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Rotations, Risk and Reward: Farming system choice on the Eyre Peninsula of South Australia

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ABSTRACT

A farming systems and rotations trial was conducted at Minnipa on the Eyre Peninsula of South Australia between 1995 and 2001. The results have been presented to local farmers as simple gross margin comparisons (with a relatively low value for the pasture phase if present) in extension publications. The results are reassessed in terms of increased livestock return, and allowing for permanent/family labour and machinery overheads. The relative risk vs return is also considered to explain the acceptance of the research by local farmers.

Rotations, Risk and Reward:

Farming system choice on the Eyre Peninsula of South Australia*

Jon Hancock[1], Ian Cooper[2] and Nam Nguyen[3]

The choice of farming system and rotation by farmers is a matter of balancing short and long-term agronomic and economic factors together with risk. Economic factors in particular need careful interpretation. Simple gross margins can be misleading.

Between 1995 and 2001 an experiment was conducted which aimed to evaluate the long-term impact of rotation, tillage and stubble on the profitability and sustainability of farming on Upper Eyre Peninsula (Hancock 1999, 2000,2001). Trials were set up to at Cungena and Minnipa.
The trials contained seven established rotations at Cungena and eight established rotations at Minnipa. Each phase of each rotation has been sown since 1994. The rotations were:
Pasture / Pasture / Wheat / Cereal (generally barley but wheat at Cungena since 1999)
Pasture / Wheat / Barley
Pasture / Wheat
Pasture / Pasture / Wheat (Cungena only)
Peas / Wheat / Barley
Canola / Wheat / Barley / Pasture (Minnipa only)
Mustard / Wheat / Barley / Pasture (Minnipa only)
Pasture / Pasture / Wheat / Oats
Legume (Vetch or Peas)/ Wheat / Cereal (Barley or Triticale)

Each rotation had three tillage treatments, which were:

- Conventional cultivation – two workings prior to sowing
- Minimum tillage – one working prior to sowing
- Direct drill – sown after knockdown herbicide application
- Cultivations were carried out with 15cm wide shares and all plots were sown with Super Seeder® points. The direct drill plots have consistently been sown about a week earlier than the conventional and minimum till plots.

Each rotation has two stubble treatments, stubble retained and stubble removed.

What happened? - Yield

The yield of wheat has continued to be unaffected by rotation at each site (Table 2). Wheat has continued to be as good after all break crops and pastures.

* An article with a similar name covering some of the results discussed here was published in "Agribusiness Perspectives" Paper 51 (Published on line 4/12/02 www.agrifood.info/Review/Perspectives/Hancock.htm)

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Table 2: Wheat yield (t/ha) when grown in different rotations at Cungena (95-97,99-01) and Minnipa (95-01).

Rotation	Cungena	Minnipa
Pa/Pa/W/Ce	1.27	1.54
Pa/W/B	1.26	1.63
Pa/W	1.25	1.57
Pa/Pa/W	1.40	-
Pe/W/B	1.28	1.60
C/W/B/Pa	-	1.56
M/W/B/Pa	-	1.56
Pa/Pa/W/O	1.35	1.71
Le/W/Ce	1.23	1.60
Average	1.29	1.60
LSD	0.21	0.15

Direct drilling has significantly increased wheat yield at Cungena and Minnipa with average yield increases of 83 and 41kg/ha respectively over conventional cultivation since 1995 (Table 3).

Table 3: Influence of tillage practice on wheat yield (t/ha) at Cungena (95-97,99-01) and Minnipa (95-01).

Tillage Practice	Cungena	Minnipa
Conventional cultivation	1.25	1.58
Minimum tillage	1.29	1.58
Direct drill	1.33	1.62
LSD	0.39	0.32

Stubble has not affected crop emergence, growth or yield at either site.

What happened? -Profitability

Ultimately, crop rotations are designed to benefit the condition of both the land and the bank balance. These trials, having been in set rotations for seven years provide an ideal opportunity to compare economic returns of rotations over the longer term.

