Drivers and constraints faced by broad-acre agriculture in WA
Some insights from recent research

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Topics covered in this talk

1. Enterprise mix & profitability
2. The value of “break” crops
3. What can precision agriculture offer?
4. Are biodiversity and production at odds?
5. Seasonal climate forecasting and fertiliser management
6. Labour as a constraint to profit gains
Enterprise mix and profitability
Group 1 (n = 82)
Classic Mixed

Group 2 (n = 42)
Lupin - Wheat

Group 3 (n = 24)
Livestock dominant

Group 4 (n = 15)
Cereal Crop dominant
Medium rainfall wheat profit - unrelated to enterprise mix
Wheat Profit

$ / ha

Frequency

-600 -400 -200 0 200

0 20 40 60

Barley Profit

$ / ha

Frequency

-400 0 200 400

0 10 20 30

Lupin Profit

$ / ha

Frequency

-600 -200 0 200

0 5 10 15 25 35

Canola Profit

$ / ha

Frequency

-400 -200 0 200

0 5 10 15 20
The value of “break” crops
Flatness of response for break crop area

![Graph showing whole-farm profit ($) against % farm under break crops for Central WB, Eastern WB, and South Coast.](image-url)
Proportion of farm sown to break crops
Low rainfall zone

Lupins

Canola
Proportion of farm sown to break crops
Medium rainfall zone

Lupins

Canola
The value of break crops

Medium rainfall zone
• 10% break crop area ~167 kg/ha benefit to wheat yield
• 10% lupin area ~ $40/ha benefit to wheat profit

Low rainfall zone
• Break crops did not effect wheat yield or profitability
• Farmers who grow break crops spend ~ $20/ha more growing a wheat crop
What can Precision Agriculture offer?
Rising fertiliser costs – a stimulus for PA?
### Profit gains from variable rate fertiliser and CT

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Size of cropping program (ha)</th>
<th>Capital Investment in PA total $</th>
<th>Annual estimated benefits to PA $/ha</th>
<th>Investment recouped by year</th>
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<tbody>
<tr>
<td>Forrester</td>
<td>2,600</td>
<td>90,000</td>
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<td>Fulwood</td>
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<td>Smith</td>
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<td>Heath</td>
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<td>McLaren</td>
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<td>56,000</td>
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</tbody>
</table>
A human capacity limitation to PA adoption?

Adopters:

- Comfortable with machinery, computers, data
- Soil test
- Use consultants
- Keep good farm records
- Prepared to spend a lot of time getting the system working
Are biodiversity gains at odds with profitability?
Spatial arrangement of poor performing patches on farm

Legend

- Cropped area
- Potential revegetation
- Existing native vegetation
Revegetation efforts in one catchment

- 1750 ha of revegetation over 15 years
- 65% trees
- 30% saltbush
- 5% lucerne, tagasaste etc
Revegetation x farm
Source of funding for revegetation
Impact of revegetation

Numbers of remnant-dependant declining species in these remnants improved

This occurred while birds in larger better-connected remnants declined

Suggested that the result for small reconnected remnants was a direct response to revegetation.
Seasonal climate forecasting for fertiliser management
Return relative to “farming for the average”

- Account for soil type and season ("perfect knowledge") up to 30/ha
- Account for season and district average soil type up to 15/ha
- Account for soil type and use long term season average up to 12/ha
- Account for soil type and season by its categorisation of below, at or above-average yield up to 18/ha
Return vs. management complexity

Management complexity
(0=low, 8=high)

Additional Return ($/ha)
Return vs. management complexity

- CT
- PA
- Luc
- Brk
- Seas.
- F'cast

Management complexity (0=low, 8=high)

Additional Return ($/ha)
Labour as a constraint to profit gains
Lucerne adoption and whole-farm profit

![Graph showing the relationship between Lucerne area (% of farm) and whole-farm profit ($). The graph illustrates a peak in whole-farm profit occurring at a Lucerne area of around 30% of the farm.]
Labour demand influenced by crop area and flock size

Data courtesy of Graeme Doole
Effect of labour constraint interacts with stocking rate

The graph shows the relationship between whole-farm profit ($US) and stocking rate (DSE/ha) with and without labour constraint. The profit peaks at a certain stocking rate, which varies with the presence or absence of labour constraints.
Conclusions

• No one enterprise mix is “optimal”
• Huge range in management ability, cost structures
• Advances in profitability will be incremental
• There is a trade-off between profit gains and management demands/complexity
• Labour shortages may constrain capacity to adopt new management strategies
• Biodiversity gains are possible as a component of a profitable farming system