

Analyzing the Impacts of Biofuel Mandates on World-Wide Grain, Livestock, and Oilseed Sectors

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***DOMESTIC AND TRADE IMPACTS OF U.S. FARM POLICY:
FUTURE DIRECTIONS AND CHALLENGES***

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ERS Bio-fuels Baseline Activity and Modeling Efforts

- Bio-fuels and the baseline activity
 - Assumptions about growth in the demand for bio-fuels
 - Bio-fuel production and demand assumed to be exogenous
- PEATsim
 - International Bio-Fuel analysis
 - Develop a Bio-fuel component

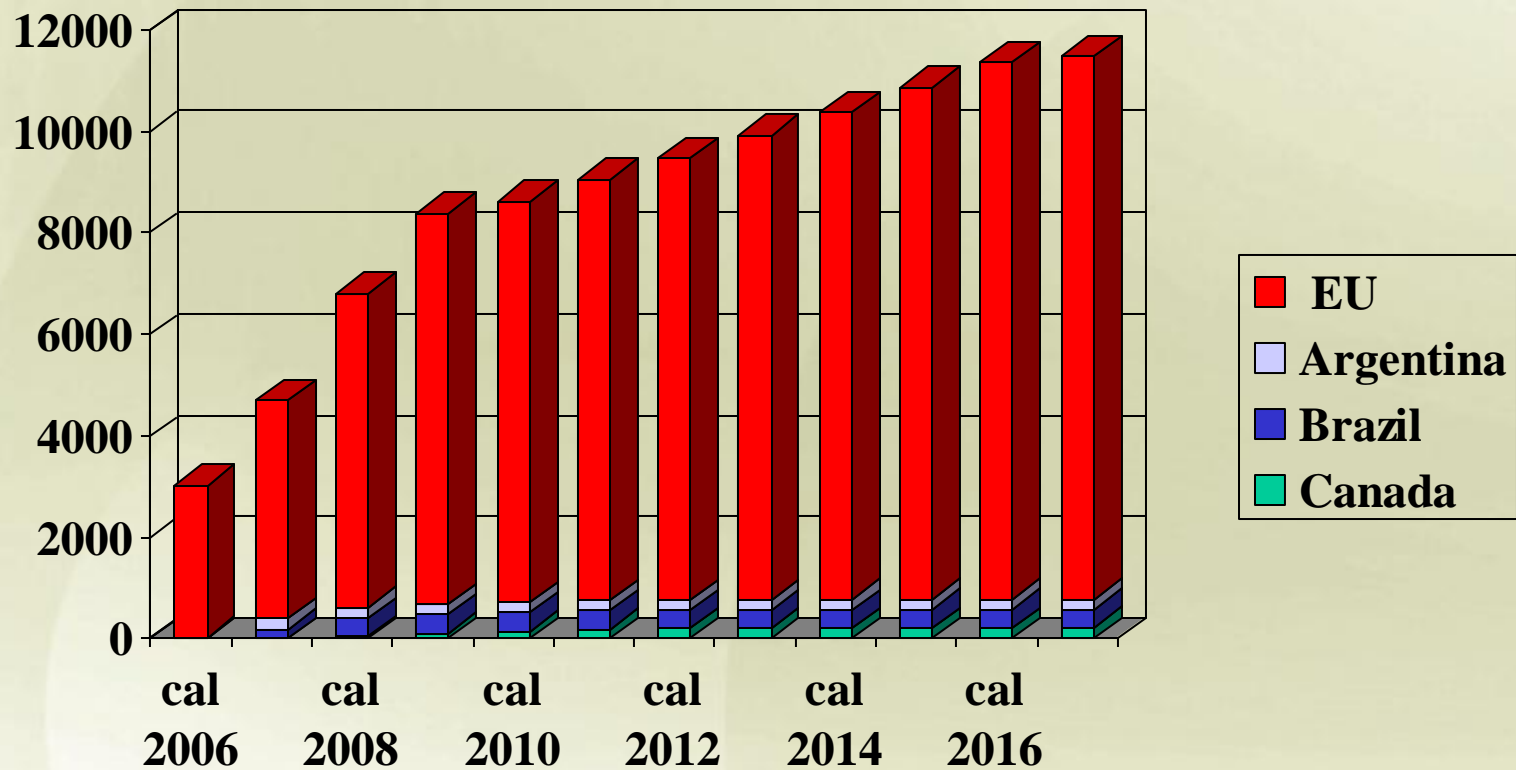


Assumptions for Biofuels

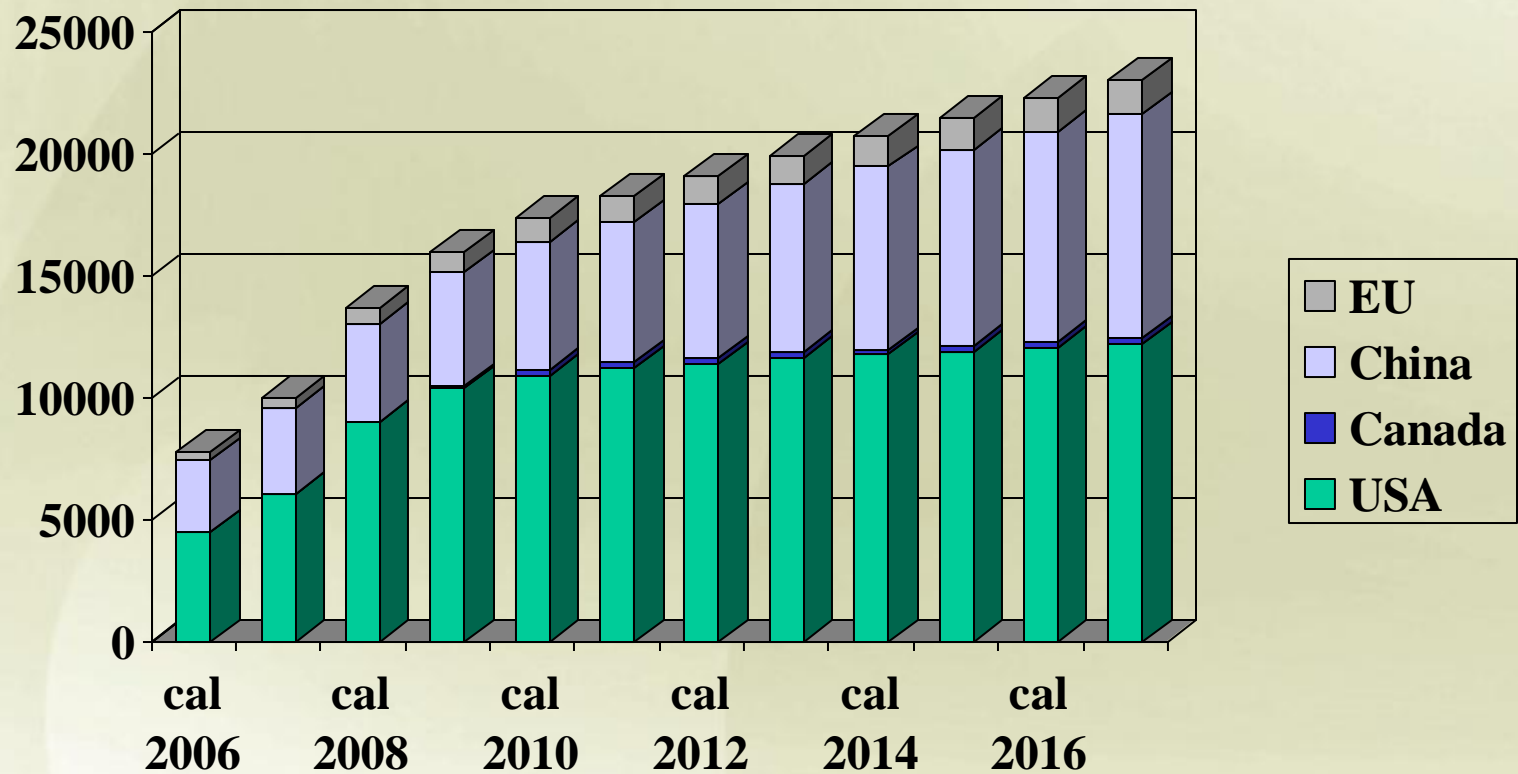
- Rapeseed oil makes up the 80 percent of bio-diesel oil for the EU
- Ethanol is produced from corn in the US and China and from wheat in the EU
- Ethanol is produced from sugarcane in Brazil



