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Containerized Exports via the Inland Waterway System: An Opportunity for Agriculture?

Prepared For:

SOY TRANSPORTATION COALITION

and

ILLINOIS SOYBEAN ASSOCIATION
CHECKOFF PROGRAM

August 2018

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Acronyms

APH	American Patriot Holdings
CIF	Cost, Insurance and Freight
Corps	Army Corps of Engineers
COV	Container on Vessel
DDGS	Distillers Dried Grains with Solubles
FGIS	Federal Grain Inspection Service
FEU	Forty-foot Equivalent Units
FOB	Free On Board
PPHTD	Plaquemines Port Harbor & Terminal District
SBM	Soybean Meal
SBO	Soybean Oil
TEU	Twenty-foot Equivalent Units

I. EXECUTIVE SUMMARY

This study provides clarity on the potential for soybeans, soybean meal and other agricultural products to benefit from a new and innovative approach moving containers for the hauling of global trade via the nation's inland waterway system. New marine vessels – designed by American Patriot Holdings, LLC. (APH) – present the potential to change dramatically the economics of containerized shipping along the inland waterway system as a container on vessel (COV) approach, rather than a container on barge program.

APH has designed and been testing two self-propelled container vessel concepts for operation on the Mississippi River with a liner vessel that can transport up to 2,500 TEUs (twenty-foot equivalent units) and a hybrid vessel that can transport up to 1,270 TEUs. The liner vessel can operate at over 13 miles per hour upriver allowing a seven-day round-trip transit from Plaquemines Parrish in Louisiana to Memphis, TN and an eleven-day round-trip transit to St. Louis, MO. The hybrid vessel is designed to operate on the inland shallow draft, locking rivers, such as the Illinois, Ohio, Missouri and Arkansas Rivers extending the reach of their service.

Meanwhile, the Plaquemines Port Harbor & Terminal District (PPHTD) is developing a new container port terminal, located between mile markers 50 and 55 on the Mississippi River that will be the southern-most full-service port complex on the Mississippi River, providing full intermodal service via river, rail, highway and air to and from the heartland of America.

APH has entered an exclusive agreement with PPHTD to develop a specially-designed gateway terminal at mile marker 55 on the Mississippi River. The PPHTD location has a 55-foot draft that will accommodate large, ocean-going vessels. PPHTD offers less marine traffic and 50 percent less ocean carrier navigation time to other upriver locations. The port is at the widest and deepest part of the Mississippi River making it capable of servicing the largest ocean carriers (20,000 plus TEU vessels).

Informa focused on the availability and potential to move corn, soybeans, soybean meal and DDGS by container on the Mississippi River System. Corn production area has expanded over the past decade moving westward and along the lower Mississippi from its traditional Midwest production areas. Soybean area has also expanded to the north and west, and along the lower Mississippi River. Ethanol production and soybean crushing are located in these areas.

The availability of corn, soybeans, SBM and DDGS near 10 targeted inland river ports was examined and summarized in Exhibit 5. Informa identified the available supply of corn, soybeans, SBM and DDGS within a 100-mile radius of the port as a compelling distance for a truck move to the river. As demonstrated, there are large supplies of crops and products near ports such as, Omaha, NE; Peoria, IL and the Quad Cities that include East Moline, Moline and Rock Island, IL; and Bettendorf and Davenport, IA. These inland river ports would be able to supply agricultural products to the Gulf utilizing barge service or APH's hybrid vessel service that is designed to move containers on smaller or locking river waterways as well as the Mississippi River.

Memphis and St. Louis would serve as consolidation points for large shipments of agricultural products. Both locations are downriver from the last lock on the Mississippi River (Chain of Rocks Lock or Lock 27 at Granite City, IL, near St. Louis) allowing for deeper draft capabilities and heavier barge loadings.

Exhibit 1: Agricultural Product Supply Near Inland River Ports, 1000 Metric Tons

	Corn 100 Mile Radius	Soybeans 100 Mile Radius	Soybean Meal 100 Mile Radius	DDGS 100 Mile Radius	Total
Chicago, IL	32,908	7,474	559	1,898	42,838
Kansas City, KS	13,343	5,671	1,795	615	21,424
Little Rock, AR	3,220	3,422	380	0	7,022
Louisville, KY	10,285	4,297	1,167	2	15,751
Memphis, TN	6,528	6,557	-	204	13,289
Minneapolis, MN	28,118	5,768	1,584	1,767	37,236
Omaha, NE	46,153	11,631	5,372	4,389	67,545
Peoria, IL	50,831	11,527	2,754	3,330	68,443
Quad Cities Area	51,828	10,212	982	4,929	67,951
St Louis, MO	20,636	6,987	-	490	28,113

Source: USDA, Agribusiness Consulting

The volumes available near Omaha, Peoria and the Quad Cities areas are all over the equivalent of three million TEUs. Most of the grain, soybeans and agricultural products that move will be carried by bulk barges. But put into terms of the APH liner system that is the equivalent of over 1,200 vessel loads or 24 per week. Corn and soybean movements tend to peak during October and November. Soybean meal and DDGS are not as seasonal.

Informa looked at the supply available for outshipment on a statewide basis. Using a surplus and deficit analysis, the production in a state less the consumption in a state results in a surplus or deficit in that state. The surplus in a state is the amount available for outshipment. Illinois and

Minnesota have a combined surplus of corn available for outshipment totaling roughly 2.9 million TEUs on an equivalent basis. An additional 1.1 million TEU equivalents is available in Nebraska and Missouri combined. Iowa has a low supply available for outshipment due to its large ethanol industry despite being the top corn producing state. Outshipments may go to other states for processing or to export.

Similarly, Illinois has over 500 thousand TEU equivalents of soybeans available for outshipment. The crushing industry in Illinois consumes a large portion of Illinois' soybean production. The large crushing industry results in greater amounts of SBM available as outshipments though. Minnesota and Nebraska each have close to 350 thousand TEU equivalents of soybeans available for outshipment.

Soybean exports have demonstrated a continued increase since 2010 except for 2011/12 and 2012/13 which declined dramatically due to drought. Corn exports on the other hand have been relatively flat except for the drought years mentioned. After rapid growth beginning in 2005, DDGS exports peaked in 2013/14. DDGS have declined slightly since then mainly due to Chinese restrictions on imports. Soybean meal exports have demonstrated growth as demand for soybean oil in the biodiesel industry has grown and demand in China and Asia for protein has grown requiring higher feed imports. Taken together, exports of corn, soybeans, SBM and DDGS increased 75 percent from 2000/01 to 2016/17, to nearly 134 million metric tons.

The Center Gulf handles 57 percent of U.S. corn exports and 59 percent of U.S. soybean exports. More than one-half of SBM exports are moved through the Center Gulf while 72 percent of DDGS exports are through the Center Gulf.

Dry bulk ocean vessels are the predominant mode used to transport grains and soybeans to global market destinations. Rail is the second most used mode to transport grain and soybean exports as cross border moves into Canada or Mexico. The use of containers for grain and soybean exports is the third largest mode, but at a much lower level.

Because the U.S. economy purchases many goods and products offshore, most of those arrive into the U.S. in a container. Those containers would then return to the offshore country empty to repeat the cycle of the highly lucrative trade flow of goods and products to the U.S. However, those containers are also an available supply of across many regions of the U.S. as a backhaul opportunity for bulk commodities and products such as grains, soybeans and products (DDGS

and SBM). The use of containers for grain and soybean exports represents about three percent to four percent of total grain and soybean exports on a given year. For the 2016/17 grain and soybean marketing year the share of containers used for total grain and soybean exports was 3.3 percent, which is modestly above the three-year average of 3.2 percent, making it the best year since 2007/08.

Asia is the primary destination for crops exported in containers. Taiwan, China, Indonesia and Vietnam comprise the top four container destinations for crops. The destination markets favor containers originating through West Coast ports. China's import decline of container volumes is a pause for concern since it was the largest market to use containers, but the fall in containers used is associated with China banning DDGS imports from the U.S.

Corn, soybeans and animal feed, which includes SBM and DDGS, are the largest agriculture related commodity moves on the inland waterway system. The volume of corn and soybeans moving by barge to export position the U.S. Center Gulf is the equivalent of nearly 4.1 million TEUs combined. Animal feeds which includes SBM and DDGS represent the equivalent of another 460 thousand TEUs. In TEU equivalents, the U.S. corn, soybeans and products programs alone represent more than 4.5 million TEUs.

For comparison purposes, a single barge loaded with 1,500 short tons is the equivalent of about 88 TEUs, while a 15-barge tow (a typical tow size operating on locking rivers) then represents 1,324 TEUs. For a barge loaded in non-locking rivers and loaded to 2,000 short tons, it represents about 118 TEUs while a 35-barge tow on the non-locking rivers would then represent 4,118 TEUs. Meanwhile, if all containers on the APH liner vessel were loaded with corn, soybeans or products, it would represent about 21 barges loaded to 2,000 short tons. However, not all containers on the APH liner vessel can be fully loaded to 17 tons without exceeding it deadweight limitations.

As previously mentioned, dry bulk ocean vessels and railroads are the top two modes handling exports of corn, soybeans and agricultural commodities. Container shipments are the third largest mode of exports. The proposed APH system will be competing against bulk ocean shipments out of the Center Gulf and container shipments, mainly out of the West Coast, so comparisons were limited to these two modal options.

Over 58 percent of U.S. corn, soybean, SBM and DDGS exports move through Center Gulf elevators, and mostly arriving to those elevators by barge. These shipments begin with the

delivery of corn and soybeans from local elevators at upriver locations tributary to the Mississippi River System. SBM and DDGS are delivered from crush plants and ethanol processors to river terminals either by truck or rail. Informa developed transportation costs from the elevator to barge loading to barge unloading at the export port and finally ocean freight to Asia, specifically China. Barge freight rates used were based on a 5-year average during peak months for grain and soybean shipments.

Containerized exports of corn and soybeans account for roughly four percent of total U.S. export inspections. The grain, soybeans and products are sourced from an elevator whether from an on-farm location or off-farm position, or a soybean crush plant or ethanol plant, similar as the movement to a bulk barge loading position. The grains, soybeans and products are moved to a container transload facility where the commodity is transloaded from one mode of transportation to another. Loaded containers are then transported via railroad to Los Angeles were the container is transferred from the railroad to the ocean-going vessel. The same Asian destination was used to calculate ocean freight. The incoming shipment of goods from Asia is considered the head-haul and is designed to cover the cost of not only the delivery of the container contents to their destination but the return of the empty container. As such, rates for the return, or back haul, of a container of goods is typically at a large discount. A combine rate for the rail and ocean movement is discounted compared to these moves made separately. The importance to the original shipper is to get their container back in order to increase turns and profits. Shippers balance containers along the same routes and have improved efficiencies in returning the containers. Still a large number of containers return empty and do not generate any revenue to offset their back haul.

APH has entered an exclusive agreement with PPHTD to develop a specially-designed gateway terminal at mile marker 55 on the Lower Mississippi River. The PPHTD location has a 55-foot draft that will accommodate large, ocean-going vessels. PPHTD offers less marine traffic and 50% less ocean carrier navigation time to other upriver locations. The port is at the widest and deepest part of the Mississippi River making it capable of servicing the largest ocean carriers (20,000 plus TEU vessels).

APH is also working to develop terminals along the inland waterway system that will allow for rapid unloading and loading of its vessels for a quick turn-around. APH and PPHTD currently have Memorandums of Understanding with ports in Memphis, the St. Louis region, Kansas City and Little Rock.

APH envisions transporting containers with high-value dry goods and products upriver and a mixture of containers containing agricultural products or dry goods and commodities back to PPHTD as well as empty containers.

The liner service will operate between PPHTD, Memphis and St. Louis. APH is initially looking at hybrid service between PPHTD and Little Rock, Cincinnati, Kansas City, the Quad Cities and Chicago.

The proposed APH system begins similar to the intermodal move to the West Coast. Corn, soybeans and other agricultural products will be delivered for transloading into containers at the river terminal as opposed to an intermodal location. This will allow containers to be loaded to maximum weight as they will not be restricted by road weight limits. APH will work with terminal operators to develop a high-speed loading system for their vessels. These vessels will then transport containers to PPHTD, similar to how containers are currently transported to the West Coast. Once at PPHTD, APH will have a dedicated terminal for its vessels where containers will be transferred to an ocean-going vessel.

The three modes of transportation were compared for five initial origin locations identified by APH. These comparisons are shown in Exhibit 2. The average freight rate for a bulk barge movement for the five origin locations is estimated at $82.26 per metric ton. By comparison an average container move to the West Coast is estimated at $184.76 per metric ton. And the estimated freight rate using the APH system is $117.91 per metric ton. It should be noted that the APH system decreases to $90.40 per metric ton when containers are loaded to maximum container weights as opposed to maximum road weights. The APH system has a competitive rate advantage compared to a container move through the West Coast. The proposed system does face established routes and requirements of balancing container movements through ports.

