Collaborative Modeling Efforts Between the U.S. and Mexican Governments

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The Value of Economic Modeling

- Economic models provide valuable insights into the possible impacts of contemplated policy changes and the actual effects of previous policy changes.

- Access to models and the quality of in-house modeling vary within and across national governments
  --Function of available resources and researchers’ familiarity with subject matter
  --Often dependent on the skills and interests of a few

- Intergovernmental collaboration as a way to foster mutual capacity building
Two Examples of Intergovernmental Modeling Collaboration from the U.S.-Mexican Experience

1) Adaptation of Mexico Model Used in *USDA Agricultural Projections*

2) Mexico-Focused Modeling Based on Global Trade Analysis Project (GTAP)
Mexico Baseline Component

- Over the past 3 years, agricultural specialists in the Mexican Government have developed a set of partial equilibrium models of their country’s major agricultural sectors.

- The original foundation of these models is the Mexico model (maintained and improved by James Hansen of ERS) that is used in the USDA Agricultural Projections.
Mexico Baseline Model: Timeline

- 2000: Visit to Washington by staff member from FIRA (Fideicomisos Instituidos en Relación con Agricultura)

- 2005: Training of FIRA staff in baseline model, extension of Mexico Model to new commodities; ERS staff visit Mexico to improve their understanding of country’s corn sector

- 2007: Visit to Washington by SAGARPA staff, incorporation of Mexico’s official model, extension to new commodities, use in formal publications
## Mexico Baseline Model: The Evolution

### Original Model

- **Livestock**: (3 sectors)
  - Pork, Beef, and Poultry

- **Crops**: (11 sectors)
  - Corn, Wheat, Rice
  - Barley, Sorghum,
  - Soybean, Rape seed, Groundnuts,
  - Sunflowers
  - Cotton
  - Fruits, Vegetable Consumption

### SAGARPA’s First approach

1. **Data**

2. **Segregate markets**
   - a. White corn
   - b. Yellow corn

3. **Integrate new commodities**
   - A. Fruits and vegetables
     - a. Tomatoes
Mexico Baseline Model: Data

Main Data Adjustments

- **Elasticities**
  - Consumer price elasticities
  - Consumer income elasticities
  - Producers supply response elasticities

- **Macroeconomic variables**
  - Economic growth
  - Exchange rate
  - Oil prices (?????)

- **Prices** (Consumer and Producer prices)
- **Per capita consumption**
- **Inventories**
# Mexico Baseline Model: Data

<table>
<thead>
<tr>
<th>Original Model</th>
<th>SAGARPA´s Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macroeconomic</strong></td>
<td><strong>Macroeconomic</strong></td>
</tr>
<tr>
<td>World Bank</td>
<td>World Bank</td>
</tr>
<tr>
<td><strong>International Prices</strong></td>
<td><strong>International Prices</strong></td>
</tr>
<tr>
<td>FAO and USDA</td>
<td>FAO and USDA</td>
</tr>
<tr>
<td><strong>Domestic Prices</strong></td>
<td><strong>Domestic Prices</strong></td>
</tr>
<tr>
<td>PS&amp;D</td>
<td>SIAP</td>
</tr>
<tr>
<td><strong>Domestic Variables</strong></td>
<td><strong>Domestic Variables</strong></td>
</tr>
<tr>
<td>PS&amp;D</td>
<td>SIAP</td>
</tr>
</tbody>
</table>

- FAO: Food and Agriculture Organization
- USDA: United States Department of Agriculture
- SAGARPA: Secretary of Agriculture, Rural Development, Fisheries and Food
- PS&D: National Planning and Evaluation System
Area harvested will surpass 7 million hectares in 2008.

Surplus of 1 million tons is expected for 2008. Similar trend will continue over the long term.

White corn prices are highly correlated with yellow prices.
Mexico Baseline Model: Yellow Corn

- Area harvested may reach 450,000 hectares in 2008. Ethanol prices will drive production.
- Demand and production will grow at average rates of 3.0% and 3.5%, respectively.
- Prices will keep growing until 2010.
Area harvested is expected to diminish in the long run.

Demand is expected to decline due to the slow growth of the textile sector.

