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New Zealand Agricultural &
Resource Economics Society (Inc.)

Impacts of changes in China and India on New Zealand trade and greenhouse gas emissions

**Meike Guenther, Caroline Saunders & Peter
Tait**

AERU, Lincoln University, N.Z.

Paper presented at the 2014 NZARES Conference
Tahuna Conference Centre, Nelson, New Zealand. August 28-29, 2014

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Saunders & Peter Tait



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Outline of presentation

1. Overview of the problem
2. Literature review
3. Method & model
4. Scenarios
5. Results
6. Conclusion
7. Future research



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Increasing food consumption, changes in dietary patterns & GHG emissions

- Global increase in food consumption.
- Changes in dietary patterns away from staples towards more livestock products, esp. in India & China.
- Livestock sector generates 18% of global GHG emissions (mainly ruminants).



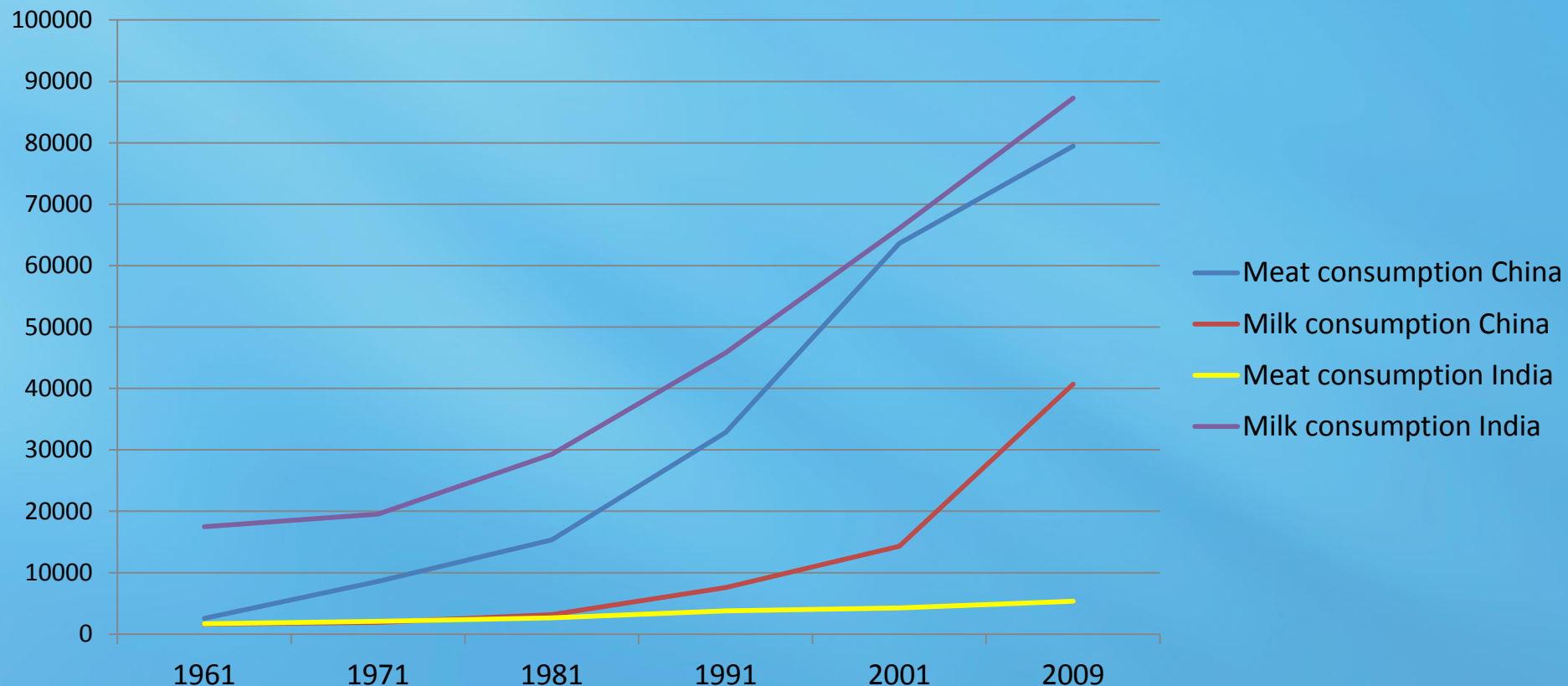
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Increase of milk & meat consumption in China & India, 1961 - 2009

Kilo tonnes



Source: FAOSTAT (2012)



