CONTROLLED TRAFFIC DRAINAGE PROJECT

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Site: Gnarrwarre

These results relate to the trial printed on page 33 of the *1998 Field Day Book.*

BACKGROUND

Poor soil structure combined with high winter rainfall throughout much of south western Victoria produces conditions almost every year which results in waterlogged crops.

Farmers cropping well drained soils are obtaining cereal yields over 5 t/ha and canola yields over 3 t/ha. For example, the introduction of the premium malting barley Franklin has given many farmers a new target in expected yield - some farmers are consistently producing yields over 7 t/ha.

The new canola varieties including Dunkeld and the Triazine resistant types have taken the risk out of this excellent break crop.

The release of the red wheat varieties with their early sowing capability has given farmers the means to take advantage of an early break and fully utilise the long growing seasons.

Crop nutrition has also gone ahead in leaps and bounds in recent years. Soil testing, tissue testing, sap testing and nitrogen test strips have all led to a much improved management of crop nutrition.

Although these breeding and agronomic advantages have produced wonderful benefits, they have predominantly been on well drained soils. ***Waterlogging remains the biggest constraint to crop expansion and improved yields over a large part of the south west.***

There is a limited number of well drained paddocks in south west Victoria. With the average cost of producing a cereal crop over $185 / ha and canola at over $250 / ha, farmers have naturally been reluctant to expand their cropping programs - except on good country programs or expanding their current program.

The ***key*** to further crop expansion and improved yields with ***reduced risk*** is the development of cheap and effective drainage techniques suitable for south west Victoria.

RESULTS

	20m beds	*Underground*	*Control*	*1.5m beds*
Grain yield (t/ha)	4.85	5.7	4.8	4.3
1000 Kernal weight (g)	43.7	42.4	42.3	41.4
Protein (%)	7.3	7.2	8.0	7.6

The wheat yield on the raised beds is clearly below the other treatments. Sowing difficulties resulted in only four true rows of wheat being established on each bed instead of the desired six rows. This was due to "rounding" of the beds and depth of sowing problems (discussed later).

Soil moisture in late spring indicated the beds were drier to 40cm depth than the other treatments - this was after a long drying cycle (approximately 5 weeks)

Results over 3 years (t/ha)

	20m beds	*Underground*	*Control*	*1.5m beds*
1996 Canola	3.52	3.52	2.20	3.45
1996 Barley	6.55	6.90	5.70	6.30
1998 Wheat	4.85	5.70	4.80	4.30

Plant Root Growth Analysis

In the summer of 1998/99 La Trobe University school of Agriculture carried out root growth analysis on the drainage demonstration site at Southern Farming Systems. The crop was wheat (the third crop on the raised beds). The root parameter at four depths were analysed separately. They were 0-5cm, 5-10cm, and 15-20cm.

· All parameters are measured per plant.

Total Root Length (cm)	**Narrow Raised Beds**	**Wide Raised Beds**	**Underground**	**Control**
0 - 5 cm	200	184	270	269
5 - 10 cm	188	170	276	306
10 - 15 cm	210	179	261	277
15 - 20 cm	178	76	153	147
Total	**776**	**609**	**960**	**999**

Number of Root Tips	**Narrow Raised Beds**	**Wide Raised Beds**	**Underground**	**Control**
0 - 5 cm	772	574	838	800
5 - 10 cm	282	336	557	659
10 - 15 cm	489	400	593	618
15 - 20 cm	427	230	443	289
Total	**1970**	**1540**	**2431**	**2366**

Roots Surface area (cm^2)	Narrow Raised Beds	Wide Raised Beds	Underground	Control
0 - 5 cm	69.7	57.4	72.8	96.2
5 - 10 cm	42.0	36.5	52.5	61.3
10 - 15 cm	33.3	30.0	39.7	36.4
15 - 20 cm	24.7	11.0	21.4	18.0
Total	**169.0**	**135.0**	**186.4**	**211.9**

Root Branching (No. forks)	Narrow Raised Beds	Wide Raised Beds	Underground	Control
0 - 5 cm	1639	1440	1801	1812
5 - 10 cm	1691	1606	2069	222
10 - 15 cm	1540	1480	1639	1571
15 - 20 cm	1168	428	781	76
Total	**6038**	**4964**	**6290**	**6370**

Total Root Length

There was found to be a higher proportion (50%) of total root length in narrow raised beds in the 10-20cm depth compared with the wide raised beds (41%), the underground (43%), and control (42%) at the same depth.

Surface root length (0-10cm) was highest in the control treatment, suggesting consistently wetter conditions at the surface as a result of poor drainage.

Number of Root Tips

Narrow raised beds and underground treatments showed greater root activity at depth. In the underground treatment, the activity may be current (due to higher soil water content) whereas the narrow raised bed showed better overall soil water exploitation. Narrow raised beds had 21% of total root tips in the 15-20cm layer compared with 14% in wide raised beds, 12% in the control and 18% in the underground.

Higher percentages of total root tip at the 0-10cm layer in the control (62%) during mid grain filling again suggesting greater root activity confined to the surface due to insufficient drainage.

Conclusion

Observations in N.S.W., Victoria and Western Australia clearly show that tap rooted crops have excellent straight tap roots when grown on beds when compared to flat paddocks.

These initial considerations suggest narrow raised beds may offer a better overall soil water exploration throughout different depths of the profile and a better depth of rooting by crops.