Transport Capacity for 600 Million Bushels of Soybean Utilization

Summary of Findings

informa economics

Prepared for Illinois Soybean Association

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Background

A stated goal of the Illinois Soybean Association ("IL Soy") is "maximum profitability and global competitive positioning for Illinois soybean producers." As part of that goal, IL Soy envisions the "utilization of 600 million bushels of Illinois soybeans by 2020." Profitability and competitive positioning is greatly influenced by transportation and infrastructure. Transportation is the means to realize value for farmers shipping their harvest from a farm to a market position. An inadequate infrastructure however, will marginalize the economic returns to a farmer through higher costs associated with fuel, lower velocity, light loading of equipment, and excessive wear and tear on equipment. The added costs described will work to reduce the farm gate price of the soybeans the farmer sells, and impact the capability of the supply chain system to achieve the targeted utilization of 600 million bushels.

Project Objective, Scope and Methodology

- Project Objective
  - The utilization of Illinois soybeans during 2010/11 totaled more than 460 million bushels. The analysis presented in this study aims to determine the capability of the current system to accommodate the increase in utilization to 600 million bushels and identifies areas in which further infrastructure investment may be needed.
- Scope
  - The institutional and industrial capabilities analyzed include:
    - Grain storage situation and flow rates;
    - The roadways and truck loadings,
    - The rail network and carloadings;
    - The lock and river navigation network and barge loadings; and
    - Export container movements.
- Methodology Overview & General Assumptions
  - A review of the existing transportation distribution and logistics infrastructure, flows, institutional capabilities and industrial capacities is analyzed and compared against requirements under the 600 million bushel utilization scenarios (requirements were derived in part by a county level least cost transportation model) to identify key limiting factors across Illinois and nearby states and to determine where additional investment may be needed.
  - It was assumed that processing infrastructure (i.e., crush, ethanol, and livestock) capacity and/or utilization rates expanded as necessary to achieve scenario output assumptions.
  - It was assumed that there was no major infrastructure failure or event.

600 Million Bushel Pathway Scenarios Analyzed

- A series of scenarios were prepared to conduct the analysis
- Key differences between alternative 600 million bushel scenarios is based on assumptions regarding the extent to which export markets may shift in favor of more whole soybeans as opposed to soybean meal.
  - Domestic demand growth from livestock and poultry industries is relatively moderate. The larger demand growth opportunity is anticipated to be on the export side.
  - The scenarios are based primarily around whether this world protein demand growth translates into higher whole bean demand or higher meal demand.

Scenario Assumptions

	Benchmark		Pathways to 600 Million Bushels					
	2010/2011		Baseline		Scenario 2		Scenario 3	
	Volume	% Utilization	Volume	% Utilization	Volume	% Utilization	Volume	% Utilization
Soybeans (mil bu)								
Utilization	457		600		600		600	
In-State Crushing	249	54%	280	47%	320	53%	249	41%
FSI	14	3%	18	3%	18	3%	18	3%
Outshipments of Soybeans	194	42%	302	50%	262	44%	334	56%
Domestic	18	4%	22	4%	22	4%	22	4%
Foreign	176	38%	281	47%	241	40%	312	52%
Soybean Meal (mil short tons)								
Production/Utilization	5.91		6.65		7.61		5.91	
In-State Livestock Demand	0.71	12%	0.82	12%	0.82	11%	0.78	13%
Outshipments of Soybean Meal	5.20	88%	5.83	88%	6.79	89%	5.13	87%
Domestic	3.82	65%	4.51	68%	4.51	59%	4.19	71%
Foreign	1.38	23%	1.32	20%	2.28	30%	0.94	16%
Soybean Oil (mil lbs)								
Production/Utilization	2,787		3,136		3,588		2,787	
Biodiesel	169	6%	286	9%	286	8%	286	10%
U.S. Food and Industrial (excl. Biodiesel)	2,140	77%	2,552	81%	2,552	71%	2,401	86%
Foreign Exports	477	17%	298	10%	750	21%	100	4%
Corn (mil bu)								
Utilization	2,037		2,233		2,233		2,233	
In-State Processing	808	40%	851	38%	851	38%	851	38%
Seed	4	0%	4	0%	4	0%	4	0%
Livestock Feed	110	5%	137	6%	137	6%	137	6%
Outshipments	1,115	55%	1,242	56%	1,242	56%	1,242	56%

