Economic Aspects of Asian Soybean Rust

By Dr. Robert Wisner, University Professor & Coles Professor of International Agriculture, Iowa State University

For National Soybean Rust Symposium, St. Louis, Mo. Nov.-29-Dec. 01, 2006
Economics of Asian Soybean Rust in U.S.

• U.S. Losses ’05 & 06 kept at a minimum by highly successful work of researchers, Extension, govt., industry & Weather

Large regional differences in potential impacts
Economics of Asian Soybean Rust in U.S.

• How to evaluate the economic value of your work?

• Opportunities for interdisciplinary work with ag economists
  -- Optimum timing & application rates of fungicides with varying SB prices
  -- Competitive position of SB vs. alternative crops with varying SB prices & probability of ASR severity levels
  -- Economic value of spore-movement forecasting model
Economic Dimensions of Asian Soybean Rust in U.S.

• **Micro or Farm Level**
  -- Yield losses
  -- Chemical costs
  -- Application costs
  -- Insurance coverage
  -- Government payment impacts (LDPs, CCPs)

• **Macro or “Big-Picture” Effects**
  -- National Production Impact
  -- National Control Costs
  -- Price Impacts
  -- Total Dollar Impact

**International Dimensions** (Because of global SB market)
USDA Asian Soybean Rust Report 2004

• Concentrated on Macro or “Big-Picture” Effects
  --Built up from farm-level impacts

• Asian Rust hadn’t entered U.S.
  -- First year impact (After entry)
  -- Third-year impact
  -- Included price, yield, cost impacts
  -- National Production Impact

• International Dimensions
  • Supply shortage in U.S. would be tempered by prices signaling to expand in South America
Economics of Asian Soybean Rust in U.S.

• 2006 U.S. Soy Crop:
  --3.204 bil. Bu.
  –Price: $6.20
  –Value: $19.86 bil.
  –(2nd Most Valuable Crop)
  –Corn: About $34.3 bil.
Source: http://www.sbrusa.net/
Percentage of years out of 30 that climatic conditions are expected to support establishment of soybean rust

Source: http://www.sbrusa.net/


Note: Map based on 30 years of data to estimate infection potential.
Regional Designations for Soybean Production

• Southeast: AL, FL, SC, GA
• Mid-South: AR, LA, MS
• Appalachia: KY, TN
• E. Lakes: MI, WI
• E. Corn Belt: IL, IN, OH
• W. Corn Belt: MO, IA, MN
• N. Plains: KS, NE, SD, ND
• Mid-Atlantic: DE, MD, VA, NC
Percent Changes in U.S. Soybean Planted Acres by Major Crop Regions, 2003-06

- S.E.:
- Mid-Atlantic:
- Mid-South:
- Appalachia:
- E. Corn Belt:
- W. Corn Belt:
- E. Lake:
- N. Plains:
- U.S.
<table>
<thead>
<tr>
<th>Region</th>
<th>Mil. Bu.</th>
<th>% of U.S.</th>
<th>Value, Mil. $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeast</td>
<td>17</td>
<td>1%</td>
<td>106</td>
</tr>
<tr>
<td>Mid-Atlantic</td>
<td>80</td>
<td>3%</td>
<td>498</td>
</tr>
<tr>
<td>Mid-South</td>
<td>179</td>
<td>6%</td>
<td>1,112</td>
</tr>
<tr>
<td>E. Corn Belt</td>
<td>1,005</td>
<td>31%</td>
<td>6,229</td>
</tr>
<tr>
<td>E. Lakes</td>
<td>156</td>
<td>5%</td>
<td>970</td>
</tr>
<tr>
<td>W. Corn Belt</td>
<td>1,020</td>
<td>32%</td>
<td>6,326</td>
</tr>
<tr>
<td>N. Plains</td>
<td>602</td>
<td>19%</td>
<td>3,734</td>
</tr>
<tr>
<td>NJ, NY, PA</td>
<td>29</td>
<td>1%</td>
<td>182</td>
</tr>
<tr>
<td>Tenn., KY</td>
<td>104</td>
<td>3%</td>
<td>646</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>0.3%</td>
<td>62</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,204</strong></td>
<td><strong>100%</strong></td>
<td><strong>19,864</strong></td>
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</tbody>
</table>
### Example Farm-Level Impacts

