A bioeconomic framework for phosphorus deep-placement decisions

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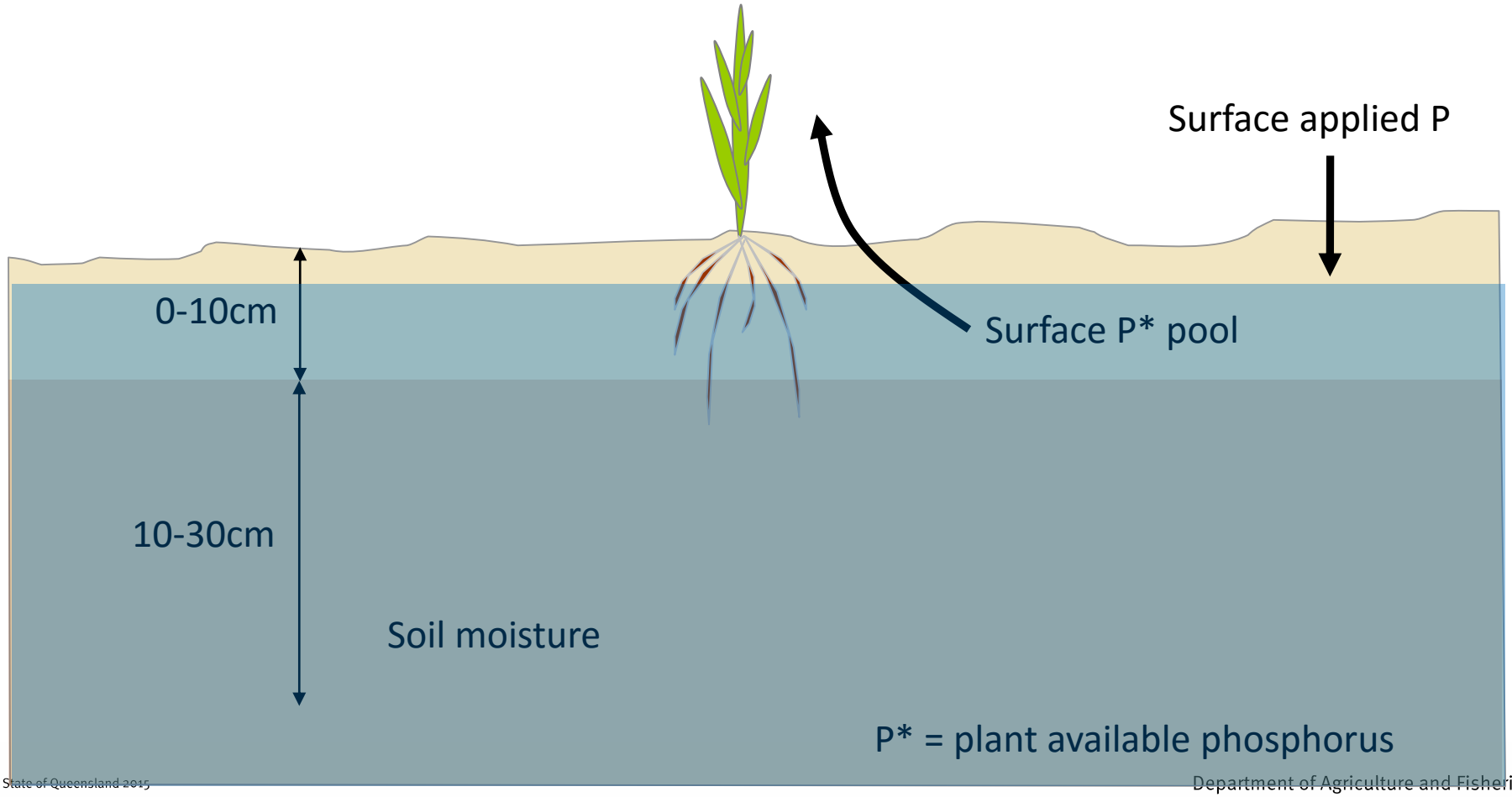
Why deep placement of P?