Key Conclusions

Based on this analysis, Illinois does appear to have sufficient infrastructure to handle the 600 million bushels of soybean utilization. However, there are a few areas that are tighter than others and may require further investment

- Modest increases in storage are required to maintain reasonable utilization rates and seasonal flows. However these increases are in line with historical growth trends.
- Current rail and barge infrastructure are not expected to be an impediment to reaching IL Soy's vision of 600 million bushels of soybean utilization.
  - The one factor that could potentially put a notable constraint on rail car availability is the growth of the oil and natural gas industry in North Dakota and their increasing demand from covered hoppers to haul frac sand. However, the rail industry is responding to the increased demand and is manufacturing new rail cars.
- Container movements of grain are not expected to be a bottleneck for 600 million bushels of soybeans in Illinois. However, compared to barge and rail, container demand could be tighter as availability is driven by demand for foreign products that are delivered in containers. If container availability does not reach levels assumed in this analysis, some corn and soybeans that are not identity preserved would be transported by available barge and rail.

Key Conclusions

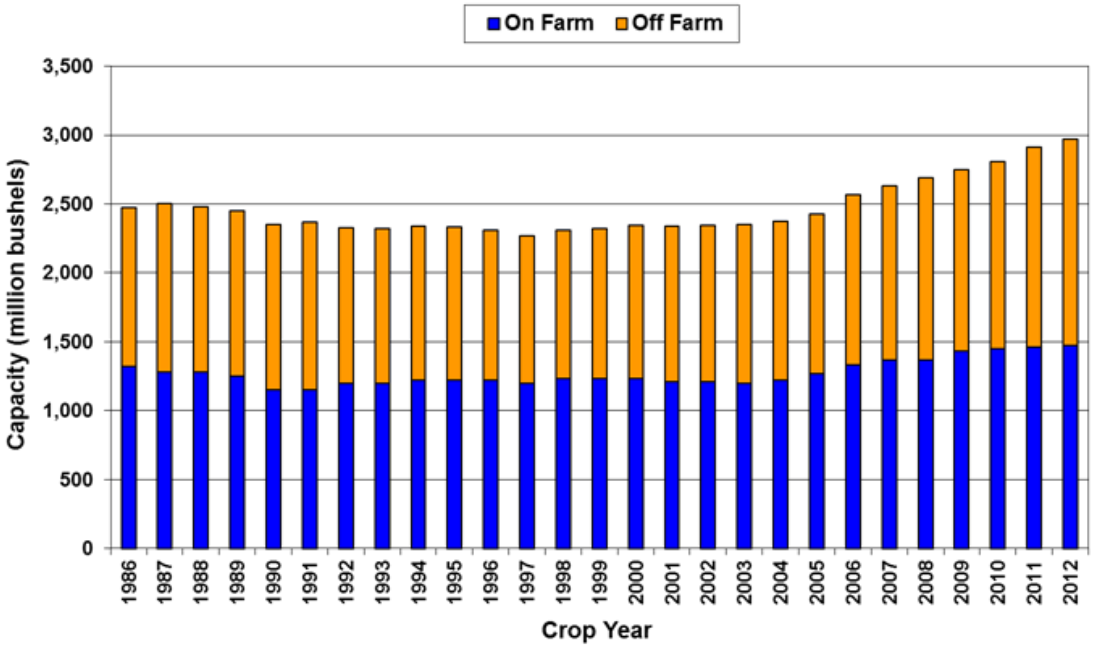
- In all of the 600 million bushel scenarios analyzed, it was assumed that there would be general increases in processing infrastructure.
- The primary area of potential concern is in the roadways, as truck driver availability may be a limiting factor to total truck capacity and further investment in Illinois roadways is required to address the deteriorating infrastructure; however, this is largely a county-level problem.
  - County level infrastructure conditions vary widely. At the county level, three potential problem areas (8 counties) were identified (listed below). These eight counties all currently have 20 or more posted or closed bridges and they exhibit an expected truckload increase resulting from the state of Illinois' utilization of 600 million bushel as a scenario that exceeds 10,000.
    - Vermilion, Iroquois and Livingston
    - Shelby, Christian, and Sangamon.
    - Hancock and Pike

