National Market-based Instruments Pilot Program

Improving Water Quality in the Lockyer Creek Catchment: Stakeholder Workshop

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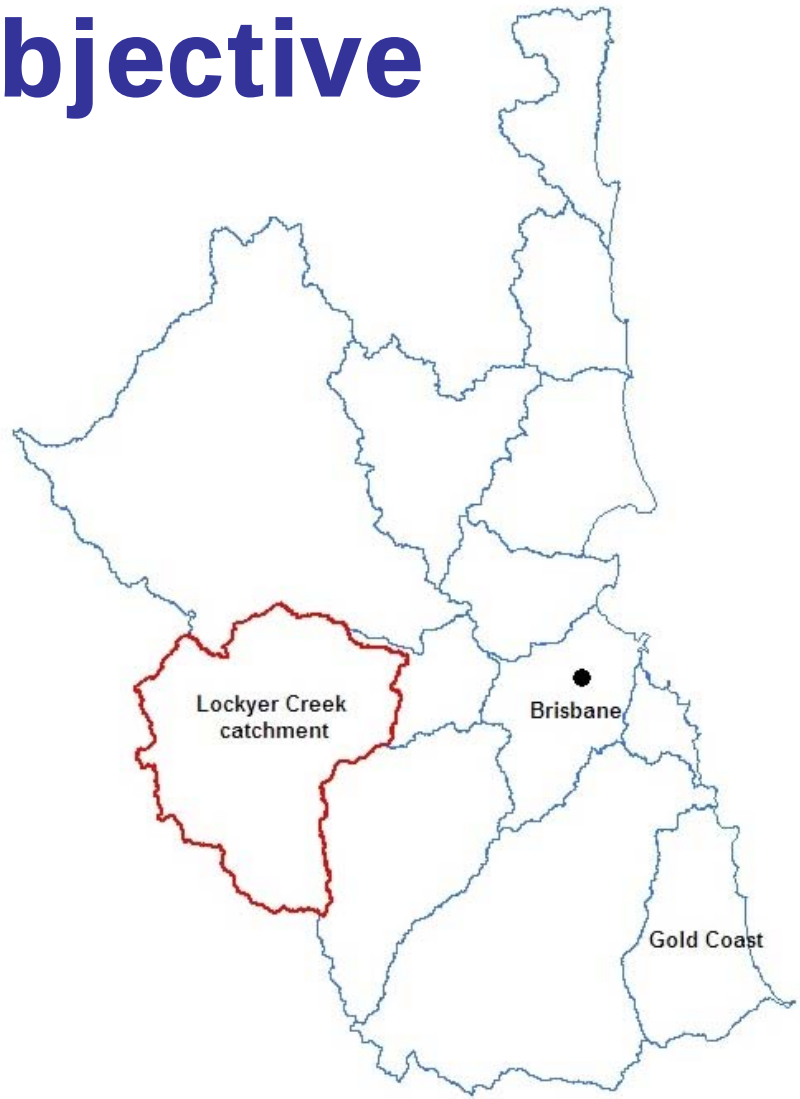
Overview

- Project background
- Characteristics of NPSP
- Methodology
  - Data
  - Modelling
- Preliminary results
- Proposed experiments
- Discussion

Project Objective

- The aim of this project is to explore the ways market based instruments could be used to improve the quality of water entering the Lockyer Creek catchment.



Research Questions

- What is the current state of Lockyer Creek catchment data on farming activity, BMP outcomes and costs?
- Are MBIs appropriate for delivering water quality improvements in the Lockyer Creek catchments?
- Are quantity-based instruments superior to price-based instruments?
- Which combination of market-based instrument features should be adopted?
  - permit banking, spatial trading, rules/trading ratios and other policy permutations.

Tasks

- Conceptualise the problem
- Collect and consolidate Lockyer Catchment economic and biophysical data.
- Develop conceptual biophysical-economic model of supply and demand for abatement in Lockyer Creek catchment.
- Develop and implement economic experiments to answer the research questions.

