Charting the Course

- Impact of Infrastructure on U.S. Agriculture
- Key Agricultural Transportation and Infrastructure Issues
- Transportation of Grains, Soybeans and Products
- South America Infrastructure Influence
- Sustainable Transportation
Impact of Infrastructure on U.S. Agriculture
Industries Fully Dependent on Soybeans, Grains and Related Products

To the Second Order Consumers in the Supply Chain:

◊ Delivery of commodities from farming of significant importance to the U.S. economy
◊ 1.5 million jobs,
◊ More than $352 billion in U.S. output,
◊ Over $41 billion in labor earnings, and
◊ Greater than $74 billion in value added on the U.S. economy.
Infrastructure Framework

- Infrastructure Problems = Inefficiencies
- Inefficiencies = Lower Effective Transport Capacity
- Lower Effective Transport Capacity = Higher Rates
- Higher Rates = Lower Farmer Returns
Key Transportation and Infrastructure Issues
### Key Infrastructure Issues

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Project Description</th>
<th>Cumulative Outlays ($ millions)</th>
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</thead>
<tbody>
<tr>
<td>Inland Navigation Lock and Dams</td>
<td><strong>Mississippi River Lock 20, 1,200 foot Lock Addition + Lock &amp; Dam Rehabilitation</strong></td>
<td>$311.1</td>
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<td><strong>Mississippi River Lock 25, 1,200 foot Lock Addition + Scour Repairs &amp; Rehabilitation</strong></td>
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<td><strong>Ohio River Olmsted Lock &amp; Dam Construction and Lock 52 and Lock 53 Removal</strong></td>
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<td><strong>Ohio River Markland Lock Major Rehabilitation</strong></td>
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<td><strong>Illinois River LaGrange Lock Addition</strong></td>
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<td>Channel Dredging by Army Corps of Engineers District</td>
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<td>Mobile</td>
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<td>Portland</td>
<td>$288.0</td>
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Modal Developments beyond the U.S. Borders: Panama Canal

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<thead>
<tr>
<th>Dimension</th>
<th>Current (ft)</th>
<th>3rd Lock (ft)</th>
<th>Change</th>
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<td>39.5</td>
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<td>180.0</td>
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<td>Ship Length</td>
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Soybean Planted Acreage Impact
- 70 miles ◇ 26.7 mil.
- 111 miles ◇ 27.9 mil.
- 161 miles ◇ 49.6 mil. (two-thirds U.S.)
Cost Savings to Soybean and Grain Users Derived From Infrastructure Improvements

- Improved reliability in the delivery time of soybeans and grains
- Reduced travel time and transit costs
- Improved efficiency at ports for using larger, more efficient ocean going vessels
- Potential re-assignment of rail traffic to barge traffic for freight currently utilizing rail to avoid deficiencies at key lock and dam facilities
## Annual Summary Investment Outlays & Returns for Soybeans & Grain Industries

<table>
<thead>
<tr>
<th>Description</th>
<th>Impact Type</th>
<th>Dollar Value (million)</th>
<th>Economic Impact</th>
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<td>Earnings (million)</td>
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<td>Supply Chain Impacts</td>
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Long-Term Problem on the Rivers

Army Corps of Engineers Project Completion Schedule for Select Locks

Army Corps of Engineers Project Completion Schedule
Major Rehabilitation

- Mel Price Upper Miss
- ILL WW Thomas O'Brien L/D
- LaGrange
- L/D 25 Upper Miss Dam

Year: 2010, 2020, 2030, 2040, 2050, 2060, 2070, 2080, 2090, 2100

Army Corps of Engineers Project Completion Schedule
New Construction

- L/D 24 Upper Miss 1200' Lock Addition
- L/D 22 Upper Miss 1200' Lock Addition
- LaGrange 1200' Lock Addition
- L/D 25 Upper Miss 1200' Lock Addition
- Kentucky Lock Addition
- Olmsted L/D Construction

Year: 2010, 2020, 2030, 2040, 2050, 2060, 2070, 2080, 2090, 2100
Deteriorating Infrastructure Situation

- Backlog of Lock and Dam Repairs and Emergency Repairs
  - Industry needs reliability through infrastructure maintenance
  - Not full solution, clearing deferred maintenance buys down risk of catastrophic event or closure until authorized major rehabilitation or new construction can be appropriated and completed
  - Diversion to other modes substantial
    - 1 Barge = about 1,600 tons or 53,000 bushels
    - 1 Railcar = about 110 tons or 3,670 bushels
    - 1 Truck / Container = about 26 tons or 870 bushels
    - So, One 15-barge tow on Illinois River is equivalent to 216 rail cars or 1,050 semi-trucks

- If 90-day closure at LaGrange Lock during peak soybean harvest movement
  - 341 barge loadings diverted as 5,000 rail carloads or 21,000 truck loads
Extreme Wall of Water
Not all Rivers Created Equal