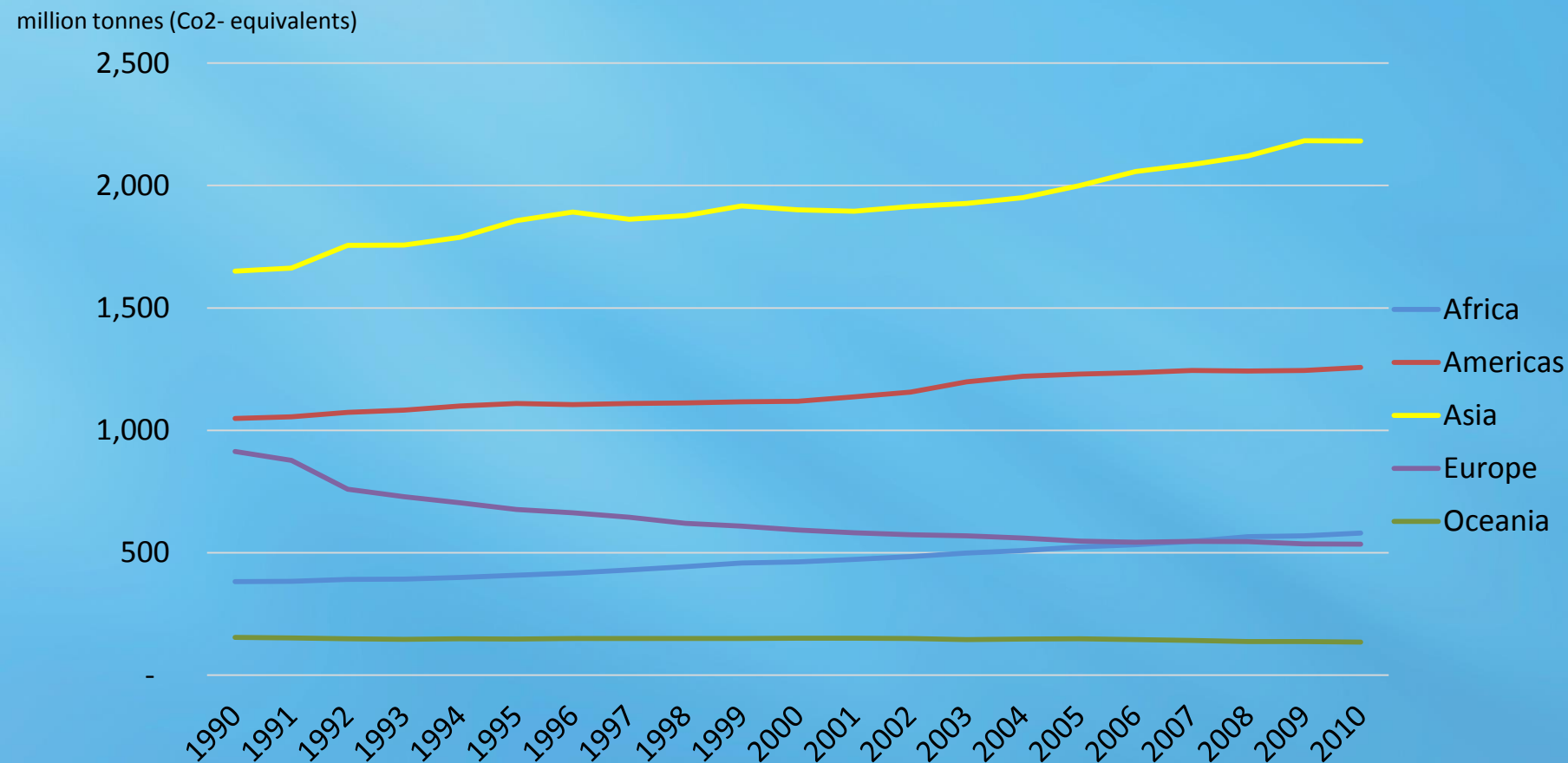
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Agricultural GHG emissions by region in million tonnes, 1990 – 2010



Source: FAOSTAT (2013).



