The Lincoln Trade and Environment Model

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LTEM : Research and end users

- Estimating impact of changes in EU agricultural and environmental policy on NZ (ARGOS)
- Identifying value to NZ of preferential access to markets (MFAT)
- Identifying the impacts of WTO proposals and EU reform
- Risks and benefits of GM production (ERMA MFE Treasury)
- Risks and benefits of organic and IPM systems of production (ARGOS)
- China NZ FTA (MFAT)
- Precision agriculture (MAF)
- Irrigation expansion (MAF)

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Background to the trade model

- Unique agricultural trade model which links trade through to production system and the environmental consequences
- 19 countries, 22 commodities
- Includes GHG, energy and groundwater, for New Zealand, Australia, EU and US
- Segments markets by type of production (eg; Organic versus conventional)
- Simulate impacts of changes in trade policy and environmental policy (eg. Kyoto Protocol)

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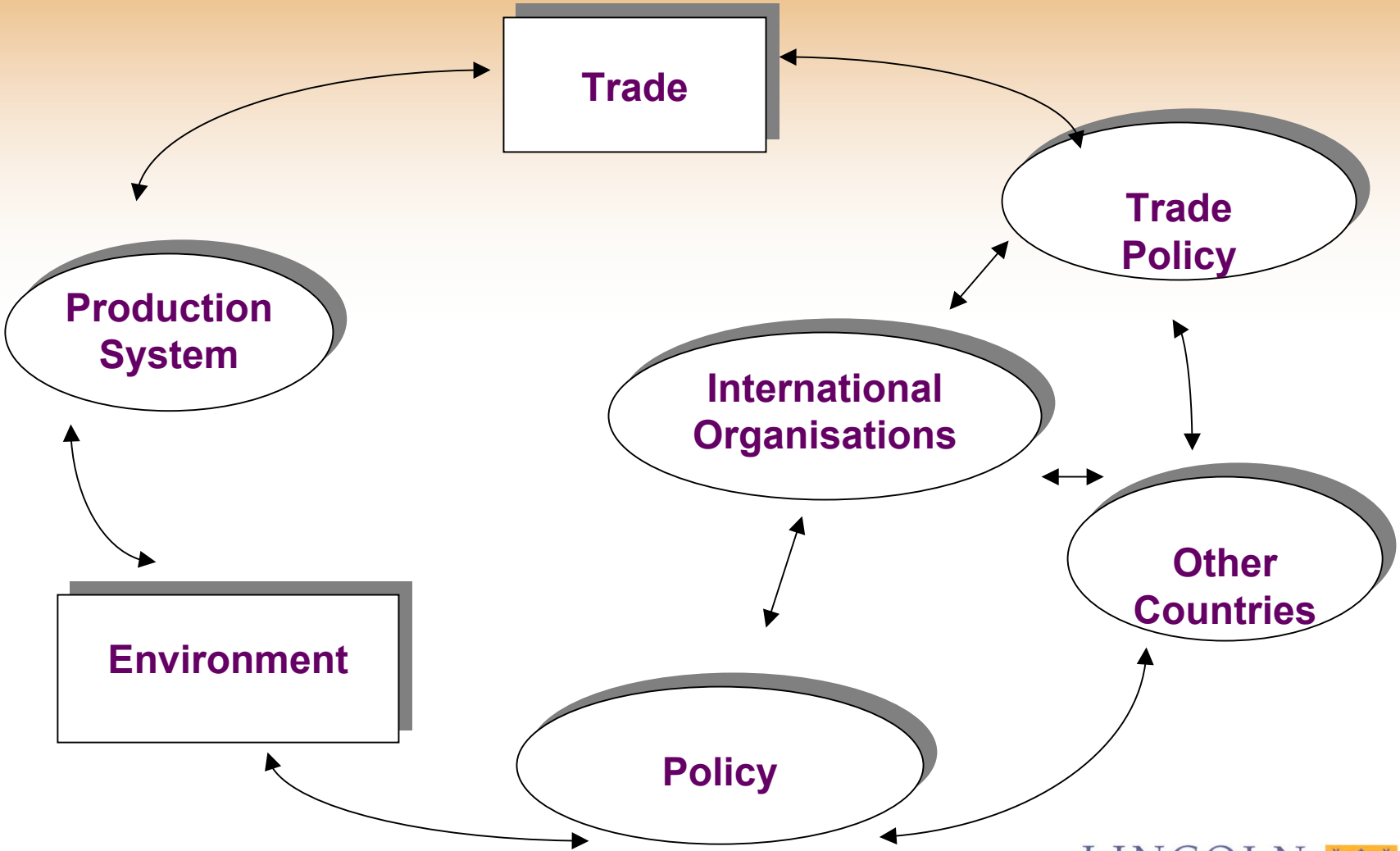
Stylised Description of Trade Model



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Overview of the GHG Research

- Using an agricultural trade model and extending it to include methane and nitrous oxide emissions
- Evaluating the effect of various scenarios related to climate change policy on agricultural production, returns and trade, as well as GHG emissions

Energy Modelling

- Impacts of biofuels policies
  - demand shocks
  - Price and production impacts
- Energy Use
  - GHG emissions
  - production costs

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General Equation Structure

- **Adding Greenhouse Gases to the LTEM:**
- **Qs = f(Price, $P_{SUBSTITUTES\ AND\ COMPLEMENTARY\ COMMODITIES}$, P_{INPUTS}, $N_{UMBER\ OF}$ A_{NIMALS})**
- **N = f(Relative prices of Nitrogen and Concentrates)**
- **NA = f(Relative prices of N and Concentrates, relative producer prices)**
- **GHG = 21(αNA) +310(βN, θNA)**

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Example of model simulation

- Mitigation strategy for GHG emissions:
- 2 scenarios:

  1. EU reduces stocking rate and N fertiliser application

  NZ systems remain the same

  2. NZ and EU both reduce stocking rate and N fertiliser application

  (The EU is a major trading partner for NZ, and the agricultural sector in NZ is sensitive to EU changes)
- These results are compared with the base scenario in 2010

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Raw Milk producer returns (Percentage change from base in 2010)

	EU	NZ
EU changes		
Stocking rate and N	-10.0	2.2
EU and NZ changes		
stocking rate and N	-9.7	-30.7

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Percentage changes in GHG emissions from base scenario

	EU	NZ	
	2 & 3	**2**	**3**
Region A	-34.2	0.85	-31.2
Region B	-0.89	0.91	-11.8
Region C	-61.7	0.87	-19.1
Total	-34.7	0.87	-21.9

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Impact of trade policy change

- Livestock sector
- Base scenario – effect of current policies in 2010
- EU liberalisation scenario – effect in 2010 of removal of support to agriculture
- As expected, price in EU falls, world price rises and New Zealand price rises

Implications for NZ agriculture

- EU liberalisation predicted to result in increased price and production levels for NZ
- Corresponding increase in greenhouse gas emissions from agriculture
- Further mitigation required in NZ
- NZ penalised twice??

Outcomes

- strengthen the ability of negotiators to obtain market access
- inform policy makers and negotiators of the impacts of NZ and other environmental policy, on NZ returns from agriculture
- encourage adoption of environmental criteria to increase market access
- enable exporters to evaluate their comparative advantage as well as the likely effects of environmental trade barriers
- assess market potential of novel products to maximize returns to NZ
- enhance the returns from science research through the unique links in the LTEM between biophysical science and social science

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Further developments in the model

- Expansion into forestry
- Expand environmental variables in the model to include biodiversity
- Sensitivity analysis
- Modelling impact of changes in emerging countries to add to the China work

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