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Options for simultaneous greenhouse gas abatement and profitability on Australian broadacre cropping farms

Nikki Dumbrell, Marit Kragt, Elizabeth Meier, Peter Thorburn, Jody Biggs

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Options for simultaneous greenhouse gas abatement and profitability on Australian broadacre cropping farms

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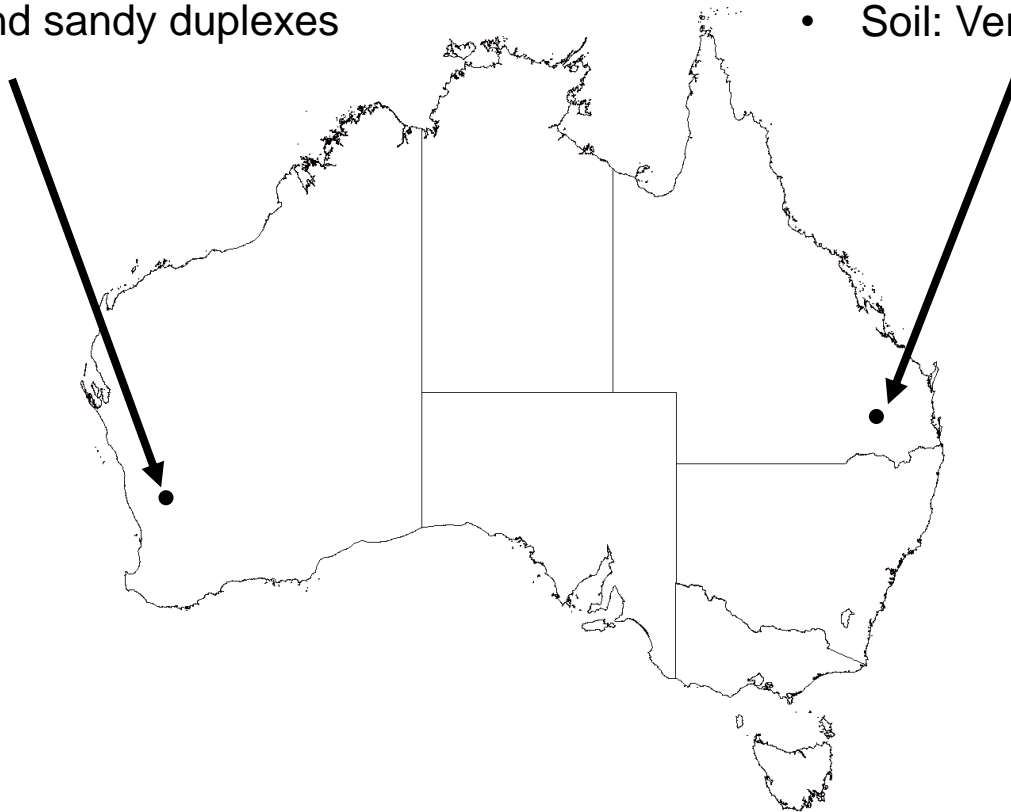
Case study farms

Dalwallinu, Western Australia

- Mediterranean climate
- Average rainfall 350mm
- Soil: Sand and sandy duplexes

Brigalow, Queensland

- Sub-tropical climate
- Average rainfall 700mm
- Soil: Vertosols



Methods

For a group of management scenarios we used APSIM to predict:

- crop yield
- N₂O emissions
- changes in soil organic carbon

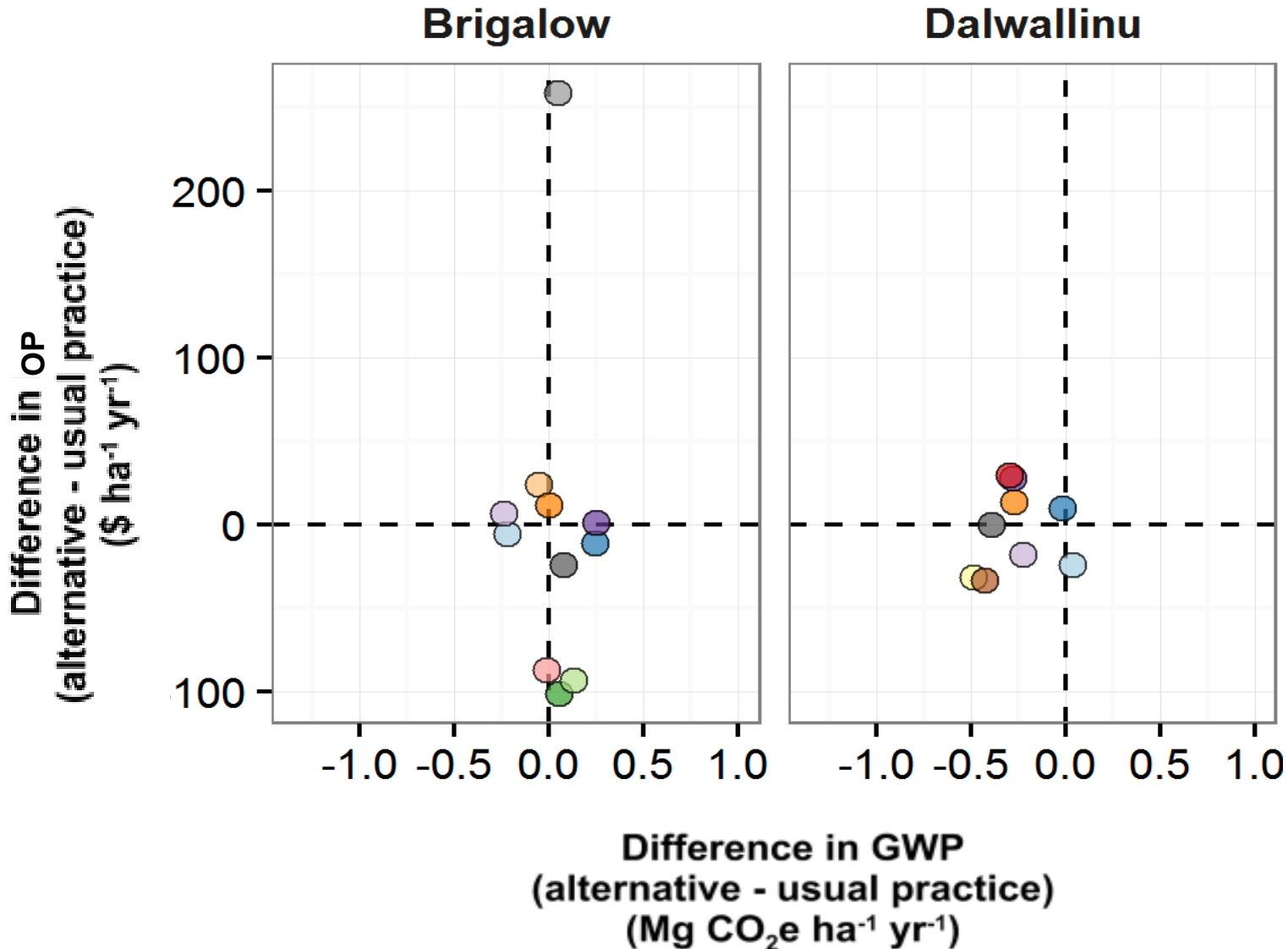
We convert the N₂O emissions and the change in soil organic carbon to CO₂ equivalents following the IPCC methodology

We teamed this with some economic analysis to look at how farm profitability is impacted under changed management

