



An Integrated Assessment of Land-use Change in the Border Rivers-Gwydir Catchment

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Presentation outline

- Background
- Potential for GHG reduction from farmers
- Previous studies
- Objectives of research
- Methodology
- Results
- Conclusions

Background

- Greenhouse gases (GHG) are rising
- GHG contribute to global warming
- Australia is the highest emitter of GHG per capita
- Australia is committed to reducing their GHG emissions

Australian farming sector

- Potential for GHG mitigation:
 - Reduce emissions
 - Increase soil carbon
 - Bioenergy
 - Second-generation biofuels
 - Wood or carbon plantations
 - Conservation forests

Land-use change for climate mitigation

- Considerable potential for biosequestration
- Realisation may greatly reduce the costs of mitigation (Garnaut 2008)
- Incentives required

Previous studies

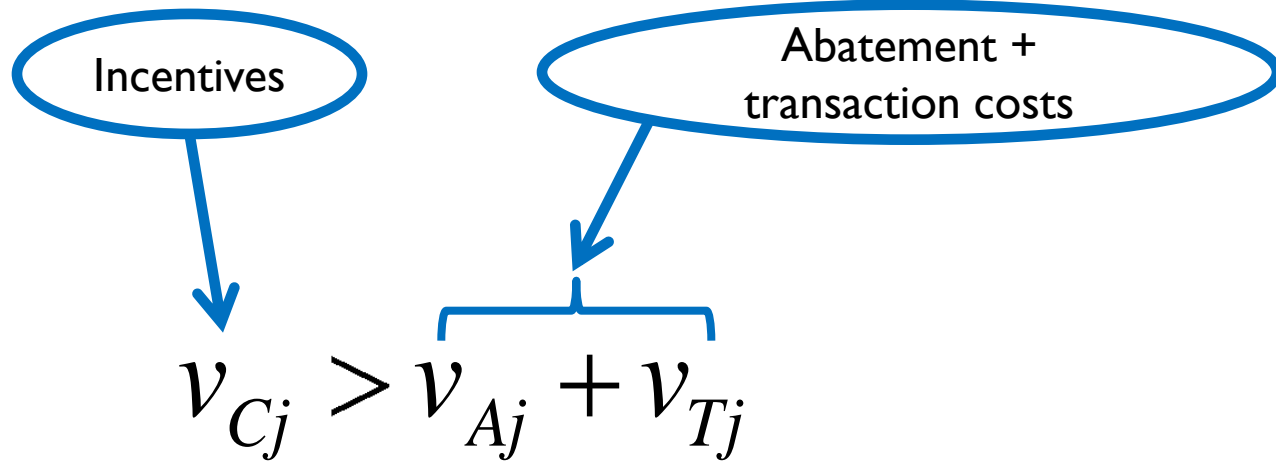
- Numerous studies (e.g. Polglase *et al* 2008 & Grieve *et al* 2008)
- Optimal management strategy for a given LUC
- Often fail to quantify the transaction costs

Objectives of research

- What is the potential supply of carbon mitigation services?
- What are the abatement and transaction costs?
- What economic incentives are necessary?
- How will different policy arrangements affect this supply?