**One Spraying**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. cost/treatment*</td>
<td>$16/A.</td>
</tr>
<tr>
<td>Assumed yield loss**</td>
<td>(8%)</td>
</tr>
<tr>
<td>Normal soybean yield in S.E.***</td>
<td>30.5 bu./A.</td>
</tr>
<tr>
<td>Avg. Soybean Price, $/Bu.</td>
<td>$6.00/bu.</td>
</tr>
<tr>
<td>Approx. loss/A.</td>
<td>$30.64</td>
</tr>
<tr>
<td>Total soybean value/A. (Normal)</td>
<td>$183.00</td>
</tr>
<tr>
<td>Percent of gross value lost</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

*Based on Gary Munkvold, Associate Professor and Seed Science Endowed Chair
Iowa State University Dept. of Plant Pathology estimates, ISU

**Assumes careful scouting & timely treatment for rust
***4-state southeastern U.S. average yield, 2003-05.
Example Regional Impacts

Asian Soy Rust throughout Southeast
- One spray-745,000 A. x $30.64/A. = $22.8 mil.
- Two sprays: = $34.9 mil.

Asian Soy Rust on 20% of mid-South
- One spray-1.09 mil. A. x $33.4/A. = $36.4mil.
- Two sprays: = $53.8 mil.

Potential Price Impact: Bu. Loss = .17% of U.S. crop x 2.5% = Price Rise: $0.026/Bu.

Southeast crop value gain: $0.58 mil.
Mid-South crop value gain: 5.02 mil.

Combined Net Loss to Soy Industry, S.E. & Mid-South: One spray $53.6 mil.
Two sprays $83.1 mil.
Regional Impacts, Continued

Potential Price Impact ( Included in prev. slide):

- Bu. Loss = .17% of U.S. crop x 2.5% Price Rise for each % crop loss = +$0.026/Bu.
  
  Southeast crop value gain: $0.58 mil.
  Mid-South crop value gain: 5.02 mil.
Regional Impacts much larger if Asian Rust moves into Corn Belt

Asian Soy Rust on 15% of East Corn Belt
Net Loss to Soy Industry

- One spray-2.9 mil. A. x $37.5/A. = $154.4 mil.
- Two sprays: = $200.8 mil.

Potential Price Impact: Bu. Loss = 2.4% of U.S. crop x 2.5 x $6: Price Rise: $0.36/Bu.

Increased value of crop is included in losses

Combined with southern losses:

- One Spray $208 mil.
- Two Sprays $237.5 mil.

(8% Losses too small for insurance benefit)
USDA 2004 Economics of Asian Soybean Rust Report

• Largest impact was on soy growers
• Other Impacts
  -- Livestock feed costs
  -- Consumers through higher food costs
• 3-Yrs. Out Estimated Total Impact
  Large loss $ 2.00 bil.
  Medium loss $ 1.17
  Small loss $ 0.24
### USDA 2004 Economics of Asian Soybean Rust Report

- **3-Yrs. Out Estimated Impact**

<table>
<thead>
<tr>
<th>Category</th>
<th>Medium* (Spread)</th>
<th>Low**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean producers</td>
<td>-$828 mil.</td>
<td>-$164</td>
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<tr>
<td>Livestock producers</td>
<td>-57</td>
<td>-9</td>
</tr>
<tr>
<td>Other crop producers</td>
<td>+5</td>
<td>+18</td>
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<tr>
<td>Consumers</td>
<td>-287</td>
<td>-240</td>
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</table>