Exhibit 2: Comparison of American Patriot Holdings Service to Bulk Barge and West Coast Container Movements, $ per Metric Ton

Origin	Bulk Barge	Container to West Coast	APH Service
Memphis, TN	$ 75.69	$ 176.50	$ 107.06
St. Louis, MO	$ 79.80	$ 197.77	$ 113.12
Little Rock, AR	$ 75.87	$ 189.89	$ 113.98
Kansas City, MO	$ 92.07	$ 189.79	$ 127.54
Joliet, IL (Chicago)	$ 87.87	$ 169.85	$ 127.83

The proposed APH system would have a transit time advantage over barge and intermodal service from elevator to export position. The APH system is approximately 7 days faster than bulk barge to the Gulf and 6 days faster than intermodal to Los Angeles. APH has an ocean transit time advantage over bulk grain and agricultural moves of roughly 8 days as bulk moves will travel around the Cape of Good Hope and it assumed that container moves will transit the Panama Canal. Intermodal has an ocean transit advantage of 8 days over the APH route as it is a shorter route. Overall, intermodal shipments have only a 2-day advantage over the APH system which has a 14.5-day advantage over bulk.

Given the development of container imports through the Gulf Coast, the APH system offers a strategic alternative to current shipping modes. Identity preservation and quality preservation are important considerations for the use of containers that could offset additional costs over dry bulk. The ability of buyers to purchase large shipments or the need for smaller shipments are an additional competitive advantage to container movements.

Container movements account for less than five percent of all grain and soybean export movements. Bulk barge movements have a competitive advantage over container movements due to the differential in price. Bulk barge is expected to remain the predominant mode of transportation for the export of grain and soybeans. The proposed service to be offered by APH does have a price advantage over intermodal moves through the West Coast. On an overall scale of all grain and soybean exports and sales, the proposed APH system is unlikely to have a significant impact on local basis, yet will provide more optionality and flexibility accessing key global markets.

II. INTRODUCTION

This study provides clarity on the potential for soybeans, soybean meal and other agricultural products to benefit from a new and innovative approach moving containers for the hauling of global trade via the nation's inland waterway system. New marine vessels – designed by American Patriot Holdings, LLC. (APH) – present the potential to change dramatically the economics of containerized shipping along the inland waterway system as a container on vessel (COV) approach, rather than a container on barge program. This study answers key questions of whether the U.S. soybean industry and other agricultural industries will benefit from a container on vessel system; whether this new supply chain is a viable option meeting the demands of international customers; and, most importantly if U.S. soybean producers will profit from this approach.

Meanwhile, the Plaquemines Port Harbor & Terminal District (PPHTD) is developing a new container port terminal, located between mile 50 and 55 on the Mississippi River that will be the southern-most full-service port complex on the river, providing full intermodal service via river, rail, highway and air to and from the heartland of America. Complementing the Port is the APH new "State of the Art" self-propelled container vessels, specifically designed for the Mississippi River to ensure optimal speed and transportation efficiencies. APH has two vessel options being considered, a liner vessel and a hybrid. The liner service will operate between the PPHTD terminal and multiple upriver loading terminals, tentatively planned for St. Louis and Memphis. The liner vessel is being designated to serve the non-locking navigation segments of the Mississippi River System (from St. Louis to PPHTD). The liner vessels will have cargo carrying capacities of approximately 15,300 Short Tons and 2,500 TEUs (twenty-foot equivalent units). APH's hybrid vessel is initially scheduled to provide service between PPHTD and Little Rock, Kansas City and Joliet. The hybrid vessel is being designed to operate on shallower draft locking segments of the Mississippi River System and will have cargo carrying capacities of approximately 11,458 short tons and 1.270 TEUs.

The study identified the current movements of agricultural products on the Mississippi River System and container movements by rail to export locations. The current cost of these movements from elevator to final market position was considered and compared to that of the proposed APH container on vessel concept.

III. CROP AND AGRICULTURAL PRODUCT OVERVIEW

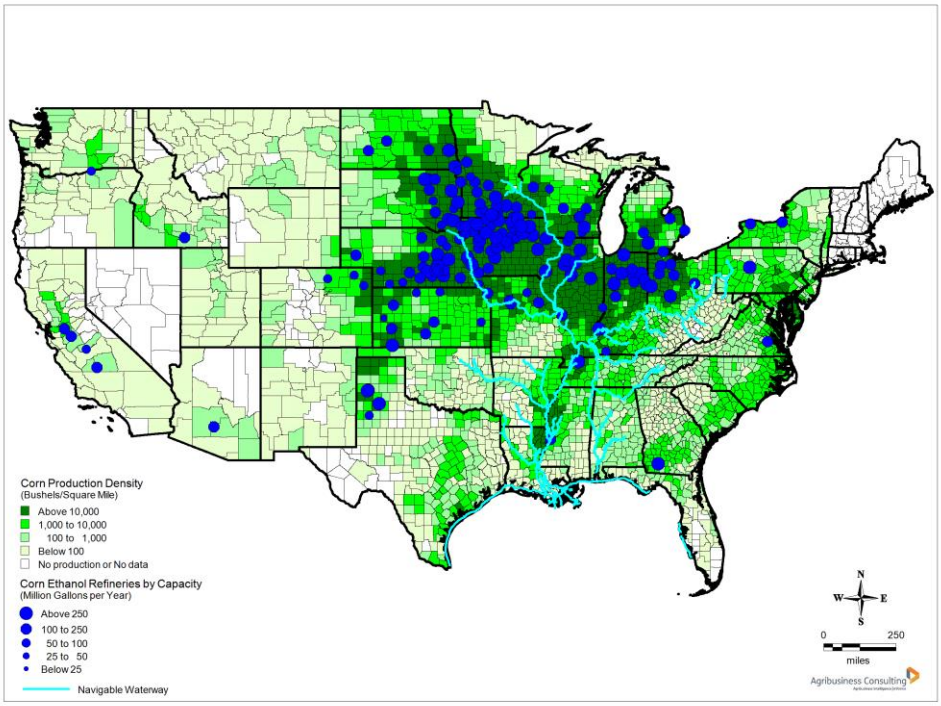
A. **Crop and Agricultural Product Availability**

This section looks at the production of corn, soybeans, soybean meal (SBM) and dried distillers grains with solubles (DDGS) to illustrate the availability of these products for export on the inland waterways system.

Corn production area has expanded the past decade moving westward and along the lower Mississippi River, with the highest productive area located in the Midwest as shown in Exhibit 3. In 2017 U.S. farmers harvested 14.6 billion bushels or 371 million metric tons of corn, up more than 12 percent over that decade. The most productive states include Iowa, Illinois, Nebraska, Minnesota and Indiana and account for roughly 60 percent of U.S. corn production. Iowa and Illinois together account for over 30 percent of total U.S. corn production.

In terms of corn usage much goes to an ethanol plant, and most of those plants are located near the high-density corn production areas of the Midwest and depicted in Exhibit 3.

Exhibit 3: U.S. Corn Production and Ethanol Plant Locations

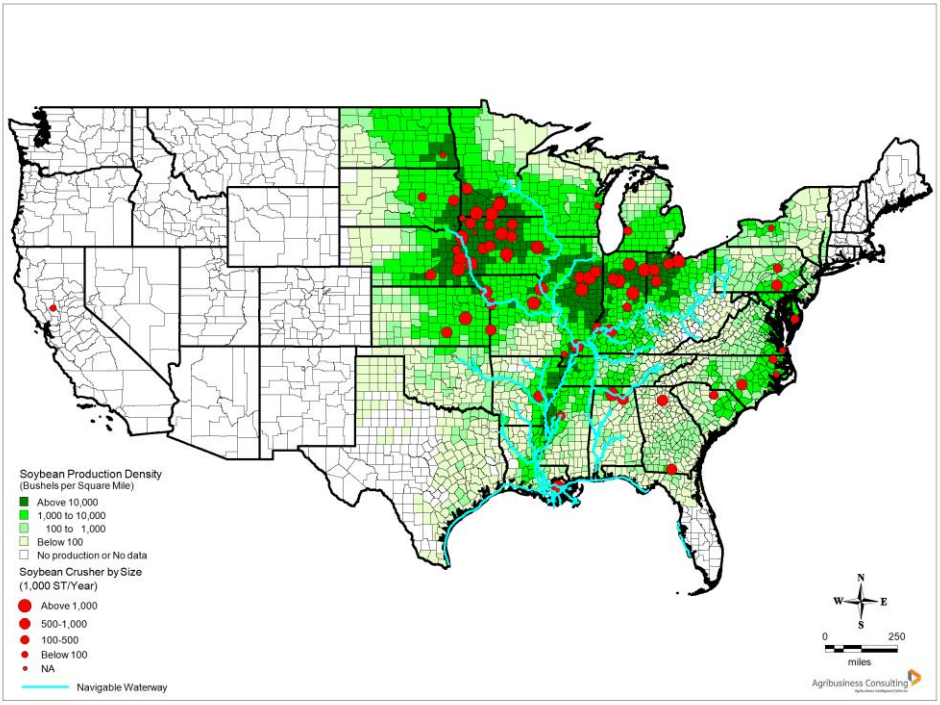


Source: USDA and IEG Vantage

Soybean area has also expanded to the north and west, and along the lower Mississippi River. In 2017 U.S. soybean production totaled 44 billion bushels or 119.5 million metric tons, increasing 64 percent in a decade. Illinois is the top soybean producing state in the U.S. accounting for 14 percent of U.S. soybean production. Iowa follows closely behind Illinois accounting for 13 percent of U.S. soybean production. The same top five corn states account for over 50 percent of U.S. soybean production.

As depicted in Exhibit 4, soybean crushing facilities that produce soybean oil and SBM are mainly located in the major soybean production areas. There are several crush facilities located along the inland waterways system.

Exhibit 4: U.S. Soybean Production and Crushing Plant Locations



Source: USDA and IEG Vantage

The availability of corn, soybeans, SBM and DDGS near 10 targeted inland river ports was examined and summarized in Exhibit 5. The 10 inland ports include Chicago, IL; Kansas City, KS; Little Rock, AR; Louisville, KY; Memphis, TN; Minneapolis, MN; Omaha, NE; Peoria, IL; Quad Cities Area of Illinois and Iowa; and St. Louis, MO. Informa identified the available supply of corn, soybeans, SBM and DDGS within a 100-mile radius of the port as a compelling distance for a truck move to the river. It should be noted that truck movements often extend up to 250 miles, but

the 100-mile radius reduces overlap in the draw area estimates. As demonstrated, there are large supplies near ports such as, Omaha, NE; Peoria, IL and the Quad Cities that include East Moline, Moline and Rock Island, IL; and Bettendorf and Davenport, IA. These inland river ports would be able to supply agricultural products to the Gulf utilizing barge service or APH's hybrid vessel service that is designed to move containers on smaller or locking river waterways as well as the Mississippi River.

This analysis does not fully take into consideration that agricultural products are moved to inland river port areas, such as St. Louis, by rail. A rail to river barge move at St. Louis for example, extends the reach of the river inland and offers grain to be loaded on a barge downriver from locks on the inland waterway system. Loading barges downriver from the locking segments of the river allows greater loading capability as there is a greater draft option of up to 14 feet, whereas barges transiting a lock are limited to no more than nine feet six inches in draft.

Memphis and St. Louis would serve as consolidation points for large shipments of agricultural products. Both locations are downriver from the last lock on the Mississippi River (Chain of Rocks Lock or Lock 27 at Granite City, IL, near St. Louis) allowing for deeper draft capabilities and heavier barge loadings.

Exhibit 5: Agricultural Product Supply Near Inland River Ports, 1000 Metric Tons

	Corn 100 Mile Radius	Soybeans 100 Mile Radius	Soybean Meal 100 Mile Radius	DDGS 100 Mile Radius	Total
Chicago, IL	32,908	7,474	559	1,898	42,838
Kansas City, KS	13,343	5,671	1,795	615	21,424
Little Rock, AR	3,220	3,422	380	0	7,022
Louisville, KY	10,285	4,297	1,167	2	15,751
Memphis, TN	6,528	6,557	-	204	13,289
Minneapolis, MN	28,118	5,768	1,584	1,767	37,236
Omaha, NE	46,153	11,631	5,372	4,389	67,545
Peoria, IL	50,831	11,527	2,754	3,330	68,443
Quad Cities Area	51,828	10,212	982	4,929	67,951
St Louis, MO	20,636	6,987	-	490	28,113

Source: USDA, Agribusiness Consulting

Barge shipments tend to peak in October and November during the height of the harvest season. Barge freight rates tend to follow this change in volume as shown in Exhibit 6 and Exhibit 7 and are used as a proxy for the volume as monthly volume data for the lower Mississippi river is not exact. Memphis and Davenport are shown to demonstrate the seasonality but also to point out

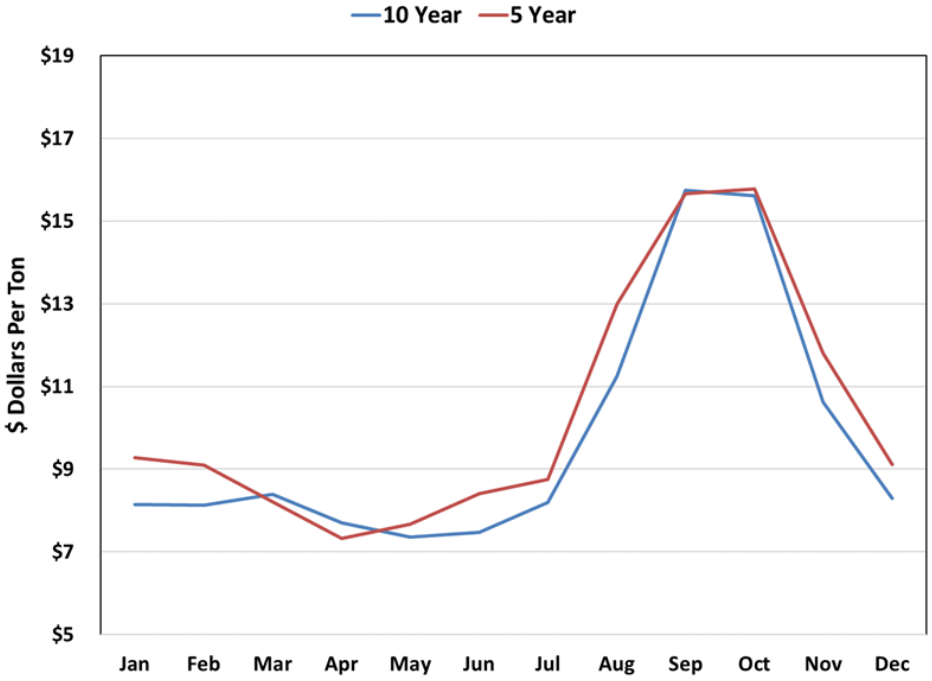
that the inland waterway system closes to navigation from Keokuk, IA upriver during the winter months of mid-December through mid-March.

