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

Meike Guenther, Caroline  
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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).



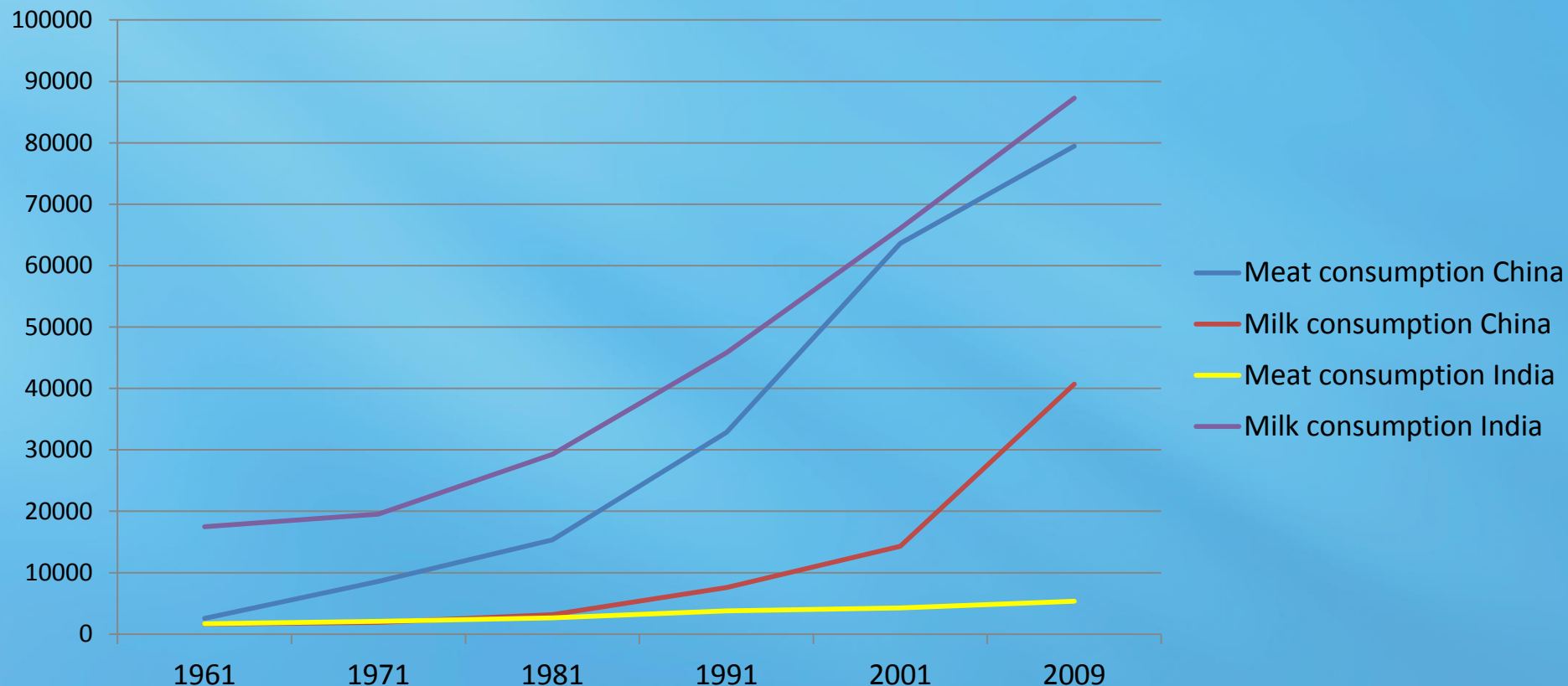
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# Increase of milk & meat consumption in China & India, 1961 - 2009

Kilo tonnes



Source: FAOSTAT (2012)



