Australian Government
Department of the Environment and Water Resources

Marine and Tropical Sciences Research Facility

Cost-effectiveness of management practices for water quality improvement in the Wet Tropics

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Project 3.7.5:
Socio-economic constraints to and incentives for the adoption of land use and management options for water quality improvement

CSIRO

Cardwell Shire Floodplain Program

FNQ NRM LTD

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Overview

- Dilemma
- Objectives
- Methodology
- Results
- Conclusions and discussion

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Dilemma

Mission: Halting and reversing the decline in water quality from GBR catchments while maintaining and enhancing socio-economic prosperity in the GBR region

Issues: Can current and future management practices achieve this mission?
How can we achieve this mission cost-effectively?
What is needed to do so?

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Objectives

- Assess the cost-effectiveness of land use and management options for water quality improvement, including agricultural as well as non-agricultural diffuse and point sources.
- Identify agent profiles, aspirations and attitudes, characterising (private) agent specific constraints to and risks associated with the adoption of land use and management options for water quality improvement.
- Identify community (including institutional) structures and networks, characterising (social) community specific constraints to and risks associated with the adoption of land use and management options for water quality improvement.
- Identify and assess instruments that are most effective in promoting the adoption of 'best' land use and management options by community embedded agents.

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Methodology

1. Production system simulation models (APSIM) to assess industry specific long term costs/benefits of management practices

- Input combinations and timing
- Corresponding yields, cover factors and inorganic nutrient concentrations
- Corresponding gross margins (discounted annual averages)

2. Water quality simulation model (SedNet/ANNEX) to assess long term effectiveness of management practices

- Based on cover factors and inorganic nutrient concentrations

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Methodology

3. Spatially explicit environmental-economic model (EESIP) to determine industry specific:

→ management patterns achieving water quality outcomes

→ (marginal) water pollution abatement cost functions

based on:

- Spatially explicit bio-physical conditions (slope, distance, soils, etc.)
- Spatially explicit economic conditions (distance, infrastructure, markets, etc.)
- Industry and management practice gross margins (based on APSIM – see 1.)
- Industry and management practice effectiveness (based on SedNet/ANNEX – see 2.)

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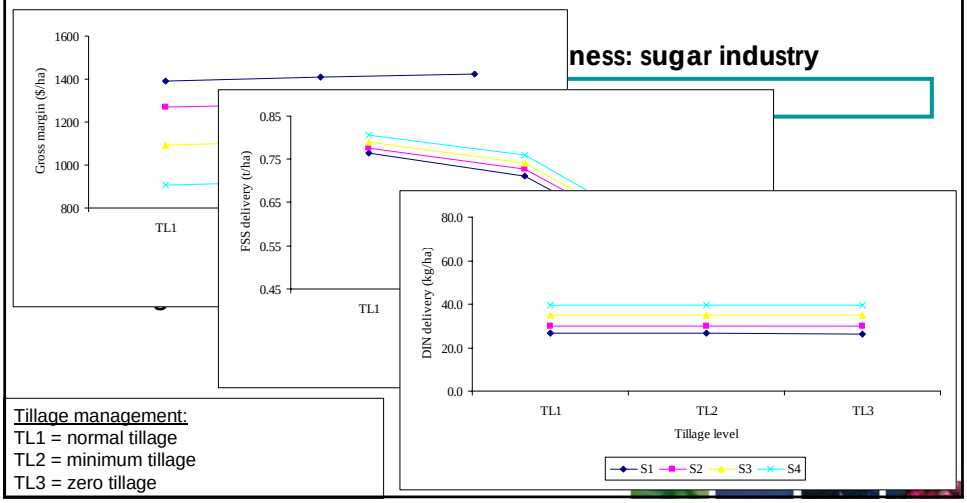
Results



Tillage management:
TL1 = normal tillage
TL2 = minimum tillage
TL3 = zero tillage

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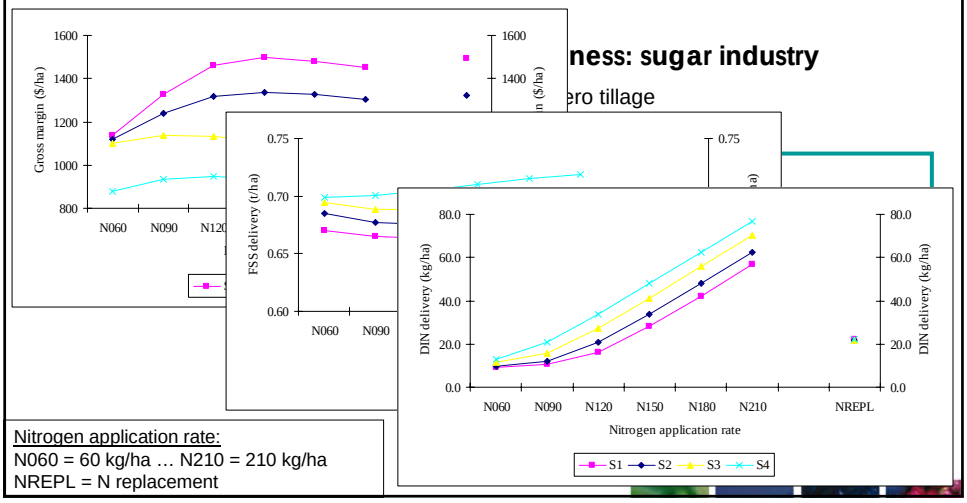
Results



