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New Zealand Agricultural and Resource Economics Society (Inc.)

THE IMPACT OF MANAGEMENT CHANGES DESIGNED TO REDUCE DISCHARGES TO WATER ON FARM PROFITABILITY AND ENVIRONMENTAL OUTCOMES

Stuart Ford
The AgriBusiness Group

Paper presented at the 2007 NZARES Workshop, Wellington, New Zealand. August 23, 2007.

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Presentation to NZARES Workshop
23 August 2007

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Context

- **MAFPolicy funded research as contribution to Primary Sector Partnership Group of SWPoA.**
  - **Range of possible management practice changes are possible to reduce diffuse discharges to water and increase efficiency of water use under irrigation.**
  - **Sub-optimal outcomes are likely if targets (or other policies) are developed without understanding the cost-effectiveness of these practices.**
  - **Method needed to calculate cost-effectiveness.**
  - **Developed a project to explore what is the least cost way to achieve a particular reduction in discharges.**

Method

- **Science based linked modeling.**
  - Identified 20+ management practices.
  - Seven case study farms. (MAF farm monitoring)
  - Incorporate best science knowledge (AgR, NIWA, C&F, AquaLinc).
  - Modeling tools. (OVERSEER, LUCI, Udder, FarmMax, Financial Models).
  - Results
    - Discharges (N, P , Faecal micro organisms, Water Use)
    - Farm Financial Performance
    - Abatement cost / unit reduction.
    - Practice cost / effectiveness.

Method – Management Practices

- Nitrification inhibitors
- Optimised farm nutrient use
- Wintering pads
- Standoff pads
- Low / No Nitrogen input farming
- Wetlands
- Stream stock exclusion
- Stream vegetated strips
- Stream stock crossings
- Farming system intensity changes
- Land application of effluent
- Deferred effluent irrigation
- Low rate effluent application
- Advanced pond effluent systems
- Improved arable rotation.
- Nitrogen budgeting.
- Irrigation system audit and redesign
- Irrigation scheduling – low tech
- Irrigation scheduling – hi tech

Method – Case Study Farms

Case Study Farms – based on Farm Monitoring Models

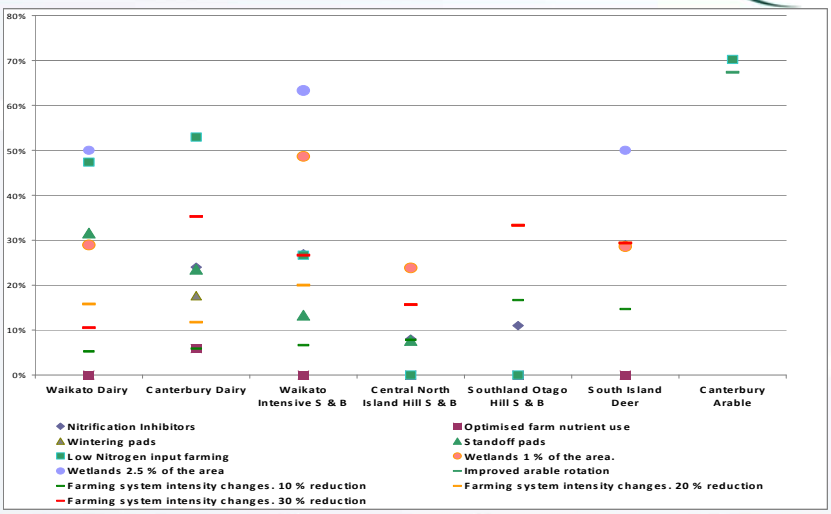
- Waikato Dairy
- Canterbury Dairy
- Waikato Intensive Sheep and Beef
- Central North Island Hill Country Sheep and Beef
- Southland / Otago Hill Country Sheep and Beef
- South Island Deer
- Canterbury Arable

