

# Impacts of U.S. biofuel policies on international trade in meat and dairy products

*Domestic and Trade Impacts of U.S. Farm Policy: Future Directions and Challenges*

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# Outline

- Ethanol and the Renewable Fuels Standard
- Other modelling research
- Lincoln Trade and Environment Model
- Scenarios modelled
- Results – U.S. and world
- Discussion and conclusion



# Ethanol background

- Increased ethanol interest
  - Arab oil embargo
  - Greenhouse gas emissions
  - Improved corn-based ethanol technology
- U.S., State tax credits promote ethanol
- Energy Savings Act (2007) Renewable Fuels Standard (RFS): 15 billion gallons ethanol in 2015



# Potential impacts of RFS

- RFS increases demand for corn
- The U.S. provides about 60% of world corn exports
- Diverting U.S. corn to ethanol likely to increase food prices
- Largest impacts on crop and livestock sectors
- Food security concerns for poor



# Prior modelling research

- Swenson (2006) – regional input-output modelling review
  - Small impacts on counties' economies
  - Increased food prices
- Elobeid and Tokgoz (2006) – world partial equilibrium model
  - Ethanol market; U.S., Brazil, and ROW
  - U.S. policies raise corn prices 2.78% (2007)



# Lincoln Trade and Environment Model

- LTEM used to analyse RFS
- Non-spatial, partial equilibrium international trade model
  - Based on SWOPSIM, later VORSIM (Roningen)
- Synthetic model: parameters from literature
- Biofuels modelling comprised:
  - 18 countries or regions (incl. ROW)
  - 22 commodities (three for oilseed complex, five for dairy industry, four livestock, plus corn)



# Description of scenarios

- RFS modelled as exogenous increase in corn demand
  - Corn market affected directly
  - Corn also input into livestock equations
- Scenario #1: 15 billion gallons equals 37% increase in U.S. corn demand
- Scenario #2: 37% increase in demand, and 10% corn productivity increase



# U.S. corn results

Impacts on corn producer prices, production and trade  
(per cent change)

	Scenario 1 (demand)	Scenario 2 (demand & efficiency)
Producer price	15.1	8.3
Production	8.9	16.5
Trade	-46.4	-26.1





# World price impacts

Impacts on corn, meat and milk world prices  
(per cent change)

	Scenario 1	Scenario 2
Corn	15.15	8.28
Beef and veal	0.93	0.52
Sheep	1.06	0.60
Poultry	1.11	0.63
Whole milk powder	0.59	0.33
Butter	0.78	0.44



# Country-specific results

Producer returns changes for selected countries  
(per cent change)

	Scenario #1		Scenario #2	
	USA	NZL	USA	NZL
Corn	25.41	32.43	26.17	17.17
Beef and veal	-0.32	1.42	-0.18	0.80
Sheep	-0.12	1.96	-0.07	1.10
Poultry	0.00	2.08	0.00	1.17
Raw milk	-0.04	1.22	-0.02	0.69



# Discussion

- Several effects of increased corn demand
  - Lower U.S. exports
  - Higher production everywhere
  - U.S. livestock: slightly higher prices, slightly lower production, change in feed composition
  - Food system adapts
- Uneven impacts across production systems
  - Intensive, grain-based systems have higher costs, essentially unchanged revenues
  - Pasture-based systems have higher revenues, unchanged costs: NZ benefits from RFS



# Conclusion

- Corn market impacts of ethanol
  - Large in isolation
  - Moderated by trade impacts
  - Efficiency gain reduces impact
- Small flow-on impacts on livestock sectors
- Extensive, pasture-based production gains from ethanol demand
- Modelling useful for analysing impacts



# Future research programme

- Sensitivity analysis on elasticities
- More work on pig and poultry sectors
- Biofuels demand in other countries
  - Affects different crops, e.g., sugar in Brazil
  - Biodiesel in addition to ethanol – affects oilseed crops
- Disaggregate into production systems
- Analyse greenhouse gas impacts



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*Thank you!*

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