Domestic prices will be influenced by the international price.
• Beef production may reach 2 million tons in 2008.
• Pork production will expand 1.1% annually, and demand will increase almost 2% annually.
• Poultry production and demand will grow at a considerable rate of 3%.
Mexico Baseline Model: Next steps

1. Improve policy components

2. Develop stochastic components

3. State level

4. New commodities
   a) Sugar cane
   b) Fisheries

5. Link to a North American component
Mexico-Focused GTAP Modeling

Computable General Equilibrium (CGE) Model

Zahniser and Burfisher (2006)
Evaluated impact of full implementation of NAFTA’s provisions on production and trade
SAGARPA/ASERCA staff provided Mexican tariff data and evaluated the model’s structure
Results circulated within U.S. and Mexican Governments and presented at academic conferences

Ongoing research: Evaluate NAFTA’s implementation in the current context of higher commodity prices
NAFTA with Higher Commodity Prices

Uses GTAP data within the standard IFPRI model, as modified by McDonald, et al. (2006), to allow for substitution among intermediate inputs
Two regions: Mexico and Rest of World
Twenty-one (21) sectors, 16 of which are agricultural, including white and yellow corn

Two scenarios:
(1) Updated base scenario: GTAP database (2001) updated with 2008 tariff levels
(2) Alternative scenario: Updated base scenario shocked with an exogenous price increase
<table>
<thead>
<tr>
<th>Sector</th>
<th>Import tariff rate (percent)</th>
<th>Sector</th>
<th>Import tariff rate (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Rice</td>
<td>0</td>
<td>11 Crops not elsewhere specified</td>
<td>1</td>
</tr>
<tr>
<td>2 Wheat</td>
<td>0</td>
<td>12 Dairy</td>
<td>3</td>
</tr>
<tr>
<td>3 White corn</td>
<td>0</td>
<td>13 Natural resources</td>
<td>3</td>
</tr>
<tr>
<td>4 Yellow corn</td>
<td>0</td>
<td>14 Meat</td>
<td>0</td>
</tr>
<tr>
<td>5 Other cereal grains</td>
<td>0</td>
<td>15 Oils and fats</td>
<td>3</td>
</tr>
<tr>
<td>6 Dry edible beans</td>
<td>0</td>
<td>16 Refined sugar</td>
<td>15</td>
</tr>
<tr>
<td>7 Other horticultural products</td>
<td>1</td>
<td>17 Other food</td>
<td>3</td>
</tr>
<tr>
<td>8 Oilseeds</td>
<td>0</td>
<td>18 Light manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>9 Raw sugar</td>
<td>27</td>
<td>19 Petroleum</td>
<td>3</td>
</tr>
<tr>
<td>10 Fibers</td>
<td>0</td>
<td>20 Heavy manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>21 Services</td>
<td></td>
<td>21 Services</td>
<td>0</td>
</tr>
</tbody>
</table>
## Scenario of Higher Commodity Prices

Calculated using projections for MY 2009/10 from *USDA Agricultural Projections to 2017* and historical data for MY 2000/01 (or calendar years 2010 versus 2001)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percentage change</th>
<th>Sector</th>
<th>Percentage change</th>
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<tbody>
<tr>
<td>1 Rice</td>
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<td>2 Wheat</td>
<td>91</td>
<td>12 Dairy</td>
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<tr>
<td>3 White corn</td>
<td>105</td>
<td>13 Natural resources</td>
<td>84</td>
</tr>
<tr>
<td>4 Yellow corn</td>
<td>105</td>
<td>14 Meat</td>
<td>40</td>
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<td>5 Other cereal grains</td>
<td>89</td>
<td>15 Oils and fats</td>
<td>171</td>
</tr>
<tr>
<td>6 Dry edible beans</td>
<td>12</td>
<td>16 Refined sugar</td>
<td>21</td>
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<tr>
<td>7 Other horticultural products</td>
<td>48</td>
<td>17 Other food</td>
<td>16</td>
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<tr>
<td>8 Oilseeds</td>
<td>96</td>
<td>18 Light manufacturing</td>
<td>25</td>
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<tr>
<td>9 Raw sugar</td>
<td>-4</td>
<td>19 Petroleum</td>
<td>219</td>
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<td>10 Fibers</td>
<td>-7</td>
<td>20 Heavy manufacturing</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21 Services</td>
<td>25</td>
</tr>
</tbody>
</table>
### Domestic output: Greater commodity production, less manufacturing production

<table>
<thead>
<tr>
<th>Sector</th>
<th>Change in domestic output (percent)</th>
<th>Sector</th>
<th>Change in domestic output (percent)</th>
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<tbody>
<tr>
<td>1 Rice</td>
<td>32</td>
<td>11 Crops not elsewhere specified</td>
<td>1</td>
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<tr>
<td>2 Wheat</td>
<td>60</td>
<td>12 Dairy</td>
<td>-15</td>
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<tr>
<td>3 White corn</td>
<td>5</td>
<td>13 Natural resources</td>
<td>13</td>
</tr>
<tr>
<td>4 Yellow corn</td>
<td>43</td>
<td>14 Meat</td>
<td>2</td>
</tr>
<tr>
<td>5 Other cereal grains</td>
<td>8</td>
<td>15 Oils and fats</td>
<td>20</td>
</tr>
<tr>
<td>6 Dry edible beans</td>
<td>-6</td>
<td>16 Refined sugar</td>
<td>0</td>
</tr>
<tr>
<td>7 Other horticultural products</td>
<td>11</td>
<td>17 Other food</td>
<td>-1</td>
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<tr>
<td>8 Oilseeds</td>
<td>221</td>
<td>18 Light manufacturing</td>
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<tr>
<td>9 Raw sugar</td>
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<td>19 Petroleum</td>
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<td></td>
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<td>21 Services</td>
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</table>
## Imports: Changes correspond to prices