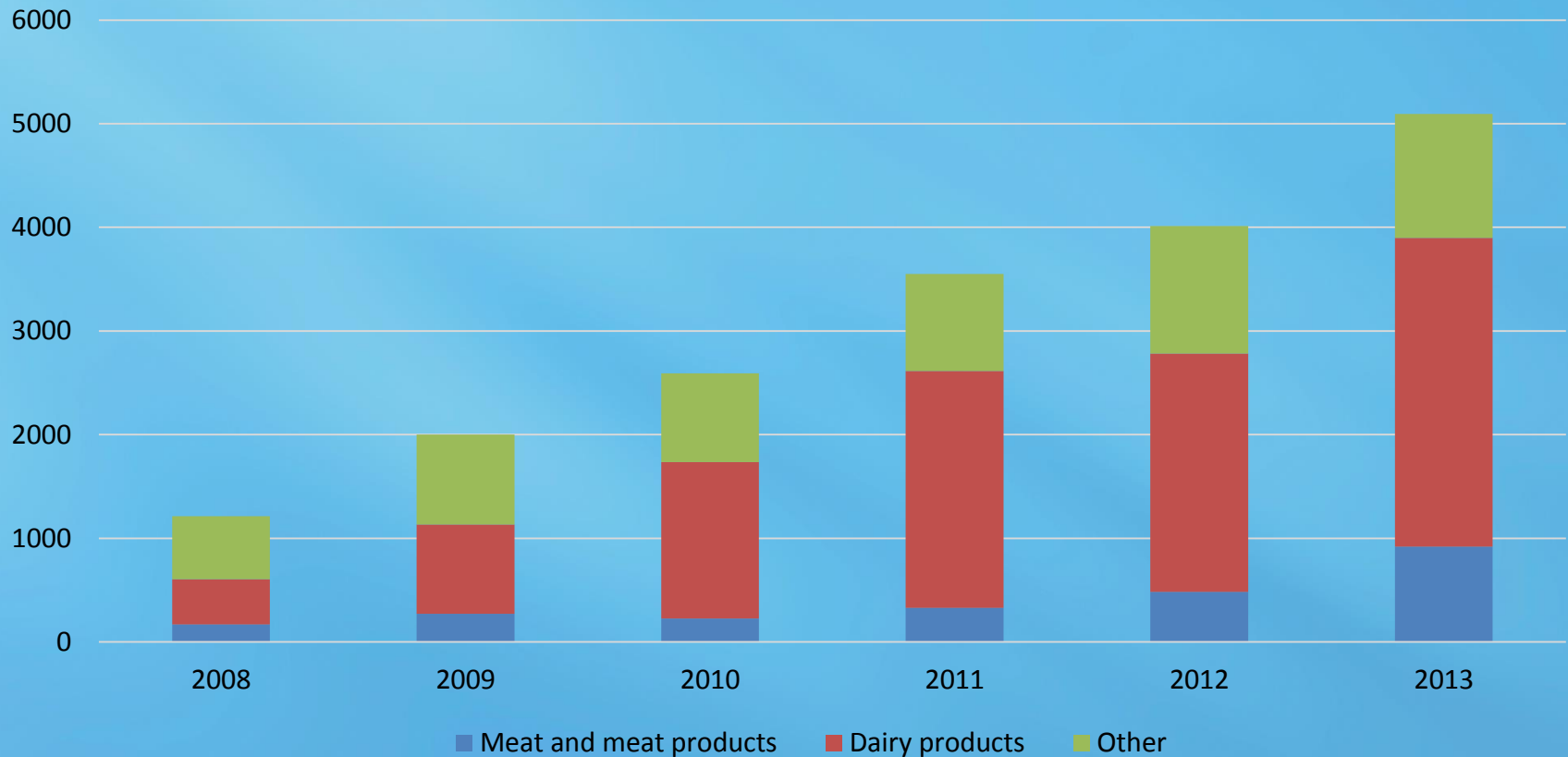
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NZ agricultural exports to China

\$m FOB



Source: Statistics NZ (2010;2013)