Methodology

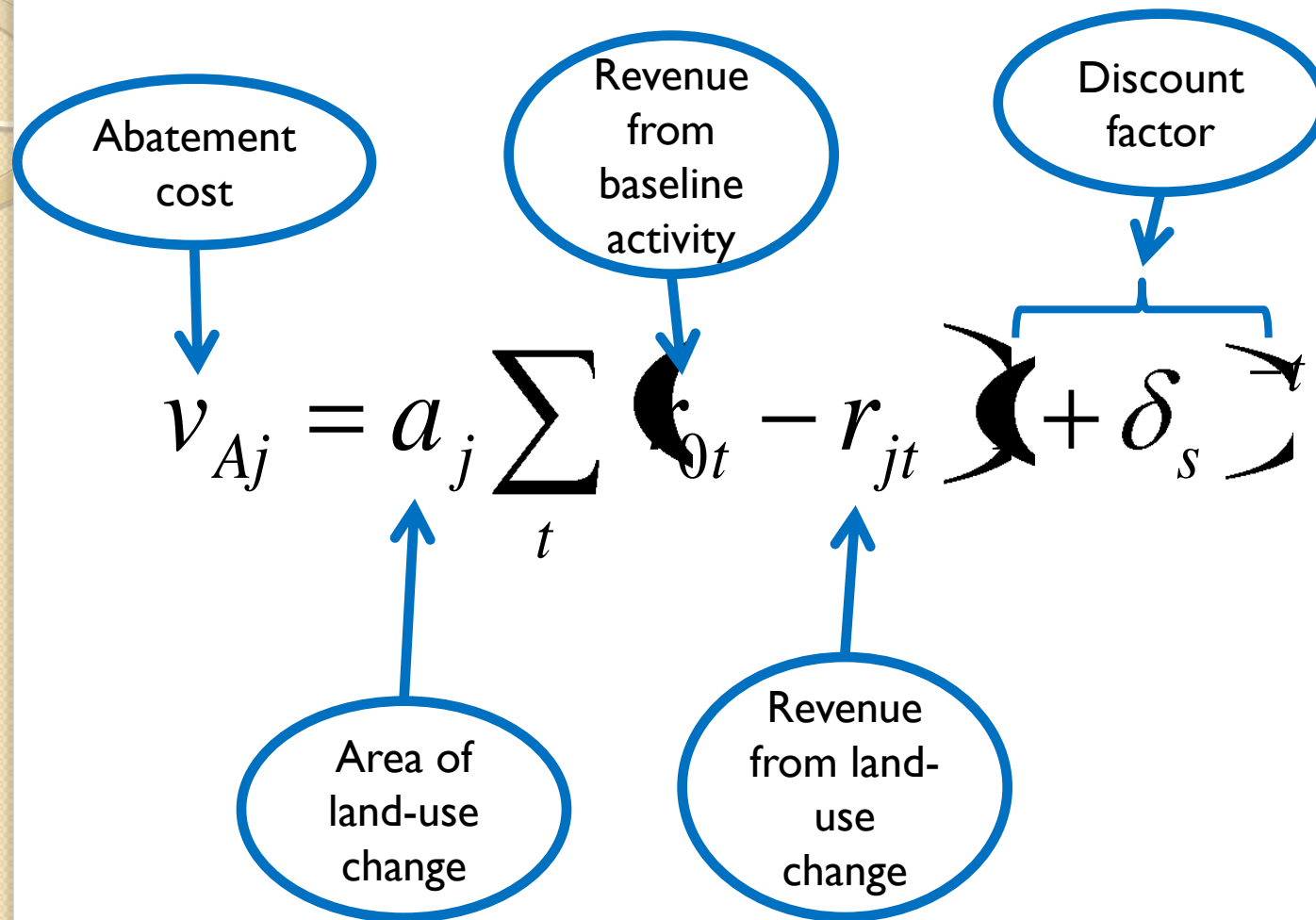
- For the supply of land-use changes from landholders:



Abatement costs

- Calculated as opportunity cost
- Dependent on:
 - Location
 - Current land use
 - Soil type
 - Climatic variables