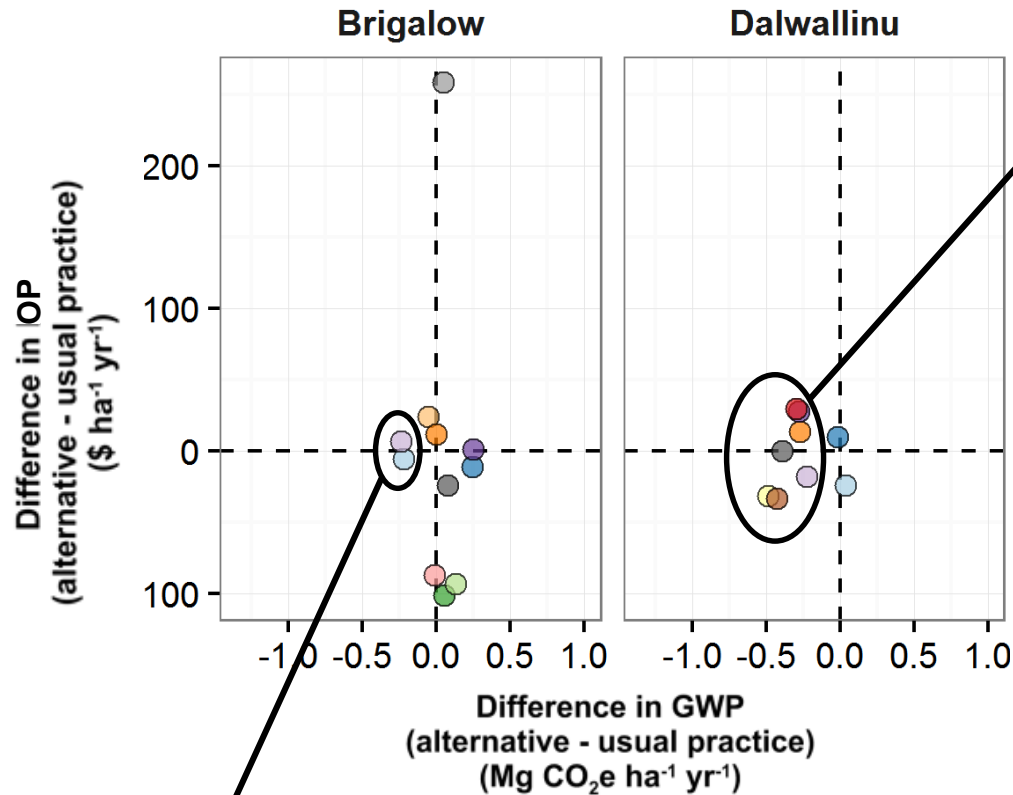
- We use operating profit to measure the change in profitability
- Operating profit = total revenue – total costs (before interest and tax)



Trade-off between abatement and profitability



Practices that provide abatement



Brigalow

Practices that provide abatement:

- Stubble burnt with 25% less nitrogen fertiliser
- Stubble retained with 25% less nitrogen fertiliser

Dalwallinu

Practices that provide abatement:

- Stubble retained, and
- Improved legume pastures in rotation
- 25% more nitrogen fertiliser
- Feedlot manure applied every 5 years
- 25% less nitrogen fertiliser
- Opportunistic summer cropping with cowpeas
- Improved legume pastures in rotation and opportunistic summer cropping with cowpeas

What is interesting about these results?

Dalwallinu

- Maximum abatement achievable is
 $0.49 \text{ t CO}_2\text{-e ha}^{-1} \text{ yr}^{-1}$
- Maximum abatement achievable whilst **increasing** profitability?
 $0.30 \text{ t CO}_2\text{-e ha}^{-1} \text{ yr}^{-1}$
- The introduction of improved pastures and increasing N fertiliser by up to 25% were predicted to achieve abatement and increase profitability.



Brigalow

- Maximum abatement achievable is
 $0.24 \text{ t CO}_2\text{-e ha}^{-1} \text{ yr}^{-1}$
- Maximum abatement achievable whilst **maintaining** profitability?
 $0.24 \text{ t CO}_2\text{-e ha}^{-1} \text{ yr}^{-1}$
- No practices were predicted to achieve abatement and **increase** profitability.



Key messages

- There are options for farmers to reduce greenhouse gas emissions and maintain/increase profitability
- But, there is a gap in the abatement that can be achieved biophysically and the abatement that can be achieved profitably
- So, if we want to increase farmers contribution to greenhouse gas emissions reductions we need to think about ways for them to adopt the practices that are currently unprofitable
 - Do we need to invest in R&D that could help to lower the costs of adopting these practices?
 - Do we need to look at sources of funding to compensate the farmer's costs?
 - The Emissions Reduction Fund provides compensation to farmers if they adopt approved practices that reduce greenhouse gas emissions
 - But, there are no approved practices for grain growers (at the moment)