Category	Estimated Current	Additional Needed for Scenarios
Grain Storage (million bu)	2,911	270
Truckloads	4,838,170	559,642
Number of Railcars	10,667	-
Number of Barges	4,500	-

Storage

Current Situation: Capacity and Historic Trends

- As of December 1, 2011, Illinois had 1,460 million bushels of on-farm storage capacity and 1,451 million bushels of off-farm storage.
- Total farm storage capacity has been trending upward over the past decade, with off-farm storage increasing at a slightly faster pace than on-farm storage.



Source: USDA

Storage

Current Situation: Capacity Utilization

- Total storage capacity utilization rates are high relative to many other Corn Belt states, averaging 78% over the past three years.
- At the peak stocks month of December, on-farm utilization has averaged 87% and off-farm storage has averaged 69% capacity utilization over the past three years.
- Over the past decade, on-farm utilization reached a maximum of 99% in 2004/05 and off-farm utilization reached a peak of 85% in 2005/06 and again in 2007/08.

	10 Yr. Max	10 Yr. Min	3 Yr. Avg (2009/10-2011/12)
Illinois	91%	73%	78%
Indiana	90%	67%	74%
Kentucky	67%	51%	58%
Missouri	72%	49%	59%
Iowa	90%	68%	72%
Wisconsin	79%	61%	76%
Michigan	81%	65%	76%
Ohio	85%	57%	76%
Minnesota	88%	67%	75%
Kansas	74%	46%	69%
Nebraska	84%	65%	77%

Storage

600 Million Bushel Scenario Analysis

- Throughput volumes by destination type were estimated by scenario using a least cost transportation model and results are compared against current estimated storage capacity.
- Based on this analysis, required turns necessary to move scenario throughput volumes using current storage capacity are well below what is reasonably achievable for many of the storage facility types.

Scenario	On-Farm Storage	Country Elevator	Shuttle Elevator	River Elevator
	Est. Throughput Corn & Soybeans (mil bu)			
2010/11 Benchmark	1,235.8	920.2	81.0	889.5
Baseline 600	1,370.1	1,076.8	105.5	1,153.5
600 Scn. 2	1,370.7	1,077.9	105.5	1,129.1
600 Scn. 3	1,369.2	1,075.8	106.0	1,172.4
	Est. Current Storage Capacity (mil bu)			
	1,450.0	**746.9**	**163.5**	**108.8**
	*Implied Turns**			
2010/11 Benchmark	0.9	1.2	0.5	8.2
Baseline 600	0.9	1.4	0.6	10.6
600 Scn. 2	0.9	1.4	0.6	10.4
600 Scn. 3	0.9	1.4	0.6	10.8

* Without any new storage built. If trends in storage capacity build out continue, these turns can be expected to be lower. However, these turn estimates do not include throughput of other crops or soybean meal. Additionally, some elevators will be turning at much higher levels and some will turn less.

Storage
Conclusions

- Illinois storage capacity is sufficient, even at current levels, to handle the 600 million bushel scenarios examined within this study. However, an additional 270 million bushels of additional storage would be beneficial, helping maintain current capacity utilization and seasonal flow rates.
- This level of increase is considered to be achievable given storage build-out trends exhibited over the past decade. Specifically, this expansion can be expected to be mostly in on-farm storage and final destinations (e.g., ethanol, crush, livestock), and to a lesser extent from country elevators (including those expanding to increasing levels of car loadings similar to shuttle elevators).

Truck/Roadway

Current Situation

- According to the American Society of Civil Engineers (ASOCE), 17% of Illinois' bridges are structurally deficient or functionally obsolete, and 16% of Illinois' major roads are in poor or mediocre condition.
- Illinois has 2.5 miles of roadway to every square mile of land, which is a dense roadway system. This roadway density reduces the impact of deteriorating roads and bridges.
- However, the longer term problem is the number of deficient bridges is increasing, the time and money required to rehabilitate a bridge is increasing, and the volume of agriculture goods are increasing.
- Furthermore, total roadway demand which has been reduced over the past few years by the economic recession, can be expected to increase in the future as the economy recovers. If the roadways are allowed to continue to deteriorate, eventually, freight movement patterns will be altered.