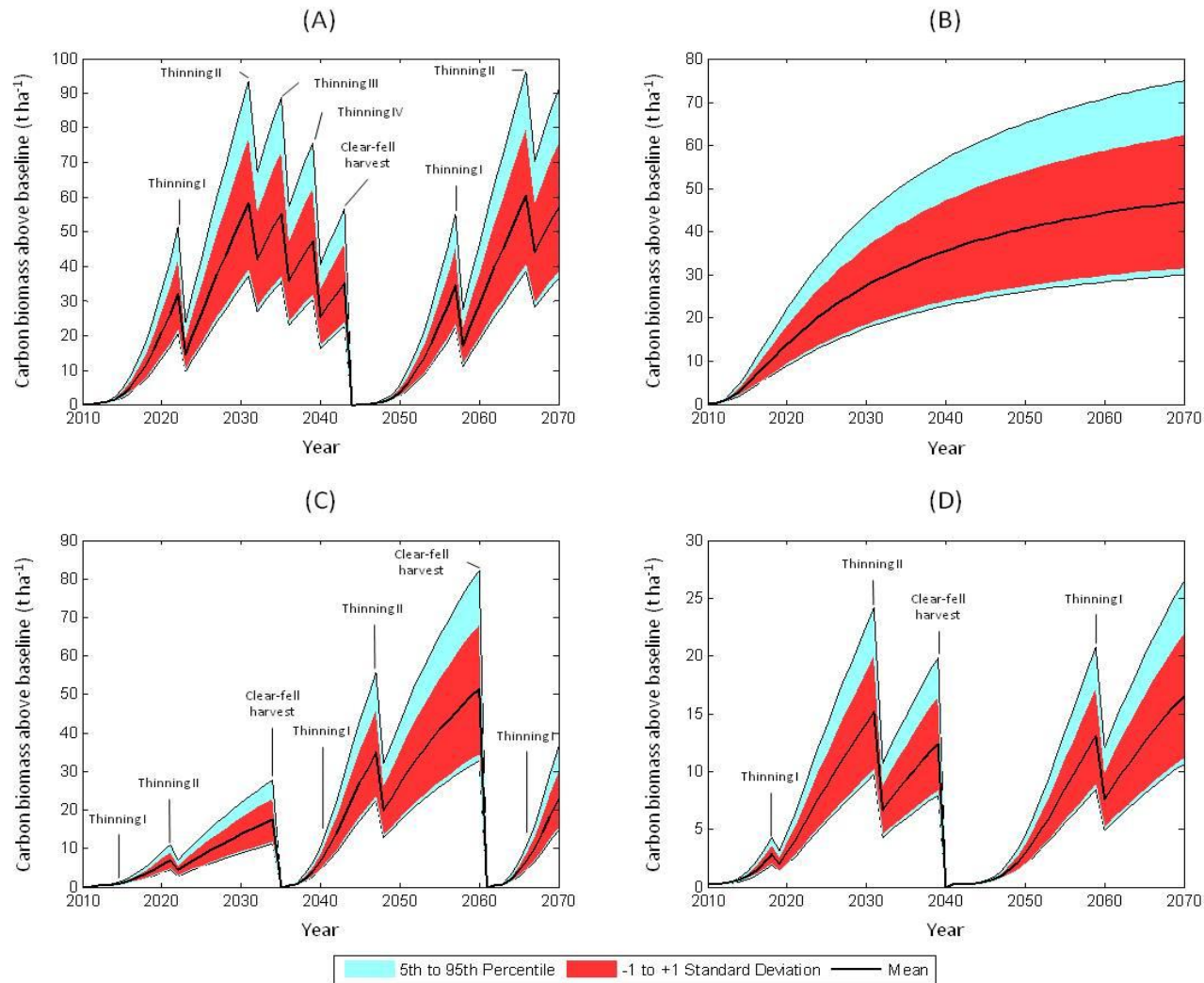
Abatement costs



Simulations

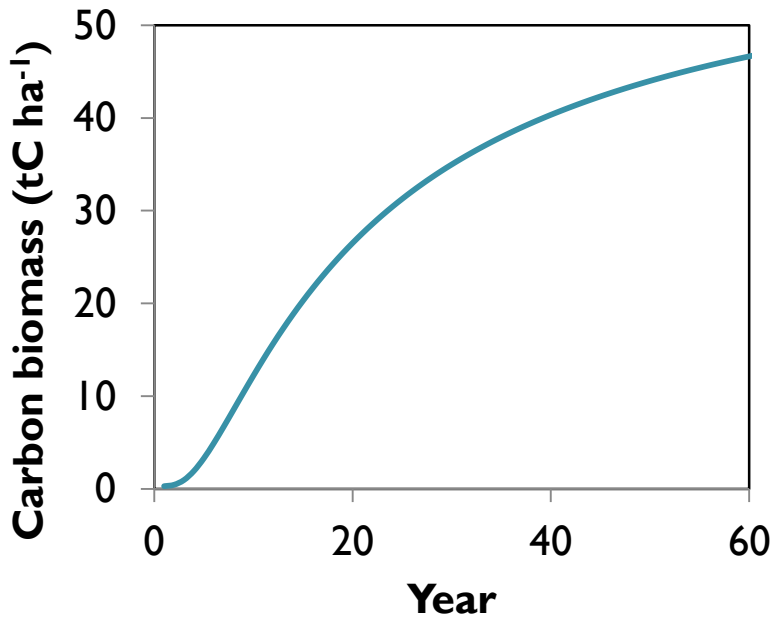
- Developed model of LUC in Border Rivers-Gwydir catchment
- Modelled current land uses and 4 proposed land uses
- Calculated carbon sequestration using FullCAM model
- Abatement costs calculated from a variety of secondary sources

Carbon sequestration ($t\ C\ ha^{-1}$)