Method – Case Study Farms

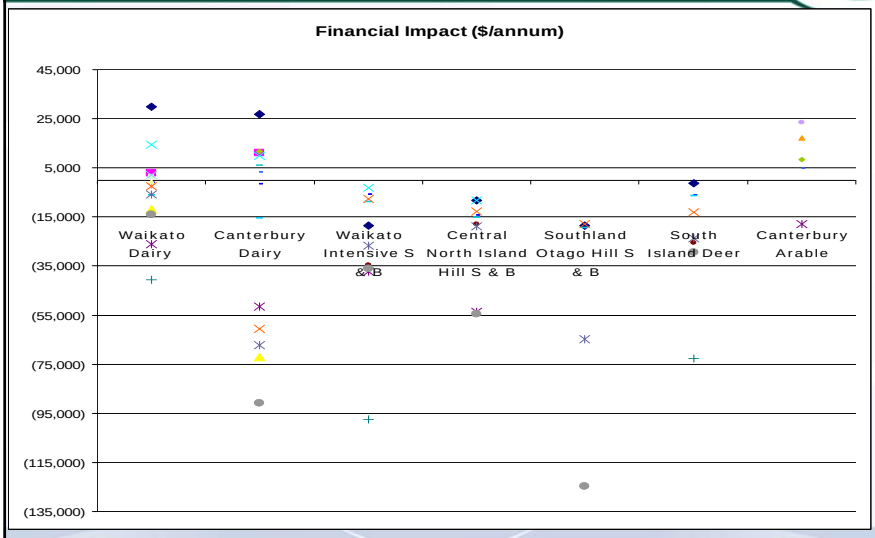
Farm Business Impacts on:

- Productivity
- Level of inputs
- Operating costs
- Capital structure
- Debt servicing costs
- Profitability
- Resilience

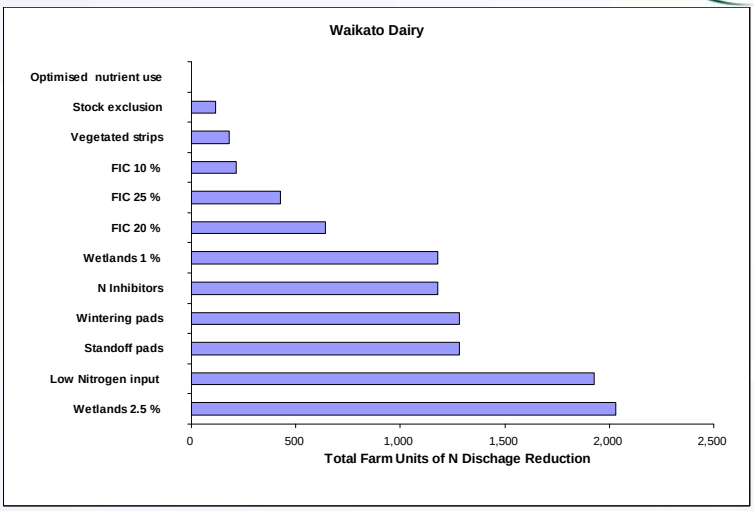
Results – Reduction in whole farm N discharges.%



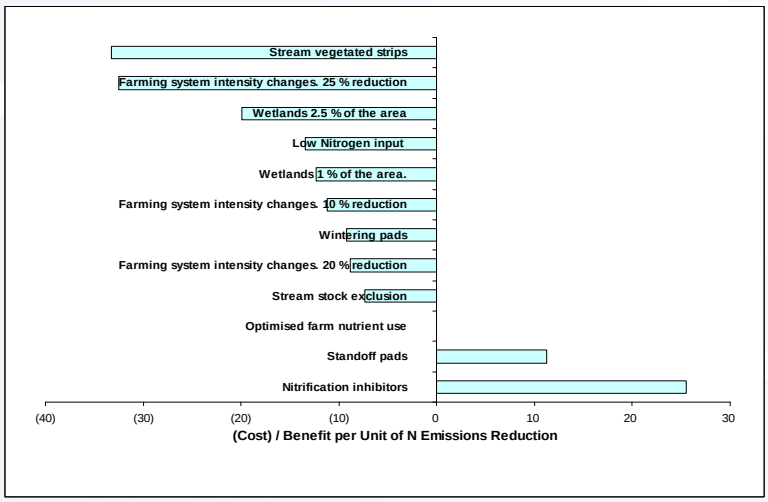
Results – Financial Impact



Results – Reduction in discharge units



Results – Abatement cost / unit reduction



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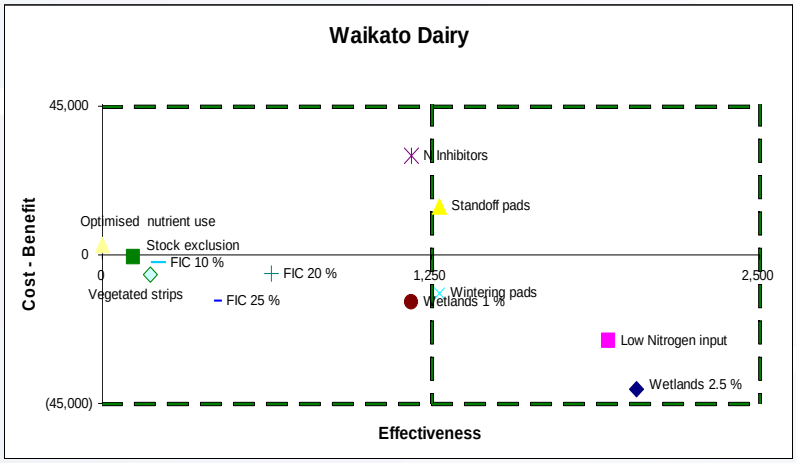