The harvest movement peaks on the inland rivers have become more pronounced as the U.S. races to send grains and soybeans to the export market ahead of South America's crop harvests beginning in February and running through to June. The 2016/17 fourth quarter (June through August 2017) was significantly stronger than the previous year (June through August 2016) due to a disappointing South American crop pushing volume back to the U.S.

Grain and soybeans, and products are move to market positions with a variety of modal options including bulk barge to the U.S. Center Gulf, rail that predominately serves the Pacific Northwest and Texas Gulf, and containerized loadings from several inland locations. The peak for containerized loading during 2016/17 was more pronounced than in previous years but 13 percent lower than the 2014/15 year as lower priced bulk options by covered barge from the state of Illinois to the Center Gulf and low priced dry bulk ocean freight have been highly competitive to container freight the previous two years. APH is proposing a more stable rate for shipments over the year that would avoid peaks in the freight rate.

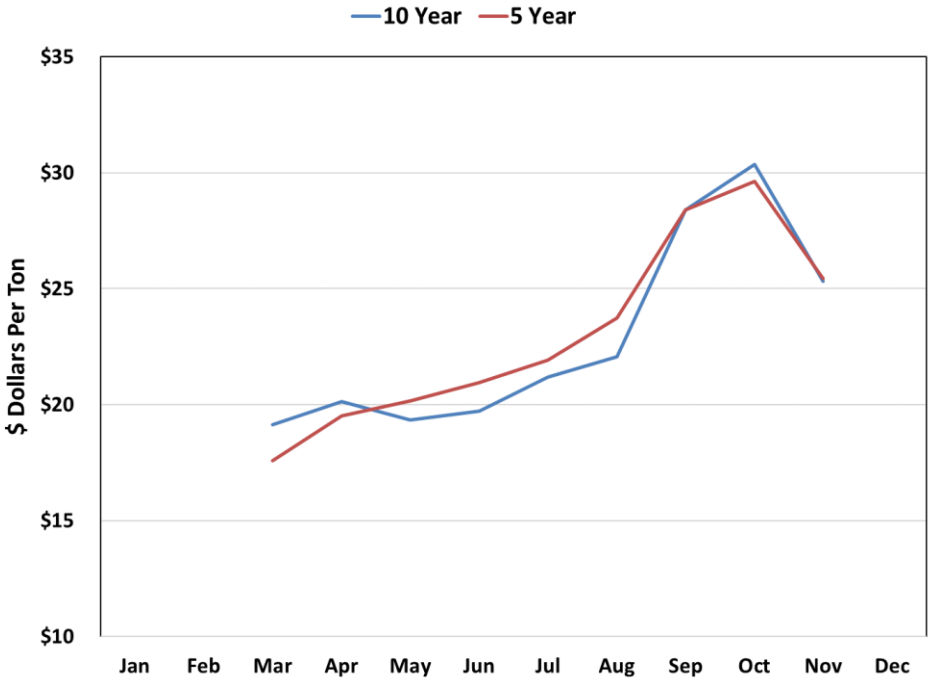
SBM and DDGS container exports do not appear to have a clear pattern. Because SBM and DDGS are products, they do not experience the same seasonality as soybeans and corn.

Exhibit 6: Seasonality of Memphis Barge Freight Rate



Source: USDA and IEG Vantage

Exhibit 7: Seasonality of Davenport Barge Freight Rate



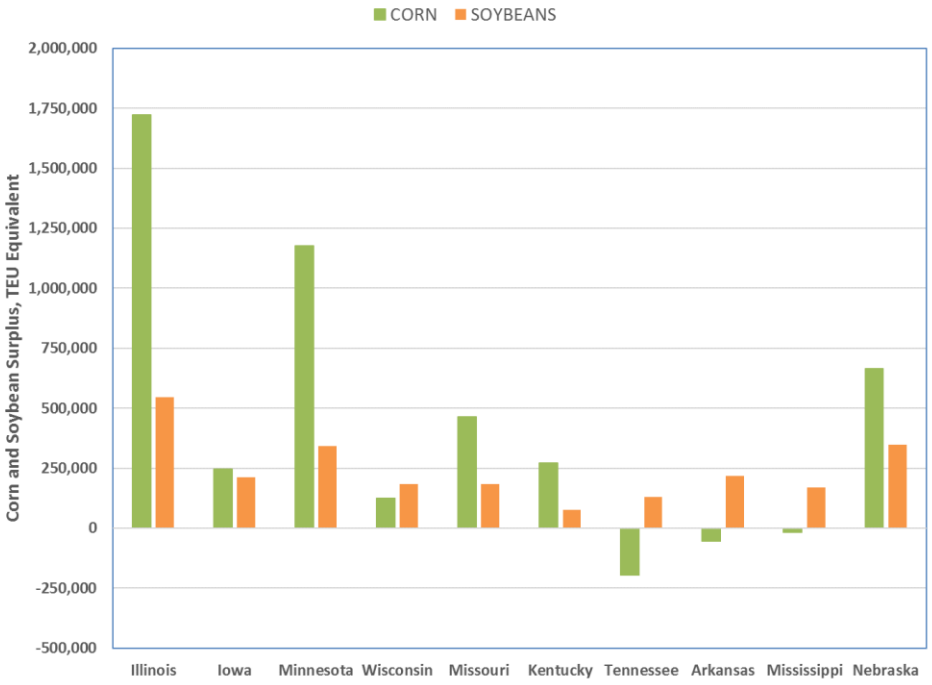
Source: USDA and IEG Vantage

Informa uses a proprietary surplus and deficit analysis approach to estimate the volume of available supply of crops and products for movement out of, or into a state or region. A surplus state or region produces more crops than it consumes for use at a crush plant, corn processing facility (e.g., ethanol plant), for feeding or directly into an export mode, and stores as ending stocks or inventories. Those surplus supplies are identified as outshipments. Conversely, a state or region that is deficit crops requires inshipments from other states or regions to fulfill its crush, corn processing, feeding, export and ending stock requirements. An export of a crop is attributed to that state or region where the crop is loaded onto or into an export vessel or into a mode of transport where the crops were inspected (e.g., crops transloaded into containers, inspected and the container sealed; those grains, soybeans or products loaded near Chicago for example are recorded as exports from Illinois).

Illinois and Minnesota have a combined surplus of corn available for outshipment totaling roughly 2.9 million TEUs on an equivalent basis as shown in Exhibit 8 and Exhibit 9. An additional 1.1 million TEU equivalents is available in Nebraska and Missouri combined. Iowa has a low supply available for outshipment due to its large ethanol industry despite being the top corn producing state. Outshipments may go to other states for processing or to export.

Illinois has over 500 thousand TEU equivalents of soybeans available for outshipment. The crushing industry in Illinois consumes a large portion of Illinois' soybean production. The large crushing industry results in greater amounts of SBM available as outshipments though. Minnesota and Nebraska each have close to 350 thousand TEU equivalents of soybeans available for outshipment.

Exhibit 8: Surplus Corn and Soybeans Available as Outshipments, in Twenty-Foot Equivalent Units by State



Source: Agribusiness Consulting

Exhibit 9: Surplus Corn and Soybeans Available as Outshipments Table, in Twenty-Foot Equivalent Units by State

State	CORN	SOYBEANS
Illinois	1,723,529	547,059
Iowa	247,059	211,765
Minnesota	1,176,471	341,176
Wisconsin	123,529	182,353
Missouri	464,706	182,353
Kentucky	270,588	76,471
Tennessee	(194,118)	129,412
Arkansas	(52,941)	217,647
Mississippi	(17,647)	170,588
Nebraska	664,706	347,059
Sum	**4,670,588**	**2,405,882**

Note: Assumes 17 short tons per TEU

Source: Agribusiness Consulting

The average loadings of soybeans in a container as reported through the Department of Agriculture's Federal Grain Inspection Service (FGIS) data have increased nearly 8 percent from about 50,000 pounds (the equivalent of 840 bushels or 22.8 metric tons) to 54,000 pounds from 2012/13 to 2017/18. The FGIS does not report container size being used (e.g., twenty-foot equivalent or TEU, or forty-foot equivalent or FEU). However, as an overall rule of thumb, grains and soybeans tend to move in TEUs while products such as soybean meal and DDGs move in FEUs. Heavier loadings allow for a lower per unit shipping cost while requiring fewer containers to move the same volume of soybeans. These loading weights are in line with report assumptions of 17 short tons per TEU and 25 short tons per FEU. Though the containers can be loaded heavier to 24 short tons in TEUs and 29.5 short tons in FEUs.

B. **Current Crop and Agricultural Product Exports**

U.S. exports of corn have been steady since the 2000/01 crop year at just under two billion bushels per year except for 2011/12 and 2012/13 which were drought years resulting in lower production and available supply to the export market. Corn exports were record large in 2016/17 due to a large U.S. corn crop and Brazil's smaller crop, resulting in higher exports of corn as shown in Exhibit 10.

Soybean exports have grown from one billion bushels per year in 2000/01 to over 2.1 billion bushels in 2016/17. Soybean exports were down in 2011/12 and 2012/13, like corn, but not by as high of a percentage.

Exhibit 10: U.S. Corn and Soybean Exports (Million Bushels)

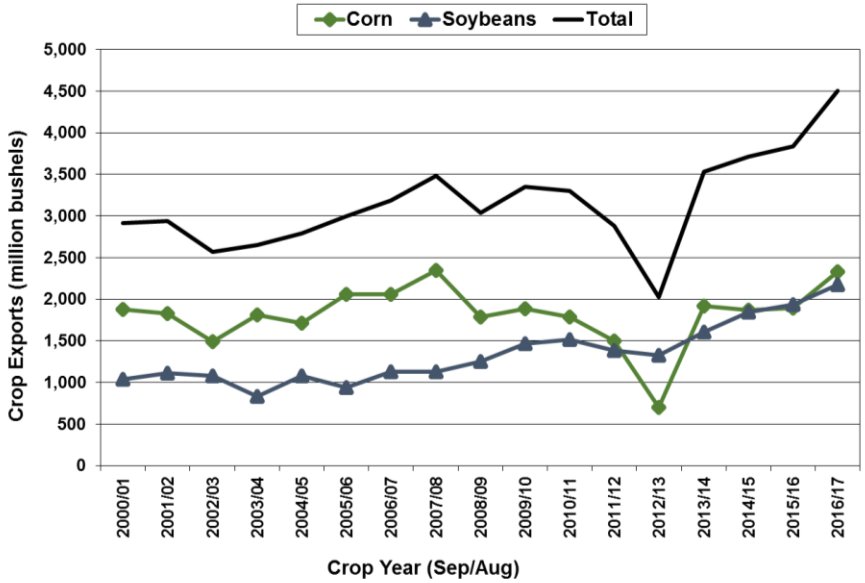


Exhibit 11: U.S. Corn and Soybean Exports Table (Million Bushels)

Million Bushels	2000/01	2005/06	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Corn	1,876	2,061	1,790	1,500	698	1,921	1,867	1,898	2,327
Soybeans	1,042	936	1,511	1,380	1,328	1,607	1,843	1,936	2,174
Total	2,917	2,997	3,301	2,880	2,026	3,528	3,710	3,834	4,501

An increase in the U.S. domestic soybean crush has been driven by demand for soybean oil in the biodiesel market, which has resulted in a growth of available soybean meal. A shift in diets in China and Asia to higher protein has increased demand for SBM as feed allowing for the export of a large portion of the SBM production increase. SBM exports have increased from 8.1 million short tons in 2000/01 to 11.4 million short tons in 2016/17 as shown in Exhibit 12.

DDGS exports exploded in the mid-2000s with the increase in ethanol production peaking at 13.2 million short tons in 2013/14. The increase in ethanol production capacity slowed at that point as the ethanol mandate was being met. DDGS exports have declined to 12.2 million short tons in 2016/17 as China placed restrictions on the importation of DDGS.