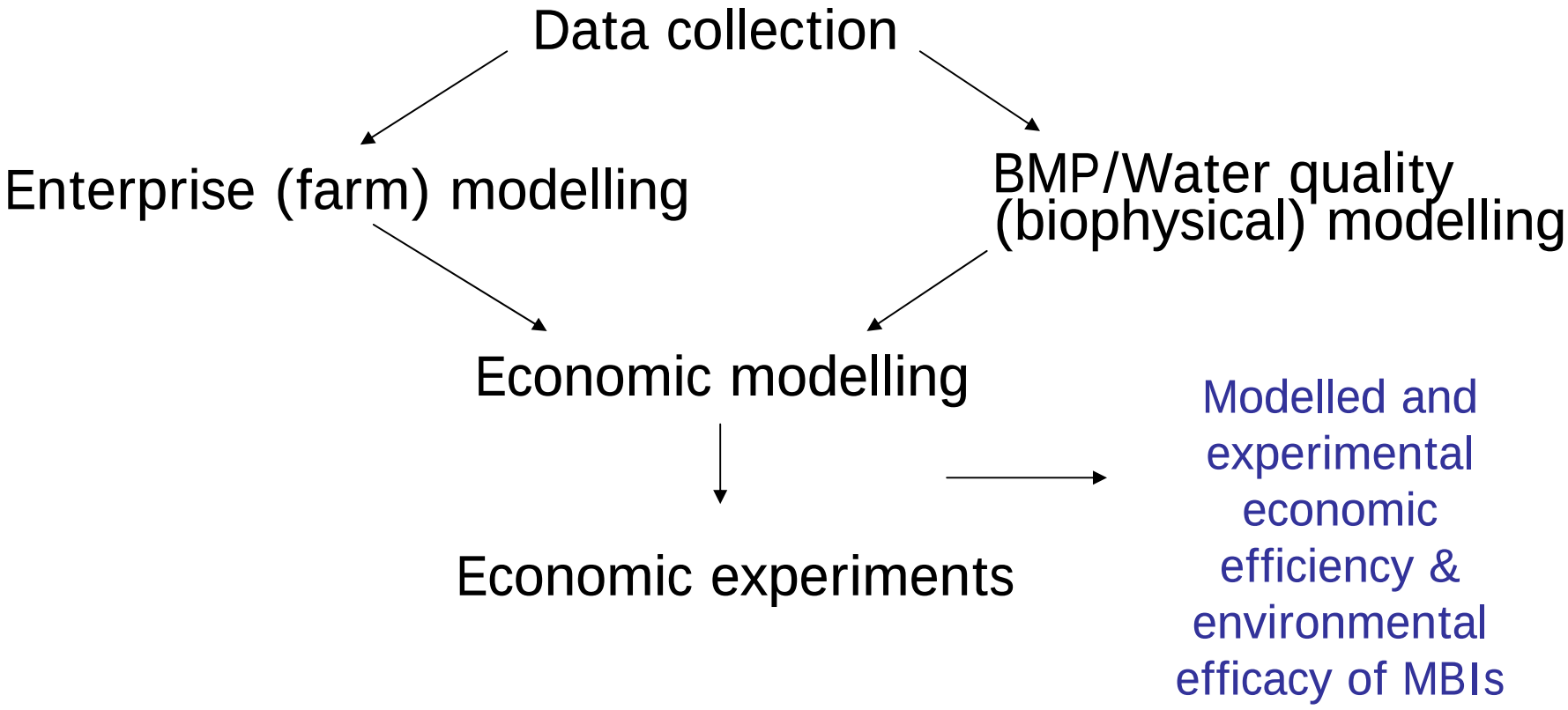
Purpose of this workshop

- Report and review the biophysical and economic data underpinning the study
- Present preliminary modelling results
- Review the proposed experimental designs

Characteristics of Nonpoint Pollution

- Many polluting firms or agents
- Driven by stochastic processes
- Interdependency
- Pollutants are not uniformly mixed
- Time lags
- Emissions unobservable
- Unable to observe inputs or practices (types)
- Imperfect knowledge about pollutant generation, transport and fate
- Unable to infer individual emissions from ambient concentrations

Methodology



Data

- Catchment water quality and abatement
  - Climate – rainfall and PET
  - Land use
  - Sediment BMPs
  - Efficacy of sediment BMPs e.g. t/ha/yr sediment removed
  - Cost of BMPs (capital, recurrent) ($)

- Enterprise (farm) data
  - Derived from land use data
  1. Farm sizes (ha)
  2. Farm types (crop types and rotations, irrigated/non-irrigated, livestock mix)
  3. Farm income/gross margins ($/ha)

Data limitations

- Management practices
  - Data availability: little to no information on the efficacy of BMPs for the Lockyer (data available for other areas/agri-types)
  - Data quality: variable measures of performance (e.g. t/ha/yr, t/yr, mg/L)
  - Synoptic estimates of BMP performance with little-no information specific to the Lockyer or SEQ
- Enterprise (farm) data
  - Data availability: Difficult to obtain primary data in SEQ and Queensland generally
  - Data quality: Uncertainty in estimates
  - e.g. no data was found on grazing size, types, & margins in the Lockyer
  - Unlike NSW, no gross margin data collected in Queensland at the region/catchment scale
  - ABARE data too coarse

BMP/Water quality modelling

- Dependent on interaction between:
  - Data availability
  - Spatial resolution (farm, reach, subcatchment, catchment)
  - Model capability
  - e.g. MUSIC v. E2
  - In this case: Lockyer EMSS developed by WBM on behalf of MBWCP