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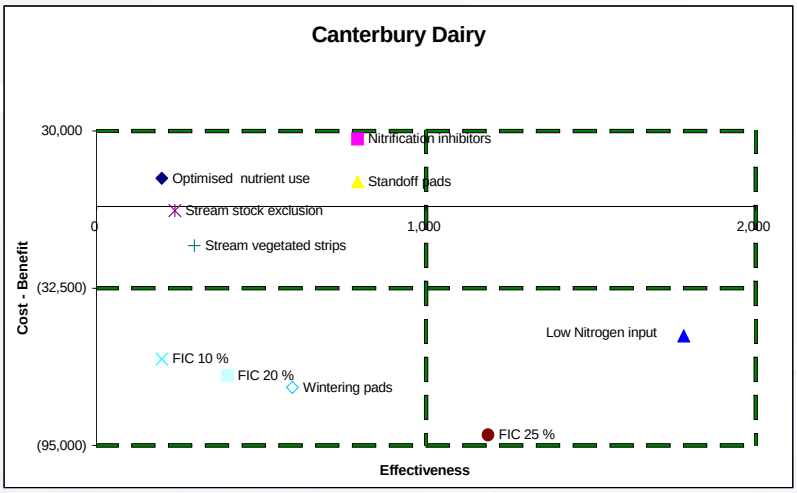

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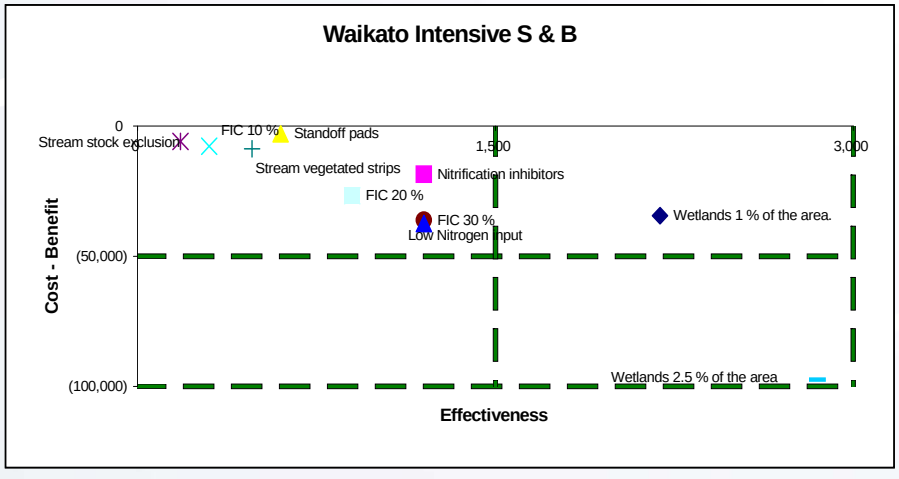

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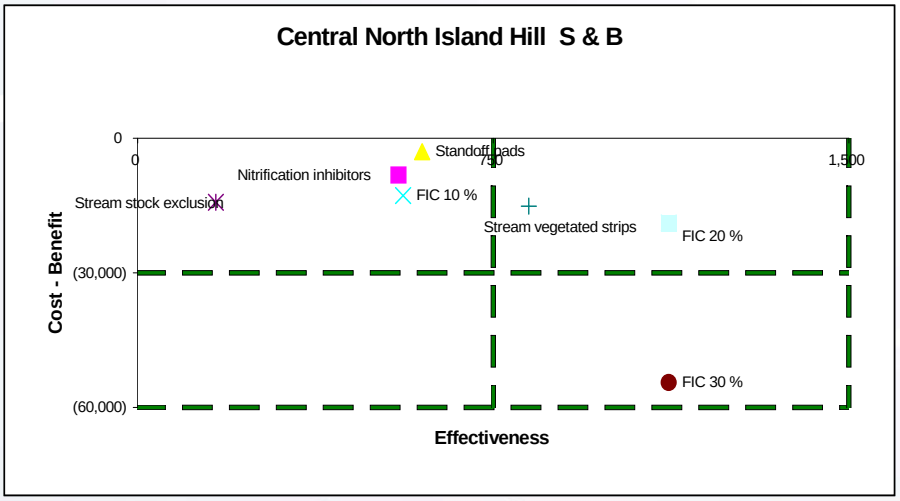