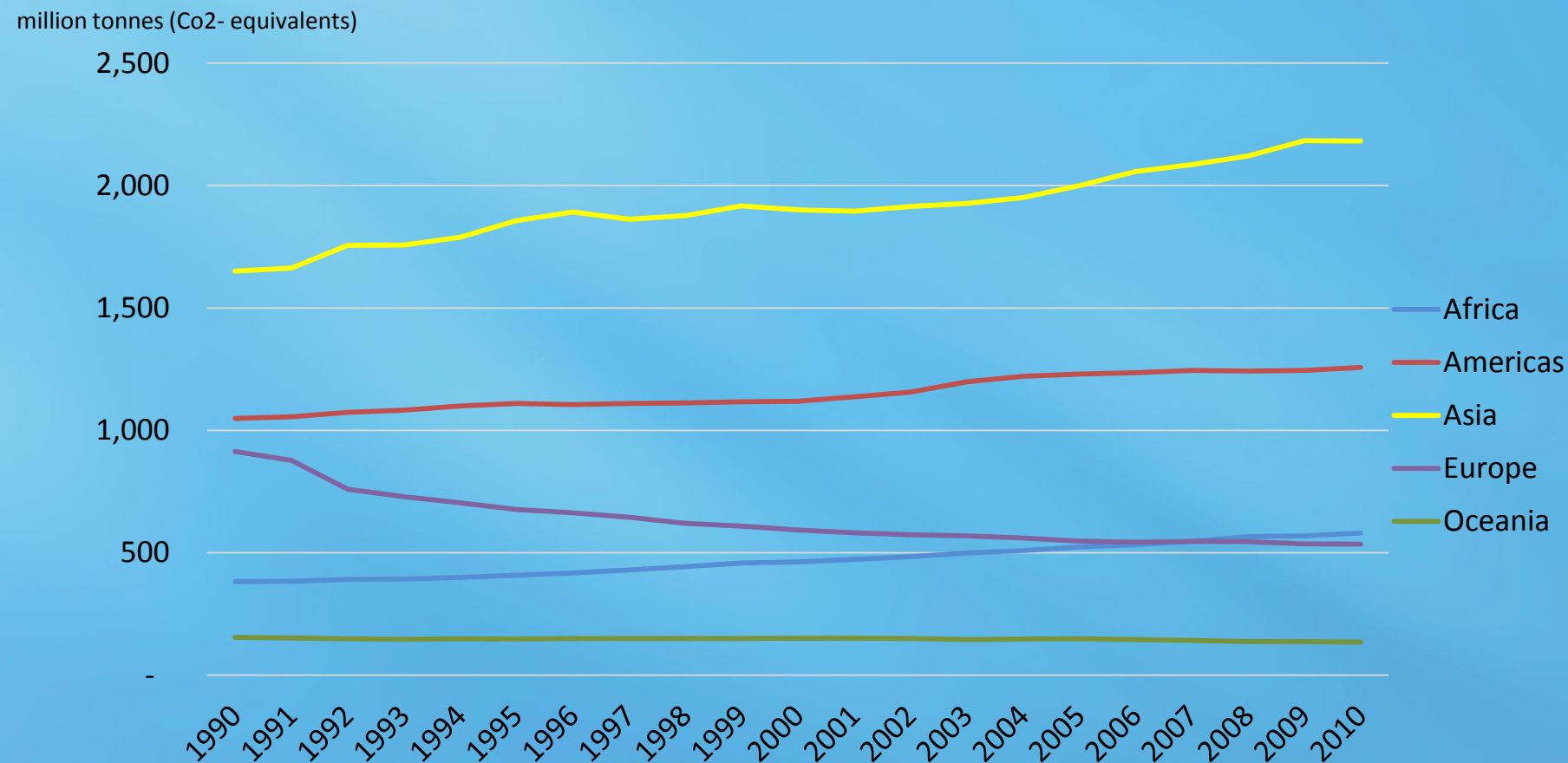
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# Agricultural GHG emissions by region in million tonnes, 1990 – 2010



Source: FAOSTAT (2013).