Exhibit 12: U.S. Soybean Meal and DDGS Exports (Million Metric Tons)

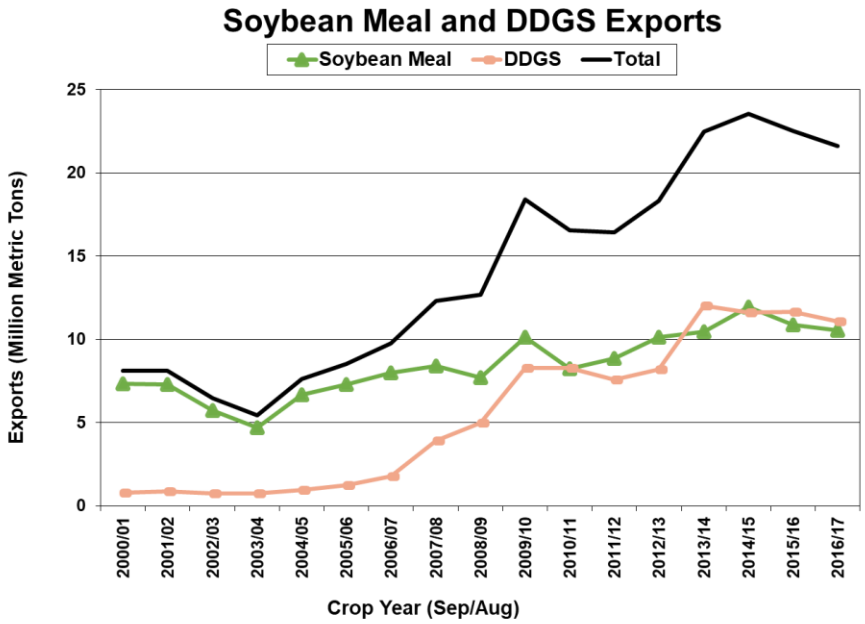


Exhibit 13: U.S. Soybean Meal and DDGS Exports Table (Million Metric Tons)

Million Short Tons	2000/01	2005/06	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Soybean Meal	7.3	7.3	8.2	8.8	10.1	10.5	11.9	10.9	10.5
DDGS	0.8	1.2	8.3	7.6	8.2	12.0	11.6	11.6	11.1
Total	8.1	8.5	16.5	16.4	18.3	22.5	23.6	22.5	21.6

Taken together, exports of corn, soybeans, SBM and DDGS increased 75 percent from 2000/01 to 2016/17, to nearly 134 million metric tons, as shown in Exhibit 14.

Exhibit 14: U.S. Corn, Soybean and Feed Exports (Million Metric Tons)

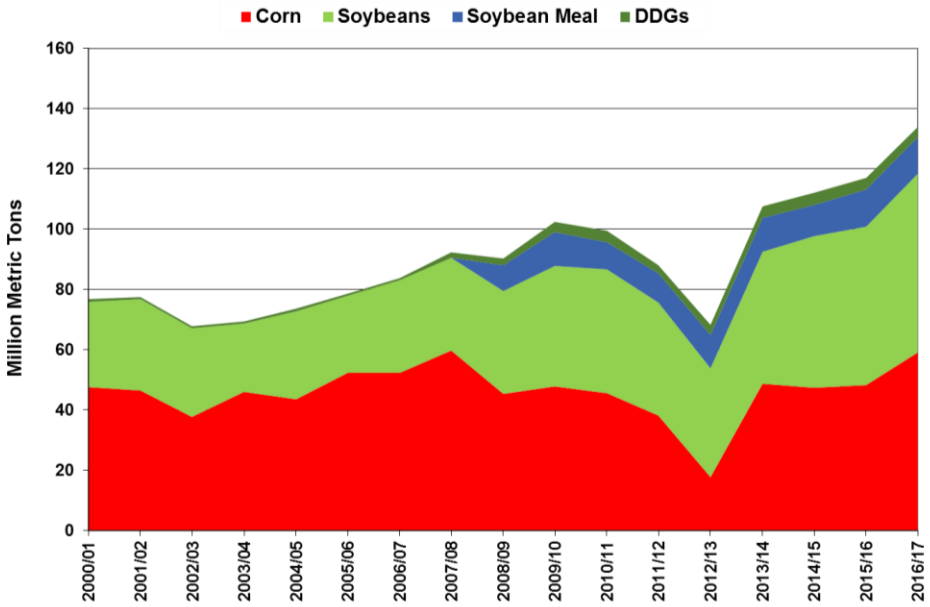


Exhibit 15: U.S. Corn, Soybean and Feed Exports Table (Million Metric Tons)

Million Metric Tons	2000/01	2005/06	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Corn	47.6	52.4	45.5	38.1	17.7	48.8	47.4	48.2	59.1
Soybeans	28.3	25.5	41.1	37.6	36.1	43.7	50.2	52.7	59.2
Soybean Meal	0.0	0.0	9.1	9.7	11.1	11.2	10.4	12.4	12.2
DDGs	0.7	0.7	3.8	2.7	3.2	3.8	4.2	3.7	3.5
Total	76.7	78.5	99.5	88.1	68.2	107.5	112.2	117.0	133.9

The Center Gulf handles 57 percent of U.S. corn exports and 59 percent of U.S. soybean exports as shown in Exhibit 16. More than one-half of SBM exports are moved through the Center Gulf while 72 percent of DDGS exports are through the Center Gulf.

Less than one-fourth of corn and soybean exports move through export elevators in the PNW. An even smaller percentage of SBM and DDGS exports are through the PNW, eight percent and 14 percent, respectively as shown in Exhibit 18.

Together the Center Gulf and PNW account for 80 percent of corn exports and 83 percent of soybean exports.

Exhibit 16: U.S. Center Gulf Corn, Soybean and Feed Exports (Million Metric Tons)

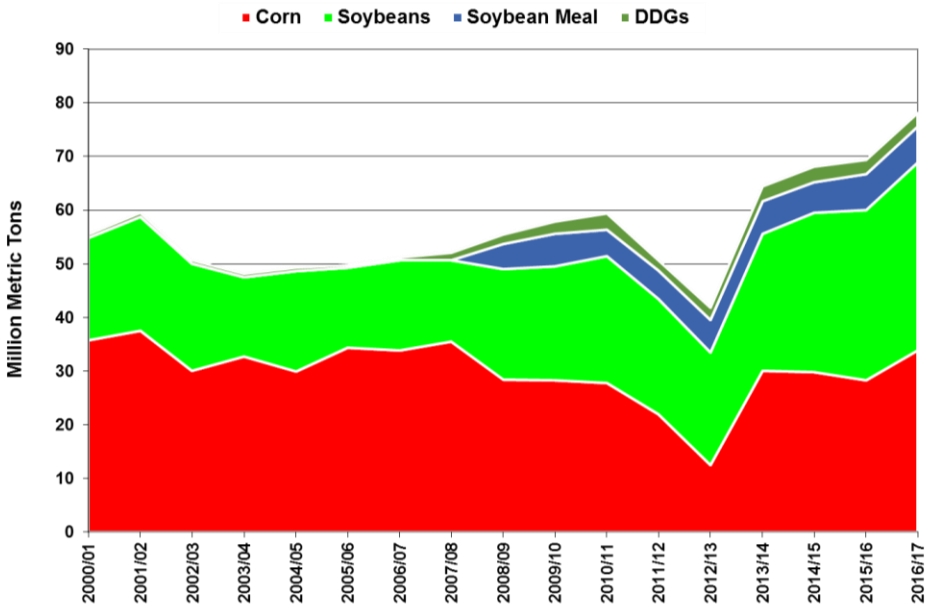


Exhibit 17: U.S Center Gulf Corn, Soybean and Feed Exports Table (Million Metric Tons)

Million Metric Tons	2000/01	2005/06	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Corn	35.7	34.3	27.8	22.0	12.5	30.0	29.8	28.2	33.8
Soybeans	19.1	14.9	23.6	21.4	20.9	25.5	29.7	31.7	35.1
Soybean Meal	0.0	0.0	5.0	5.4	6.1	6.1	5.7	6.8	6.7
DDGs	0.7	0.6	3.0	1.9	2.2	2.8	3.0	2.7	2.5
Total	55.5	49.8	59.4	50.6	41.8	64.5	68.1	69.4	78.1

Exhibit 18: U.S. Pacific Northwest Corn, Soybean and Feed Exports (Million Metric Tons)

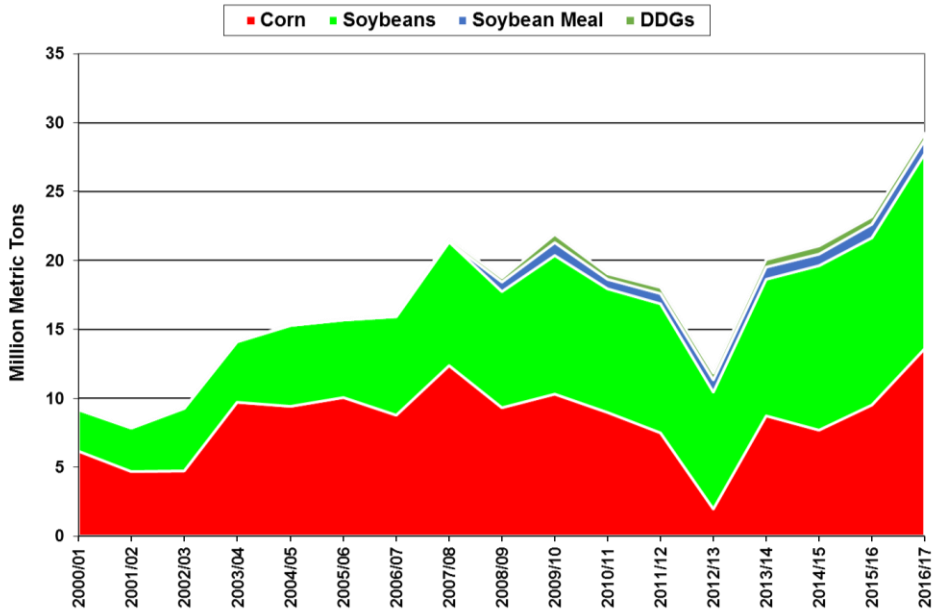


Exhibit 19: U.S. Pacific Northwest Corn, Soybean and Feed Exports Table (Million Metric Tons)

Million Metric Tons	2000/01	2005/06	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Corn	6.2	10.0	9.0	7.5	2.0	8.7	7.7	9.5	13.6
Soybeans	3.0	5.6	9.0	9.3	8.5	9.9	11.9	12.1	14.1
Soybean Meal	0.0	0.0	0.7	0.8	0.9	0.9	0.8	1.0	1.0
DDGs	0.0	0.1	0.4	0.4	0.5	0.5	0.6	0.5	0.5
Total	9.2	15.8	19.1	18.0	11.9	20.1	21.1	23.2	29.3

Dry bulk ocean vessels are the predominant mode used to transport grains and soybeans to global market destinations. Rail is the second most used mode to transport grain and soybean exports as cross border moves into Canada or Mexico.

The use of containers for grain and soybean exports is the third largest mode, but at a much lower level. The available supply of empty containers throughout various regions of the U.S. provides a backhaul opportunity for bulk commodities and products such as grains, soybeans and products (DDGS and SBM). The modal usage of grain and soybean exports is shown in Exhibit 20.

The use of containers represents about three percent to four percent of total grain and soybean exports on a given year. For the 2016/17 grain and soybean marketing year the share of containers used for total grain and soybean exports was 3.3 percent, which is modestly above the three-year average of 3.2 percent, making it the best year since 2007/08.

Exhibit 20: U.S. Corn and Soybean Export Inspections by Mode (Million Bushels)

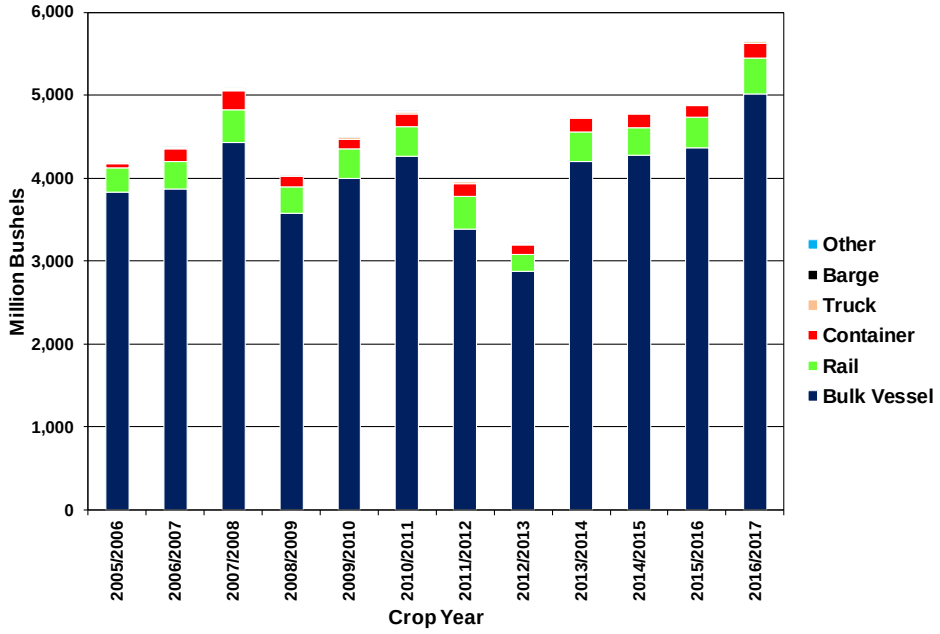


Exhibit 21: U.S. Corn and Soybean Export Inspections by Mode Table (Million Bushels)

