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A bioeconomic framework for phosphorus deepplacement decisions

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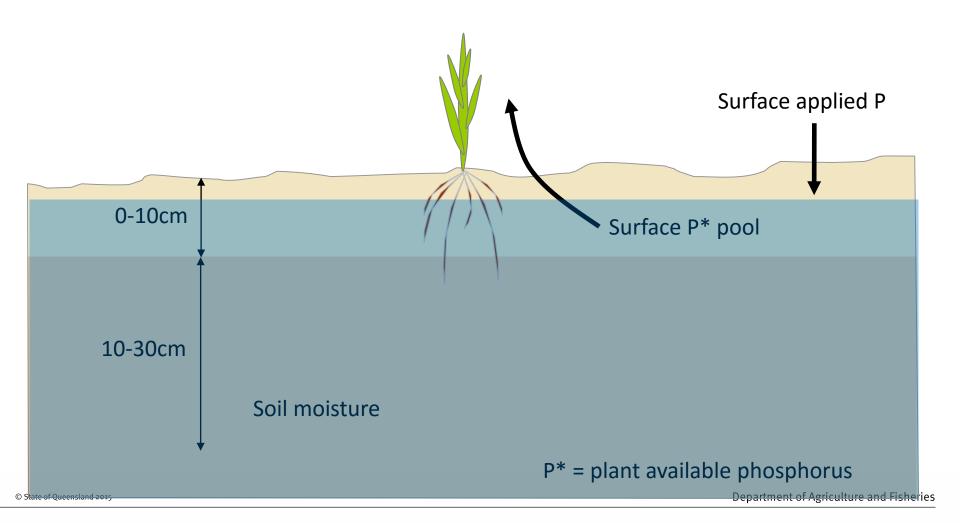