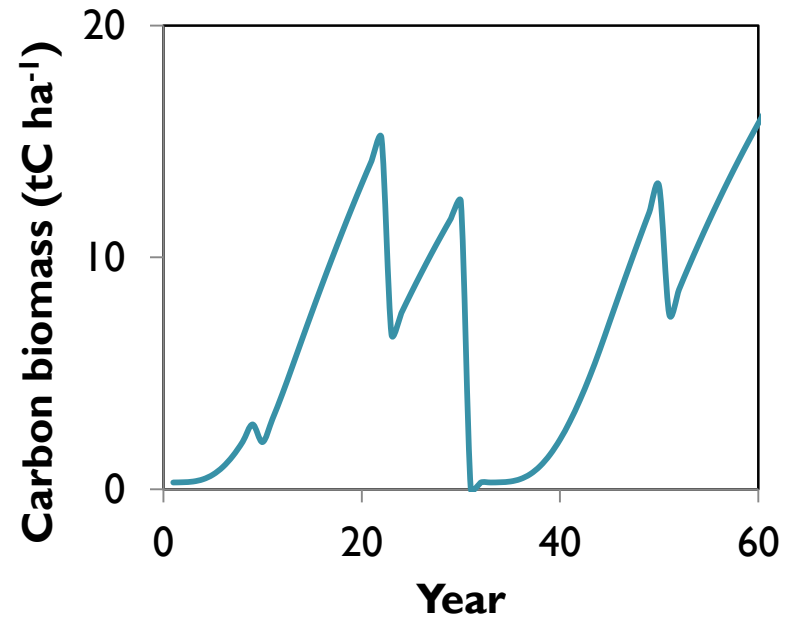


Carbon sequestration

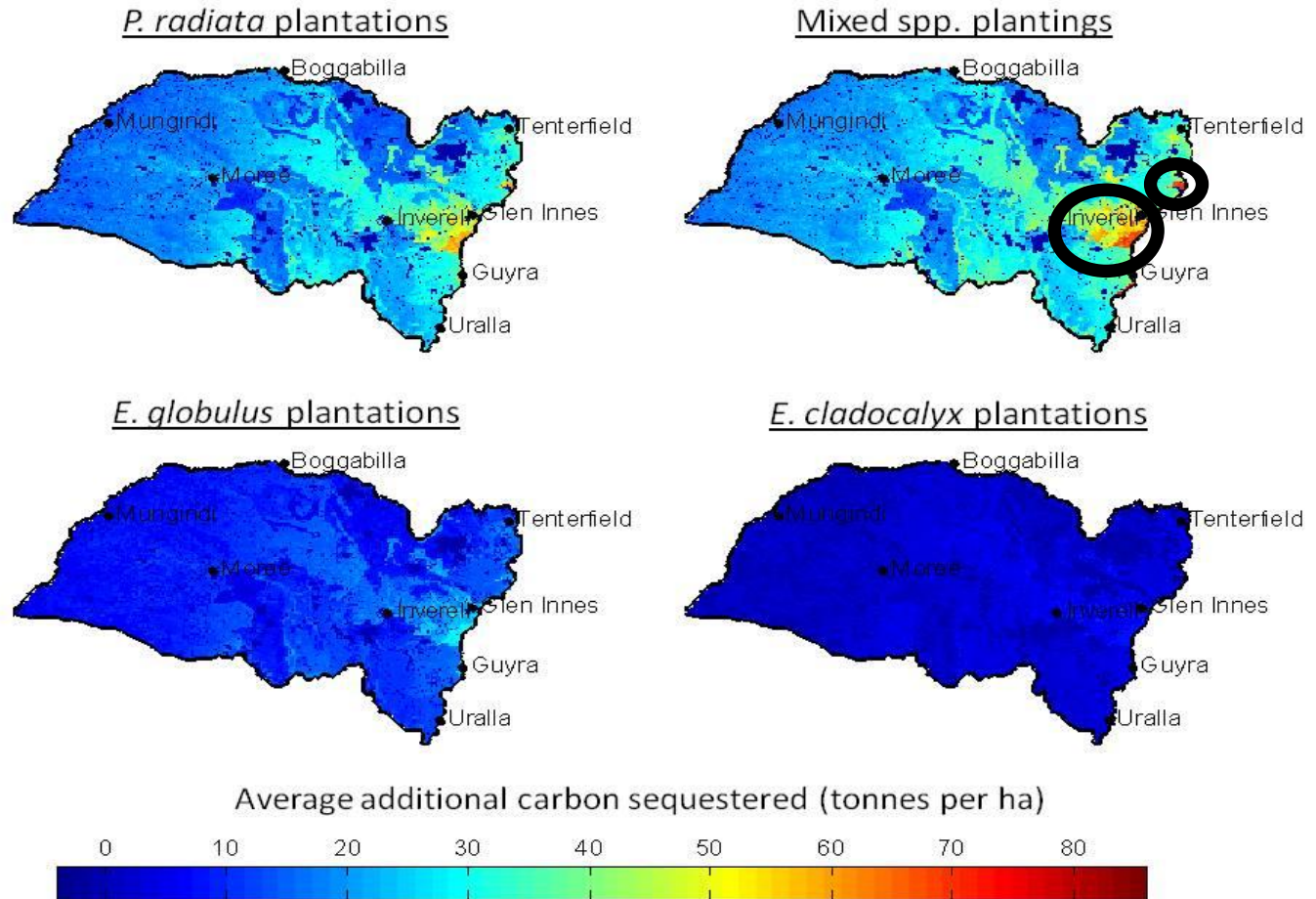
Av. change from current land use to mixed spp. environmental plantings