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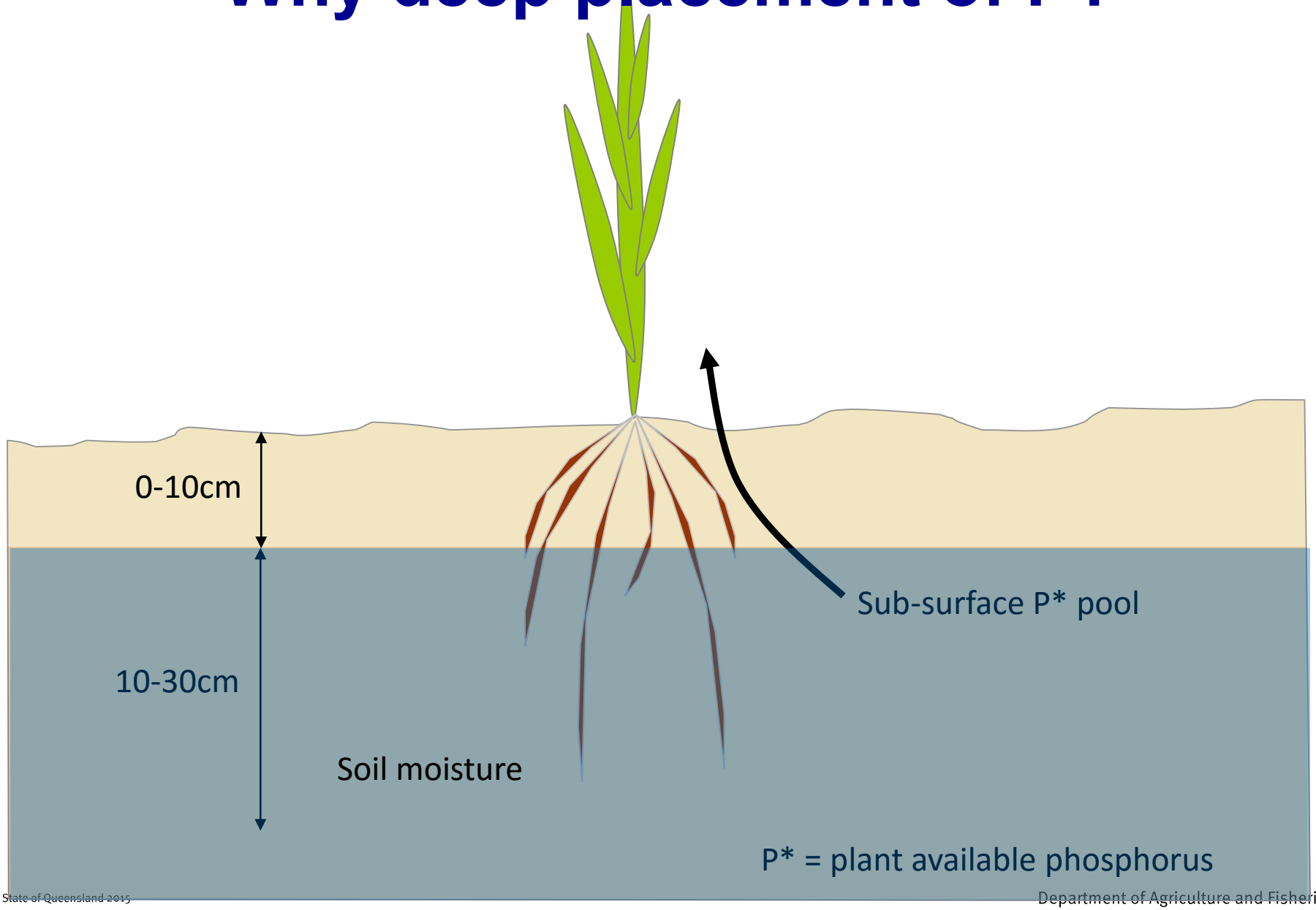