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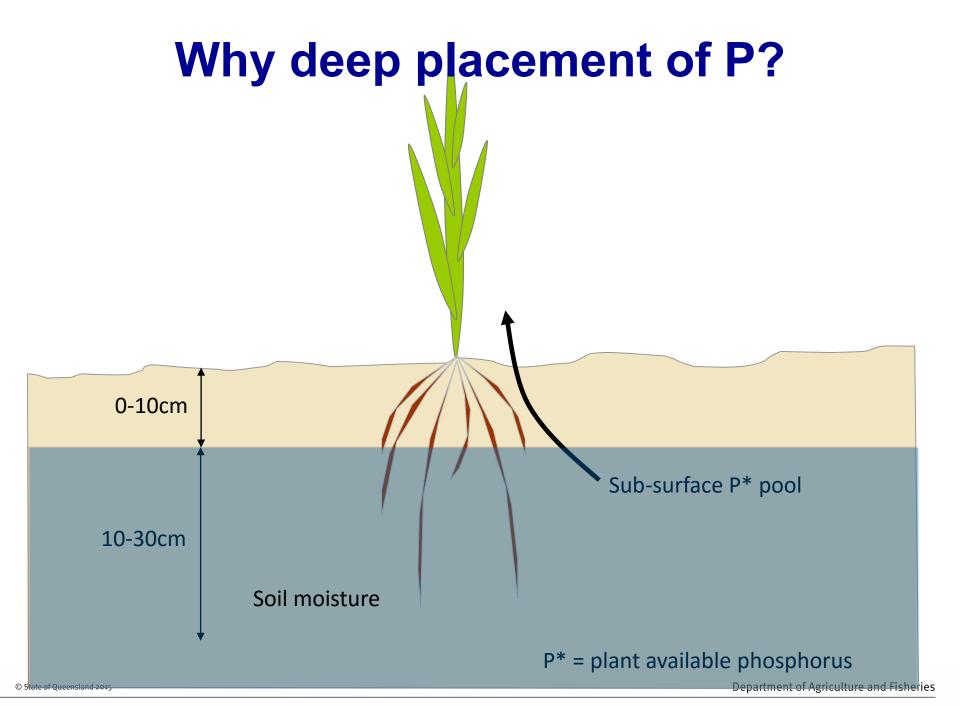
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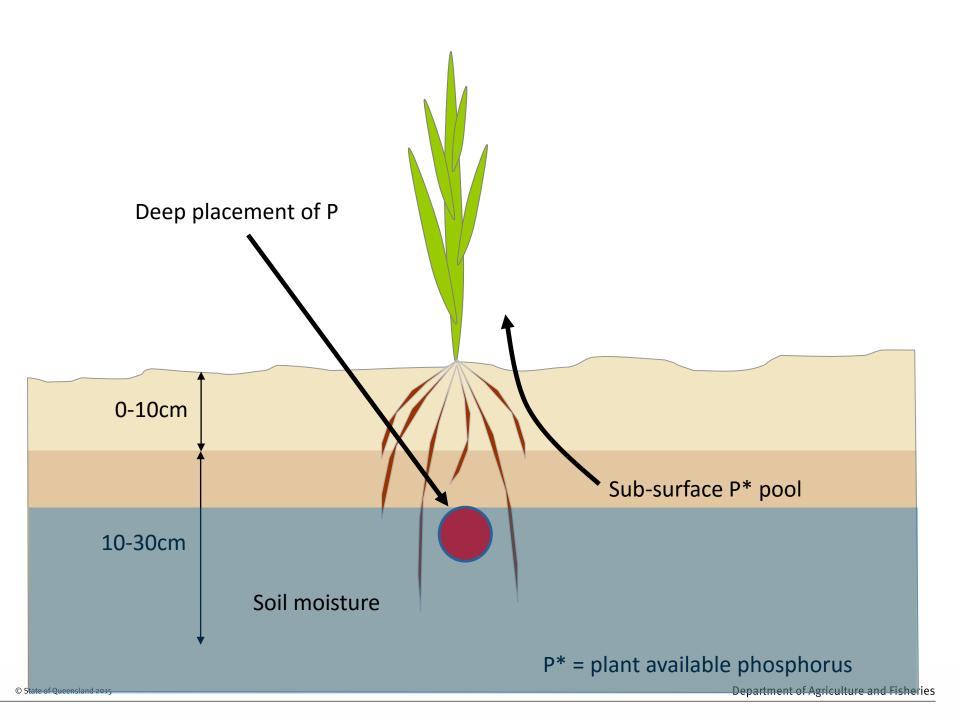