Av. change from current land use to *Eucalyptus globulus* plantation



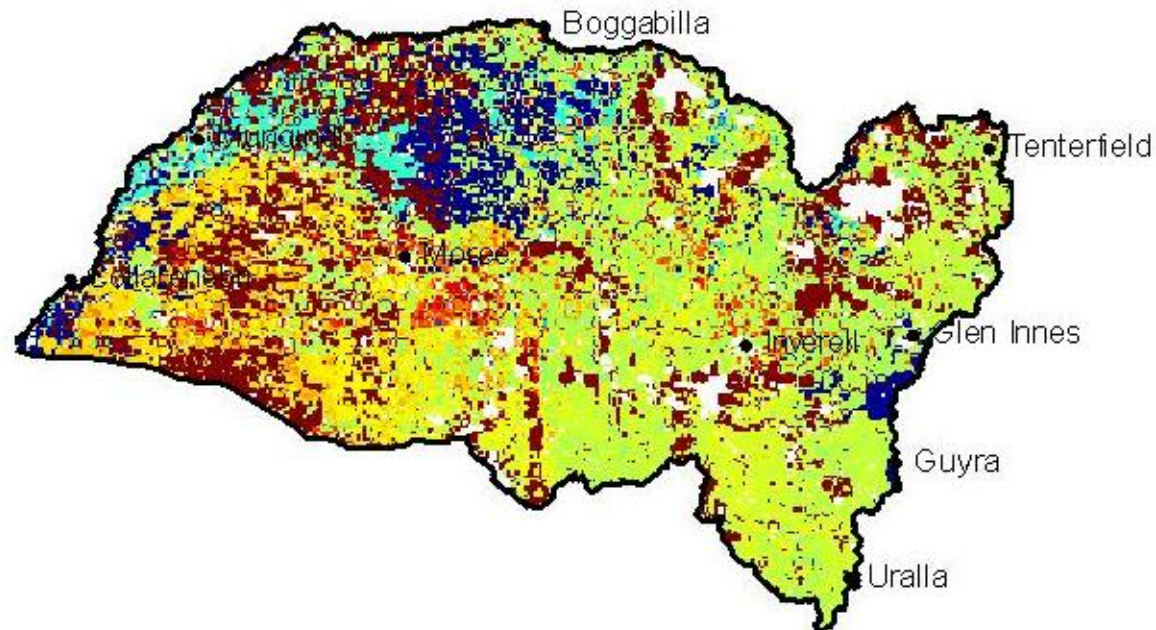
Average additional carbon sequestration (t C ha^{-1})



Abatement costs (\$ tCO₂e⁻¹)