BMP modelling

- BMP selected:
  - 30m wide riparian revegetation incl. fencing for grazing & rural residential
  - Little quantitative data to justify modelling of other potential BMPs

- Using EMSS:
  - Riparian buffer treatment model & parameterisation (Hairsine 2001)
  - Revegetated stream length is a function of total catchment stream length, land use areas within the subcatchment and respective model farm area
  - proportional representation based on km stream length/ha land use in that subcatchment

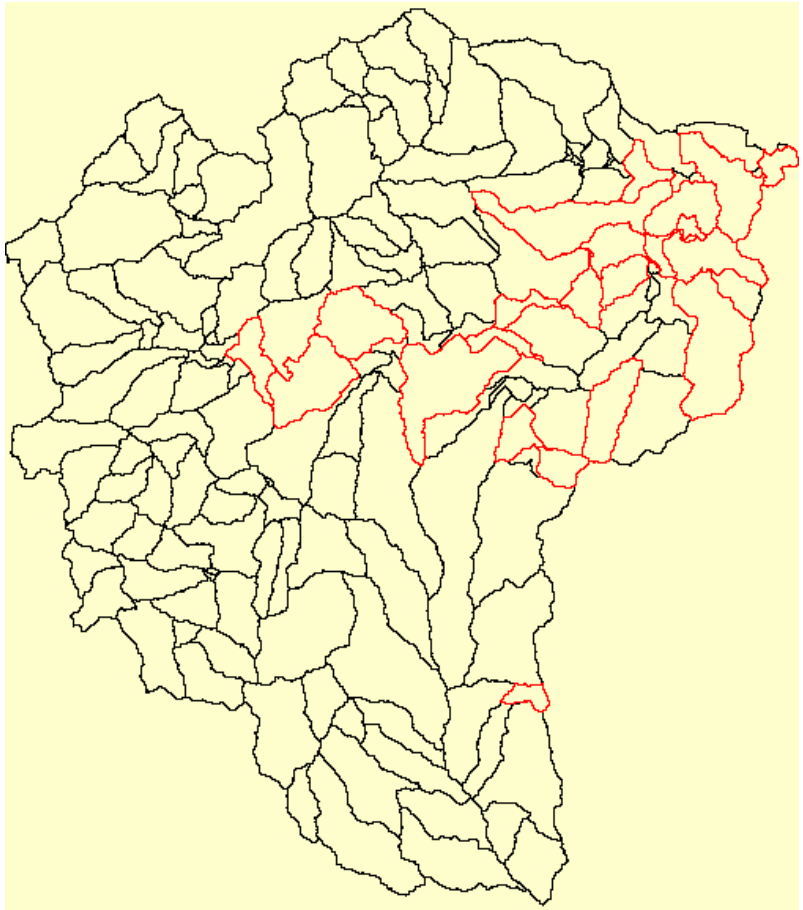
Biophysical Modelling Issues

- Relationship between a nominal 30m riparian buffer and how EMSS represents riparian buffer is unclear i.e. no relationship between width and efficacy, efficacy a function of loading rates