Truck/Roadway

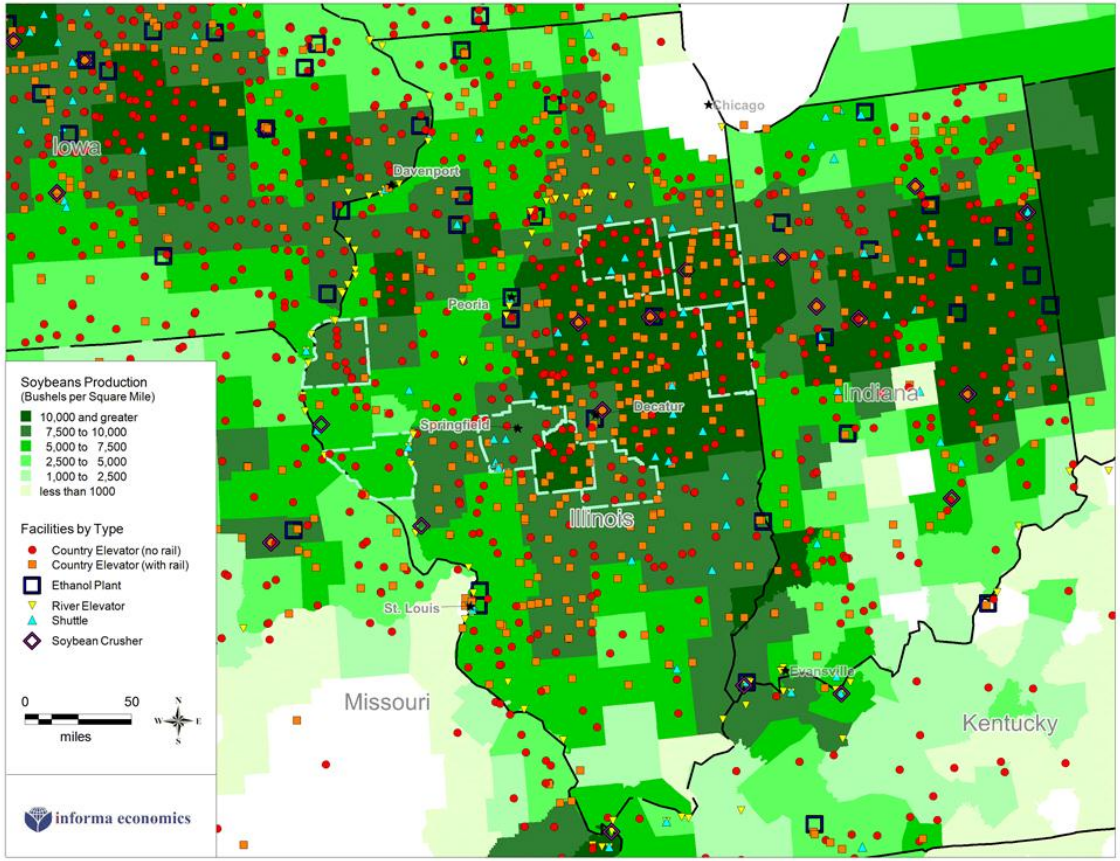
600 Million Bushel Scenario Analysis

- In order to accommodate 600 million bushels, it is estimated that total truckloads would need to increase by 11.5% and ton-miles would increase by 440 million (representing a 0.02% to 0.03% increase in total truck ton-miles). A larger concern is the traffic congestion that would be generated from a rapidly improving economy.
- County level infrastructure conditions vary widely. At the county level, three potential problem areas (8 counties) were identified. These eight counties all currently have 20 or more posted or closed bridges and expected truckload increases resulting from the 600 million bushel scenario exceed 10,000. (see map on next slide)
  - Vermilion, Iroquois and Livingston
  - Shelby, Christian, and Sangamon
  - Hancock and Pike

Truck/Roadway

600 Million Bushel Scenario Analysis

At the county level, three potential problem areas (8 counties) were identified.



