8.2 CROP ROTATION TRIAL (TASMANIA)

Location: "Riccarton" Campbell Town

Researcher : SFS Group at Campbell Town

Growing season rainfall (April – Nov): 265 mm

Background:
Most cropping in the Central/Northern Midlands in the past has been long pasture phases with 1-3 years of cereals in between. The need is now seen to increase the amount of area sown to crop and therefore change the established system. Difficulties in growing break crops in the area have made it hard to establish a long-term sustainable continuous cropping rotation.

Aims:
- To try and identify the dryland cropping rotation for the Central/Northern Midlands area, which will give the best balance of sustainability, profitability and risk management.
- To improve the implementation of better cropping systems in the area.

Methodology:
Six blocks of 0.4 ha each were established in 1998/99 with different rotation options. The 6 different rotations were selected as either the most common or the most likely to succeed in the district. Poppies were excluded, as although they are commonly grown in the locally, they would be very difficult to manage in the proximity of the other crop types, particularly in relation to spraying. The rotation trial had to involve decision making and methods that would be employed in a larger scale paddock situation. The 6 rotations are listed in the table below.

Blocks were grazed when necessary. Gairdner barley was sown over all blocks in 2002.
Soil analyses were conducted at the start of the trial (May 1998) and again in 2002.

Sowing Date: 25 June 2002
Sowing rate: 110kg/ha
Harvest date: 30 January 2003
Fertiliser: 125kg 14:18:0:6

Results:

Rotation	Years	Yield (t/ha)	Av. establishment (plants/m²)	Grain size distribution	
				%>2.5mm	%<2.5mm
1. Field peas/Barley	1:2	3.62	10.25	85.7	14.3
2. Canola/Barley	1:3	2.09	10.95	87.2	12.8
3. Continuous Barley		1.62	9.55	86.4	13.6
4. Sub Clover/Barley	1:1	2.48	9.40	69.3	30.7
5. Ryegrass & Sub/Barley	4:3	2.14	8.80	46.4	53.6
6. Ryegrass & Lucerne/Barley	4:3	2.10	8.50	51.0	49.0

The greatest yield (3.62 t/ha) was achieved in treatment 1 -field peas/cereal. The next highest yield (2.48 t/ha) was achieved with the sub-clover cereal rotation. Canola/cereal, Ryegrass & sub, and Ryegrass & lucerne treatments yields were similar (range: 2.09 – 2.14 t/ha). Continuous barley yield was well down compared to all other treatments (1.62 t/ha).

An analysis of the grain size distribution within each treatment revealed a surprising result. The first 3 rotations all produced grain with 85% or better greater than 2.5 mm. By contrast rotations 5 and 6 produced grain with only about 50% greater than 2.5 mm. Grain from rotation 4 was about 70% greater than 2.5 mm.

Soil tests (2002) indicate that available phosphorous increased under the cropping rotations (1-3). Organic Carbon levels increased in all rotations from 1998 to 2002, with the greatest increase (1.3%) in the ex-pasture blocks (5 & 6).

Deep soil nitrate nitrogen tests conducted in October 2002 showed a variation across rotations. The highest levels were from rotation 5 (Ryegrass & sub-clover) at 80.2 mg/kg. Nitrate nitrogen level in rotation 2 (Canola/cereal) was substantially depleted compared to the rest at 25.2 mg/kg.

Conclusions:
The rotation involving peas out-yielded all other rotations. The continuous barley was not surprisingly the lowest yielding plot. In replicated small plot trials at Riccarton yields from continuous barley have only been 50% of annual clover/barley plots.

It is likely that the ex-pasture plots (ryegrass/sub and ryegrass/lucerne) with a good supply of nitrogen produced high levels of dry matter (DM) over the growing season. With the dry finish to the season this DM production was excessive resulting in greater water useage and lower grain yields. This is also supported by the seed size data where rotations 5 and 6 produced fewer large (> 2.5mm) grains compared to the other treatments ie ran out of moisture.

The average plant establishment across the trial was low and tended to decrease across the site.

However, as the crop was direct drilled, the ex-pasture blocks would have had minimal soil working to overcome potentially greater levels of soil compaction. Data on soil compaction and infiltration rates is still being assessed to confirm this. In addition higher soil P levels in the cropping rotations (1-3) may have contributed to better yields.

Other factors to consider in relation to the results of this trial are crop vigour and weed infestation levels observed during the earlier stages of crop development. Rotations 2 (Canola/cereal) and 3 (continuous barley) showed noticeably less vigorous plants, and rotation 3 had a noticeably greater level of weed infestation compared to the rest of the trial.

Ideally the trial needs to be repeated in a more favourable year to better understand the effects of different break crops.

Acknowledgements : Crosby Lyne

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