Million Bushels	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Bulk Vessel	3,838.3	3,867.2	4,435.9	3,580.5	3,997.1	4,265.0	3,382.2	2,870.9	4,206.3	4,276.8	4,369.4	5,015.4
Rail	286.2	340.3	393.2	311.6	355.9	351.5	399.1	206.0	355.9	335.9	372.3	430.4
Truck	3.3	11.1	21.3	21.3	16.9	25.6	17.8	15.7	6.9	6.3	12.3	20.1
Barge	10.7	6.4	8.4	5.0	1.6	1.8	0.8	1.7	0.0	0.0	0.0	0.0
Container	53.0	145.5	220.6	127.9	120.2	160.6	158.1	117.1	165.0	160.5	139.3	184.2
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	0.1	0.0	1.1	1.0
Total	4,191.5	4,370.5	5,079.4	4,046.4	4,491.7	4,804.6	3,958.2	3,212.3	4,734.3	4,779.5	4,894.5	5,651.0

Exhibit 22: Containerized Exports of U.S. Crops and Crop Products

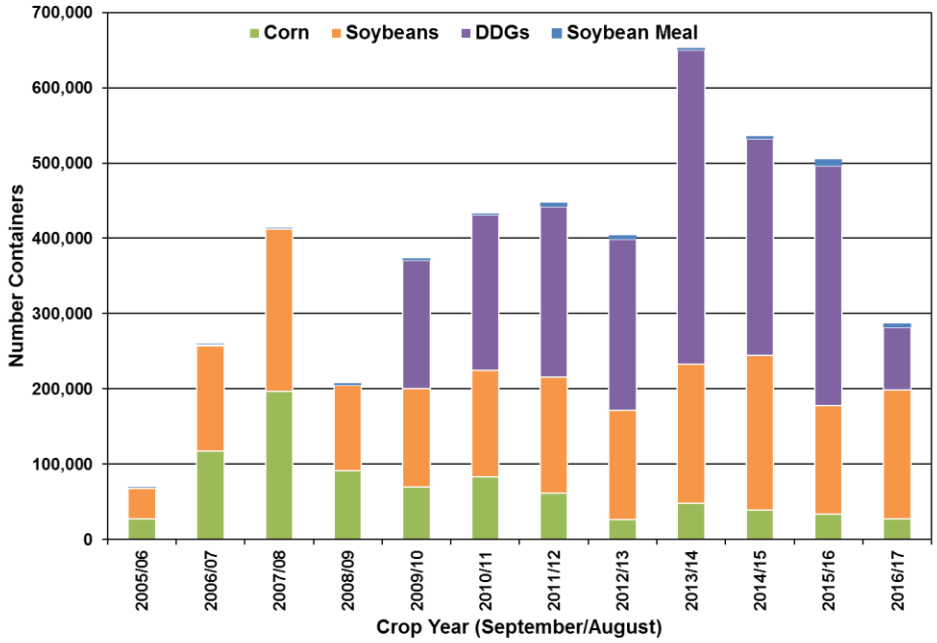


Exhibit 23: Volume of U.S. Soybean Exports in Containers (Metric Tons)

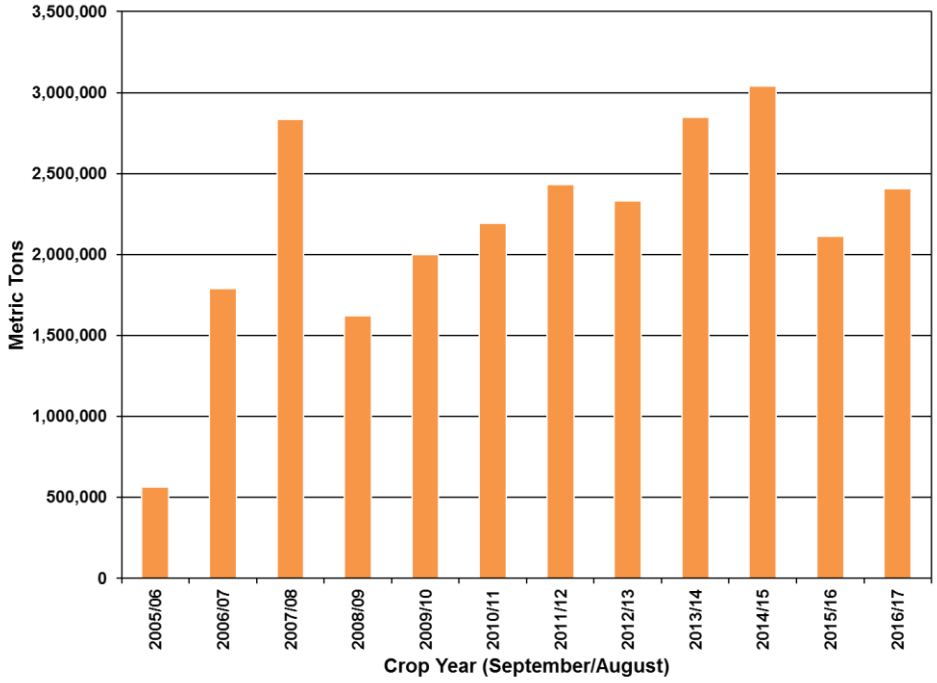
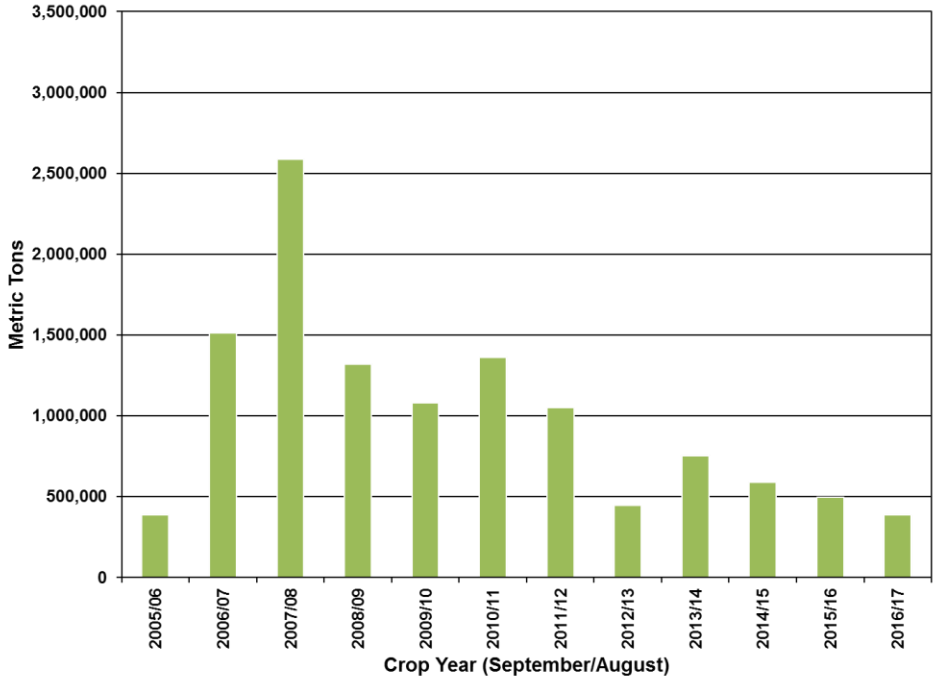


Exhibit 24: Volume of U.S. Corn Exports in Containers (Metric Tons)



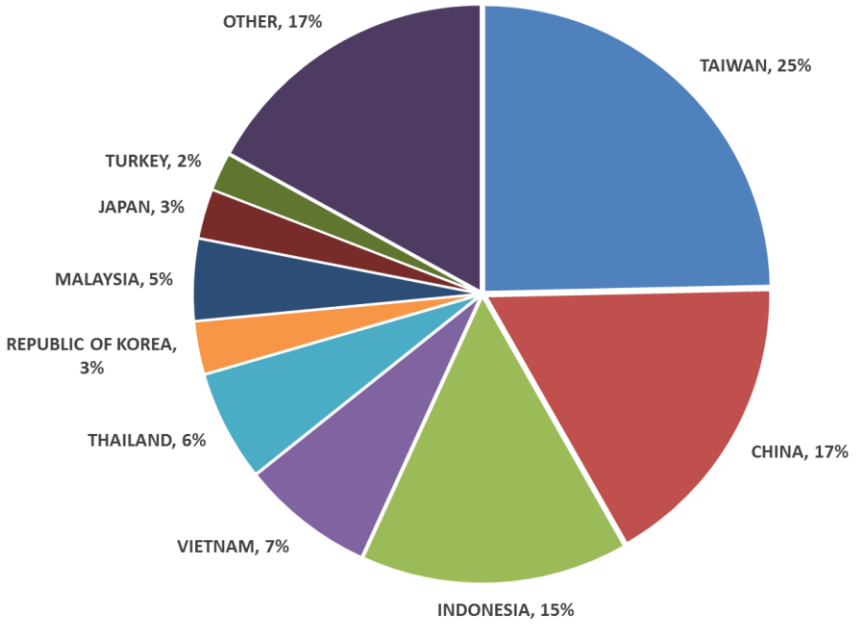
Asia is the primary destination for crops exported in containers. The destination markets favor containers originating through West Coast ports. China's import decline of container volumes is a pause for concern since it was the largest market to use containers, but the fall in containers used is associated with China banning DDGS imports from the U.S.

Exhibit 25: Top Country Destination for Select U.S. Agricultural Commodities and Products Container Exports (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
TAIWAN	57,033	225,559	287,014	128,287	111,544	129,135	119,120	89,723	98,851	98,279	73,939	82,400
CHINA	133,828	94,710	59,887	77,122	190,464	207,086	258,665	256,286	400,048	233,430	190,740	76,859
INDONESIA	20,559	45,548	67,573	55,470	64,739	76,985	73,109	58,607	76,834	85,137	69,390	71,163
VIETNAM	3,766	7,857	14,867	28,398	42,086	54,814	53,707	57,362	55,580	76,208	99,766	64,954
THAILAND	10,788	15,597	11,677	17,469	27,563	35,200	29,152	30,003	36,992	55,345	49,949	38,968
REPUBLIC OF KOREA	10,034	15,902	26,014	20,026	25,677	28,985	33,370	31,284	37,483	52,266	43,151	29,300
MALAYSIA	3,110	9,236	28,957	18,088	19,046	25,554	19,342	19,504	15,692	16,392	19,033	22,800
JAPAN	15,791	22,307	23,370	17,009	20,619	23,506	18,925	18,735	22,598	21,106	20,348	16,304
TURKEY	16,202	33,936	17,073	22,868	29,090	37,441	25,562	29,022	29,957	14,802	13,440	15,885
OTHER	47,487	79,580	55,092	72,434	86,612	113,720	89,976	85,066	74,375	75,942	79,507	81,797
Grand Total	318,598	550,232	591,524	457,171	617,440	732,426	720,928	675,592	848,410	728,907	659,263	500,430

Source: PIERS, IEG Vantage

Exhibit 26: Top Country Destinations Market Share for Select U.S. Agricultural Commodities and Products Exports by Container (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

Exhibit 27: Top Foreign Port Destinations for U.S. Container Exports for Select Agricultural Commodities and Products (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
KAOHSIUNG	66,347	228,298	294,772	136,414	130,471	152,278	145,146	112,822	104,363	111,256	104,916	97,081
SINGAPORE	21,709	27,759	37,525	35,400	31,356	25,872	24,339	45,506	34,021	39,907	24,362	37,744
LAEM CHABANG	5,635	9,802	6,232	10,822	16,760	29,859	24,806	15,597	17,919	32,604	31,777	27,814
QINGDAO	35,825	28,766	21,752	34,455	70,223	76,954	91,094	78,628	178,436	93,756	54,651	25,116
HONG KONG	16,135	21,148	11,994	13,394	16,436	16,390	18,114	25,894	30,203	26,265	26,672	19,987
BUSAN	23,740	20,106	28,265	19,674	19,241	21,940	21,842	20,632	28,301	26,409	23,344	19,332
SHANGHAI	53,505	43,343	19,311	22,992	43,420	52,891	58,695	66,039	64,645	53,379	28,562	16,005
JAKARTA	433	2,067	7,242	8,296	13,438	16,315	18,141	9,353	17,781	19,984	16,014	14,501
HAIPHONG	250	971	931	4,150	6,281	11,859	7,503	12,925	13,880	20,017	24,295	13,460
SURABAYA	155	1,321	6,207	5,207	9,282	13,815	12,128	4,948	12,329	12,201	16,301	12,076
PT KELANG	246	664	7,490	4,336	5,298	9,357	6,776	6,099	5,220	7,456	8,974	11,404
HO CHI MINH	192	1,586	4,111	6,607	10,038	11,320	9,627	8,268	11,869	20,038	16,155	7,941
VUNG TAU				124	1,909	1,393	2,462	1,038	3,005	3,640	6,846	7,697
BELAWAN DELI	115	703	2,738	4,941	4,895	7,818	7,069	3,239	6,113	7,914	6,280	7,298
NAN SHAN		123	29	113	10,983	13,289	10,755	19,358	17,284	11,861	42,677	7,232
TAIPEI			2	1,275	1,417	510	2,854	3,693	3,138	3,113	3,387	7,003
OTHER	94,311	163,575	142,923	148,971	225,992	270,566	259,577	241,553	299,903	239,107	224,050	168,739
Grand Total	318,598	550,232	591,524	457,171	617,440	732,426	720,928	675,592	848,410	728,907	659,263	500,430

Source: PIERS, IEG Vantage

Indonesia, Vietnam and Thailand imports of U.S. crops and products are increasing quickly. Southeast Asia is experiencing solid income growth that is translating into higher consumption rates of meats and textiles. The development of the cold chain is enabling more at home storage and in turn, commercial animal operations that consume grain and vegetable meal.

