like what you see!

This season we are investigating the effects of wheel tracks on crop production through four CTF case studies on properties near Lismore, Balliang, Lake Bolac and Winchelsea. Results so far have identified lower germination rates and seedling vigour, and reduced plant growth on wheel tracks.

More information will be available at the end of the season but please don't hesitate to call if you have any queries or interests in CTF and/or precision agriculture.

Why adopt CTF?

The combination of guidance and driving on hard permanent wheel tracks improves paddock efficiencies, reduces costs — fuel, seed, sprays and fertiliser, enables greater accuracy of placing inputs, improves timelines of operations and reduces operator fatigue.

Matching working widths of machinery can be done in most cases without significant machinery changes or financial investment, and some benefits, such as reducing overlaps, are obtained instantly.

Don't just limit the benefits of controlled traffic to raised bed paddocks. CTF should be implemented on all cropping country. Compaction is costing you money and all soils, in any environment, will benefit from CTF.

Taming our hostile subsoils

By Bruce Wightman

Are our subsoils as hostile as many people believe? If they are hostile, then what is really wrong with them?

Renick Peries, our Soil Scientist, says the basic problems with our subsoils relate to:

- Low organic matter
- High clay content
- Low infiltration rates
- Poor storage of plant available water.
- Too much sodium
- High bulk density
- Poor nutrient balance

Well, he's convinced me that it is worth trying to improve our subsoils and together we have an aim to try and convert our present topsoil depth of 10-20cm gradually into a depth of 50cm.

Lucerne has a deep root system and Renick and others have shown that subsoil structure does improve over time. Renick has also measured improvement in plant available water and bulk density under raised beds down to approximately 40cm. This has resulted by growing good crops without waterlogging and vehicle traffic. So our raised bed/controlled traffic program will probably go a long way to improving our subsoils over time. However, we are impatient and we wish to fast-track these processes.



Taming our hostile subsoils

continued...



Over the past couple of seasons we have been ripping/slotting down to 50cm and adding materials like MAP, gypsum, poultry manure and wool scour compost.

These studies have indicated that the best prospects come from adding a material with organic matter such as the manure or compost. Where we have added poultry manure in a slot (10cm wide and 50cm deep), root structure has greatly improved to depth (see photo).

It is hoped that this structural improvement will be self-generating and last for many years. Oxygen needs to be able to enter to 50cm and under a bedding/direct drilling environment channels are abundant in the soil and will hopefully be adequate.

The responses have been enough to make us believe we should pursue our ideas. This season we have four replicated trials at Lake Bolac, Lismore, Winchelsea and Inverleigh. Some were done by hand spreading after ditchwitching a slot, while at Winchelsea we used a deep ripper and liquid poultry manure.

We have decided that if our aims are realised, the methods must be commercially practical. Therefore we commissioned Rex Watson to build a hopper above our ripper with the aim of delivering deep litter poultry manure straight from the shed directly into the subsoil.

We'll let you know how the machine performs and the results from this year's trial.



Raised Beds can make money from mud

By Bruce Wightman

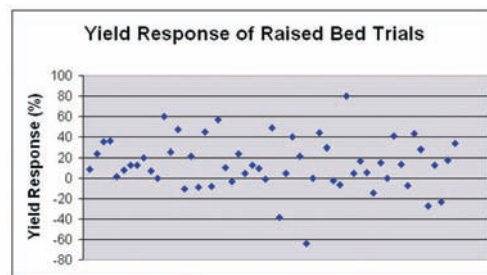
Raised beds and controlled traffic cropping to alleviate waterlogging and improve soil structure began in southern Australia in the mid 1990's. Since then, many trials, demonstrations and surveys comparing grain yields from beds and flat have been conducted over a completely diverse range of environments and soil types.

Over the past 7 or 8 years the seasons have generally been drier than average. However, there have been isolated pockets where normal to above average rainfall has fallen. Waterlogging has generally occurred in these areas.

This discussion includes 56 comparisons between beds to flat from the following environments:

- Southern Western Australia
- South East South Australia
- Northern Tasmania
- Southern New South Wales
- Southern Wimmera
- South Western Victoria

This figure paints a picture of the yield response from the 56 comparisons.



As the figure shows there has been a wide range of responses from +1116% (not seen on graph) at Hamilton to a -64% at Henty in 2000.

Of the 56 comparisons, 40 gave beds a positive yield response, 13 gave beds a negative response and 3 where the yields were equal. Overall the yield response was +35% in favour of the beds.

However with only 56 comparisons some would argue the very positive 1116% response may give a very distorted final average yield response. Leaving out this yield response drops the overall yield response to around 16% which over the past 8 years (generally dry) maybe more realistic. However the figure of +1116% must not be forgotten. It was a very wet site and large increases in yield have been observed whenever waterlogging is severe and prolonged.

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