Bio-diesel Production



Ethanol Production from grain feed stocks



PEATSim

- Partial Equilibrium
- 13 countries/regions
- Thirty-five commodities
- Gross trade model
- Static version and a dynamic
- Explicitly incorporates a wide range of domestic and border policies



PEATSim's Advantages

- Country coverage—major bio-fuel producing countries
- Policy richness of model—can include most of the major policies influencing bio-fuel production, consumption, trade
- Ability to evaluate impacts of individual policy instruments
- Multiple commodities—permits evaluation of cross-commodity impacts



PEATSim

- PEATSim is a partial equilibrium model that uses Mixed Complementarily Programming
 - Allows the model to solve the discontinuous functions associated with TRQ's
 - Should allow us to deal with mandated levels of bio-fuel use
 - Can handle kinked demand functions



PEATSim

- Policy instruments in PEATSim
 - tariffs
 - TRQs
 - support prices
 - producer payments/subsidies
 - production (marketing) quotas
 - export subsidies (implicit)



Commodity Coverage

- Rice, Wheat, Corn, Other coarse Grains
- High-fructose corn syrup (HFCS)
- Sugar
- Soybeans, Sunflower seeds, Rapeseed, Cottonseeds, Peanuts, Other oilseeds
- Soybean oil, Sunflower seed oil, Rapeseed oil, Cottonseed oil, Peanut oil, Tropical oil, Other oilseed oil
- Soybean meal, Sunflower seed meal, Rapeseed meal, Cottonseed meal, Peanut meal, other oilseed meal
- Cotton
- Beef and veal, Pork, Poultry meat
- Milk, Butter, Cheese, Non-fat dry milk, Fluid milk, Whole dry milk, other dairy products



Country Coverage

- United States
- European Union
- Japan
- Canada
- Mexico
- Brazil
- Argentina
- China
- Australia
- New Zealand
- South Korea
- Rest of the world



Present Analysis

- Most of the work done at ERS has been based on assumed levels of bio-fuel use or mandates
- Work on modeling the markets for ethanol and bio-diesel and link these to the agricultural markets.



Scenarios

- We looked at 3 scenarios
 - The US expanding ethanol production by 10 percent
 - The EU expanding biodiesel by 10 percent
 - The US, EU, China, and Brazil expanding biofuels production by 10 percent
 - China's ethanol production is not large
 - We will examine the impacts on Livestock



Impact of a 10 percent expansion in US ethanol production

Percent Change US Crop Results

	Rice	Wheat	Corn	Soybeans	Cotton	Sugar
Production	-0.38	-0.09	0.89	-0.30	-0.61	0.12
Consumption	0.05	0.52	3.46	-0.18	-0.03	0.01
Exports	-0.86	-0.82	-12.24	-0.55	-1.03	0.07
Imports	-0.01	-0.01	-0.04	-0.01	-0.01	-0.53
Producer price	0.82	0.90	3.65	1.11	1.45	0.55

United States Livestock Results

	Beef	Pork	Poultry	Milk	Butter	Cheese	Nonfat Dry Milk	Whole Dry Milk	Other Dairy Products
Production	-0.33	-0.47	-0.40	-0.14	-0.20	-0.24	-0.20	-0.67	-0.02
Consumption	-0.32	-0.42	-0.47	-0.14	-0.19	0.03	0.16	0.13	-0.02
Exports	0.40	-0.82	0.16	0.00	0.00	0.00	-2.51	0.00	0.00
Imports	0.00	-0.24	-0.30	0.00	0.00	7.68	0.00	9.33	0.00
Producer price	1.42	0.73	1.01	1.08	1.70	0.95	0.60	0.63	1.13