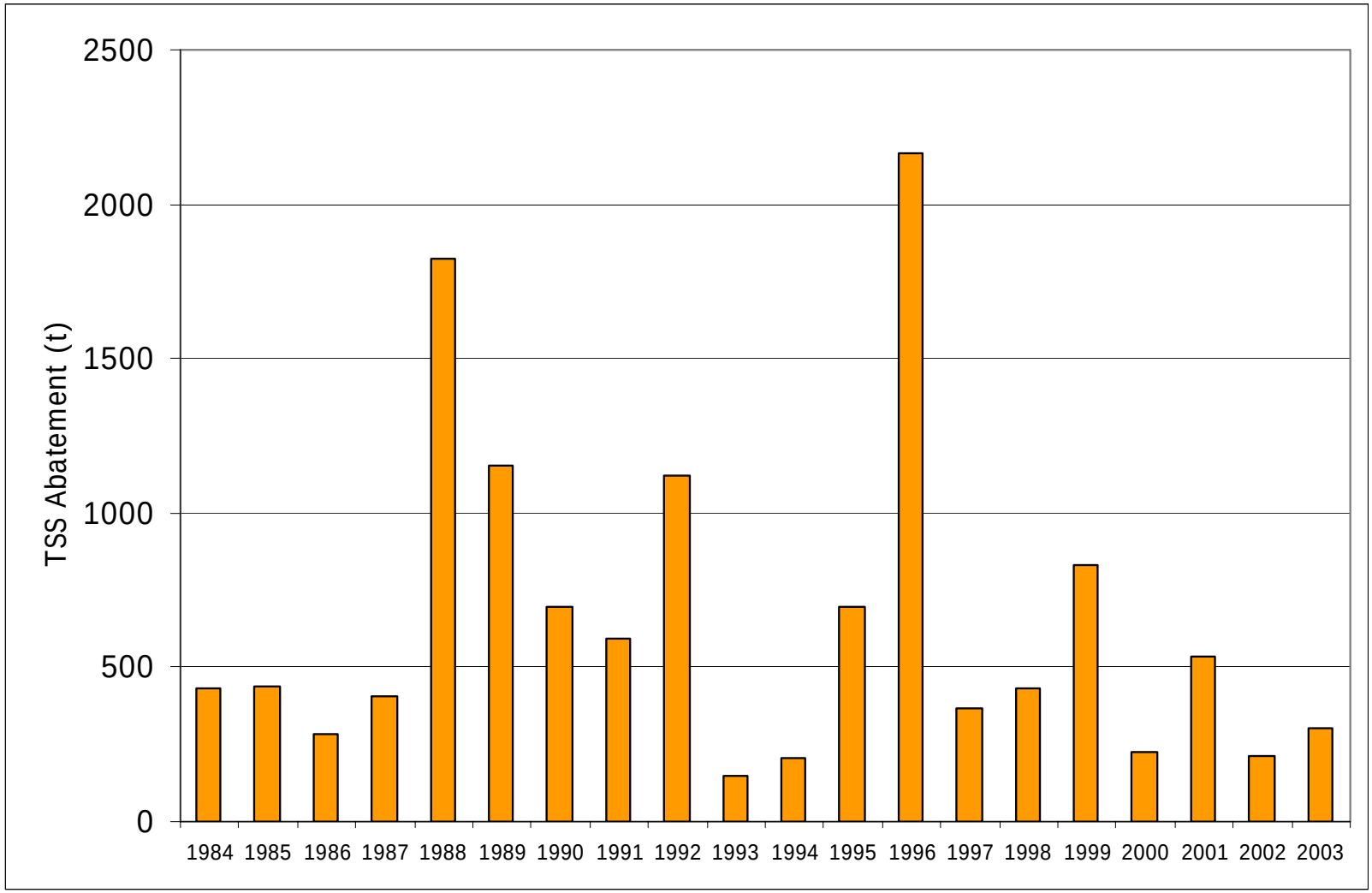
- Role of stream sediment budgets unclear
  - Storage?
  - Importance?

Modelling Outputs

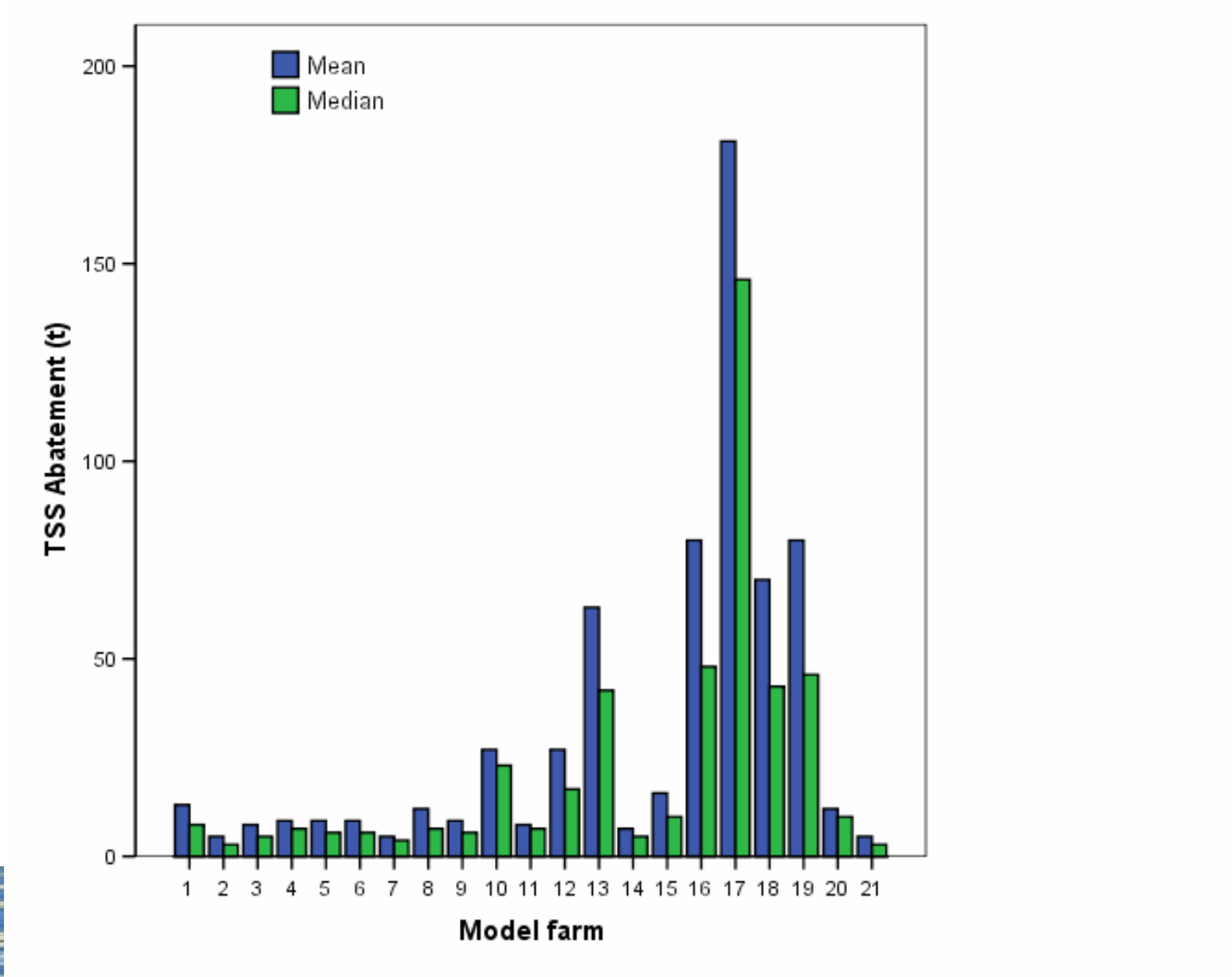
- 40 subcatchments with highest mean pollutant export rates over 20 yr modelled period (1984-2003)
  - Filtered by min. subcatchment size
  - Filtered by land use and model enterprises