The threat for container traffic is the destination markets reaching an economy of scale required to efficiently utilize the bulk transportation system.

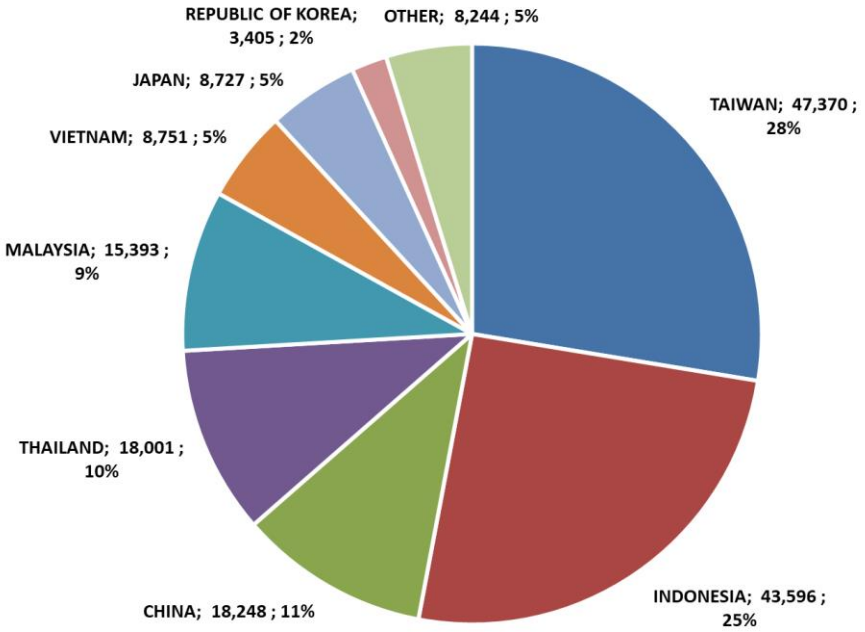
Developed countries utilize containers to preserve specialized traits, such as food grade soybeans to Japan.

Exhibit 28: Top Country Destinations for U.S. Soybean Container Exports (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
TAIWAN	26,307	102,302	115,782	43,804	34,725	35,202	43,782	43,738	49,326	48,881	31,818	47,370
INDONESIA	1,409	13,106	39,349	27,293	37,850	44,523	46,915	30,929	49,202	55,834	38,702	43,596
CHINA	326	3,252	21,842	6,836	13,679	9,221	9,473	13,410	27,796	23,204	13,444	18,248
THAILAND	393	506	1,073	3,233	7,190	7,808	11,974	7,820	12,124	19,121	14,679	18,001
MALAYSIA	104	1,653	13,046	9,829	11,868	11,174	8,448	10,313	8,821	9,101	12,101	15,393
VIETNAM	150	544	4,572	7,803	7,559	11,119	12,604	18,416	13,593	16,300	10,920	8,751
JAPAN	10,193	13,414	13,710	9,887	10,715	11,157	9,225	8,754	12,313	12,904	11,023	8,727
REPUBLIC OF KOREA	155	951	1,136	1,422	2,520	3,524	3,662	2,713	3,654	5,073	3,489	3,405
OTHER	1,517	4,615	4,712	3,431	5,417	7,604	8,027	8,694	8,187	14,816	8,705	8,244
Grand Total	**40,554**	**140,343**	**215,222**	**113,538**	**131,523**	**141,332**	**154,110**	**144,787**	**185,016**	**205,234**	**144,881**	**171,735**

Source: PIERS, IEG Vantage

Exhibit 29: Top Country Destinations Market Share for U.S. Soybean Container Exports (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

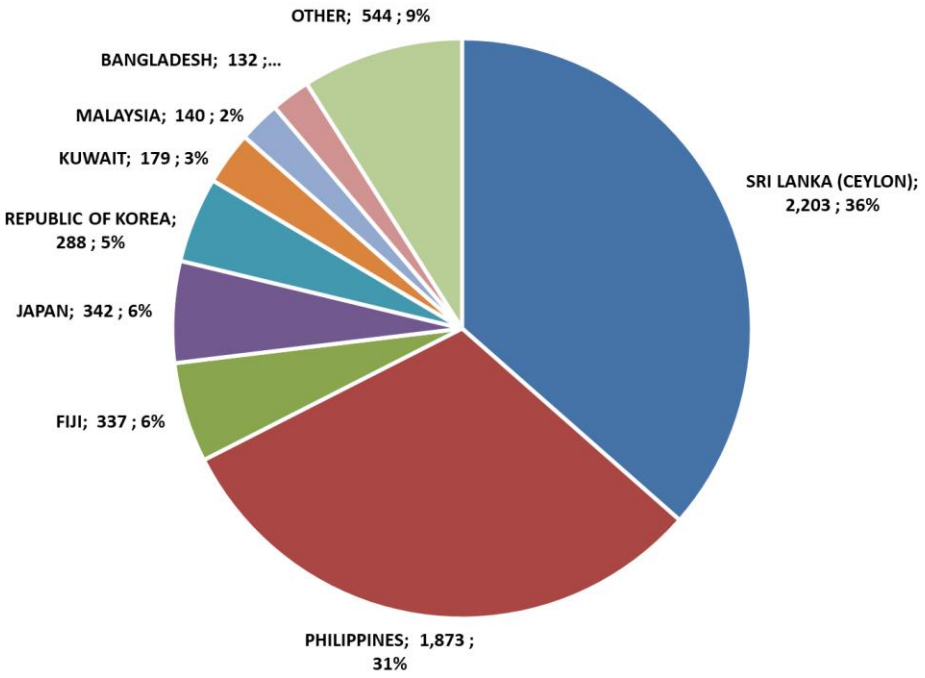
Southeast Asia SBM container imports is showing strong growth to support its expanding livestock feeding industry.

Exhibit 30: Top Country Destinations for U.S. Soybean Meal Container Exports (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
SRI LANKA (CEYLON)	-	-	-	-	58	40	211	485	654	990	4,154	2,203
PHILIPPINES	-	311	22	1,232	1,372	1,756	4,348	3,800	305	596	871	1,873
FIJI	-	-	-	-	-	-	33	56	88	142	195	337
JAPAN	29	41	24	28	45	28	110	234	442	669	381	342
REPUBLIC OF KOREA	-	-	22	42	45	-	-	55	244	376	521	288
KUWAIT	-	-	-	-	-	-	-	-	8	-	-	179
MALAYSIA	-	-	7	10	26	-	-	-	-	-	8	140
BANGLADESH	-	-	-	-	42	-	-	80	810	80	1,923	132
OTHER	37	254	504	1,593	1,216	274	614	274	122	685	1,183	544
Grand Total	**66**	**606**	**579**	**2,905**	**2,804**	**2,098**	**5,316**	**4,984**	**2,673**	**3,538**	**9,236**	**6,038**

Source: PIERS, IEG Vantage

Exhibit 31: Top Country Destinations Market Share for U.S. Soybean Meal Container Exports (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

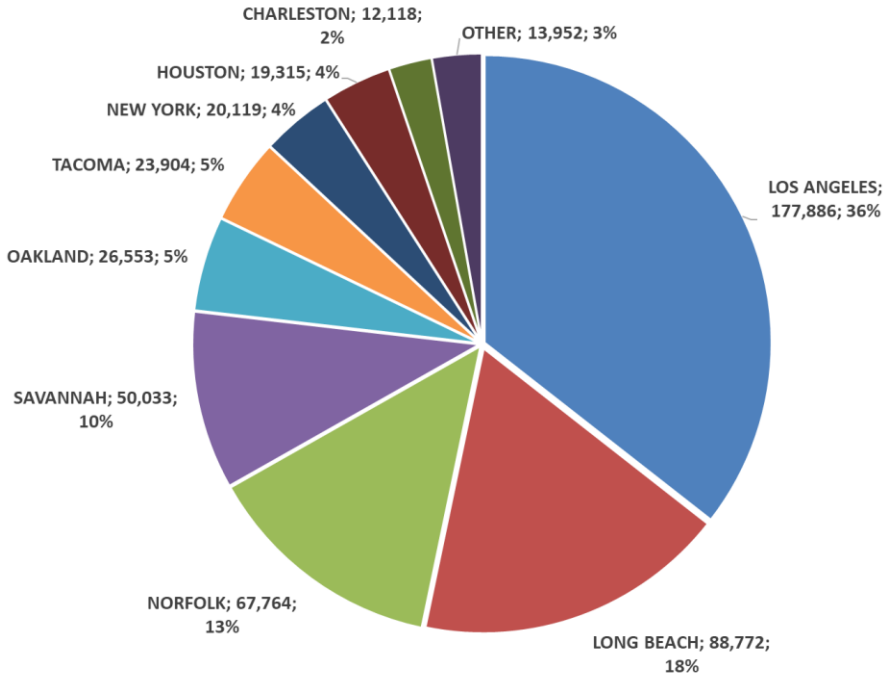
Although the two largest ports that handle containerized exports of U.S. grains, soybeans and products are located on the West Coast, the East Coast has seen larger volumes of agriculture container exports in recent years, especially following labor and management issues during 2014. Norfolk, VA is the fastest growing port handling containerized exports of grains, soybeans and products.

Exhibit 32: Top U.S. Container Exports by U.S. Port for Select Agricultural Commodities and Products (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
LOS ANGELES	115,358	173,521	168,800	156,252	205,617	274,398	278,543	226,829	253,406	205,003	178,832	177,886
LONG BEACH	66,981	106,651	142,958	101,414	167,044	190,932	165,582	160,124	258,952	193,414	165,127	88,772
NORFOLK	6,934	19,447	41,992	32,544	48,137	36,333	37,069	50,030	83,116	84,057	72,317	67,764
SAVANNAH	41,074	54,710	26,977	39,630	43,521	49,238	68,007	69,064	62,484	74,366	63,100	50,033
OAKLAND	22,356	34,828	37,072	31,357	40,365	36,641	36,152	34,637	38,620	26,971	25,033	26,553
TACOMA	9,070	70,744	93,663	32,655	19,517	31,383	38,893	36,599	38,120	34,603	62,738	23,904
NEW YORK	1,989	2,965	12,930	6,574	19,038	24,580	33,664	26,170	39,924	42,271	45,576	20,119
HOUSTON	27,578	29,559	16,073	24,254	26,062	38,118	13,717	18,902	21,372	19,927	13,738	19,315
CHARLESTON	3,909	6,723	4,571	6,285	7,500	7,056	7,839	5,063	15,130	18,610	9,393	12,118
OTHER	23,349	51,084	46,488	26,206	40,639	43,747	41,462	48,174	37,286	29,685	23,409	13,952
Grand Total	318,598	550,232	591,524	457,171	617,440	732,426	720,928	675,592	848,410	728,907	659,263	500,416

Source: PIERS, IEG Vantage

Exhibit 33: Top U.S. Ports Market Share of U.S. Container Exports for Select Agricultural Commodities and Products (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

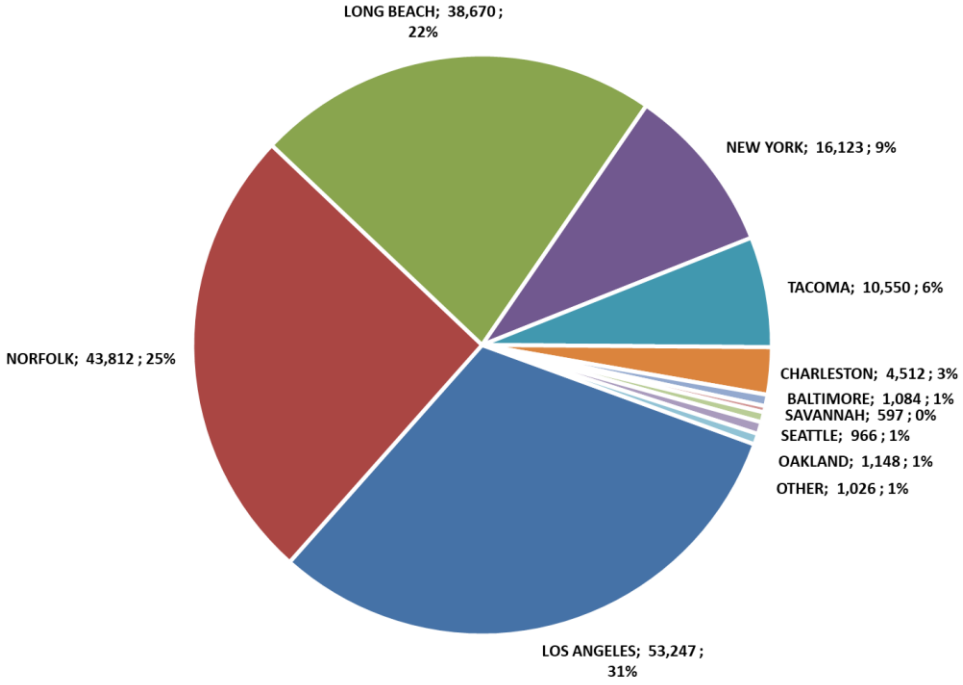
Soybean container exports are dependent on container availability, which drives volume through the major ports of the U.S. Overall volume is shifting from the West Coast to the East Coast, with Norfolk, VA being the fastest growing port. Los Angeles, Norfolk and Long beach accounted for over 80 percent of soybean container volume in 2016/17.