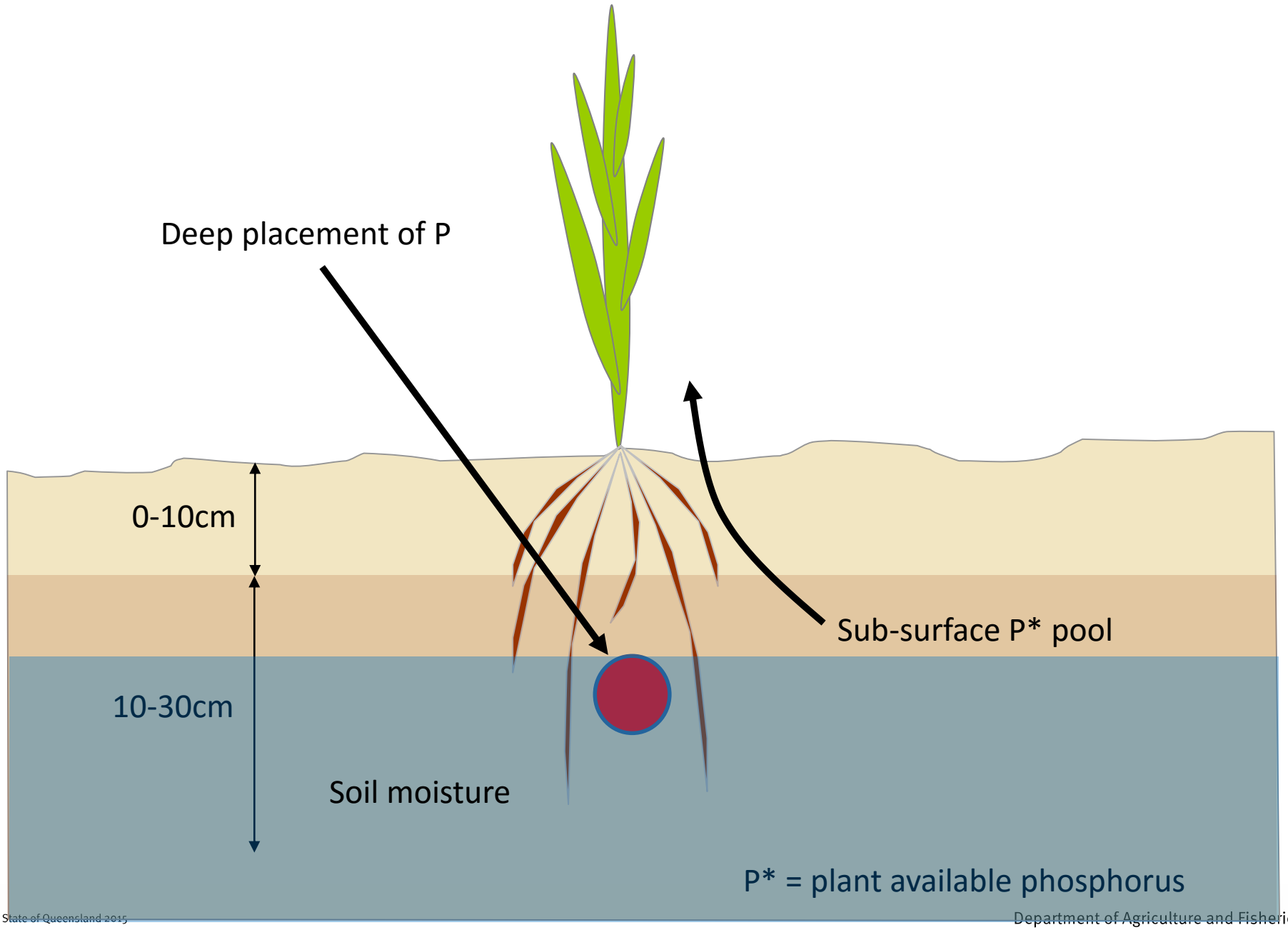

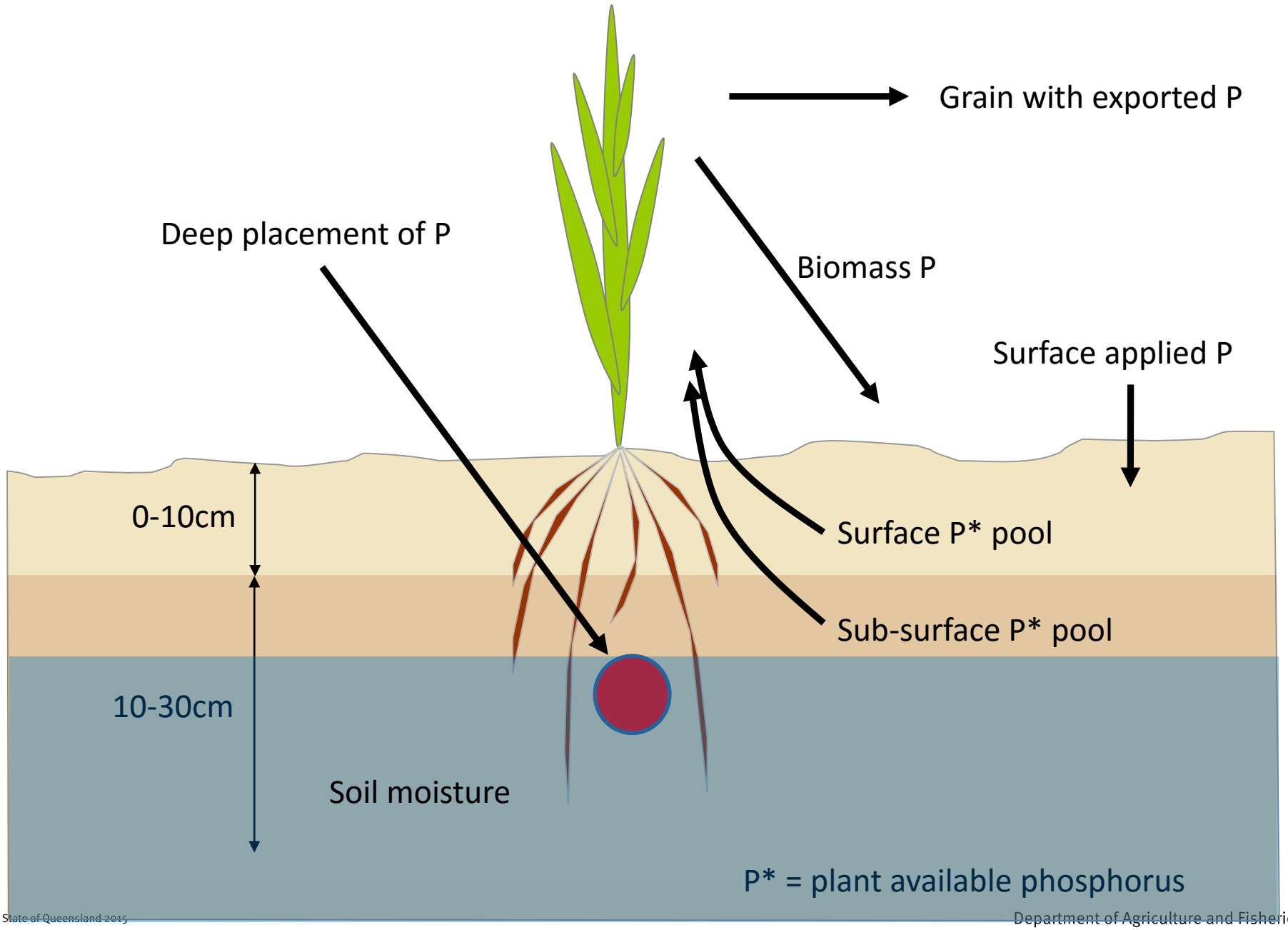

The BIG Deep-P Question

How much P?