MODELLING OUTPUTS: High inter-annual variability in total abatement – all farms, all years (& therefore CE as $/t)



MODELLING OUTPUTS: Inter-farm heterogeneity between average/median abatement performance



Data & Biophysical Modelling Summary

- From the data:
  - Horticulture (15 firms)
  - Grazing (2 firms)
  - Rural residential (2 firms)
  - Revegetation BMP

- EMSS:
  - Baseline pollutant export – 'status quo'
  - Pollutant export with BMP – BMP modelling of riparian revegetation

- Outputs for each farm & subcatchment :
  - Total abatement per farm (t & t/yr)
  - Abatement (t/ha/yr)

- Combined with data on farm financials :
  - Cost of revegetation ($/ha, $/km)
  - Opportunity cost of abatement ($)
  - Abatement costs per farm ($/t, $/t/ha, $/t/ha/yr)

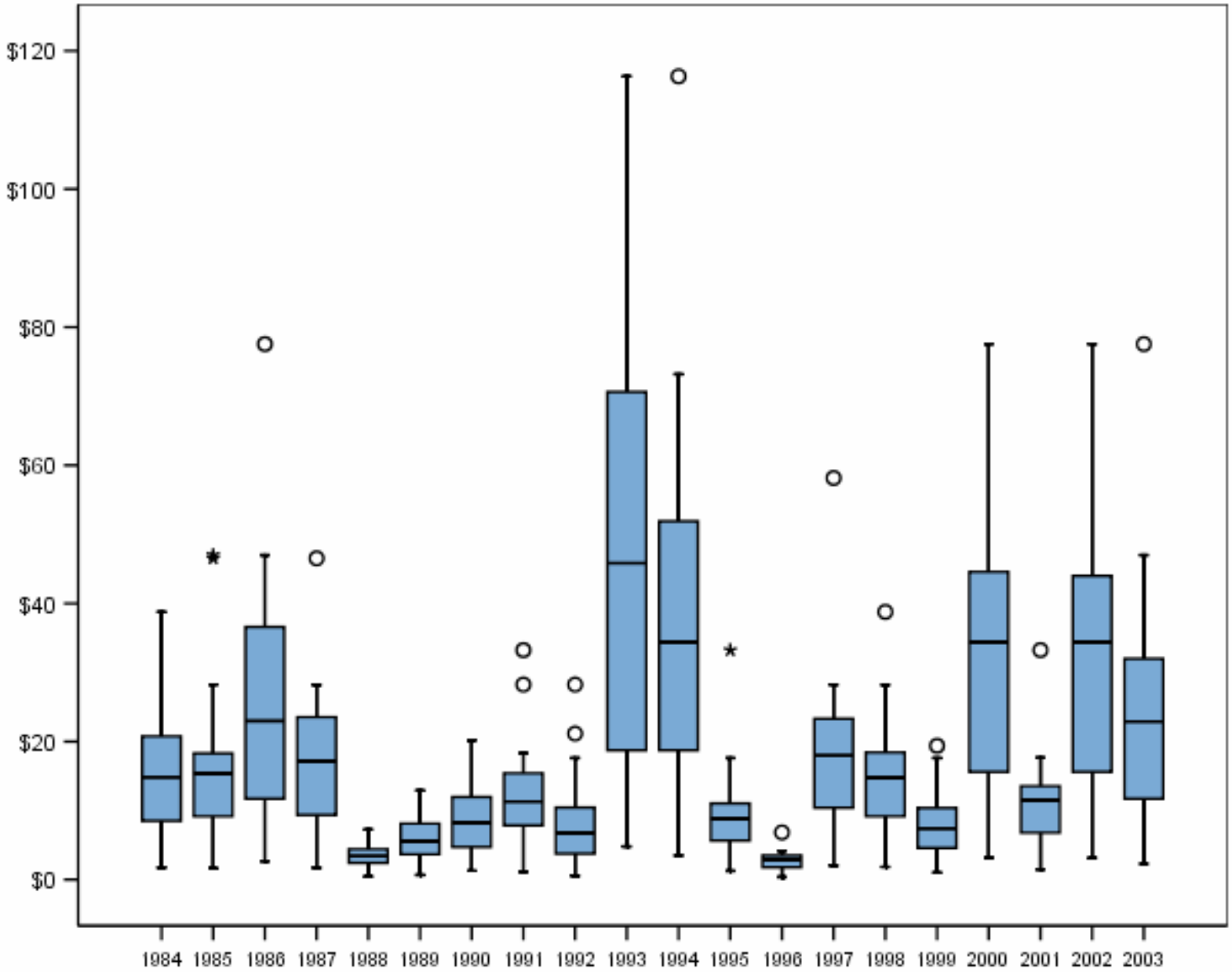
Data & Biophysical Modelling

Questions?