Truck/Roadway
Conclusions

- At a statewide level, the increase in volume from grain and soybeans necessary to achieve 600 million bushels of soybean utilization can be handled. However, results confirm previous discussions with county engineers that due to the funding methods and county demographics, certain counties are facing a challenge to maintain the infrastructure, as the level of roadway deterioration is not equal across counties.
- Availability of equipment is not a problem. However, truck driver availability can be expected to be a growing limitation. The need for truck drivers is expected to become heightened in 2013 when stricter federal limits on the number of hours drivers can work are enacted. Driver shortages are effectively limiting the need for more truck capacity.

Rail

Current Situation

- All seven Class I railroads operate in the state (no other state can claim this). Illinois has the most freight railroad track miles of all its surrounding states, 42 freight railroads and 7,313 freight railroad track miles.
- The industry has been transitioning from smaller trains that hauled relatively shorter distances using smaller cars to an industry with more cars per train on longer hauls using bigger cars through shuttle train programs.
  - Currently, there are 43 shuttle train facilities in Illinois, with three announced facilities scheduled to come online between fall 2012 and spring 2013.
  - The growth in ethanol production is expected to slow over the next few years. As a result, shuttle trains should continue to increase the average rail distances of corn, as the anticipated growth in surplus corn is transported to export and out-of-state feeding positions.
- Illinois soybean carloadings peaked at over 70,000 short tons in 2001/02, fell to over 40,000 ST in 2004/05, and have slightly increased since then.
- Corn carloadings in Illinois peaked at nearly 336 thousand short tons in 2002/03 just before many ethanol plants came online. Corn carloadings have since been in a decreasing trend, returning to levels last seen before the turn of the century.

Rail

600 Million Bushel Scenario Analysis

- Given the various 600 million bushel scenarios presented in this report, the number of railcars needed for soybeans, meal, corn and wheat would range from 188,000 to 200,000 rail loadings for 105 ton cars .
- Assuming 20 days for the average roundtrip and 18 possible trips per covered hopper would require 10,318 to 10,958 covered hopper railcars.
- Given logistical efficiencies, not including major weather events that can shut down grain transportation (i.e., Hurricane Katrina), the number of railcars in and around Illinois will not be a constraint to Illinois reaching the 600 million bushels of soybeans.
- This increase of roughly 11,000 covered hopper cars represents approximately 3% of the current fleet of railcars transporting grain in the U.S.

Rail
Conclusions

- Illinois rail infrastructure is not expected to be an impediment to reaching IL Soy's vision of 600 million bushels of soybean utilization.
- The one factor that could potentially put a notable constraint on rail car availability is the growth of the oil and natural gas industry in North Dakota and their increasing demand from covered hoppers to haul frac sand. However, the rail industry is responding to the increased demand and is manufacturing new rail cars.

