6. SYSTEMS TRIALS

6.1 SPRING WATER USE TRIAL

Location: "Weering" Cressy – owner Mr S. Chirnside

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Background:
Crop performance on raised beds has been extremely encouraging, however in some situations crops can run out of water during grain fill because of poor access to deeper soil moisture. Rooting depth of cereals on raised beds is still disappointing in many situations due to inhospitable subsoils. The inability of crops to forage for deeper subsoil moisture leads in some years to a reduction in potential yield and a reduction in grain quality through poor grain development.

Aim:
To identify whether deep ripping and other soil treatments will result in an increase in spring water use by crops and therefore increased yields and improved grain quality.

Acknowledgements:
This trial was funded by the Grains Research and Development Corporation as the Project SFS4 ("Agronomy Research For Sustainable Farming Systems in the High Rainfall Zone").

Trial Method:
The site was chosen because of its representation of significant areas of crop production in SW Victoria.

There were 4 treatments used, namely:

Treatment 1: Shallow cultivation. Soil worked to a depth of approximately 10cm.

Treatment 2: Gypsum + Deep Rip. Soil worked to a depth of approximately 30cm with an "Airway" cultivator prior to bed forming. Gypsum was applied at 2.5 tonnes per hectare.

Treatment 3: Direct Drill. Crop was sowed into previous stubble with no cultivation.

Treatment 4: Deep Rip. Soil worked to a depth of 30 cm prior to bed forming.

The plot area was 6 beds wide (2m bed width) and 30 metres in length. Each treatment was replicated 3 times

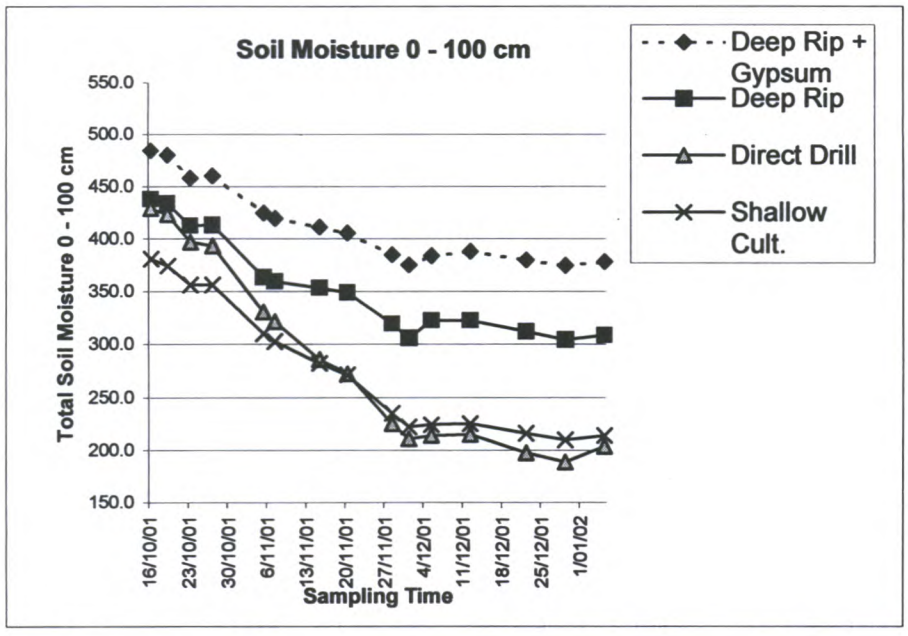
Planting date: 27th June 2001
Variety: Gairdner Barley
Sowing Rate: 100 kg/ha
Rainfall(mm):

April	125	August	62.5
May	10.5	Sept	40.5
June	50	Oct	72.5
July	0	Nov	50.5
		TOTAL	*411.5*

Fertiliser: 100 kg/ha MAP
Herbicides: 1 L/ha Roundup Xtra 23/5/01
Insecticides: 85 ml/ha Dimethoate 23/5/01
125 ml/ha Fastac + 100 ml/ha Dimethoate 31/07/01
125 ml/ha Fasrac 10/10/01

Soil Moisture Assessment:
A capacitance probe was used to measure soil moisture at 10cm intervals down the profile. Readings were taken at regular intervals during the crop growing season.

The following graph shows the total water content in the top100cm of the soil profile for each of the treatments during the period of sampling. The Deep Rip and (Deep Rip plus Gypsum) treatments had much greater soil water contents than the Direct Drill and Shallow Cultivation treatments. It is interesting to note also that the Direct Drill treatments initially contained slightly more soil moisture in early spring than the Shallow Cultivation treatment and that this situation reversed during the summer months. This could suggest that the cultivation did have an effect of allowing moisture into the profile better than the direct drilled treatment.



On analysing the daily rainfall data, there are several significant rainfall events as given in the following table.