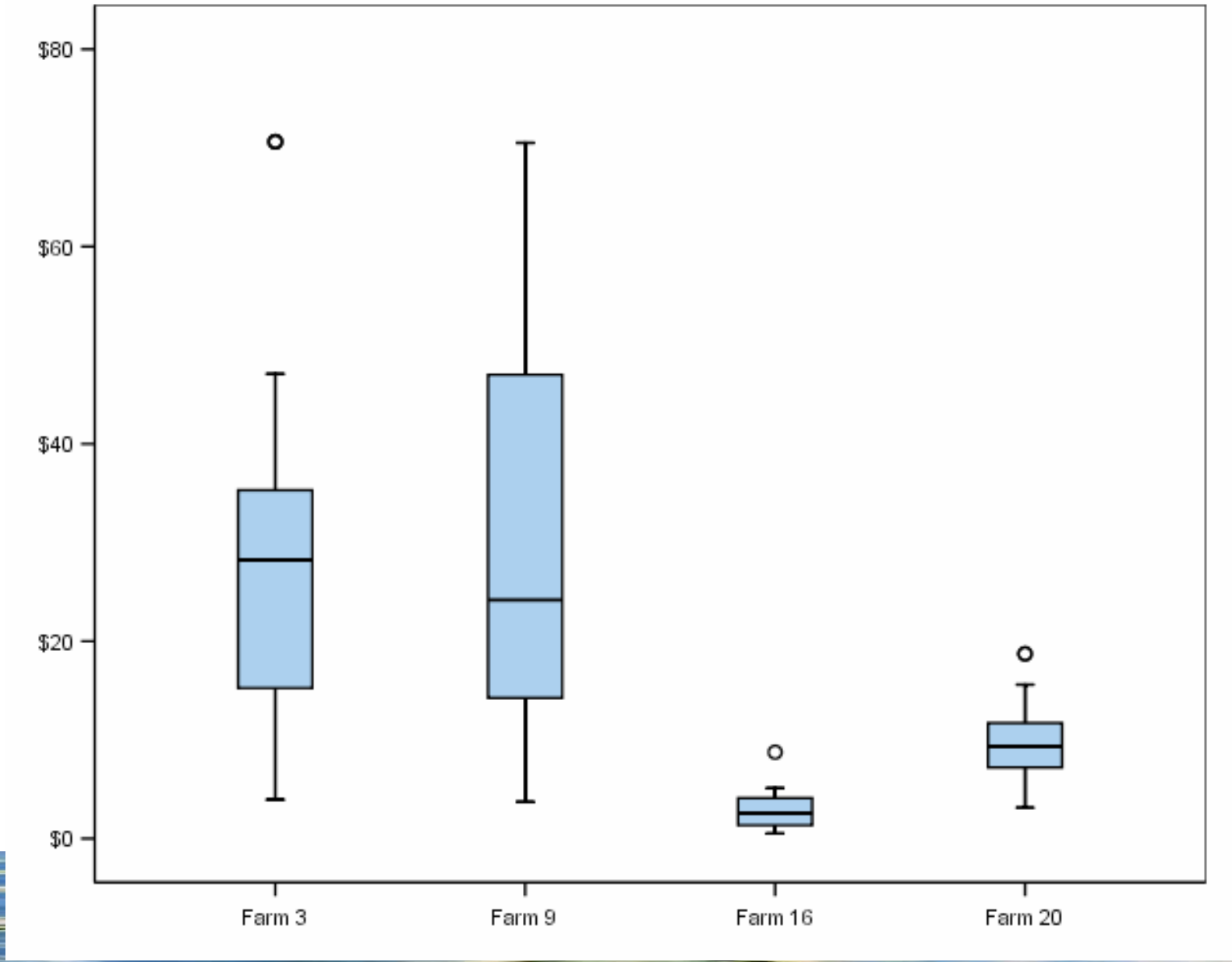
Economic modelling

- From the outputs of the data collection and biophysical models – economic modelling of actions versus outcomes
- Issues examined today:
  - Variability in cost-effectiveness of abatement