How often ?

Economic Nutrient Decisions

N & Starter P

- Short-term decision (current season)

Deep-P

Long-term decision (many seasons)

Economic Nutrient Decisions

N & Starter P

- Short-term decision (current season)
- Known soil moisture

Deep-P

Long-term decision (many seasons)

Unknown future soil moisture

Economic Nutrient Decisions

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

Economic Nutrient Decisions

N & Starter P	Deep-P
• Short-term decision (current season)	Long-term decision (many seasons)
• Known soil moisture	Unknown soil moisture
• Fixed crop prices (can contract)	Unknown future crop prices
• Known N & P $ at application	Unknown future N & P$

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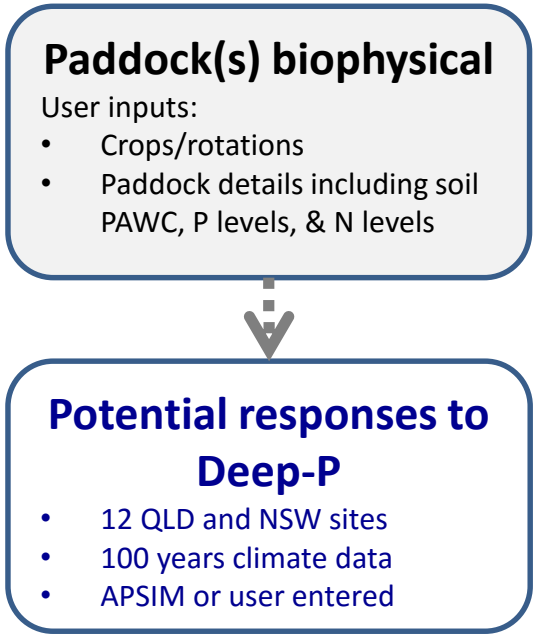
Bio-economic Framework

Paddock(s) biophysical

User inputs:

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

Bio-economic Framework



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Potential responses to Deep-P

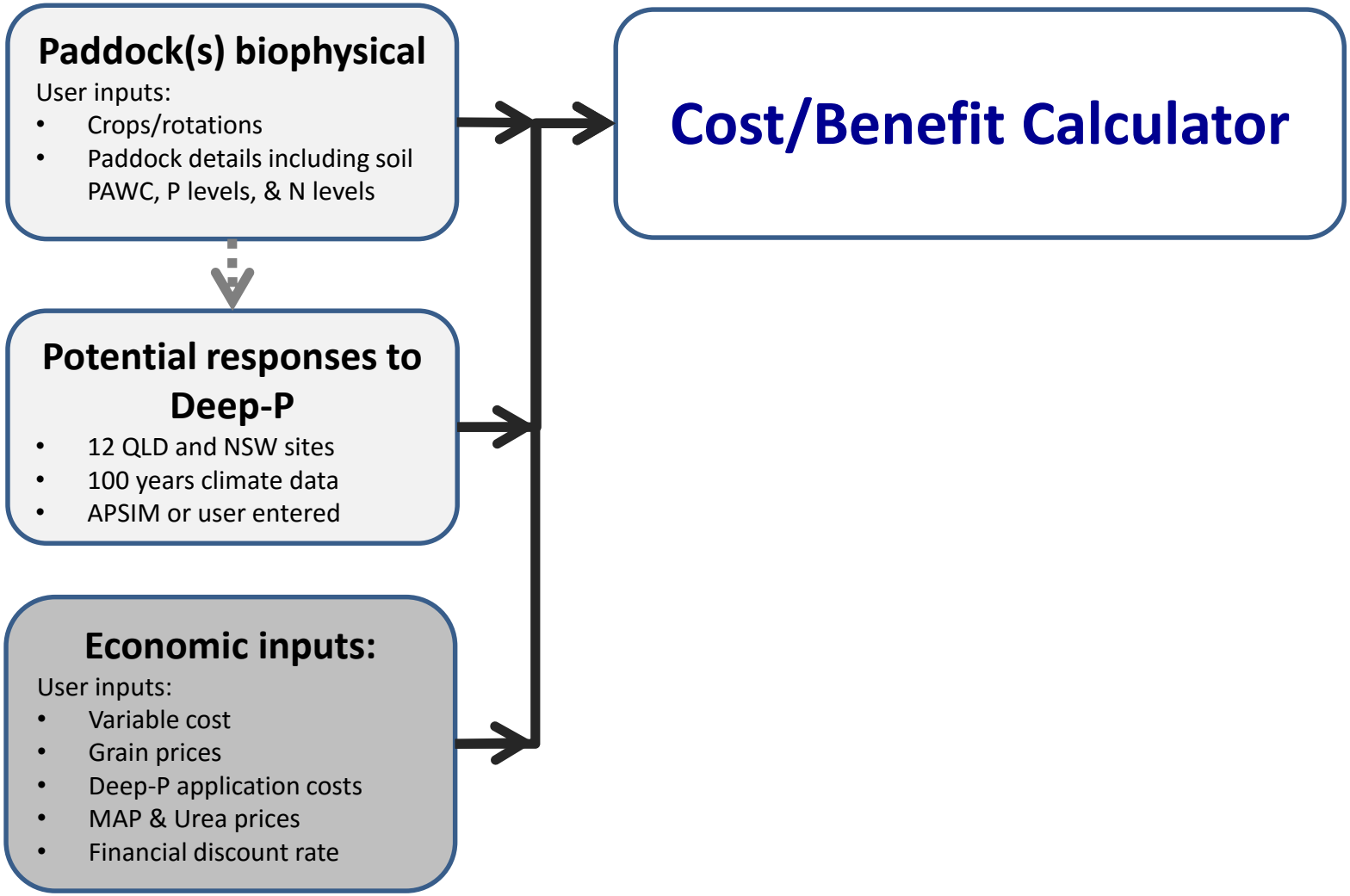
- 12 QLD and NSW sites
- 100 years climate data
- APSIM or user entered

