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.
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
<table>
<thead>
<tr>
<th>Region</th>
<th>Mil. Bu.</th>
<th>Crop %</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>Total</td>
<td>3,204</td>
<td>100%</td>
<td>19,864</td>
</tr>
</tbody>
</table>
Example Farm-Level Impacts
One Spraying

• Approx. cost/treatment* $16/A.
• Assumed yield loss** (8%)
• Normal soybean yield in S.E.*** 30.5 bu./A.
• Avg. Soybean Price, $/Bu. $6.00/bu.

• Approx. loss/A. $30.64

• Total soybean value/A. (Normal) $183.00

• Percent of gross value lost 16.7%

*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. = $36.4 mil.
• 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.
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>
</tr>
<tr>
<td>Livestock producers</td>
<td>-57</td>
<td>-9</td>
</tr>
<tr>
<td>Other crop producers</td>
<td>+5</td>
<td>+18</td>
</tr>
<tr>
<td>Consumers</td>
<td>-287</td>
<td>-240</td>
</tr>
</tbody>
</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?)
63 Planned + current in Iowa
11 Just across the borders

Capacity: 129% of 2006 crop

Iowa corn processing & ethanol plants, current & planned, 11/20/06
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

Mil. Acres vs. 2005

Figure 3. U.S. Planted Acreage of Major Grains, Oilseeds, and Cotton

Source of data: USDA, NASS
Iowa Current & Potential 2012 Crop Acreages

With la. Corn yld. + 15 bu./A. from 2005

- **Corn**
- **Cont. corn**
- **Soybeans**
- **Hay**
- **Oats**
- **CRP**

Mil. Acres

- 0
- 5
- 10
- 15
- 20
- 25

2005-06

All Plants @ capacity

Plants @ cap. + 20%
‘Example’ of Exchange Rate Impact
Iowa’s Soybean Costs
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>
<thead>
<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>
<th>$55.00</th>
<th>$60.00</th>
<th>$65.00</th>
<th>$70.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean Oil Price $/lb</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0.19</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.20</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.21</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.22</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.23</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.24</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.25</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.26</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.27</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.28</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.29</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.30</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</td>
</tr>
<tr>
<td>$0.31</td>
<td>$0.18</td>
<td>$0.16</td>
<td>$0.14</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.08</td>
<td>$0.06</td>
<td>$0.04</td>
<td>$0.02</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

• USDA, NASS, Crop Production, Annual Summary, January 2006
• USDA, NASS, Crop Production, November 9, 2006
• USDA, WAOB, World Agriculture Supply-Demand Report, 11/09/06
• Renewable Fuels Association, ethanol.org
• grainnet.com and various press releases and industry reports on planned ethanol plants
• Enos Ma, Agricultural Economics, University of Sao Paulo, personal communication
• USDA, National Soybean Rust Commentary
• Gary Munkvold, Associate Professor and Seed Science Endowed Chair, Iowa State University Dept. of Plant Pathology, communication on spraying costs