Gross margins were calculated for each plot in each year using actual plot data. Commodity prices used were averaged over the time of the trial (1994 to 2001) and used in each gross margin to minimise the confounding affect of price variability between years. For the purpose of these gross margins, historical estimated silo returns (ESR's) for wheat were assumed to be equivalent to the current ESR under the harvest payment scheme. The current fees and levies were deducted from the average grain prices and the current Golden Rewards system of payment was applied for wheat with premiums or discounts given for the protein and screenings content of the grain. Mustard, which doesn't have a market yet, was given the same price as canola, and pastures which were not grazed were given values of $10/ha and $20/ha for Cungena and Minnipa respectively. All gross margins were calculated on a GST exclusive basis.

A valid comparison was created through constructing two sets of gross margins. In one, costs were attributed to the actual management of the trial and in the other, to a typical management practice used in the district. This has been done as the large number of

plots in this trial and the associated limitations has meant that the most cost effective chemicals have not always been used. The profitability in terms of the gross margins of the different rotations is shown in Figures 1 and 2.

Figure 1: The economics of growing various rotations at Cungena (1995 to 1997, 1999 to 2001)

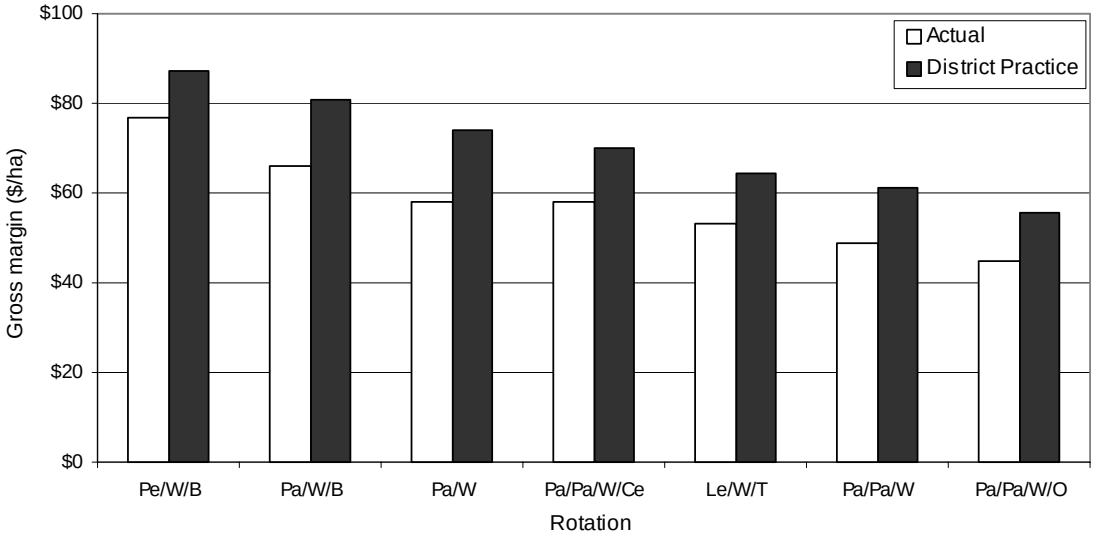
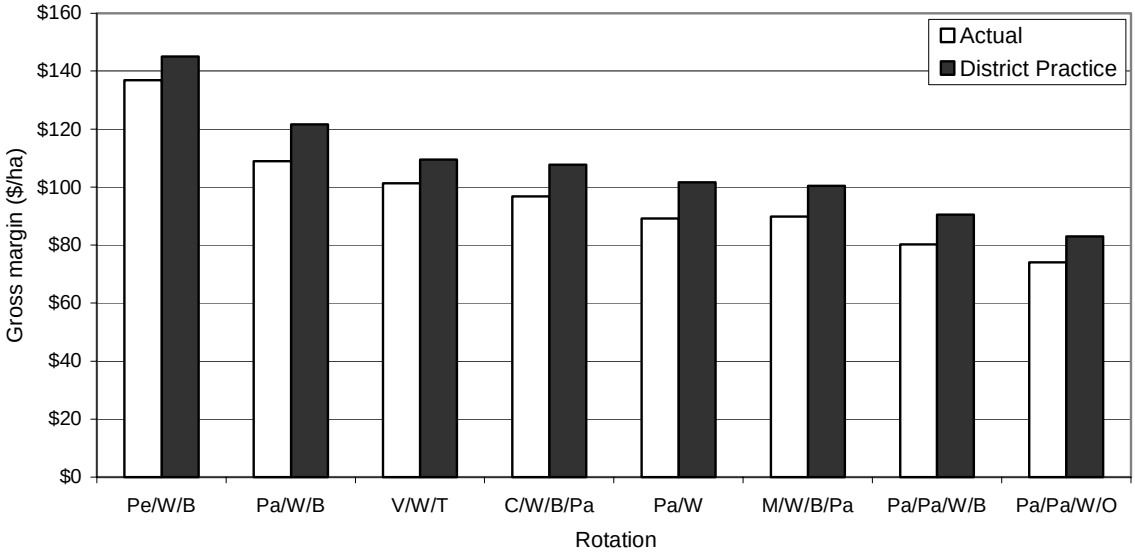