  - Stochastic versus fixed measures of abatement performance
  - Derivation of outcome (TSS abatement) versus action-based (km revegetation) supply curves

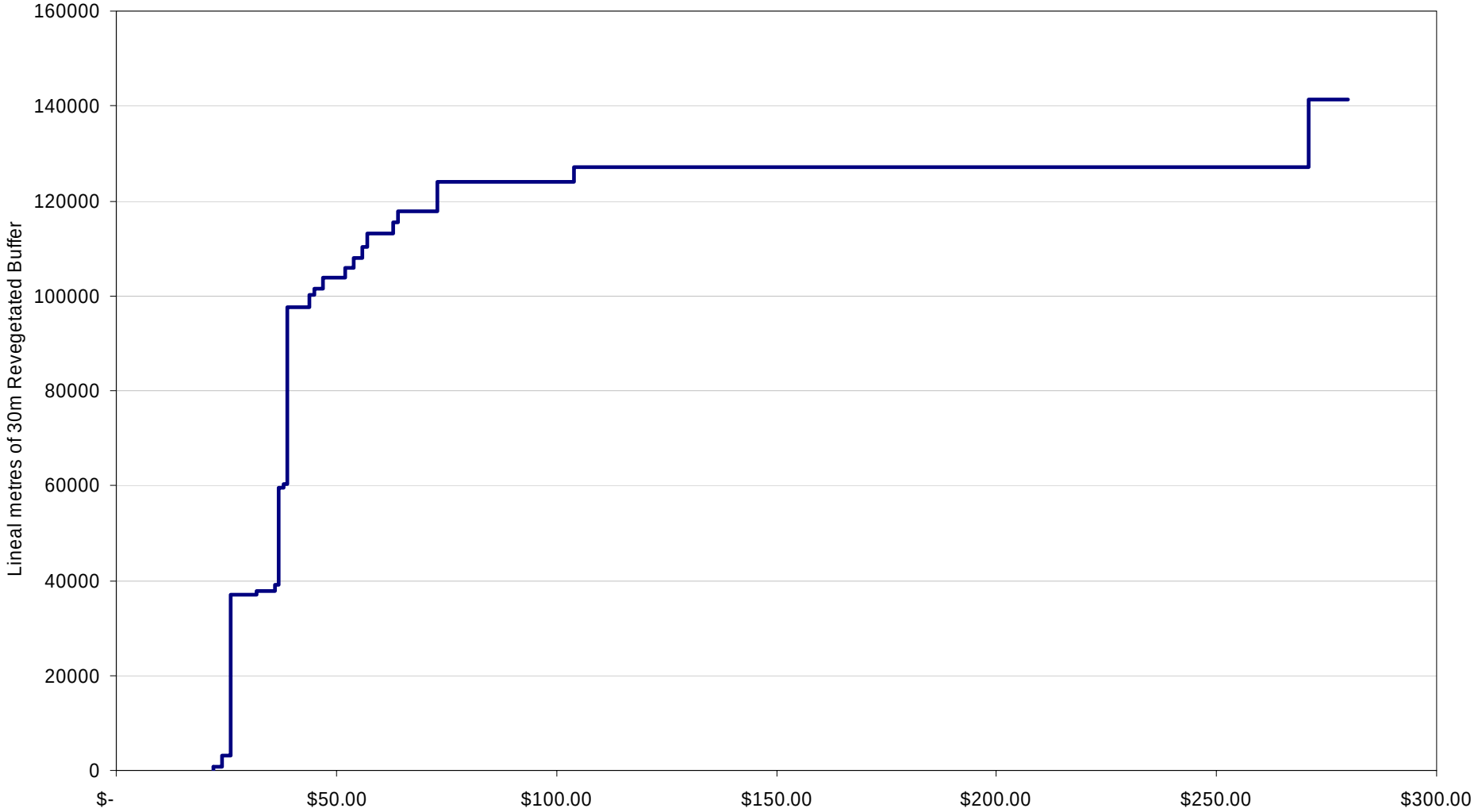
Inter-annual variability in abatement costs – All farms ($/kg)