<table>
<thead>
<tr>
<th>Sector</th>
<th>Change in Real Import Quantity (percent)</th>
<th>Sector</th>
<th>Change in Real Import Quantity (percent)</th>
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<tbody>
<tr>
<td>Rice</td>
<td>-44</td>
<td>11 Crops not elsewhere specified</td>
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<tr>
<td>Wheat</td>
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<td>12 Dairy</td>
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<tr>
<td>White corn</td>
<td>-11</td>
<td>13 Natural resources</td>
<td>-14</td>
</tr>
<tr>
<td>Yellow corn</td>
<td>3</td>
<td>14 Meat</td>
<td>-2</td>
</tr>
<tr>
<td>Other cereal grains</td>
<td>-4</td>
<td>15 Oils and fats</td>
<td>-60</td>
</tr>
<tr>
<td>Dry edible beans</td>
<td>80</td>
<td>16 Refined sugar</td>
<td>9</td>
</tr>
<tr>
<td>Other horticultural products</td>
<td>-15</td>
<td>17 Other food</td>
<td>34</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>3</td>
<td>18 Light manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>Raw sugar</td>
<td>21</td>
<td>19 Petroleum</td>
<td>-20</td>
</tr>
<tr>
<td>Fibers</td>
<td>30</td>
<td>20 Heavy manufacturing</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>21 Services</td>
<td>4</td>
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</table>
Exports: Changes also correspond to prices

<table>
<thead>
<tr>
<th>Sector</th>
<th>Change in Real Export Quantity (percent)</th>
<th>Sector</th>
<th>Change in Real Export Quantity (percent)</th>
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<tbody>
<tr>
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<td>2 Wheat</td>
<td>147</td>
<td>12 Dairy</td>
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<tr>
<td>3 White corn</td>
<td>63</td>
<td>13 Natural resources</td>
<td>26</td>
</tr>
<tr>
<td>4 Yellow corn</td>
<td>137</td>
<td>14 Meat</td>
<td>13</td>
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<tr>
<td>5 Other cereal grains</td>
<td>62</td>
<td>15 Oils and fats</td>
<td>130</td>
</tr>
<tr>
<td>6 Dry edible beans</td>
<td>-23</td>
<td>16 Refined sugar</td>
<td>-6</td>
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<tr>
<td>7 Other horticultural products</td>
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<td>17 Other food</td>
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<td>8 Oilseeds</td>
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<td>9 Raw sugar</td>
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<td>10 Fibers</td>
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<td>20 Heavy manufacturing</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21 Services</td>
<td>-2</td>
</tr>
</tbody>
</table>
Increased household consumption, higher wages for unskilled labor

<table>
<thead>
<tr>
<th>Variable</th>
<th>Change (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real household expenditures</td>
<td>0.7</td>
</tr>
<tr>
<td>Real GDP</td>
<td>-0.3</td>
</tr>
<tr>
<td>Exchange rate (peso/world currency)</td>
<td>-21.2</td>
</tr>
<tr>
<td>Factor payments</td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>17.0</td>
</tr>
<tr>
<td>Unskilled labor</td>
<td>0.9</td>
</tr>
<tr>
<td>Skilled labor</td>
<td>0.2</td>
</tr>
<tr>
<td>Capital</td>
<td>0.3</td>
</tr>
<tr>
<td>Input-output coefficients, refined sugar</td>
<td></td>
</tr>
<tr>
<td>White corn</td>
<td>-1.9</td>
</tr>
<tr>
<td>Yellow corn</td>
<td>-3.7</td>
</tr>
<tr>
<td>Raw sugar</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Collaborative Modeling: Conclusions

- Collaborative modeling between the U.S. and Mexican Governments has provided valuable insights about many aspects of the NAFTA agrifood sector:
  -- Last step of NAFTA trade liberalization
  -- Rise in commodity prices
  -- Possible future course of the Mexican economy

- An approach that harnesses synergies
  -- Expanded pool of knowledge, skills, and abilities
  -- Mutual capacity building
  -- Opportunity to disseminate research more widely