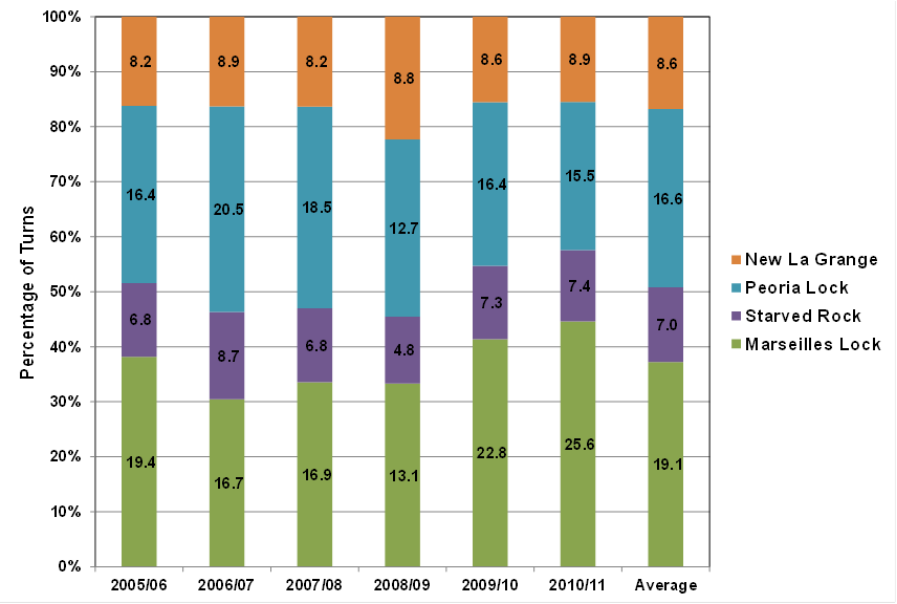
Barge
Current Situation

- Illinois has the most navigable waterway miles of any state in the U.S. with 1,102 miles.
- The average barge length of haul for soybeans from Illinois to export position at the Center Gulf is 1,205 miles as compared with Indiana which is 1,014 and Iowa which is slightly higher with 1,296 miles.
- Historical grain barge loadings demonstrate a shift in loadings by waterway. The trend of relatively less grain loading on the upper Mississippi and Illinois Rivers has emerged since the early 2000s. This trend is particularly evident for soybean loadings, with increased loadings on the lower Ohio and lower Mississippi Rivers.
  - This shift in loadings has occurred during the time of the ethanol build out across the Corn Belt and within proximity of the navigable river system, especially in Iowa where corn became deficit. As corn ethanol production approaches the 15 billion gallon mandate, production growth is expected to slow dramatically and corn surpluses are expected to return along the upper Mississippi River.

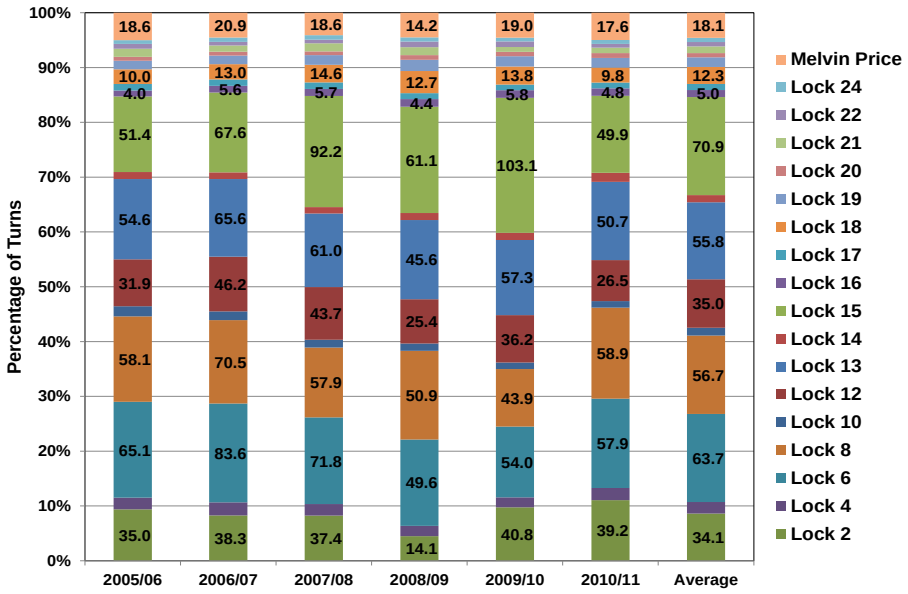
Barge

Current Situation

Illinois River Elevator Turns by Segment



Upper Mississippi River Elevator Turns by Segment



Sources: Army Corps of Engineers and Informa Economics
Notes: The numbers in the chart are average annual turns by river segment