Economic inputs:

User inputs:

- Variable cost
- Grain prices
- Deep-P application costs
- MAP & Urea prices
- Financial discount rate

Bio-economic Framework



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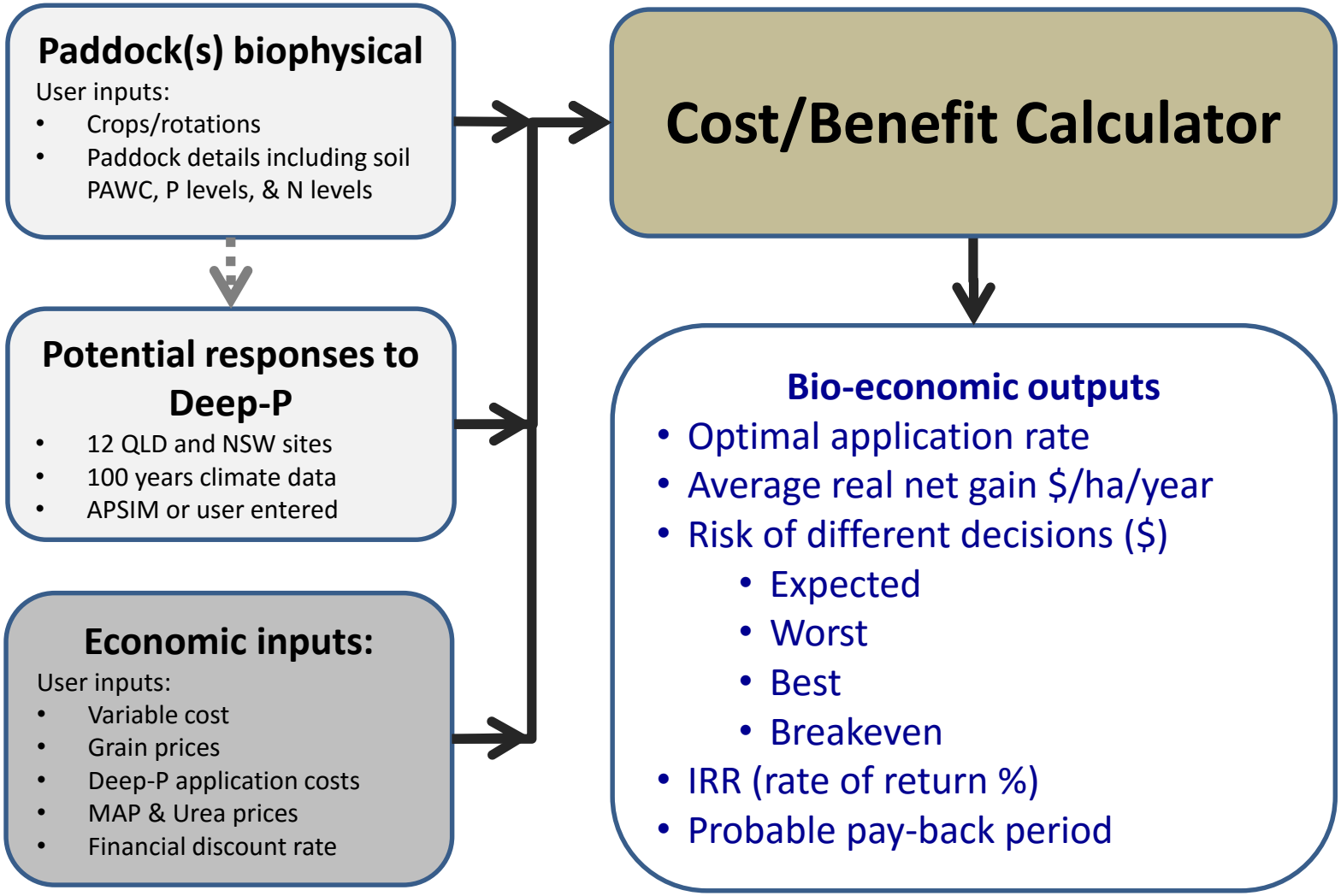

