7.2 DEVELOPMENT OF SUSTAINABLE MIXED FARMING SYSTEMS FOR HIGH RAINFALL SOUTHERN AUSTRALIA

Location: Gnarwarre

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Growing season rainfall: (Apr-Nov) 378 mm

Treatments:
The three rotation treatments are (a) Continuous Cropping: CWPeB, (b) Two year annual pasture rotation: CWPP and (c) Four year perennial pasture rotation: CWPeBPPPP (C: Canola; W: Wheat; Pe: Field Pea, B: Barley). These treatments are superimposed on the two drainage treatments. The experiment was in its second year of planned rotations in 2000.

Sowing Date:
The trial was sown between 27 June & 5 July 2000.

Seeding Rate:
Canola (var. Pinnacle) 7.5 kg/ha,
Wheat (var. Declic) 90-100 Kg/ha,
Field Pea (var. Jupiter) 125 Kg/ha,
Barley (var.Gairdner) 80 Kg/ha, Vic.
Perennial Rye (10 Kg/ha) + Gosse clover (5 Kg/ha) for perennial pasture plots and Concorde Rye (10 Kg/ha) + Balta Balansa (5 Kg/ha) for annual pastures.

Harvest date: 15 Dec (Canola) to 12 Jan (Wheat)

Background to the work:
Woolgrowers in southern Victoria have been exploring cropping options because of poor wool prices in the recent past. Heavy winter rainfall on the near impermeable clay sub-soils can cause a perched water table for extended periods during the long-cool growing season. In their search for successful options in alleviating waterlogging, Southern Farming Systems has developed two raised bed drainage systems that can minimise stress damage to crops through waterlogging. These bed systems are being further tested for their productivity and long-term sustainability.

Aim:
Three different rotations including crops and pastures are being evaluated on the different raised bed systems with the aim of identifying the best rotation (or system) for the region, that will also prevent the degradation or loss of soil chemical, physical and biological characteristics. The hypothesis being tested is that "drainage of waterlogged soils in southwest Victoria through raised beds will increase crop and pasture production with beneficial modifications to soil properties".

Fertiliser used:
All crops and pastures received 100 Kg DAP at sowing. All crops except Field Pea received 100 Kg/ha of Urea in late September.

Weed control:
Prior to sowing, all crop and new pasture plots were sprayed with Roundup at the rate if 1.5 litres/ha. Canola plots were sprayed with 2L/Ha Atrazine and 2 L/ha Simazine immediately after sowing.

In August all Canola plots were sprayed with Select @ 600 ml per has for the control of grass weeds. All Wheat and Barley plots were treated with MCPA amine. Field Pea plots could not be sprayed.

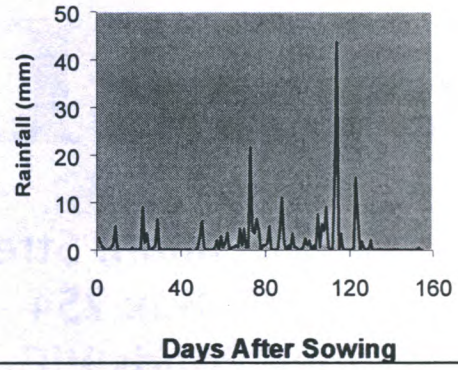
Pest control:
All plots were sprayed against the RLEM in August

Results :

Table 1. ***Grain yield: Systems Trial 2000***

CROP YIELD (t/ha): SYSTEMS TRIAL		
CROP	**Narrow raised beds**	**Wide raised beds**
Canola	1.3	1.3
Wheat	2.7	2.3
F.Pea	2.6	1.2
Barley	3.1	3.9

Figure 1. ***Rainfall distribution in 2000.***



Both total rainfall (434 mm) and growing season rainfall (348 mm) were higher in 2000 (Figure 1) compared to 1999. However, most of the productive rain was received too late in the season for most crops to benefit from. There was poor soil water storage at the time of sowing and since the autumn break was late, there was poor crop growth earlier in the season. While the cereals appeared to benefit from the spring rains in October, Canola did not, as it was advanced in phenology at the time of rain. Crops also did not appear to benefit from the Urea top dressing in September. Low yield in Field Pea in part was due to heavy weed growth, particularly on wide raised beds. Pea plots could not be sprayed on time due to adverse weather (wind). All crop yields were generally lower than in 1999. There were no significant yield differences between wide and narrow raised beds except in Field Pea and it was more a weed effect than a bed effect.

This was the second year of planned rotations. Soil bulk density in the top 7.5cm of soil measured at the end of the first cropping season (January 2000), indicated an average drop in bulk density across all plots and all soil types from 1.7 g/cm^3 to 1.2 g/cm^3, accompanied by an increase in total porosity. Consequently the upper limit of plant available water also increased. However, under dry seasonal conditions, the beneficial effects of these improvements are not realised as a result of the unproductive loss of water through soil evaporation.

Sheep grazing on raised beds in 1999 caused little or no damage to beds and crops in 2000 were sown directly on beds without the need for any re-forming. Conditions were however so dry, that grazing had to be ended before commencement of the 2000 season. Annual pastures had to be re-sown, as they did not survive into their second year due to the seasonal conditions. The delayed autumn break in 2000 resulted in poor pasture regeneration (perennial pasture) earlier in the season, particularly on narrow raised beds. Intermittent rain through winter and continued grazing appeared to cause some pugging and compaction of topsoil and pastures developed slowly during winter. Pasture plots in soils that are most prone to hard setting and waterlogging because of its high sub-surface clay content did show a marginal increase in bulk density in November.

Pasture dry matter availability, its composition and sheep live weight was recorded on a monthly basis from July to December. This data will be used in the determination of the productivity of each system.

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