Exhibit 34: Top U.S. Ports for U.S. Soybean Container Export (Twenty-Foot Equivalent Units)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
LOS ANGELES	23,484	55,194	64,334	36,402	46,852	47,401	55,625	38,798	47,623	47,718	27,587	53,247
NORFOLK	980	7,649	19,922	14,069	30,214	16,643	16,988	32,668	40,578	49,164	29,434	43,812
LONG BEACH	4,690	33,436	59,608	33,330	26,651	42,254	40,386	27,346	44,895	47,491	34,355	38,670
NEW YORK	399	795	7,406	4,266	12,427	17,168	21,165	17,107	23,692	26,639	27,007	16,123
TACOMA	5,023	29,884	43,534	14,401	4,904	6,489	10,428	12,616	8,327	9,700	16,670	10,550
CHARLESTON	47	134	24	7	192	848	232	570	6,974	7,938	607	4,512
BALTIMORE	37	97	948	218	438	357	381	340	788	1,867	1,350	1,084
SAVANNAH	2	9	3,643	502	847	669	508	807	5,639	5,967	3,598	597
SEATTLE	3,472	6,172	6,430	3,592	2,395	5,117	5,499	10,332	2,341	2,084	1,304	966
OAKLAND	2,332	6,740	8,039	6,378	5,231	3,609	2,160	2,167	2,691	2,870	2,006	1,148
OTHER	88	233	1,334	373	1,372	777	738	2,036	1,468	3,796	963	1,026
Grand Total	**40,554**	**140,343**	**215,222**	**113,538**	**131,523**	**141,332**	**154,110**	**144,787**	**185,016**	**205,234**	**144,881**	**171,735**

Source: PIERS, IEG Vantage

Exhibit 35: Top U.S. Ports Market Share for Soybean Container Exports (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

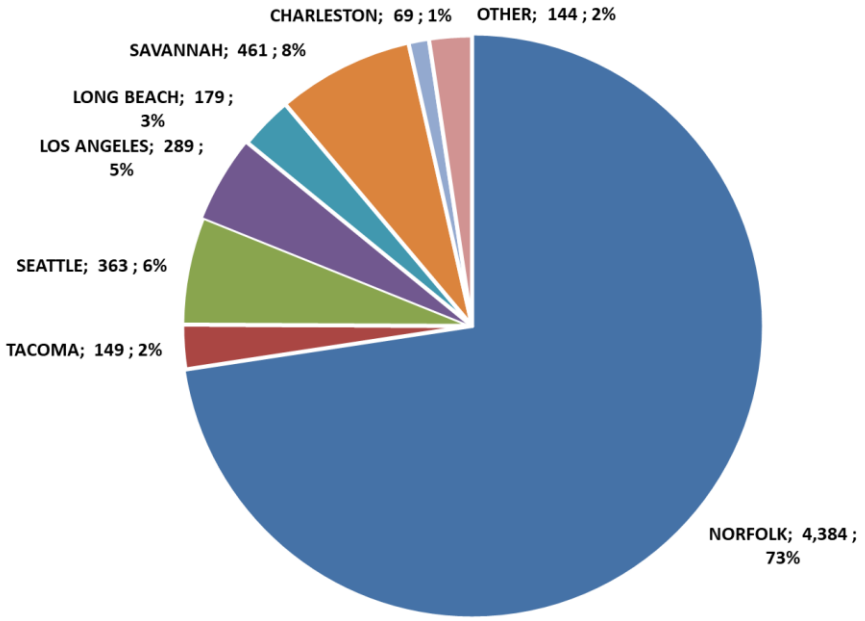
Soybean meal container exports are small, but increasing dramatically on the strength of East Coast ports; especially Norfolk, VA. The strength experienced last year in 2016/17 at Norfolk continued into the first half of 2017/18 for soybean meal container growth and appear will continue as a top export origin moving forward.

Exhibit 36: Top U.S. Ports for U.S. Soybean Meal Container Exports (Twenty-Foot Equivalent Units, TEUs)

Destination	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
NORFOLK	4	2	232	176	907	208	889	958	2,023	1,573	5,024	4,384	2,610
TACOMA	-	198	19	187	-	4	2	160	374	626	490	149	34
SEATTLE	21	278	237	263	822	48	33	212	-	19	51	363	-
LOS ANGELES	9	52	20	489	445	1,708	4,104	3,420	40	656	1,056	289	180
LONG BEACH	11	14	66	1,105	437	120	252	78	86	5	953	179	71
SAVANNAH	-	-	-	-	-	-	-	62	-	77	721	461	-
CHARLESTON	-	-	-	-	-	-	-	-	-	334	511	69	-
OTHER	21	62	5	685	193	10	36	94	150	248	430	144	19
Grand Total	**66**	**606**	**579**	**2,905**	**2,804**	**2,098**	**5,316**	**4,984**	**2,673**	**3,538**	**9,236**	**6,038**	**2,914**

Source: PIERS, IEG Vantage

Exhibit 37: Top U.S. Ports Market Share for U.S. Soybean Meal Container Exports (2016/17 Marketing Year)



Source: PIERS, IEG Vantage

IV. OVERVIEW OF EXISTING TRANSPORTATION STRUCTURE AND COST

A. **Mississippi River System Description and Importance**

The U.S. inland river system comprises the navigable areas of the upper and lower Mississippi River, McClellan-Kerr Arkansas River, Ohio River Systems, Tennessee River, and Gulf Intracoastal Waterway. The system is comprised of a series of locks and dams along the upper reaches of the navigation system. These locks and dams are important, allowing for the safe and efficient transit of the nations' commodities and products. More than one-half of all barge trips traverse at least one lock. The inland navigation system is important to the economy of the U.S. The network of navigable waterways extends along the Gulf of Mexico from Houston, TX to New Orleans, LA, up to Tulsa, OK; Kansas City, MO; Minneapolis, MN; Chicago, IL; Louisville, KY; Charleston, WV and Pittsburgh, PA as shown in Exhibit 38.

Because the Melvin Price and Chain of Rocks Locks are the last locks downbound or the first locks up bound on the upper Mississippi River, barge lockings are highly concentrated at these facilities. The Melvin Price Lock receives barge tows from the upper Mississippi River and the Illinois Waterway. Barges onto or off the Illinois Waterway represent about one half of the more than 56,000 annual lockings at Melvin Price as shown in Exhibit 39

Exhibit 38: Major Navigable Inland River System and Waterway Segments

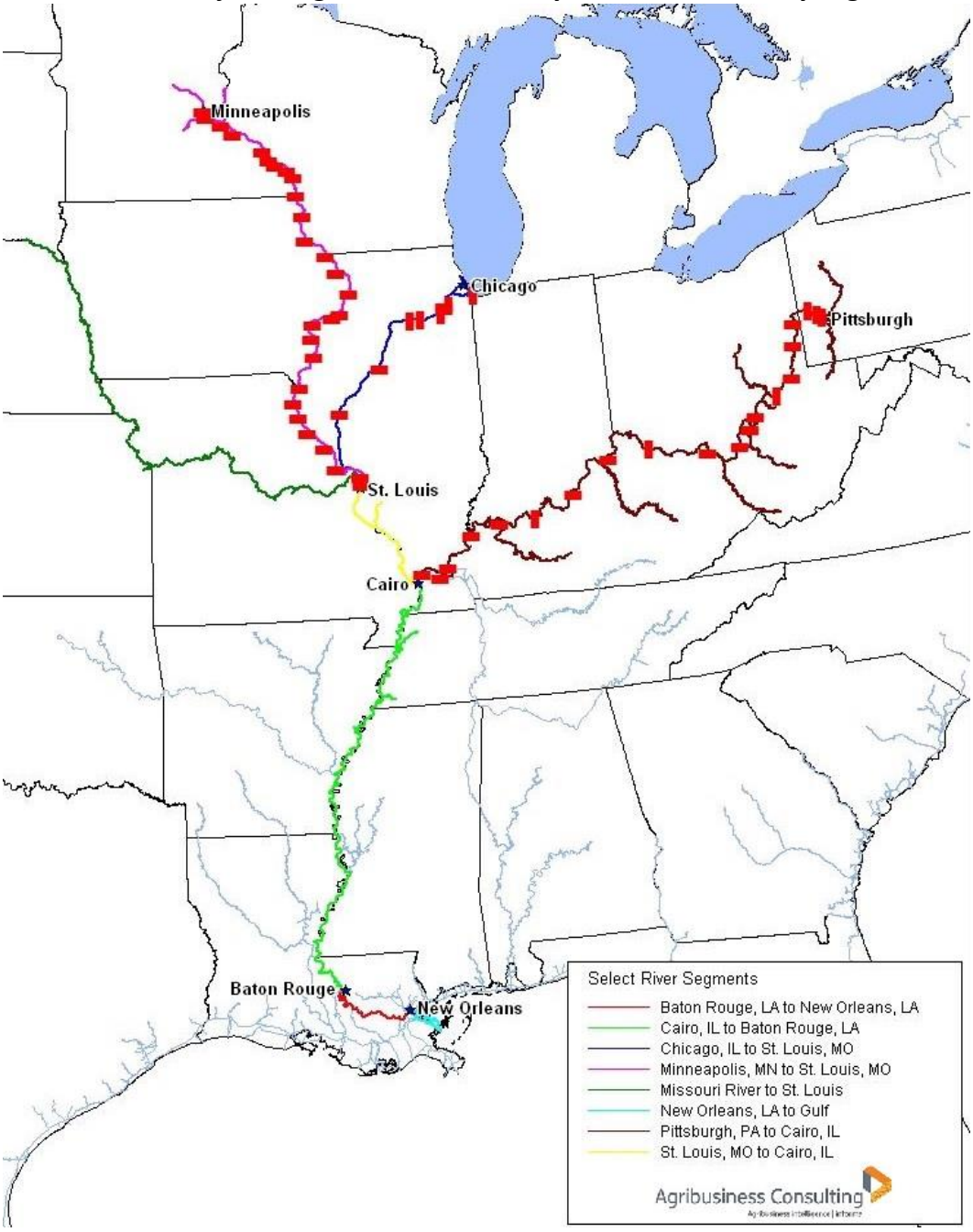
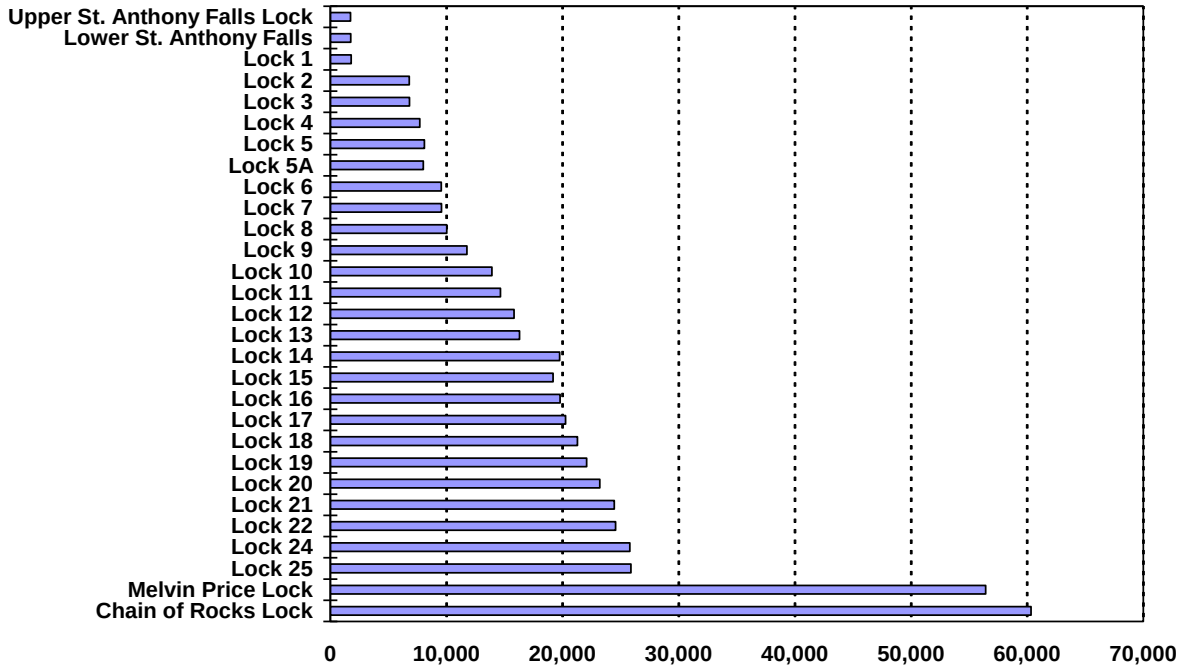


Exhibit 39: Average Barge Lockings by Mississippi River Lock



Note: Lockings include empties.

Source: Army Corps of Engineers, IEG Vantage

The Army Corps of Engineers (Corps) is under a mandate to maintain at least a nine-foot draft on the main navigation channels. Because the lower Mississippi River is wider and deeper than other segments of the Mississippi Inland Waterway System, the draft is typically greater, which allows barges on the lower Mississippi River to be loaded heavier. Additionally, there are no locks on the lower Mississippi River, which enables larger tow configurations. The cost per ton is lowered with each additional ton loaded.