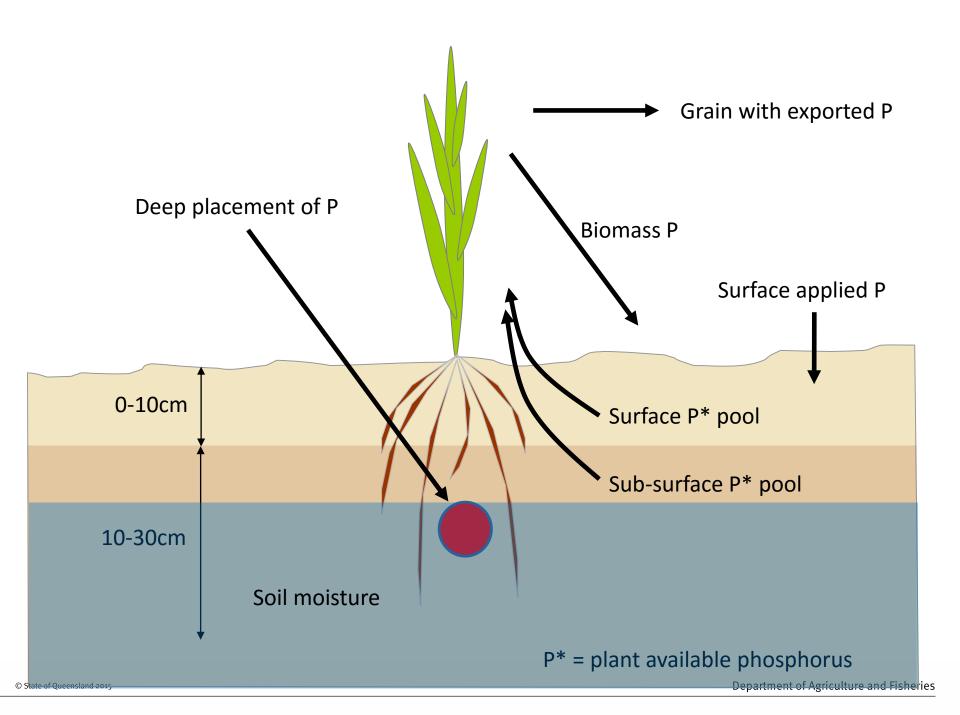


Why deep placement of P?









The BIG Deep-P Question

How much P? How often?

N & Starter P

 Short-term decision (current season)

Deep-P

Long-term decision (many seasons)

N & Starter P

Deep-P

 Short-term decision (current season) Long-term decision (many seasons)

Known soil moisture

Unknown future soil moisture

N & Starter P

- Short-term decision (current season)
- Known soil moisture
- Fixed crop prices (can contract)

Deep-P

Long-term decision (many seasons)

Unknown soil moisture

Unknown future crop prices

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- Known N & P \$ at application

Deep-P

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Unknown soil moisture

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Long-term decision (many seasons)

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Unknown future crop prices

Unknown future N & P\$

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Paddock(s) biophysical

User inputs:

- Crops/rotations
- Paddock details including soil PAWC, P levels, & N levels

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Potential responses to Deep-P

- 12 QLD and NSW sites
- 100 years climate data
- APSIM or user entered

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- MAP & Urea prices
- Financial discount rate

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Cost/Benefit Calculator



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Bio-economic outputs

- Optimal application rate
- Average real net gain \$/ha/year
- Risk of different decisions (\$)
 - Expected
 - Worst
 - Best
 - Breakeven
- IRR (rate of return %)
- Probable pay-back period

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A Case study: Goondiwindi

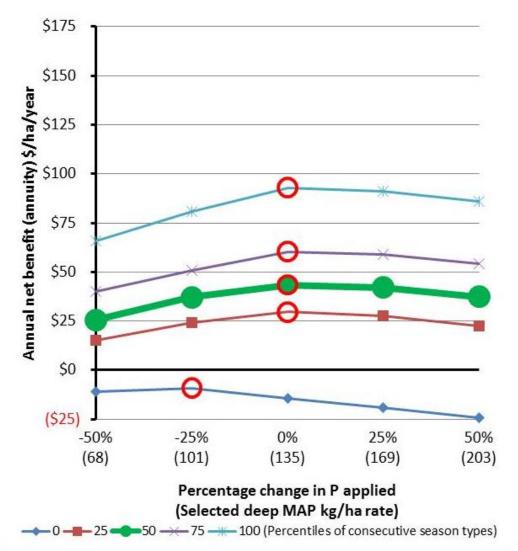
- PAWC = 180mm
- Soil PBI < 300 (P responsive)
- Sub-surface (10-30 cm) Colwell-P = 5mg/kg, BSES-P = 15mg/kg
- Cropping sequence
 - Short (3-years) --|SCP|-W|-W
 - Long (7-years) --|SCP|-W|-W|--|SCP|-W|-W
- Deep-P placement \$32/ha + P fertiliser

• MAP = \$730/t

| | Reduction in yields if Colwell-P<10mg/kg) 180mm PAWC | | | Variable costs | Farm gate prices |
|---------------|--|--------------|---------------|-------------------|------------------------|
| Crops | Dry start | No stress | Dry finish | \$/ha | \$/t |
| Chickpea (dc) | 18% | 10% | 20% | 342 | 409 |
| Sorghum (If) | 8% | 15% | 18% | 462 | 230 |
| Wheat | 8% | 15% | 18% | 319 | 257 |