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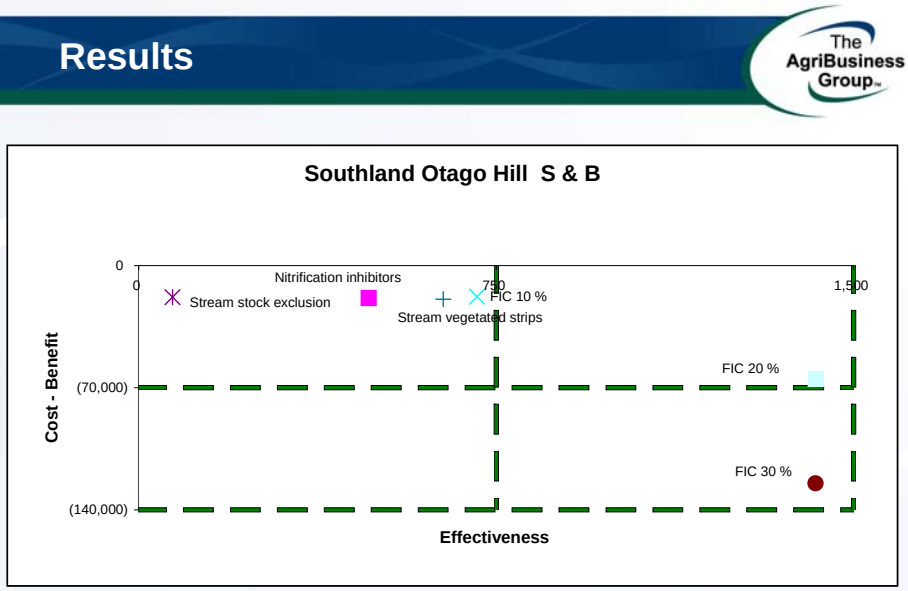

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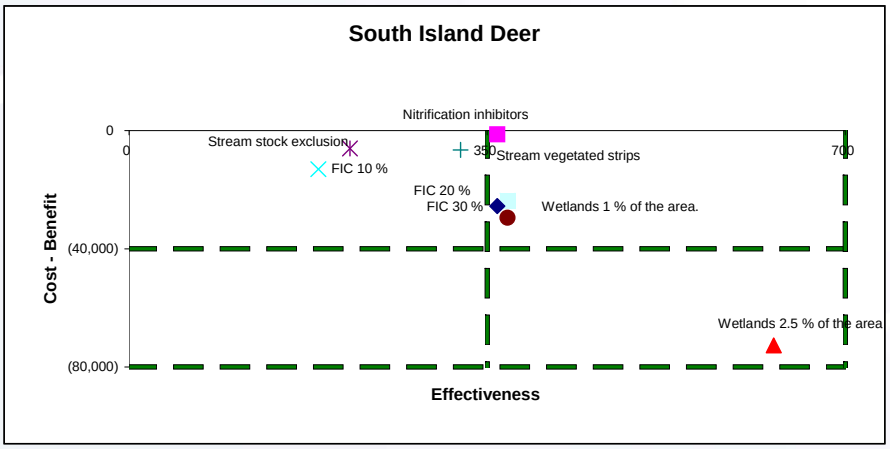

Conclusions

- All practices can reduce discharges to a varying degree.
- Not many are win: win environmentally and financially.
- Cost effective solutions vary depending on:
  - Farm type
  - Intensity
  - Characteristics – location, soils, slope etc.
  - Productivity and product prices.

Conclusions – Key Messages

- Method can be used to inform decision making at policy and farm level.
- No “one size fits all solution to discharges.”
- Need to research more cost effective and operationally efficient responses.
- Most effective options often require significant capital expenditure.
- Need to consider profitability / affordability as well as operational issues such as ease of implementation etc.
- Some practices have already been targeted by industries as preferred responses and are widely adopted.

Conclusions – Further Work

- Expand scope of case study farm types.
- Test sensitivity to science assumptions and profitability variability.
- Look at potential for combined use of practices.
- Other discharges, co benefits. (sediment, bugs).
- GHG emissions.