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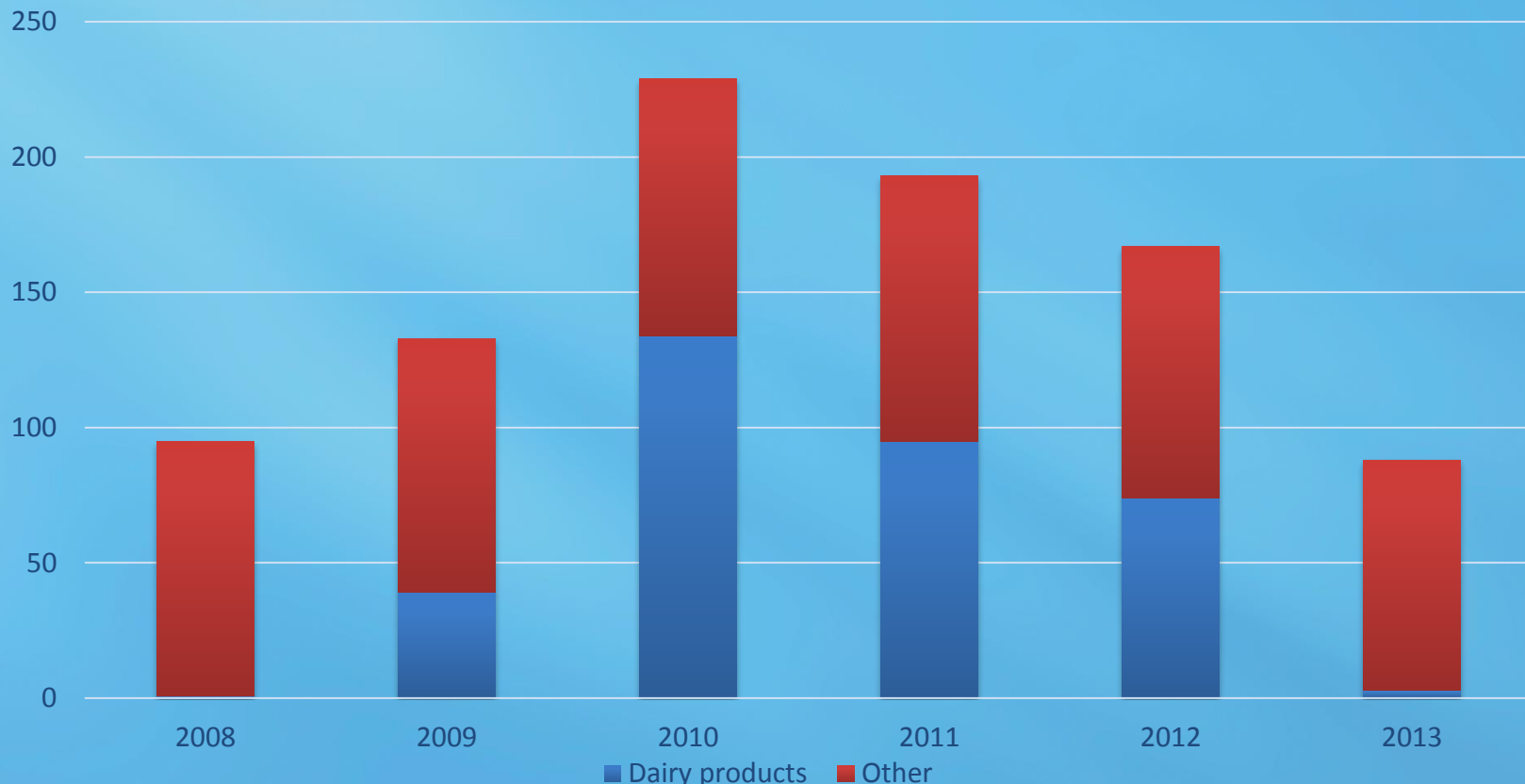
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Agricultural trade policy in China & India

- China's WTO accession in 2001
- NZ – China Free Trade Agreement (FTA) (2008)
- Tariffs on meat and dairy commodities will be completely eliminated in 2016 and 2019.
- India founding member of GATT (1947).
- In 2010, India started negotiations towards a FTA with New Zealand (9th Round in July 2013).
- Strategy to become core trade partner for NZ by 2015.



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Literature review – Methods

- ***Econometric analysis of supply and demand*** (Rae, 1998; Rae et al., 2006, Wang et al., 2005; Dong & Fuller, 2007).
- ***Total Factor Productivity*** growth in agricultural production (Nin et al, 2003; Ludena et al., 2007; Rae et al., 2005; Rae & Hertel, 2000).
- ***Trade modelling*** – Partial Equilibrium (PE) & General Equilibrium (GE) framework (Wang et al., 2008; Anderson & Strutt, 2012).
- ***Trade and Environment modelling*** using extended trade models (Schmitz et al, 2012; Saunders & Saunders, 2011; Verburg et al, 2009; Saunders et al., 2006; Catagay & Saunders, 2003).



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Literature Review – Results

- Projections showed increase in meat and dairy consumption in China and India will continue to 2040 (Delgado et al., 1999; Anderson & Strutt, 2012).
- Projected increase in meat consumption in China and India was greater than projected increase in meat production in both countries (Delgado, 1999).
- Under trade liberalisation GHG emissions were projected to increase, esp. in Asia (Schmitz et al, 2012).
- Saunders et al. (2006) projected an increase of GHG emissions in NZ from freer trade of dairy products.



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Lincoln Trade and Environment Model (LTEM) characteristics

- Non-spatial, partial equilibrium international trade model
- Focus on the agricultural sector and incorporates an environmental sub-module.
- Data from FAO, OECD, WTO and IPCC
- Base year 2008, projections to 2020
- Model includes:
 - 21 countries or regions (incl. ROW)
 - 22 commodities (incl. five for dairy, four for meat, three for oilseed complex)
- Results show prices, quantities, net trade and GHG emissions.