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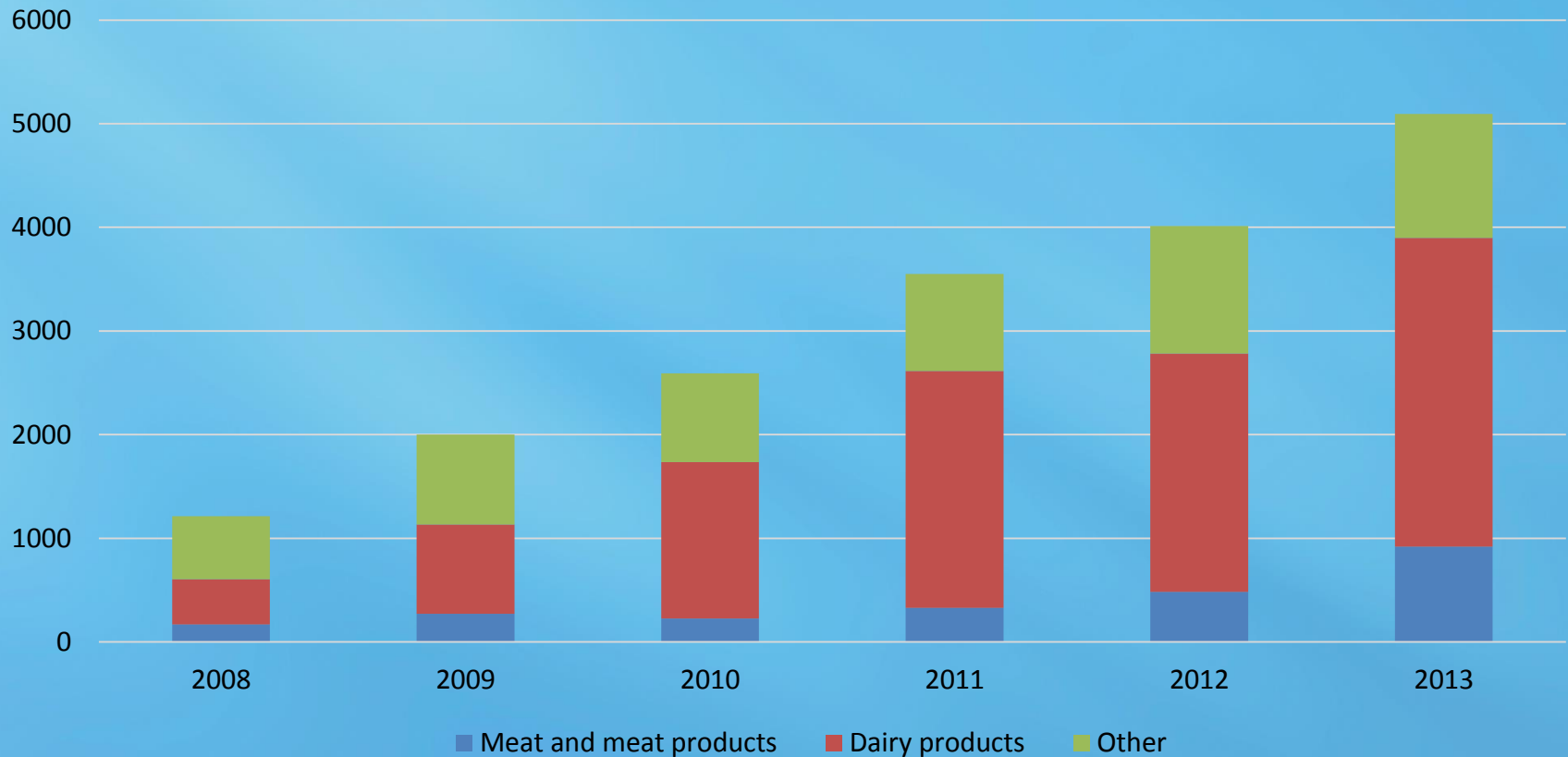
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# NZ agricultural exports to China

\$m FOB



Source: Statistics NZ (2010;2013)