Nitrogen application rate:
N060 = 60 kg/ha … N210 = 210 kg/ha
NREPL = N replacement

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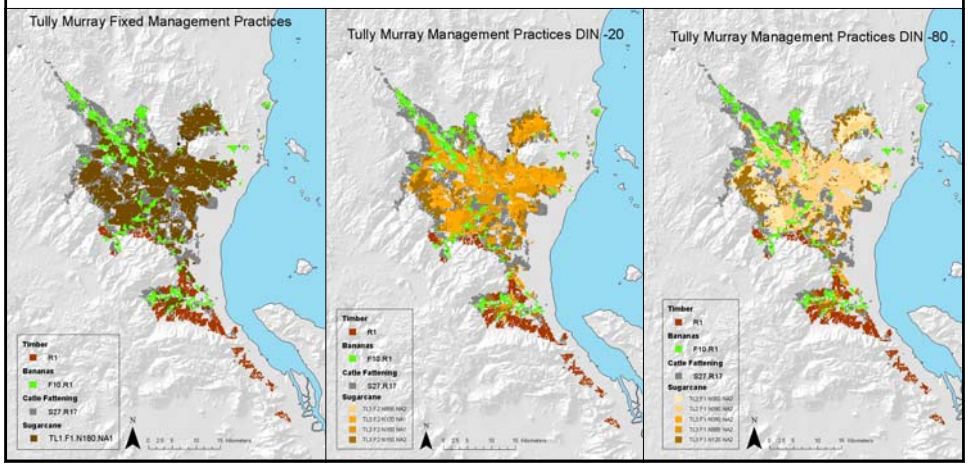
Results

2. Management patterns achieving water quality outcomes

Sugar ind'y: 65.4 m$ 66.2 m$ 59.7 m$



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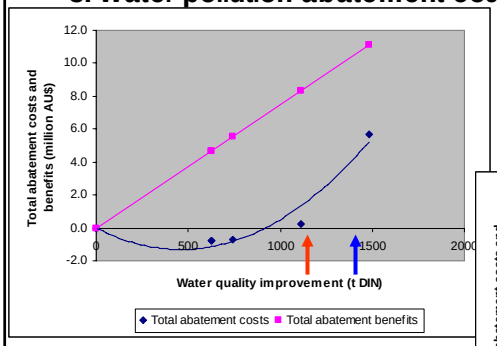
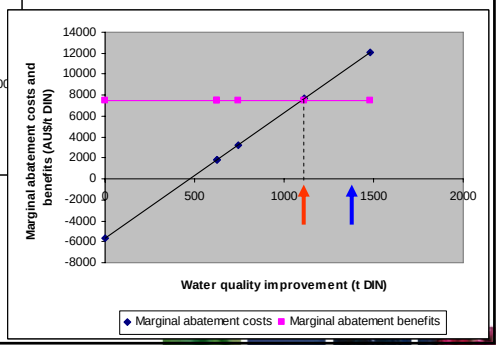
Results

3. Water pollution abatement cost function: sugar industry





Economic optimum

Water quality objective

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Conclusions and discussion

Production system simulation model (APSIM) in combination with water quality model (SedNet/ANNEX) good tool for:

- exploring cost-effectiveness of current and future management practices
- input into other environmental-economic modeling approaches

Spatially explicit environmental-economic model (EESIP) allows for:

- integration of production system simulation model and water quality simulation model
- identification of cost-effective land use and land management patterns
- determination of water pollution abatement costs functions
- identification of efficient water quality improvement targets
- estimation of costs for reaching water quality objectives

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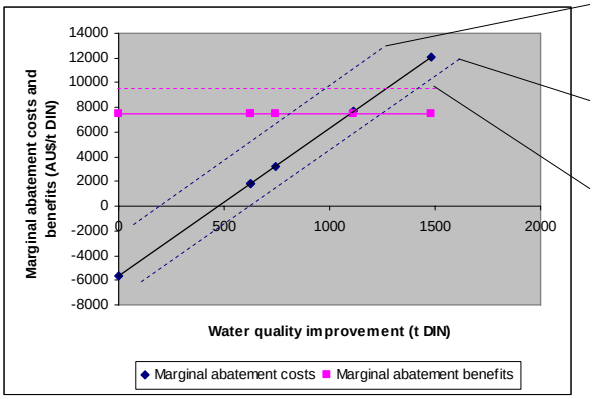
Conclusions and discussion



- Private costs uptake
- Community costs uptake
→ **Projects 3.7.5, 4.9.4, 4.9.6**

- Future MPs
- Land use change
→ **Projects 3.7.5, 2.5i.4**

- Dynamics (time lags)
- Non-use values
- Use values
- Shape?
→ **Projects 3.7.5, 2.5i.4**

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