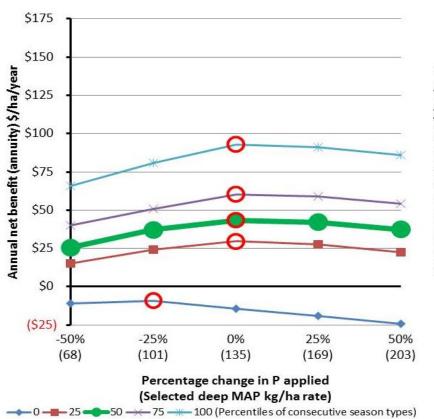
Results

Short cropping sequence (3 years) --|S CP|-W|-W



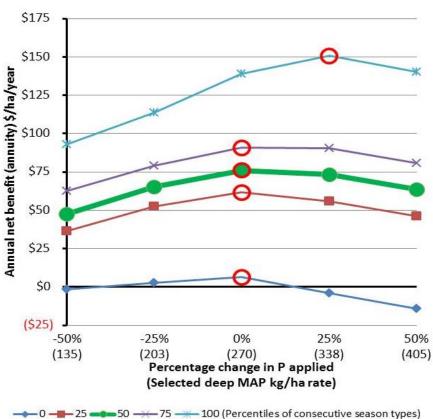
Results

Short cropping sequence (3-years)

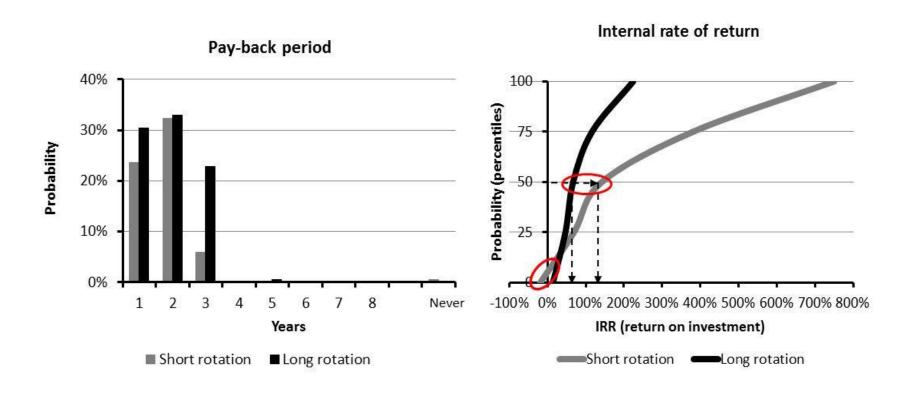


Long cropping sequence (7-years)

- -|S CP|- W|- W|- -|S CP|- W|- W



Results



Conclusion

How much P & how often?

Conclusion

| Region: | Goondiwindi |
|-----------------|------------------|
| PAWC: | 180mm |
| Colwell-P test: | 5mg/kg (10-30cm) |

| | Short sequence: 3-year | Long sequerce: 7-year |
|--------------------------|---------------------------|-----------------------|
| | S CP - W - W | S CP -W -W |
| | | S CP - W - W |
| MAP applied: | 135 kg/ha | 270 kg/ha |
| Net benefit | \$43/ha/year | \$139/ha/year |
| Risk | Can have –ve ROI, no paid | Little risk |
| | back, & highly variable | |
| Expected pay back period | ~2-years | ~2-years |
| Expected ROI (IRR) | 142% p.a. | 67% p.a. |

Other general learnings

Main drivers of Deep-P economics

- Is a *rainfed* cropping systems
- 2 Very **low Colwell-P and BSES-P** levels
- 3 High regional rainfalls4 High soil PAWC

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Thank you

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