Barge

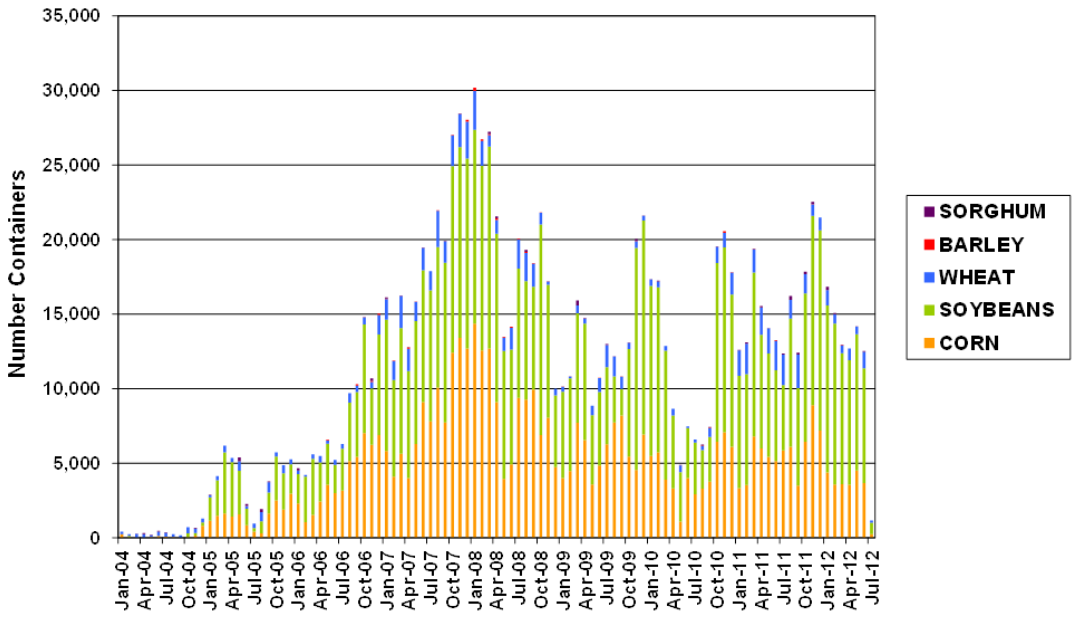
600 Million Bushel Scenario Analysis & Conclusions

- The average turns of river elevators over the last six years was analyzed to identify trends in river loading operations along waterway segments in Illinois and to determine if turns required under the 600 million bushel scenarios would present a potential barrier.
- Average turns varied greatly by river segment; ranging from 70 to less than 1. This large range of turn rates, the annual variability of turns by river segment, and the historical maximum turns at various locks and river segment serve as an indication of what is possible, and indicates significant ability to increase future turn rates if necessary and additional operations or design to accommodate high throughput.
- Barge loadings in Illinois in 2010/11 totaled approximately 15,288 for corn, soybeans and wheat, while in 2020/21 under the 600 million bushel scenario, it is expected that the total barge loadings will be higher, reaching around 18,500 . This would be less than the record 2002/03 total of nearly 25,000 grain barge loadings in Illinois.
- It is estimated that around 4,500 dry covered barges operate in Illinois throughout the year and that it would be possible for barges out of Illinois to make 14-15 round trips to the Center Gulf per year. Thus, 4,500 dry covered barges making 14 trips per year would equal 63,000 barge loadings, compared to the 18,500 requirement under the 600 million bushel scenario.

Export Container

Current Situation

- There is a current average weekly availability of 2,500 containers and a yearly demand of nearly 129,000 twenty-foot containers.
- There are currently around 14 grain and soybean transloading facilities in Illinois. In 2010/11, over 28 million bushels of soybeans were moved via container from Illinois.



Export Container

600 Million Bushel Scenario Analysis & Conclusions

- The number of soybeans moved by container could increase from 28 to over 63 million bushels by 2020/21 under the 600 million bushel scenario. This is equivalent to around 73,000 containers annually. When adding corn to the container mix, the total containers needed under the 600 million bushel scenario would be over 128,000.
- The number of available containers is driven by demand for foreign products that are delivered in containers. Ship lines deliver foreign products to the U.S. in containers and thus prefer containers to leave the U.S. full for backhaul opportunities. Additional factors affecting container demand include demand for identity preserved grain and market conditions, such as the price of the dollar.
- It is not expected that container movements of grain will be a bottleneck for 600 million bushels of soybeans in Illinois. However, compared to barge and rail, container demand could be tighter given the current average weekly availability of 2,500 containers and a yearly demand of nearly 129,000 twenty-foot containers. Timing and delivery of the containers will become very important for the 2020/21 scenarios. If the growth in available containers does not occur and 2,500 is the standard weekly number, some corn and soybeans that are not identity preserved would be transported by available barge and rail.

Thank You