*Over Corn Belt, Appalachia, Delta, S.E., N.E., with 4.3% yld. Loss, $25/A. Cost

**Over Appalachia, Delta, S.E., with 0.9% yld. Increase on treated acres
Soy Industry Dynamics

• Rapid Expansion in Corn-ethanol to pull big acreage from Soybeans in Corn Belt

• Soy Belt Northwest movement to continue (to area of lower ASR risk)

• Biofuels to bring soy expansion in S. America via higher bean prices, offsetting reduced U.S. exports

• Southern U.S. soybeans, most vulnerable to Asian Soy Rust (shift to other crops?)
Existing & Planned U.S. Corn Processing Plants
Potential capacity 80% of current corn crop

Blue = Operating
Red = construction
Green = planned
Pink = Expansion of Existing plants

8/30/06
5.5 Bil. Bu. For Ethanol

Figure 4. Extra U.S. Corn Acres Needed to Maintain Exports & Projected Ethanol

- With China not importing corn
- With China as corn importer

- Trend yld., 1990-'05
- DGS reducing corn feeding
- New acres: yld. 85% of trend
- No major droughts

Million Acres vs. 2005

- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
Figure 3. U.S. Planted Acreage of Major Grains, Oilseeds, and Cotton

Source of data: USDA, NASS
‘Example’ of Exchange Rate Impact
Iowa’s Soybean Costs

Source: Embrapa Agropecuária Oeste, Brazil & Enos Ma, University of Sao Paulo

- Graph shows the impact of exchange rates on Iowa’s soybean costs compared to Brazil’s costs with its own currency and the costs in US dollars.

- The graph includes lines for exchange rates, Iowa’s costs in US dollars, Brazil’s costs in R$, and Iowa’s costs in Brazil’s currency.

- Key highlights include:
  - 2001: +70% increase in Brazil’s cost with its currency.
  - 2003: 125.50% exchange rate.
  - 2004: 181.91% exchange rate.
  - 2006: 155.56% exchange rate.

- Sources: Embrapa Agropecuária Oeste, Brazil & Enos Ma, University of Sao Paulo.
Variable Costs
Sorriso, MT - Brazil

Sources: Embrapa Agropecuária Oeste, Brazil & Enos Ma, University of Sao Paulo
Implications

• Huge ethanol demand to change crop rotations, next 3-4 years in Midwest
• Corn Belt: Typical rotation may be 2-3 years of corn, followed by soybeans
• Lower total economic risk exposure to Asian Soybean Rust, but still large
• Important to protecting remaining crop
• Rising bean price may re-start Brazil soybean expansion
http://www.econ.iastate.edu/faculty/wisner/
MINIMUM SOYOIL PRICE FOR BIODIESEL BREAKEVEN at GIVEN WORLD CRUDE OIL PRICE

PRX_C_US_BA, GTB-06-03, Mar-14-06

<table>
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<tr>
<th>Crude Oil Price, $/bbl</th>
<th>$30.00</th>
<th>$35.00</th>
<th>$40.00</th>
<th>$45.00</th>
<th>$50.00</th>
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<th>$60.00</th>
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<td>Soybean Oil Price, $/lb</td>
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<td>($0.10)</td>
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<td>$0.14</td>
<td>$0.25</td>
<td>$0.37</td>
<td>$0.49</td>
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<td>($0.55)</td>
<td>($0.43)</td>
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<td></td>
<td>$0.31</td>
<td>($0.98)</td>
<td>($0.86)</td>
<td>($0.74)</td>
<td>($0.62)</td>
<td>($0.50)</td>
<td>($0.38)</td>
<td>($0.26)</td>
<td>($0.15)</td>
</tr>
</tbody>
</table>

For Blue Sky Scenario, PRX adopts a crude oil price of $50/bbl and thus a minimum 24 cent/lb soyoil price, to evaluate impact of subsidized biodiesel market...
References


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• Gary Munkvold, Associate Professor and Seed Science Endowed Chair, Iowa State University Dept. of Plant Pathology, communication on spraying costs