Date (2001)	Rainfall (mm)
4/10	12
8/10	14
12/10	10
16-18/10	19
24-28/10	17.5
7/11	8
12-13/11	21

There is a very good correlation between the rainfall events and the soil water response, particularly in the deep ripped + gypsum treatments. This is suggesting that the ripping treatments certainly allowed more moisture into the soil.

Soil Measurements:
A 1 metre pit was dug in each treatment after harvest to assess the soil physical and chemical properties. Soil cores will also be taken after harvest to assess the rooting depth of the barley in each of the treatments. This picture shows Dr Robert Edis from Melbourne University assessing soil characteristics and rooting depth of the crop. Preliminary analysis of rooting depth is suggesting that there is much deeper plant root development in the ripped and ripped + gypsum treatments by comparison to the shallow cultivation and direct drilled treatments.

Crop Measurements:
A 20 metre plot length was cut in each treatment using a small plot harvester contracted from the Birchip Cropping Group. Assessment of yield and grain quality was undertaken.

Results:

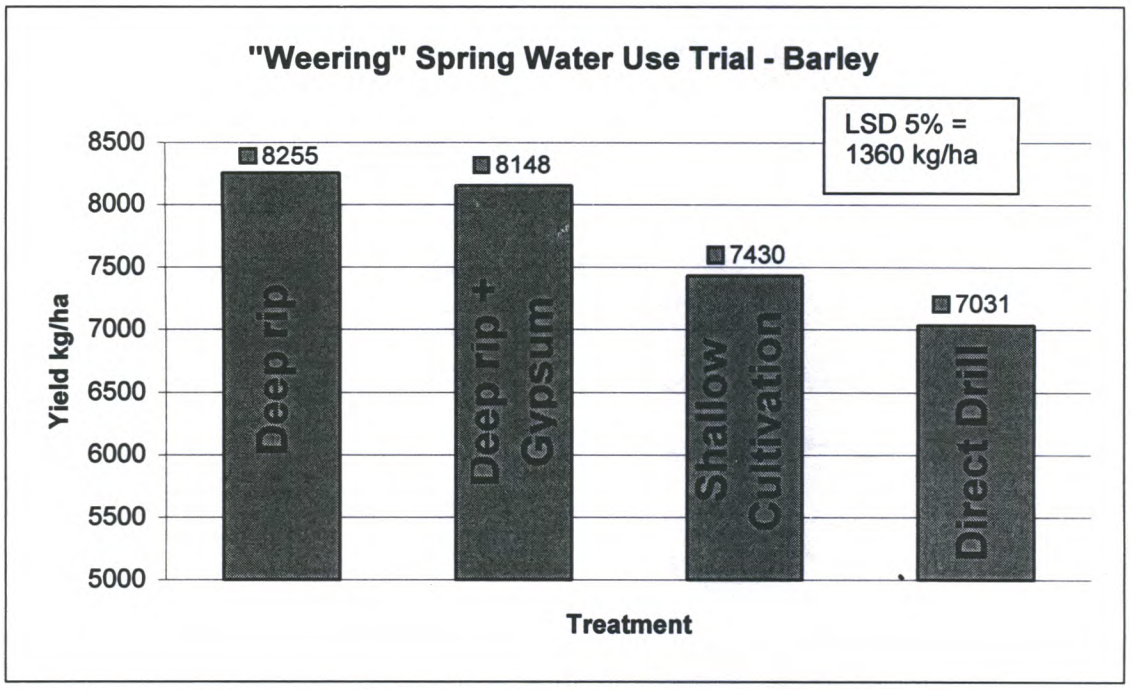
Treatment	Treatment	Yield kg/ha	Test Weight kg/hl	Protein %
1	Deep Rip	8,255	67.80	11.43
2	Deep Rip + Gypsum	8,148	66.53	11.90
3	Shallow Cultivation	7,430	67.00	11.53
4	Direct Drill	7,031	66.80	11.87
	LSD 5%	1,360	2.35	0.907

Yield:

The yield results are represented in the following graph. Despite good yield differences between treatments, the treatments were not significantly different (LSD 5% = 1,360 kg/ha)

General Observations:

The plants in the direct drill treatment lacked vigour in the early stages compared to the other treatments
The crop lodged quite badly in spots which made harvesting somewhat difficult.



Conclusions:

The data would suggest that Deep Ripping had an effect on increasing the total water content of the soil, thereby making more moisture available to the barley crop during the spring months at a time when the crop was filling the grain. This may have resulted in a higher grain yield for both Ripped and Ripped + Gypsum treatments by comparison to the Direct Drilled and Shallow Cultivation treatments (although yield difference not statistically significant).

There may also have been other factors contributing to the extra yield through deeper cultivation, such as Nitrogen mineralisation. Further analysis of rooting depth and soil characteristics may give a clearer picture as to why we achieved the yield difference. In any event it would appear that deep cultivation aids moisture retention during spring, which should contribute to higher yields.

This trial will be continued for a further 2 years.