Reshaping Agricultural Production: Geography, Farm Structure, and Finances

James M. MacDonald
USDA Economic Research Service

Kansas City Federal Reserve Bank
“Farming, Finance, and the Global Marketplace”
Kansas City, Missouri, June 8, 2010
Outline

• Country projections, from USDA baseline
  – Summarize the key implications
  – Highlight some crucial assumptions

• Farm structure
  – Shifts to larger farms: description and analysis
  – Implications for finance and business links
  – Risks and contractual arrangements
USDA Baseline Projections: Soybean Production

Crop Year

Metric tons

[Graph showing soybean production trends for Argentina, Brazil, and USA from 2008/2009 to 2018/2019, with notes on ten-year yield growth: 16% USA; 7% Argentina; 9% Brazil.]
Ten year yield growth assumptions:
Brazil 3%; China 11%; EU-27 10%; USA 14.6%
Impacts, 2009-2019

- Dietary change toward meat, feed grains
- Production increases
  - Pork & poultry (much of it in consuming countries)
  - Soybean acreage in South America
- Separately, expansions in horticultural production & trade
Baseline Assumptions, 2009-2019

• High real GDP growth in China and India
• Real increases in crude oil prices
  – $100/bbl, no change in bio-fuels policies
• Corn at $3.65, wheat at $4.75, soy at $9.20
• Long-term dollar depreciation
Productivity Sensitivities

• The projections assume trend US yield ↑
  – But flattening Brazilian yield growth
• Brazil has invested in R&D…
  – What happens with continuing ↑ in yields?
• More broadly, outcomes are quite sensitive to productivity growth (yields, feed conversion, post-harvest retention, etc).
Demand Sensitivities

• China is running an enormous current account surplus (as are other Asian countries)
  – Implies forced savings and reduced consumption
• We assume little change in this basic posture
  – Which also implies CA deficits in US
• What happens if this changes?
Farm Structure

• A skewed distribution wherever we look
  – Requires care with statistics
• Shifts of production to larger farms
  – And, larger farms contract more
• U.S.: more very small farms
  – Hollowing the middle
• Brazil: More midsize farms too
## US Farm Structure, 1982-2007

<table>
<thead>
<tr>
<th>Sales Class</th>
<th>Farms</th>
<th>Market Value of Sales (millions of 2007 $)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>2,240,976</td>
<td>2,204,793</td>
</tr>
<tr>
<td><strong>Sales Class</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>42.6</td>
<td>59.8</td>
</tr>
<tr>
<td>$10,000-$249,999</td>
<td>50.8</td>
<td>30.7</td>
</tr>
<tr>
<td>$250,000-$999,999</td>
<td>5.9</td>
<td>7.0</td>
</tr>
<tr>
<td>$1,000,000 or more</td>
<td>0.7</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: USDA National Agricultural Statistics Service, Census of Agriculture
## Brazilian Farm Structure, 1996-2006

<table>
<thead>
<tr>
<th>Sales Class</th>
<th>Farms</th>
<th>Market Value of Sales (millions of 2006 R$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4,624,617</td>
<td>4,900,876</td>
</tr>
<tr>
<td>Less than $R10,000</td>
<td>74.3</td>
<td>63.5</td>
</tr>
<tr>
<td>$R10,000-249,999</td>
<td>25.7</td>
<td>36.1</td>
</tr>
<tr>
<td>$R250,000-999,999</td>
<td>0.07</td>
<td>0.4</td>
</tr>
<tr>
<td>$R1,000,000 or more</td>
<td>0.0</td>
<td>0.02</td>
</tr>
<tr>
<td>All</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: IBGE, Agricultural Census
The U.S. Production Shift is Ubiquitous

- Persistent over time
- Across most commodities
- And large
U.S. Structural Change: Livestock

The midpoint farm size: half of production is on larger farms

<table>
<thead>
<tr>
<th>Livestock</th>
<th>1987</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herd size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>80</td>
<td>570</td>
</tr>
<tr>
<td>Head Removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broilers</td>
<td>300,000</td>
<td>681,600</td>
</tr>
<tr>
<td>Hogs</td>
<td>1200</td>
<td>30,000</td>
</tr>
<tr>
<td>Fattened Cattle</td>
<td>17,532</td>
<td>35,000</td>
</tr>
<tr>
<td>Cattle, &lt;500 lbs</td>
<td>50</td>
<td>128</td>
</tr>
</tbody>
</table>