Figure 2: The economics of growing various rotations at Minnipa (1995 to 2001)



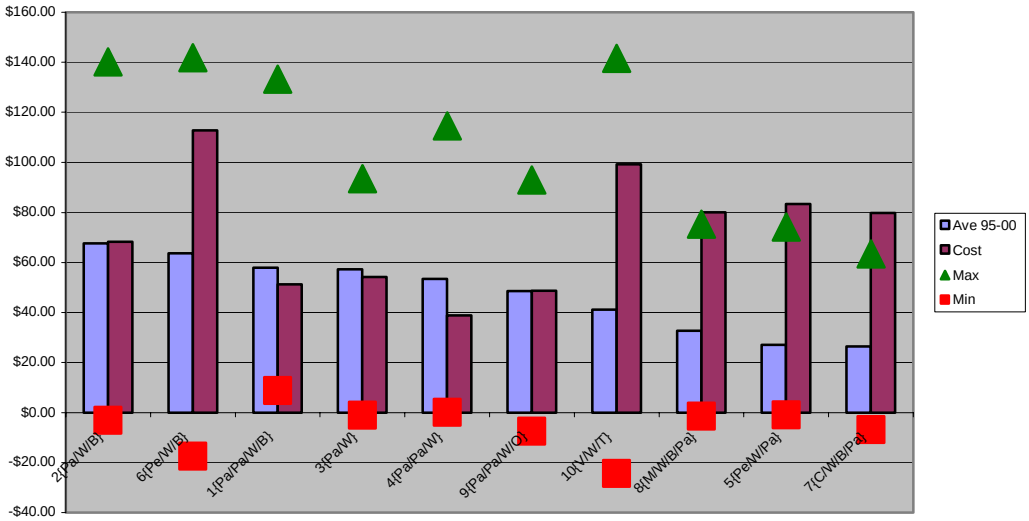
It can be seen that the rotations high in cereals tend to dominate. However they do so at higher financial risk. For example in terms of the gross margin to costs ratio a dollar of costs returned $1.48 for the Pasture/Pasture/Wheat rotation at Cungena while the return per dollar spent for the Peas/Wheat/Barley rotation was only $0.71

Direct drilling tended to have higher gross returns, but was also more expensive due to the cost of the knockdown herbicide, so the overall gross margin return between treatments was very similar.

Risk

Some aspects of risk are indicated by figure 3. Firstly the amount risked by the farmer (cost of production) varies and is greater for cropping only rotations.

Fig 3 Bestprac Cungena



Secondly the variability of returns and the likelihood of a loss is important. The maximum and minimum GMs fro the period are indicated on Figure 3 and indicate that cropping rotations tend to be more variable and have a possibility of negative returns.

Limitations of initial analysis

The above analysis was limited because

- The nominal value of given to pastures may have undervalued them
- No allowance was made for different ownership costs of machinery, particularly when evaluating the tillage methods
- Labour was not costed

What if pastures were given a higher value?