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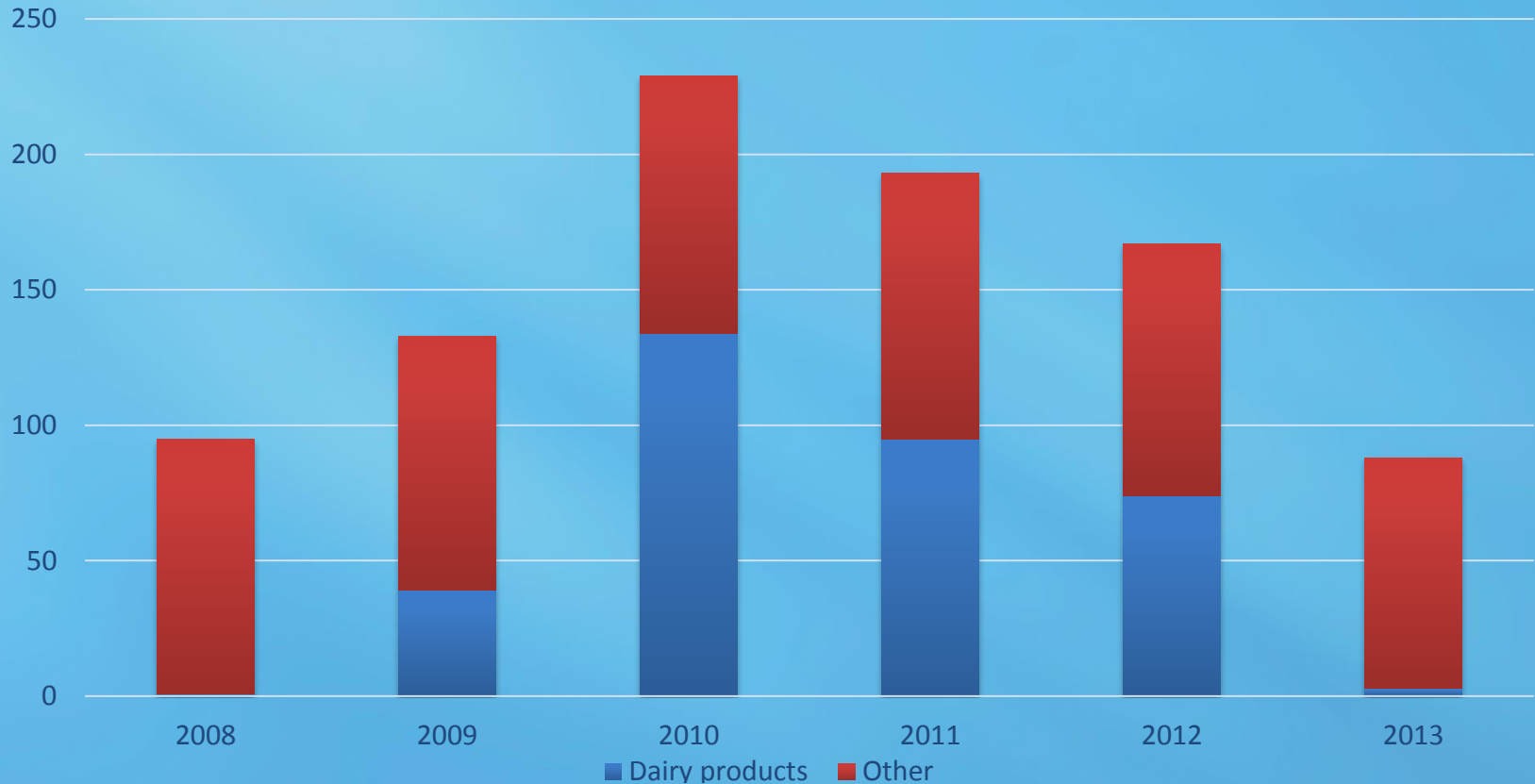
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# NZ agricultural exports to India

\$m FOB



Source: Statistics NZ (2010;2013)



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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 (9<sup>th</sup> 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 CO<sub>2</sub>-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 .....

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