Source: Census of Agriculture
U.S. Structural Change: Field Crops

The midpoint farm size:
half of harvested acres are on larger farms

<table>
<thead>
<tr>
<th>Field crops</th>
<th>1987</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atharvested acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>Soybeans</td>
<td>243</td>
<td>490</td>
</tr>
<tr>
<td>Wheat</td>
<td>404</td>
<td>910</td>
</tr>
<tr>
<td>Cotton</td>
<td>450</td>
<td>1090</td>
</tr>
<tr>
<td>Rice</td>
<td>295</td>
<td>700</td>
</tr>
</tbody>
</table>

Source: Census of Agriculture
U.S. Structural Change; Vegetables

The midpoint farm size: half of harvested acres are on larger farms

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>1987</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Harvested acres-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asparagus</td>
<td>160</td>
<td>240</td>
</tr>
<tr>
<td>Lettuce</td>
<td>949</td>
<td>1815</td>
</tr>
<tr>
<td>Peppers, Bell</td>
<td>88</td>
<td>300</td>
</tr>
<tr>
<td>Potatoes</td>
<td>350</td>
<td>990</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>400</td>
<td>820</td>
</tr>
</tbody>
</table>

Source: Census of Agriculture
U.S. Structural Change: Fruits

The midpoint farm size: half of harvested acres are on larger farms

<table>
<thead>
<tr>
<th>Fruits</th>
<th>1987</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvested Acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apples</td>
<td>83</td>
<td>146</td>
</tr>
<tr>
<td>Almonds</td>
<td>203</td>
<td>450</td>
</tr>
<tr>
<td>Oranges</td>
<td>450</td>
<td>1113</td>
</tr>
<tr>
<td>Peaches</td>
<td>92</td>
<td>120</td>
</tr>
</tbody>
</table>

Source: Census of Agriculture
Finances Are a Driving Force

Mean Rates of Return on Equity, by Farm Size, 2000-2008

Gross cash farm income ($000)

Source: NASS and ERS, Agricultural Resource Management Survey, selected years.
Drivers of Structural Change

• Scale economies?
  – Evidence strong for livestock, not for crops

• Technology and farm scope?
  – Seeds, equipment
  – Expands reach of an operator?

• Do commodity payments play a role?
Large Size--Large Capital Requirements?

• $5m for 1100 acres of corn & soybeans
  – Land, equipment, structures
• $7m for 1000 milk cows & cropping
  – Livestock, land, structures, equipment
• $0.5m for small-scale broiler/hog entry
  – Two houses, production contract

These are farm business assets, and exclude assets accessed through contract or custom hire
Farm Size and Farm Organization

• Farms are still closely held operations
  – And that makes sense
• But size matters
  – Scale economies and technology
• And that means growing capital requirements
• Is there a conflict?
Farms Find Many Ways to Assemble Capital

- Land rental
  - Land, equipment, structures
- Equipment/service sharing & rental
- Production and marketing contracts
- Shared ownership of assets
- Equity participation
New Challenges for Farm Surveys

• Complex 3-way contracts
  – Asset owner, farm operator, integrator
• Complex farm business structures
  – Linking land, physical capital, services
• Multi-unit farm businesses
• Complex land contracts
  – Leases vs. rents; cash & share
Prices, Risks, and Debt

- Current sector situation isn’t alarming…
- But for hogs and dairy, and that matters
  - Major structural changes
  - Innovative business relationships
  - Lots of debt
Monthly U.S. Milk-Feed Price Ratios, 1985-2010
Challenges

• Financial failures
  – Hogs: NC integrators
  – Dairy: Vreba-Hoff financing problems
  – Poultry: slowing growth, aging capital stock
  – Price risks unlikely to go away

• But scale advantages are real
  – Absent major changes in relative input prices

• Do we need new instruments for managing and allocating risks?
Conclusions

• Geography: What odds do we put on…
  – Asian growth and dietary shift?
  – Productivity growth projections?
  – $100/bbl real oil prices? $50? $200?

• Structure
  – Production to larger farms, still closely held

• Risks and financing challenges
  – Follow from the above
For More Information

• **Data on US farms**

• **James MacDonal**
  – 202-694-5610; macdonal@ers.usda.gov