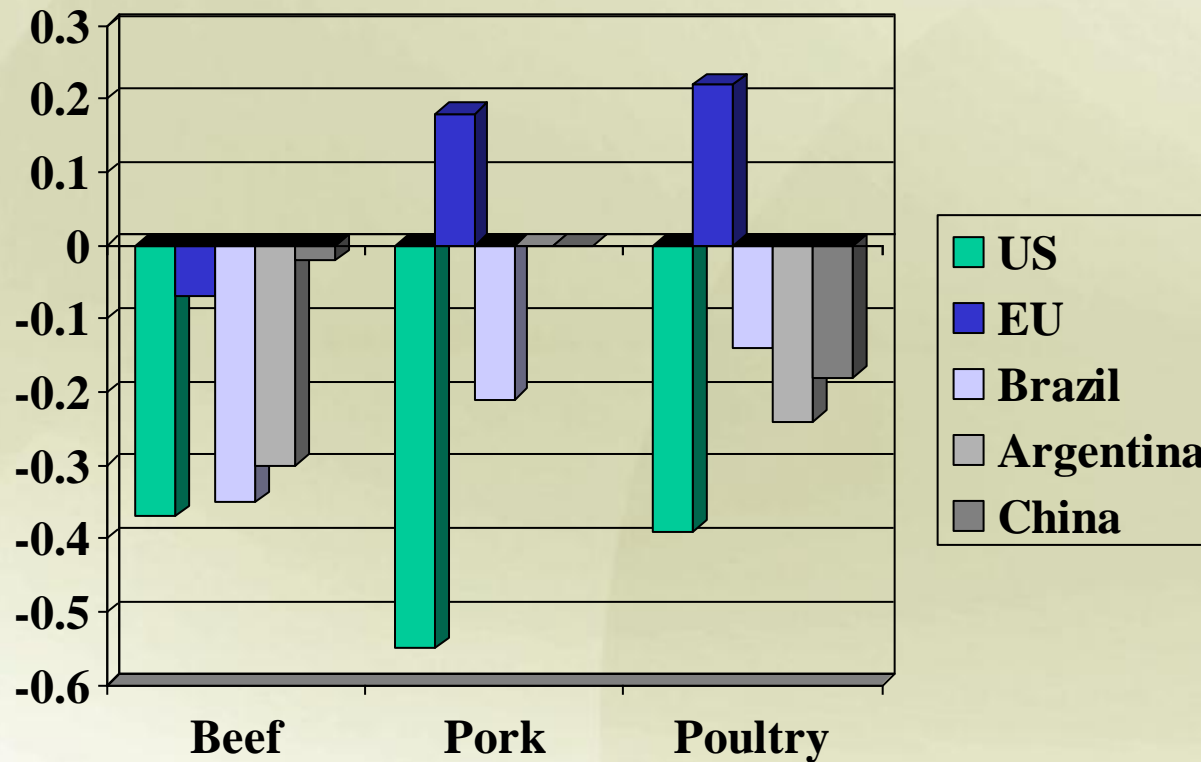


Impact of a 10 percent expansion in EU biodiesel production

EU Crop Results	Rice	Wheat	Corn	Soybeans	Cotton	Sugar	Rapeseed	Rape oil	
Production	0.03	-0.15	-0.05	0.04	-0.13	0.00	2.55	5.08	
Consumption	-0.01	-0.20	-0.04	0.10	-0.01	0.01	5.08	14.08	
Exports	0.22	0.30	0.12	0.09	0.00	-0.03	-31.19	-98.16	
Imports	-0.03	-0.05	0.23	0.10	0.09	0.00	-8.65	-15.82	
Producer price	0.32	0.52	0.33	0.42	0.51	0.19	9.00	18.79	
EU Livestock Results	Beef	Pork	Poultry	Milk	Butter	Cheese	Nonfat Dry Milk	Whole Dry Milk	Other Dairy Products
Production	0.02	0.08	0.03	0.00	0.01	-0.01	0.01	-0.02	0.00
Consumption	0.00	0.02	0.02	0.00	0.00	0.00	0.01	0.01	0.00
Exports	0.01	1.15	0.13	0.00	0.03	-0.12	-0.04	-0.04	0.00
Imports	-0.30	0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00
Producer price	0.11	-0.01	0.00	0.00	0.05	0.03	0.04	0.03	0.00



Impact on livestock of a 10 percent expansion in EU, US, China and Brazil Biofuels production (percent change)



Impact of a 10 percent expansion in EU, US, China and Brazil Biofuels production

Brazil Crop Results	Rice	Wheat	Corn	Soybeans	Cotton	Sugar	I
Production	-0.03	-0.01	1.49	-0.04	0.12	1.41	
Consumption	0.00	-0.03	-0.56	-0.08	-0.05	12.57	
Exports	0.86	0.23	29.44	0.02	0.47	-4.94	
Imports	0.34	-0.04	-3.00	-0.42	-0.02	0.00	
World price	1.26	1.55	4.28	1.73	2.20	3.03	