Daily Mississippi River Gage: Memphis

Nearly a 6-Story Building

Source: Army Corps of Engineers
Reduced Driving, Fewer Miles & Improved Efficiencies = Less Highway Funding Base

Annualized Miles Driven by Month
Rising Raw Ingredient Cost Structure Requires Offsets Elsewhere: Logistics

Monthly CRB BLS Spot Index
January 1970 - June 2013
Transportation of Grains, Soybeans and Products
Soybean Logistics Flows
Multiple Markets and Routes
Potential Grain and Soybean Flows by Surplus and Deficit Regions

Crop Production by Surplus and Deficit Regions

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<th>Deficit</th>
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Grain and Soybean Supplies and Storage Response

Grain Supply and Storage Capacity

- Sep-1 Stocks
- Production
- Storage Capacity

Million Bushels

- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
Pace of Grain Storage Expansion Similar whether On Farm or Off Farm

December 1 Grain Storage Capacity by Type

Million Bushels

Crop Year (Sep-Aug)
Potential Grain and Soybean Flows by Surplus and Deficit Regions

Grain and Soybean Net Shipment Position by Transport Region (million tons)

- Upper Mississippi
- Ohio, Indiana, Michigan, Kentucky
- Northern Plains

Crop Year

- 1988/89
- 1993/94
- 2007/08
- 2012/13
- 2013/14

Drought Year

Flood Year

Record Exports

Drought Year

Million Tons

Informa Economics
Railroad Grain Shuttle Loaders Filling the Map
Train Size Increasing, Especially Movements of Soybeans and Corn

Grain and Soybean Tonnage Moved by Train Size

<table>
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<th>51-75</th>
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Share of Grain and Soybean Loadings by River Segment

Shift in barge loadings on inland river system: North to South

- Upper Mississippi River (MSP to Missouri River)
- Illinois Waterway
- Mid-Mississippi River (Missouri River to Ohio River)
- Ohio River
- Lower Mississippi River (Ohio River to Baton Rouge)
- McClellan-Kerr Arkansas River
- Baton Rouge to New Orleans
- New Orleans to Mouth of Passes

Year:
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
Container Vessel Size Continues to Increase

Generational Development of Container Vessels

Year and Generation

Twenty Foot Equivalents (TEUs)
Illinois the Load-Center for Containerized Grain and Soybean Exports

U.S. Container Export Inspections by Crop

1,000 Bushels

- BARLEY
- SORGHUM
- WHEAT
- CORN
- SOYBEANS

Other, 16.7%
Washington, 5.2%
Ohio, 3.8%
New York, 2.9%
Maryland, 6.5%
Illinois, 64.9%
South America
Infrastructure Influence
Brazil’s Modal Developments not Sitting Idle

Soybean Modal Shares in Brazil and United States

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<tr>
<th>Year</th>
<th>Brazil</th>
<th>United States</th>
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<td>2010</td>
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- **Waterways**
- **Railways**
- **Highways**
Impacts of Proposed Brazilian Soybean Corridors Can Make a Difference

- Infrastructure projects been proposed to accommodate the reliable and efficient movement of soybeans

- Realized improvements to the infrastructure estimated to reduce freight costs
  
  ◯ $40 per metric ton, or
  ◯ Between 20% and 30% depending on the origin.

- Accounting for wait times between transportation events and export movement, the estimated cost savings could exceed
  
  ◯ 50%, or
  ◯ U.S. $55 to more than U.S. $60 per metric ton.

- Such potential improvements bring Brazil nearly on par with the United States in terms of inland transport costs, effectively bolstering its farm industry.
Sustainable Transportation moving Soybeans to Market Position
Sustainability Looks Different When Factoring Modal Conditions

- U.S. and Brazilian Soybean Production and Exports on Equalizing
  - Both send about 60% of exports to China
  - Each sends slightly varying volumes to different markets

- Brazil Modal Share becoming Comparable to U.S.
  - Truck is the discrepancy – Brazil hauling 17 times further than U.S.

- Brazil Highly Dependent on Truck to Final Market Position
  - Trucking in Brazil alone:
    - Generates one-half of total ton-miles
    - Consumes more than three-quarters of fuel burned
    - Emits nearly 90% of all CO₂
    - Represents 71% of all fuel spills

- Compared to the U.S., Brazil:
  - Consumes twice as much fuel
  - Emits four times as much CO₂
  - Spills nearly double the fuel
Summary and Conclusions
Global Summary

- The Global Age is Readily Apparent
  - The world is shrinking
  - Shipping options expanding
  - The U.S. is not as pivotal

- Developing Countries Slowly Coming of Age
  - Expanding infrastructure
  - Port developments
  - Still a ways to go however

- Economy Driving Infrastructure Issues
  - Much work to be done
  - Funding issues to abound
  - Renewed efforts of collaboration required
    - Consistent message with meaningful facts
The Shifting Nexus of Global Agriculture

Investing in Agricultural Infrastructure

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