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Scenarios

| Scenario | Type |
|----------|---|
| BL | Baseline |
| 1. | Increase of meat and dairy consumption and production in India and China (Rosegrant et al., 2001) |
| 2. | Change of meat and dairy consumption and production in India and China (OECD FAO Agricultural Outlook 2013) |
| 4. | Full trade liberalisation in China in 2008 |
| 5. | Full trade liberalisation in India in 2008 |



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Results

- China, India and New Zealand
- Percentage changes from baseline to scenario in 2020
 1. Producer returns for two meat and four dairy commodities
 2. GHG emissions (in CO₂-equivalents) for dairy, sheep and beef



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China – Effects on producer returns

% changes to baseline in 2020

| | Beef | Sheep meat | Butter | Cheese | Whole Milk powder | Skim Milk Powder |
|-------------------------------|------|------------|--------|--------|-------------------|------------------|
| High growth rates (Rosegrant) | 82 | 20 | 70 | 89 | 69 | 107 |
| Mixed growth rates (OECD FAO) | -1 | -2 | 7 | 46 | 48 | 40 |
| Full Trade Lib China | -22 | -13 | -25 | -31 | -15 | -20 |
| Full Trade Lib India | 2 | 3 | 7 | 0 | 1 | 9 |

China – Effects on GHG emissions

% changes to baseline in 2020

| | Dairy | Beef | Sheep |
|------------------------------------|-------|------|-------|
| High growth rates (Rosegrant) | 21 | 79 | 12 |
| Mixed growth rates (OECD FAO) | 13 | -1 | -6 |
| Full trade liberalisation China | -7 | -10 | -4 |
| Full Trade liberalisation India | 0 | 1 | 1 |

India - Effects on producer returns

% changes to baseline in 2020

| | Beef | Sheep meat | Butter | Cheese | Whole Milk powder | Skim Milk Powder |
|-------------------------------|------|------------|--------|--------|-------------------|------------------|
| High growth rates (Rosegrant) | 32 | 50 | 55 | 70 | 54 | 86 |
| Mixed growth rates (OECD FAO) | 51 | 30 | 82 | 45 | 47 | 141 |
| Full Trade Lib China | 3 | 6 | 1 | 1 | 9 | 1 |
| Full Trade Lib India | -31 | -30 | -12 | -40 | -57 | -55 |

India - Effects on GHG emissions

% changes to baseline in 2020

| | Dairy | Beef | Sheep |
|------------------------------------|-------|------|-------|
| High growth rates (Rosegrant) | 23 | 30 | 40 |
| Mixed growth rates (OECD FAO) | 23 | 50 | 25 |
| Full trade liberalisation China | 0 | 1 | 2 |
| Full Trade liberalisation India | -6 | -12 | -11 |

NZ - Effects on producer returns

%changes to baseline in 2020

| | Beef | Sheep meat | Butter | Cheese | Whole Milk powder | Skim Milk Powder |
|-------------------------------|------|------------|--------|--------|-------------------|------------------|
| High growth rates (Rosegrant) | 1 | 15 | -9 | -2 | -9 | 1 |
| Mixed growth rates (OECD FAO) | 1 | 9 | -11 | 1 | 6 | 10 |
| Full Trade Lib China | 3 | 8 | 3 | 3 | 7 | 2 |
| Full Trade Lib India | 2 | 4 | 7 | 2 | 2 | 7 |

NZ - Effects on GHG emissions

% changes to baseline in 2020

| | Beef | Sheep | Dairy |
|------------------------------------|------|-------|-------|
| High growth rates (Rosegrant) | 0 | 8 | -3 |
| Mixed growth rates (OECD FAO) | 0 | 4 | 1 |
| Full trade liberalisation China | 1 | 4 | 2 |
| Full Trade liberalisation India | 1 | 2 | 2 |



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Conclusion

- Producer returns from dairy could decrease, particularly when India and China significantly increased meat and dairy consumption and production simultaneously.
- Although only small, increases in NZ GHG emissions from livestock could still be important if NZ were to set agricultural GHG emissions targets.
- If China opens up its economy to all other countries, NZ did not seem to be badly affected.
- India's full trade liberalisation could rise NZ producer returns and exports particularly for dairy commodities.



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Future research

- Update base year to 2012 (projections to 2024)
- Changes in Ireland (doubling milk supply)
- Removal of EU milk quota early 2015
- Full thesis available on
<http://hdl.handle.net/10182/6376>



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THANK YOU

for the NZARES postgraduate award which helped funding this research.



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