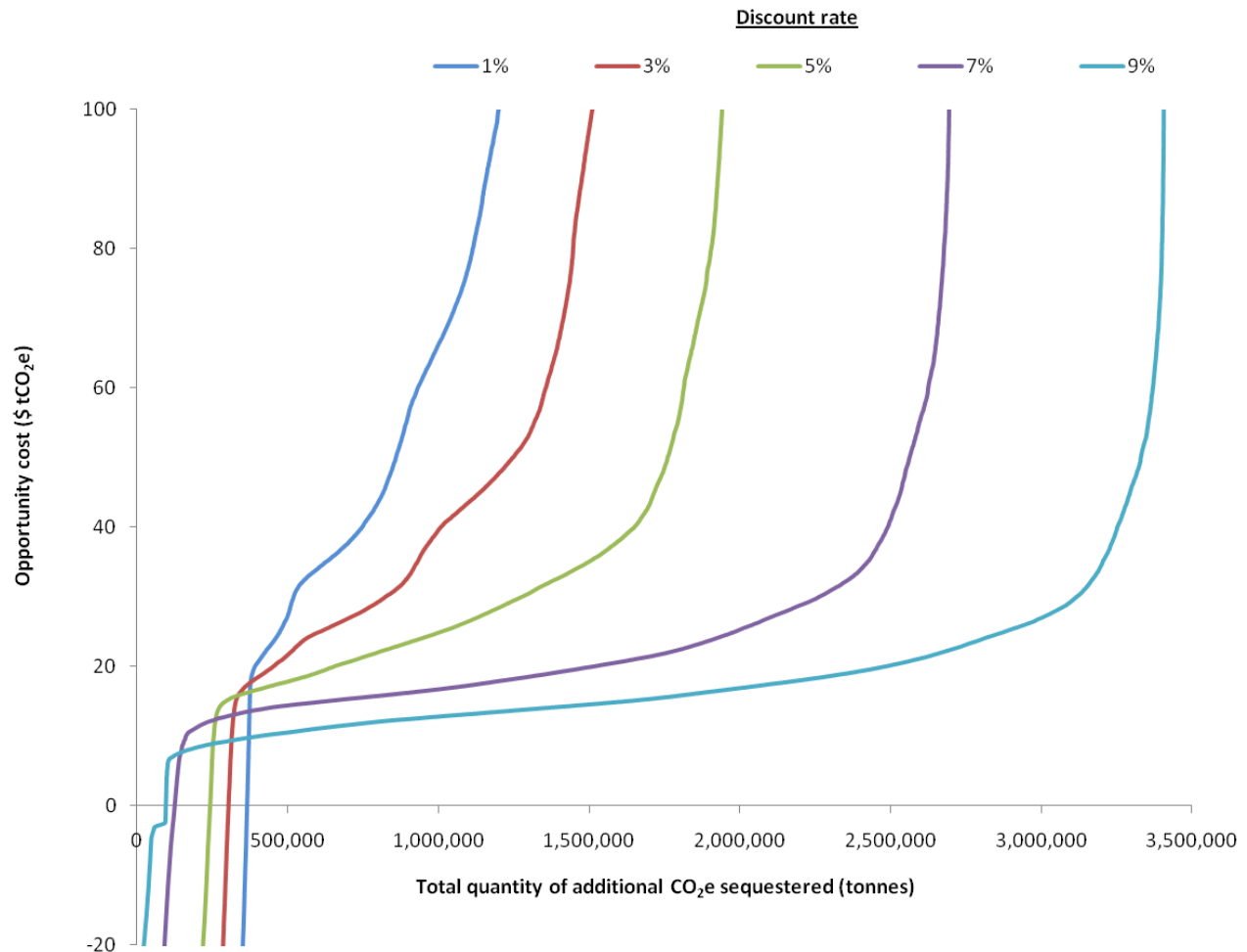
Proposed land use	Discount rate				
	1%	3%	5%	7%	9%
<i>Pinus radiata</i>	55	48	44	43	41
Mixed env. planting	38	28	22	19	17
<i>Eucalyptus globulus</i>	89	88	87	87	85
<i>Eucalyptus cladocalyx</i>	187	-18	-149	-227	-271

Sequestration potential vs. opp. cost



- Regions with the highest sequestration potential do not necessarily provide the lowest-cost strategy

Carbon sequestration supply (in absence of transaction costs)



Supply with price caps

Price cap (\$k tCO ₂ e ⁻¹)	Discount rate				
	1%	3%	5%	7%	9%
10	358	296	227	155	505
20	378	431	589	1,342	1,963
30	503	692	979	1,808	2,409
40	704	872	1,266	2,006	2,532
50	800	1,088	1,369	2,077	2,610
Unlimited	1,397	1,432	1,573	2,215	2,688

Conclusions

- Additional carbon can be sequestered from LUC
- Mixed species plantings and *Pinus radiata* plantations have the highest sequestration potential
- Targeting regions with the highest sequestration potential is not necessarily lowest-cost strategy
- Results are sensitive to discount rate