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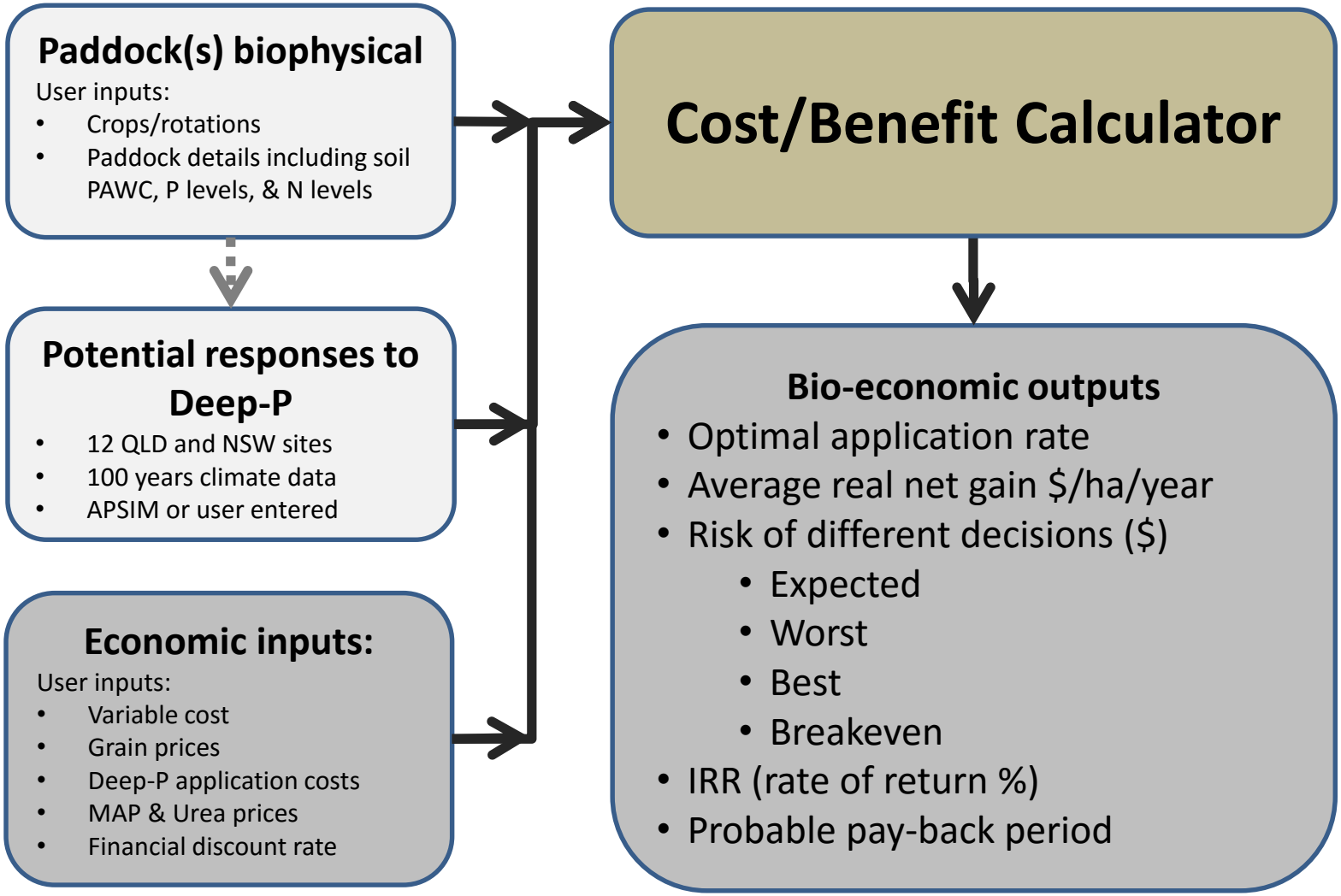


