



Collaborators

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Projects: CALM, FPC, CRC Greenhouse Accounting, WA Greenhouse Strategy, RIRDC

Preamble

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Land and water degradation (salinity, erosion eutrophication) are major ongoing issues

Various approaches (regulation, voluntary programs) tried, problems persist

Need for large catchment-scale treatments – where will the money come from? Who pays?

Market based approach reversed salinity trends in the Denmark River

Can this approach be expanded with payment for other environmental services such as water, carbon?

Overview

Carbon investment offers opportunity for reforestation and thus NRM benefits

Suggest that we can extend this to consider payment for water; implications of this

Concern that agricultural land use will be displaced by carbon plantations ("food vs fuel")

Several additional opportunities for carbon mitigation on farms



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Saline 1988
 Saline 1998

Salinity assessment via satellite: the Land Monitor project

Furby et al. 2010. *J. Environ. Quality* 39: 16-25.

Water and carbon as a product...Warren-Tone catchment



Water value

- 100 GL water @\$150,000/GL
- Net water value of \$285/ha/year

Carbon + timber value

- \$154-\$244/ha/year

Agricultural returns

- \$100-\$160/ha/year

Townsend et al. (in review) Forest Policy & Economics

Implications of having a price for water and carbon following catchment restoration



1. Restoration of dammed catchments – e.g. Mundaring, Collie
2. Are there other catchments that can be restored? Salinity Action Plan only had five water resource recovery catchments
3. Payment for retaining plantations to protect water quality? e.g. Denmark River
4. Is this a mechanism to pay for the thinning of native forest and mine-site rehab?

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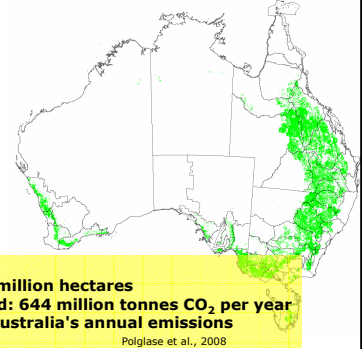


Possible extent of carbon farming



EXAMPLE SCENARIO:

- All areas where forest carbon farming is more profitable than the preceding agricultural enterprise
- Rainfall is <800 mm/year



RESULT:

- Area of opportunity: 69 million hectares
- Total carbon sequestered: 644 million tonnes CO₂ per year
- Which equals 111% of Australia's annual emissions

Polglase et al., 2008

Other analyses...



Garnaut (2008)

9.1 million ha of land where returns would be more than \$100/ha more than current land-use, water interception less than 150 mm/year and permit price of \$20/t

ABARE (Lawson et al. 2008)

CPRS-5 carbon price scenario assuming \$20.88

3.0 million ha – Timber plantations

2.7 million ha – Environmental plantings

Area planted to carbon sinks - Australia



Number of entities	Type of entity	Planting type	Area (Ha)
3	For profit company	Mallee	24,413
2	For profit company	Biodiverse	5,500
2	Government BE	Maritime pine / Mallee/hardwood <i>P. radiata</i>	14,600
5	Not-for-profit	Biodiverse, mallee	8,840
4	Individuals	Oil mallee	11,775
			65,130

Sources: Annual reports, published reports, web-data, commercial-in-confidence data

Mitchell & Harper (2010) ABARES Outlook

Explaining the gap between potential and realisable

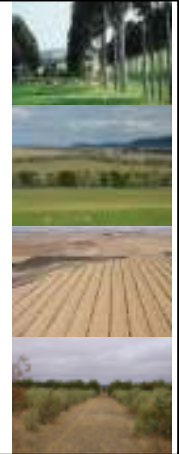
- Lack of a carbon compliance scheme
- Low carbon prices where compliance schemes exist
- Investment characteristics
 - Initial capital investment is significant compared with running costs
 - Returns over decades
- Technical risk
 - Lack of solid data in new areas
- Lack of landholder interest



Overview

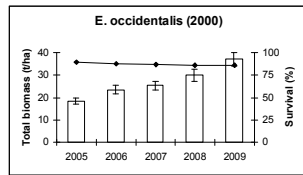
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Using salt-land as a carbon sink

- Large areas of salinized and low productivity land
- Various species on non-productive farmland
- Potential products
 - Biodiversity protection and enhancement
 - C sequestration
 - Hydrological control, land repair



68 tCO₂-e/ha at 8 years

Harper et al. (2009) RIRDC Report 09-059
Sochacki et al. (2007) Biomass and Bioenergy 31: 608-16

Can we increase soil carbon storage?

- "Evaluation of soil carbon in the Peel Region..."
- New Royalties for Regions project via the Peel Development Commission
- Partners – Murdoch, Alcoa, DAFWA, UWA, NDU, ChemCentre
- Evaluation of:
 - prospects for increasing soil carbon storage including amendments (clay, biochar, Alkaloam)
 - benefits in terms of water quality, farm profitability



What about wind erosion?



12-32t CO₂-e/ha following erosion

(Harper & Gilkes 2010 Aeolian Res. 1: 129-41)

Concluding remarks

- Potential of environmental markets (carbon, water) to drive reforestation and achieve water and NRM benefits
- Carbon forestry is part of mix of approaches to meet climate challenge
- Care needed to avoid perverse outcomes: manage through system design, planning and regulations, valuing all costs and benefits
- But also care we don't lose the opportunity to capture carbon investment to tackle NRM problems