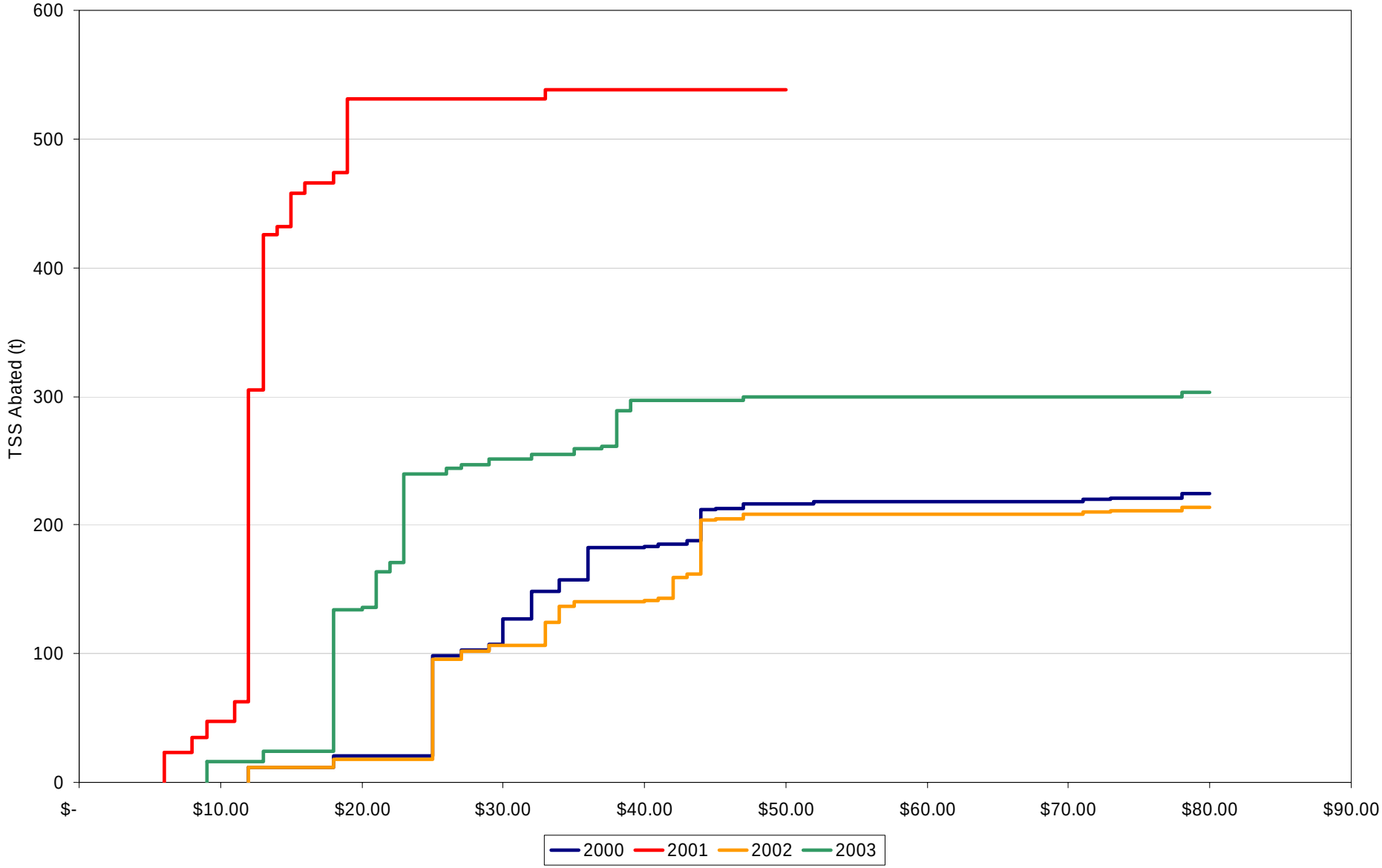
Abatement cost heterogeneity – Selected farms, all years ($/kg)



ACTION-BASED TARGET: Supply for revegetation ($/m) – All farms, all years



OUTCOME-BASED TARGET: Stochastic (static) supply of TSS abatement – All farms, 2000-2003



Possible Modelling & Experiments

- MBIs:
  - Quantity or Price-based instruments
  - Small group contracts for abatement, offsets, cap-&-trade, tenders

- Design factors:
  - Outcome-based targets or management-practice based targets (already part of the study)
  - Temporal issues – e.g. Time lags between runoff events, trading and damages/targets being achieved, permit banking
  - Spatial issues – e.g. trading ratios/equivalence, coordination
  - Environmental stochasticity- the effect of stochastic abatement uncertainty versus fixed/standardised abatement performance
  - Permit allocation

Your ideas!