Brazil Livestock Results	Beef	Pork	Poultry	Milk	Butter	Cheese	Nonfat Dry Milk	Whole Dry Milk	Other Dairy Products
Production	-0.35	-0.21	-0.14	0.06	0.08	0.11	0.08	0.11	0.07
Consumption	-0.09	0.26	0.05	0.06	0.08	0.06	0.06	0.06	0.07
Exports	-1.42	-1.84	-0.55	0.00	-12.19	2.18	0.22	0.59	0.00
Imports	-1.23	0.00	0.00	0.00	0.00	-0.22	-0.56	-0.22	0.00
World price	1.31	0.79	1.10	0.00	0.39	0.91	0.82	0.80	0.00



Impact of a 10 percent expansion in EU, US, China and Brazil Biofuels production

China Crop Results	Rice	Wheat	Corn	Soybeans	Cotton	Sugar				
Production	0.00	-0.18	0.97	-0.39	0.02	0.58				
Consumption	0.01	0.05	-0.05	-0.06	-0.03	-0.14				
Exports	0.99	0.23	37.30	0.39	0.02	0.36				
Imports	4.75	2.55	-3.25	0.22	-0.18	-7.07				
World price	1.26	1.55	4.28	1.73	2.20	3.03				
China Livestock Results	Beef	Pork	Poultry	Milk	Butter	Cheese	Nonfat Milk	Dry Milk	Whole Dry Dairy Products	Other
Production	-0.02	0.00	-0.18	-0.08	0.00	0.00	0.00	0.00	-0.34	-0.01
Consumption	-0.02	0.04	-0.12	-0.08	0.00	0.00	0.04	0.03	-0.01	
Exports	-0.27	-4.67	1.08	0.00	0.00	0.00	0.23	0.27	0.00	
Imports	-1.21	-0.86	2.95	0.00	0.00	0.00	0.05	2.96	0.00	
World price	1.31	0.79	1.10	0.00	0.39	0.91	0.82	0.80	0.00	



Impact of a 10 percent expansion in EU, US, China and Brazil Biofuels production

Percentage Change

Argentina Crop Results

	Rice	Wheat	Corn	Soybeans	Cotton	Sugar
Production	0.20	0.29	2.30	0.36	0.34	1.05
Consumption	-0.01	-0.02	-0.75	-0.06	-0.04	-0.13
Exports	0.28	0.45	3.35	2.17	2.25	7.82
Imports	-0.94	-0.25	-3.46	-0.41	-0.02	-0.38
World price	1.26	1.55	4.28	1.73	2.20	3.03

Argentina Livestock Results

	Beef	Pork	Poultry	Milk	Butter	Cheese	Nonfat Milk	Dry Milk	Whole Dairy Products
Production	-0.30	0.00	-0.24	0.17	0.09	0.33	0.09	0.23	0.04
Consumption	-0.03	0.00	0.05	0.17	0.08	0.01	0.02	0.02	0.04
Exports	-1.44	0.00	-2.61	0.00	0.21	2.99	0.31	0.35	0.00
Imports	-1.23	0.00	-1.03	0.00	0.00	-0.29	-0.26	-0.26	0.00
World price	1.31	0.79	1.10	0.00	0.39	0.91	0.82	0.80	0.00



Impacts of Biofuels Production

Increases

- The largest increase in corn prices in these scenarios is a little over 15 cents a bushel
- Livestock productions declines, but only slightly
 - Corn price increases are offset slightly by lower protein meal prices
 - Rape meal has feeding restriction that should be considered—It may be more economical to burn the meal for energy



Modeling Challenges

- Define the relationship between Oil and Gas prices and the demand for ethanol and bio-diesel.
 - Develop a small bio-energy component with supply and demand sectors
 - Incorporate trade as well as any TRQ structure that is necessary
 - Reflect domestic policies on bio-fuels



Future Modeling Efforts

- As part of the ERS analysis of bio-energy, we are developing a small bio-energy sector for our trade and policy model PEATSim
 - Dynamic PEATSim is running and being tested
 - 10 year time horizon calibrated to a baseline
 - Can be calibrated to any baseline data
 - We are incorporating a biofuel sector into this model



International Baseline

- The international baseline focused on grain and oilseed production of bio-fuels
- Brazil sugar is not part of the baseline modeling system
 - Brazil's bio-diesel production was included.