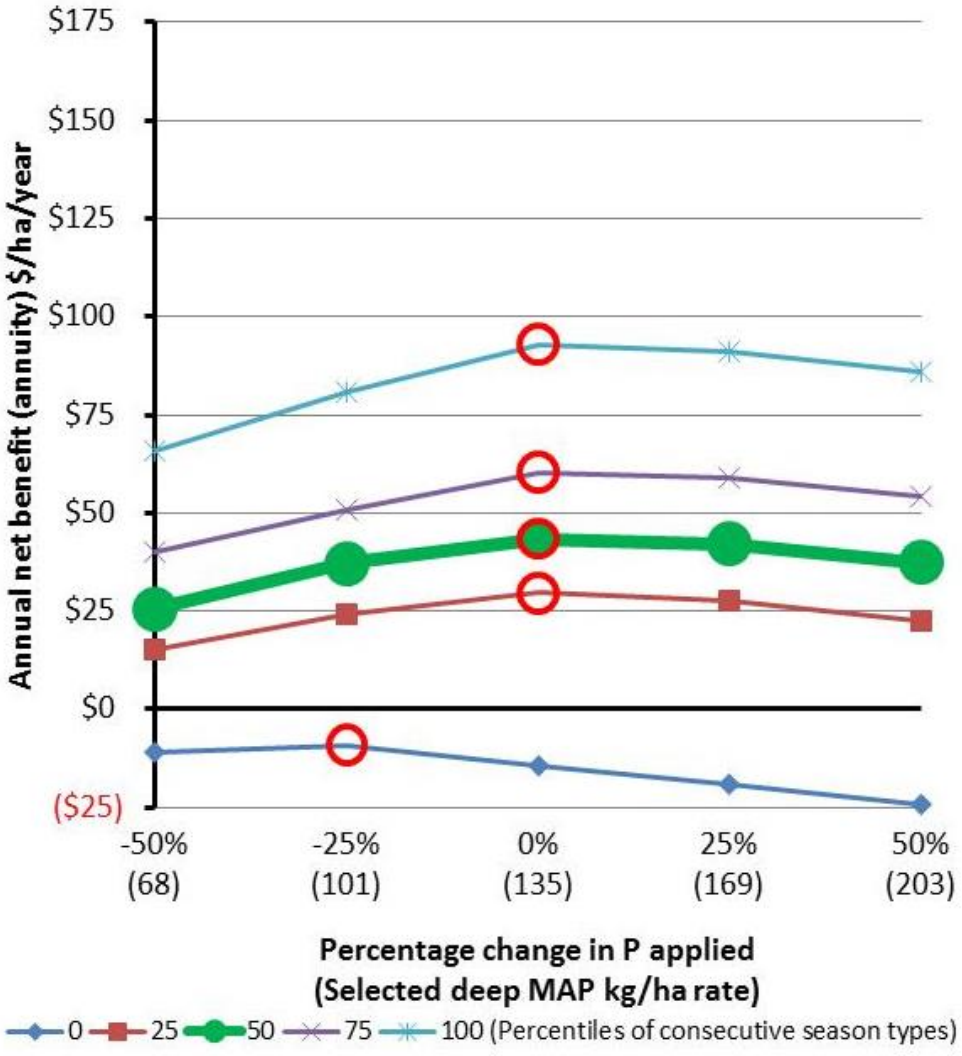
A Case study: Goondiwindi

- 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) – –|S CP| – W| – W
  - Long (7-years) – –|S CP| – W| – W|– –|S CP| – W| – W
- Deep-P placement $32/ha + P fertiliser
- MAP = $730/t

Crops	Reduction in yields if Colwell-P<10mg/kg) 180mm PAWC			Variable costs	Farm gate prices
	Dry start	No stress	Dry finish	$/ha	$/t
Chickpea (dc)	18%	10%	20%	342	409
Sorghum (lf)	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)

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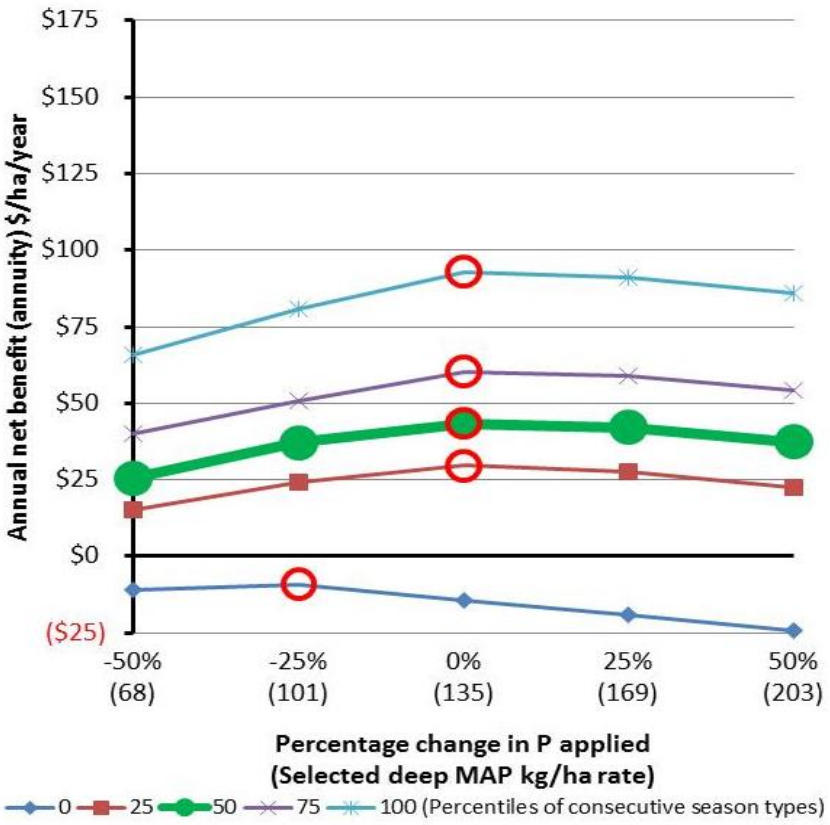
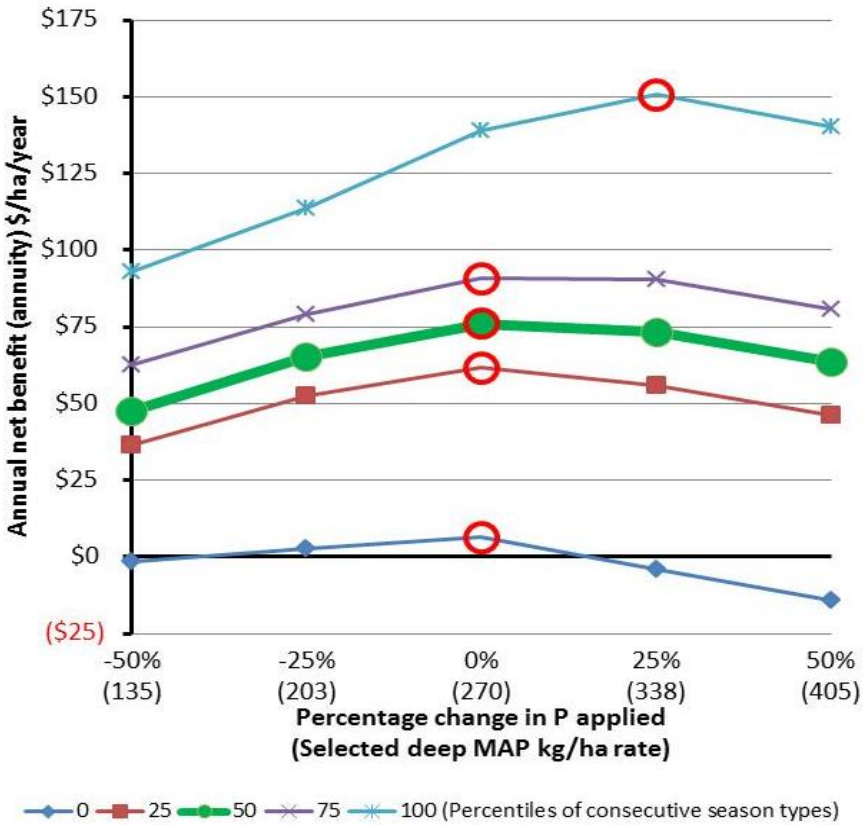