If the value of pastures were the only change made, they would have to be increased to $32 at Cungena and $100/ha at Minnipa for the pasture/wheat/barley rotation to overtake that of peas/wheat/ barley. The 2002 PIRSA Rural Solutions Farm Gross Margin Guide (Greenland 2002) suggests a $16 gross margin per Dry Sheep Equivalent for Merino Wethers in the Cereal Zone, so a little over 2 DSE/ha would achieve the required return at Cungena but it would need 6.25 DSE/ha at Minnipa. The increase in value for pastures needed is less if we allow for ownership costs of machinery and labour costs.

Allowing for machinery ownership costs and labour costs.

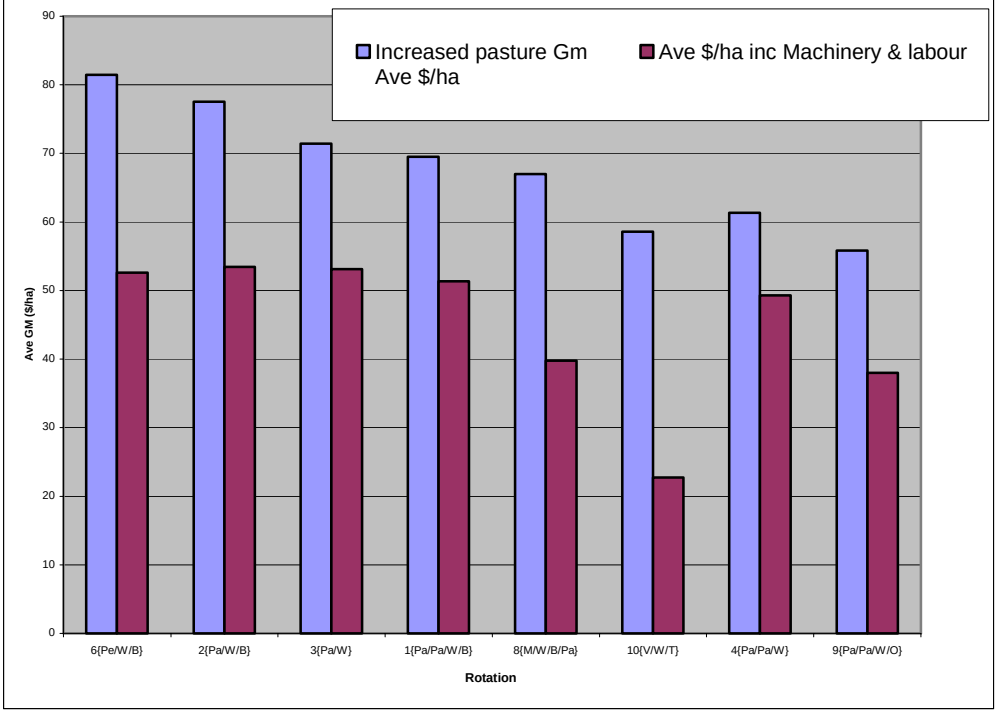
The ownership costs of machinery[4] were calculated for the different tillage methods based on average farm size and common machinery for the Upper Eyre Peninsula. The labour cost was set at $12.00/hour (based on pastoral industry award for 40 hours/week, casual worker). The resultant calculation strictly speaking is no longer a “Gross Margin” but would more correctly be termed an “Enterprise Contribution”.

The result was a reduced difference in the net return from the top rotations at both sites. At Cungena the pasture return had only to be increased to $20/ha (1.25 DSE) for both the Pasture/Wheat/Barley and the Pasture/Wheat rotations to do better than the Peas/Wheat/Barley. At Minnipa the pasture return needed to move a pasture-based rotation above the Peas/Wheat/Barley became $70/ha (4.8 DSE). If the value of owner

[4] Standard methods used eg Davies & Patton (2000) http://www.agric.nsw.gov.au/reader/2274)

operator labour/permanent is deemed to be higher then the differences are further reduced.
The results are indicated on figure 4.

Figure 4 The economics of growing various rotations at Cungena (1995 to 2001)



Conclusion

Using simple gross margins to make economic comparisons between alternative rotations may not necessarily result in the correct decision being made. Appropriate valuation of the livestock phase and the inclusion of values for labour and machinery overheads can alter the picture. Moreover managers may not select the highest return rotation if it has higher risk, either in terms of greater variability or higher costs per dollar returned.

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