Long cropping sequence (7-years)

– –|S CP|– W|– W|– –|S CP|– W|– W



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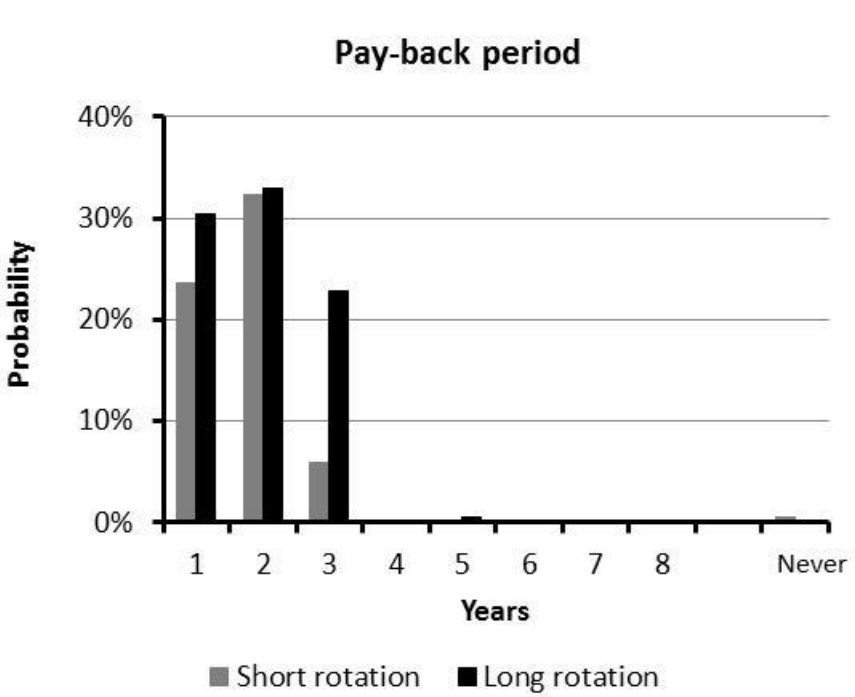

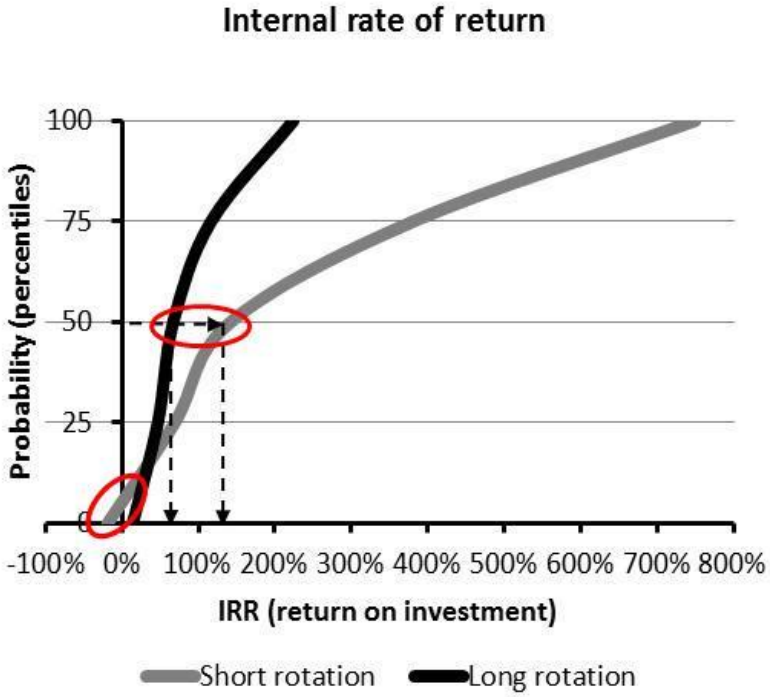

Conclusion

How much P & how often ?

Conclusion

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

	Short sequence: 3-year	Long sequence: 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 back, & highly variable	Little risk
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

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

} ***High Yields***

Acknowledgement of GRDC support

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Thank you

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