Dredging issues are a constant issue for all aspects of the waterways but has become a major concern for port dredging. Private terminals are responsible for their own dredging. Historically, public funds for public port dredging were supplemented by earmarks. Now that earmarks have been disallowed, how to fund public dredging projects is a major concern. The issue is causing heartburn for local governments who have always depended on earmarks. Many ideas are being floated to fund public port dredging, but the federal and state governments are reluctant to spend limited funds on ports.

The upper Mississippi, Ohio, Illinois, Tennessee and Arkansas Rivers are subject to lock closures. The locks and dams are owned and operated by the Corps with many that exceed 50 years in age.

For ports highly dependent of the reliable function locks and dams, the lack of maintenance is a real concern and makes it imperative that ports have access to other modes of transportation.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix as fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's modern 1,200-foot long tows must be split and lock through in two operations within the project's 600-foot chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

The Mississippi River System is a major part of U.S. transportation system. Securing alternative transportation modes during a lock failure has proven to be both expensive and difficult.

During the low water event of 2012, shifting grain from barge to rail cost $0.45 per bushel. From 2012 until now, St. Louis and West Memphis, AR have experienced a surge in new river elevator capacity. Lock closures are not the reason for the new builds but being below the locks is viewed as an advantage because shippers do not have to worry about lock failures and can load the barge heavier, which effectively lowers the barge rate on a per ton basis. Inland transportation infrastructure including highway and rail has been built to service the river elevators. For a worst-case scenario, if a lock and dam failed or interrupted traffic off an upper river, western Corn Belt corn could be railed to a river elevator below the locks at St. Louis or West Memphis to move grain, soybeans and products to export position in the Center Gulf.

B. **Commodity Movements by River Segment**

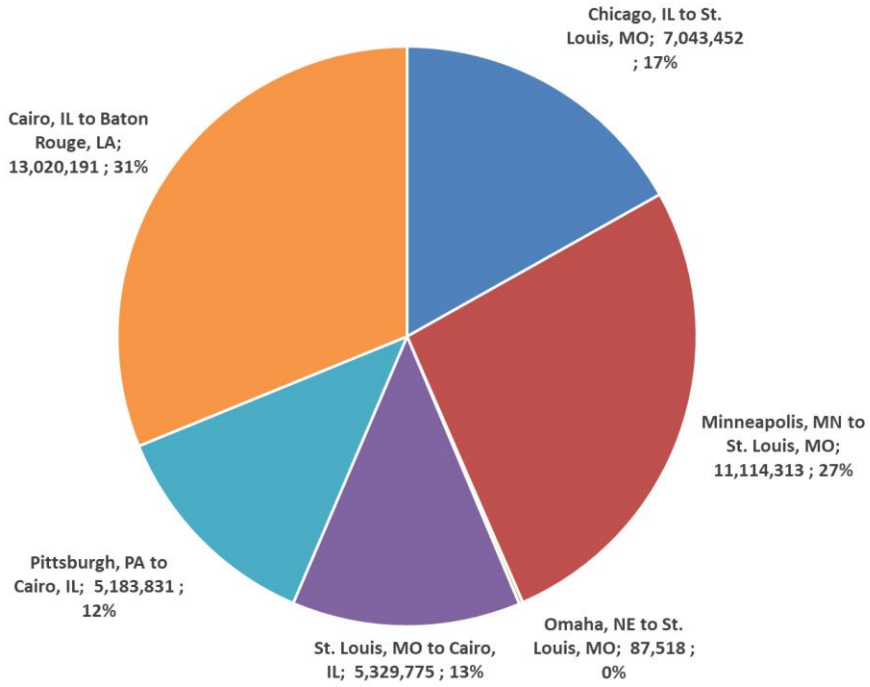
Corn, soybeans and animal feed, which includes SBM and DDGS, are the largest agriculture related commodity moves on the inland waterway system as shown in Exhibit 40. The volume expressed represent barge loadings as twenty-foot equivalent container loadings. Corn and soybeans represent nearly 4.1 million TEUs combined.

Exhibit 40: Barge Commodity Movements by River Loading Segment Represented as Twenty-Foot Equivalent Units, 2016

River Section	CORN	GRAIN MILL PRODUCTS	OILSEEDS NEC	RICE	SORGHUM GRAINS	SOYBEANS	ANIMAL FEED, PREP.	STARCHES, GLUTEN, GLUE	WHEAT	WOOD CHIPS
Chicago, IL to St. Louis, MO	456,706	954	544	-	-	262,489	137,943	365	9,977	-
Minneapolis, MN to St. Louis, MO	720,665	4,659	68,752	-	400	515,997	80,052	87	21,230	-
Omaha, NE to St. Louis, MO	5,675	-	-	-	-	7,831	-	-	103	-
St. Louis, MO to Cairo, IL	345,589	-	54,316	1,465	1,228	417,885	64,235	2,129	52,811	12,057
Pittsburgh, PA to Cairo, IL	336,126	2,140	112,369	-	855	298,043	51,775	601	38,844	12,776
Cairo, IL to Baton Rouge, LA	844,245	2,066	165,737	106,619	12,246	1,278,365	126,174	2,494	189,283	-
Sum	2,709,005	9,818	401,718	108,084	14,728	2,780,610	460,179	5,677	312,248	24,834

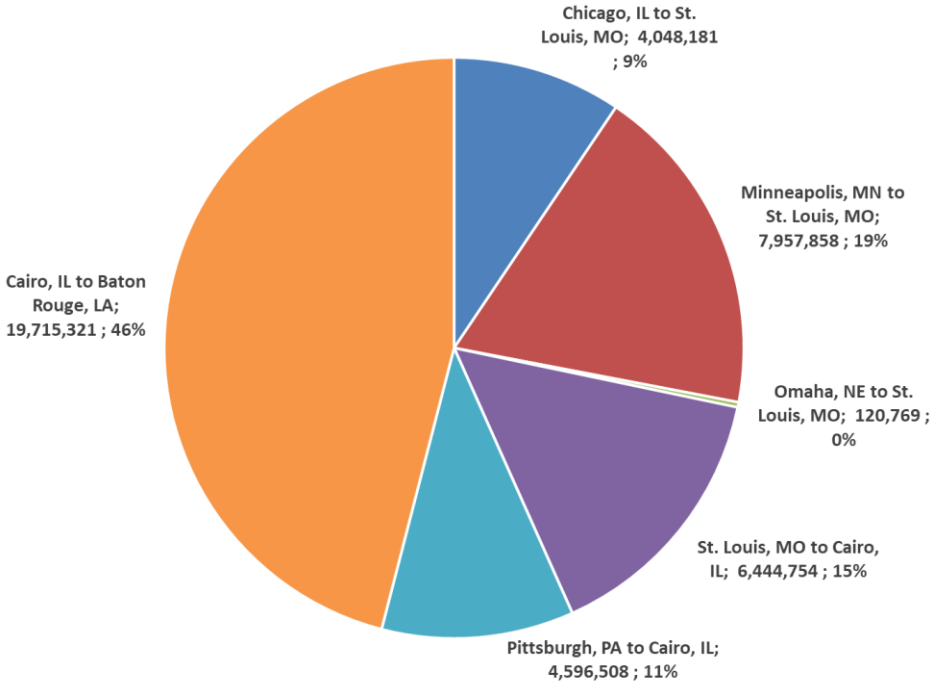
Source: Army Corps of Engineers, IEG Vantage

Exhibit 41: Corn Barge Loadings by River Loading Segment, Metric Tons and Share



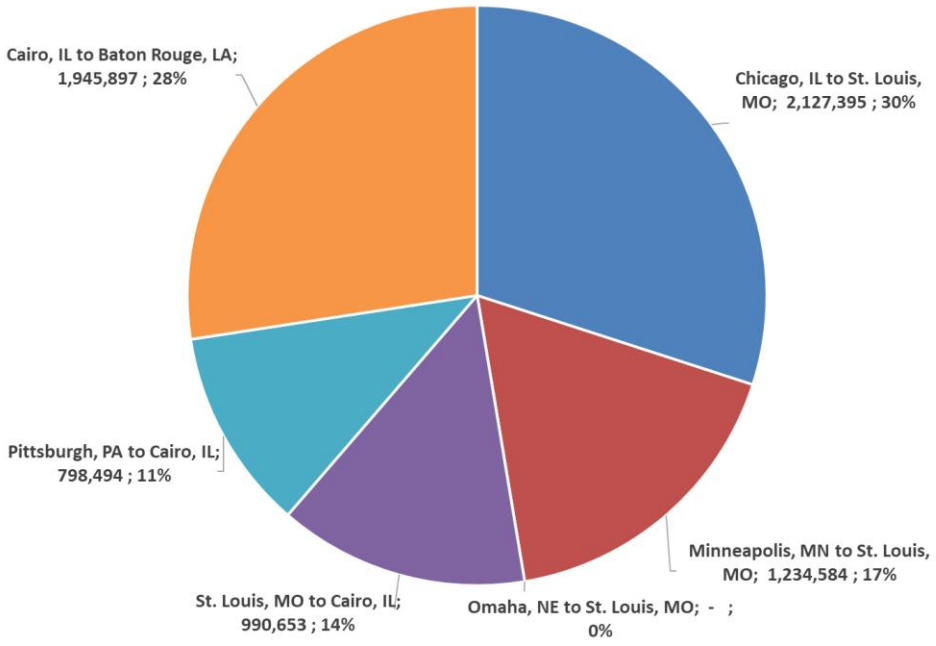
Source: Army Corps of Engineers, IEG Vantage

Exhibit 42: Soybean Barge Loadings by River Loading Segment, Metric Tons and Share



Source: Army Corps of Engineers, IEG Vantage

Exhibit 43: Animal Feed Barge Loadings by River Segment, Metric Tons and Share



Source: Army Corps of Engineers, IEG Vantage

Exhibit 44: Top Ten Products Moved through Key Inland River Ports, Inbound and Outbound, Short Tons

CINCINNATI, OH		LOUISVILLE, KY		MEMPHIS, TN		ST. LOUIS	
COAL LIGNITE	25,485,903	SAND & GRAVEL	2,652,297	COAL LIGNITE	1,815,833	**SOYBEANS**	**6,433,406**
LIMESTONE	2,151,030	GASOLINE	1,790,164	GASOLINE	1,545,739	**CORN**	**5,025,087**
SAND & GRAVEL	1,544,051	DISTILLATE FUEL OIL	945,122	**SOYBEANS**	**1,137,504**	CEMENT & CONCRETE	3,613,928
GASOLINE	1,323,427	KEROSENE	429,970	LIMESTONE	1,095,556	COAL LIGNITE	2,936,873
SOYBEANS	**1,216,579**	IRON & STEEL SCRAP	303,986	DISTILLATE FUEL OIL	1,032,853	PETROLEUM COKE	1,799,486
PIG IRON	761,445	COAL LIGNITE	285,508	SAND & GRAVEL	890,309	CRUDE PETROLEUM	1,366,248
DISTILLATE FUEL OIL	723,626	ALCOHOLS	164,254	CEMENT & CONCRETE	656,555	**ANIMAL FEED, PREP.**	**1,086,244**
IRON & STEEL SCRAP	693,527	LUBE OIL & GREASES	112,016	IRON & STEEL SCRAP	401,103	**NITROGENOUS FERT.**	**1,031,084**
NITROGENOUS FERT.	**561,609**	**CORN**	**92,670**	**CORN**	**368,102**	**OILSEEDS NEC**	**923,366**
GYPSUM	557,264	OTHER HYDROCARBONS	81,775	ASPHALT, TAR & PITCH	316,752	**WHEAT**	**860,465**

ST. PAUL, MN		KANSAS CITY		LITTLE ROCK, AR	
CORN	**1,169,639**	SAND & GRAVEL	613,730	**NITROGENOUS FERT.**	**2,003,514**
SAND & GRAVEL	916,648	**NITROGENOUS FERT.**	**33,774**	**SOYBEANS**	**1,465,965**
SOYBEANS	**842,718**	ASPHALT, TAR & PITCH	32,186	**WHEAT**	**1,217,692**
NITROGENOUS FERT.	**812,630**	PETROLEUM COKE	29,998	**FERT. & MIXES NEC**	**557,354**
CEMENT & CONCRETE	756,419	CEMENT & CONCRETE	9,117	PRIMARY I&S NEC	309,703
IRON & STEEL SCRAP	313,898	**FERT. & MIXES NEC**	**6,164**	IRON & STEEL SCRAP	251,144
FERT. & MIXES NEC	**264,209**	SLAG	2,972	PETROLEUM COKE	223,598
POTASSIC FERT.	239,183	WATERWAY IMPROV. MAT	639	I&S BARS & SHAPES	221,643
WHEAT	**106,305**	COAL LIGNITE		**POTASSIC FERT.**	**206,032**
SODIUM HYDROXIDE	82,542	LIMESTONE		SAND & GRAVEL	172,736

Notes: (a) Cincinnati, OH is between Ohio River miles 356.8 and 491.4.

(b) Louisville, KY is between Ohio River miles 601 and 616.

(c) Memphis, TN is between Mississippi River miles 715.5 and 741.

(d) St. Louis, MO is between Mississippi River miles 171 and 208.8 above the Ohio River junction and miles 138.8 and 171 to the Ohio River.

(e) St. Paul, MN is between Mississippi River miles 830 and 847

(f) Kansas City, Mo is 9 acres located at mile 367.1 of the Missouri River

(g) Little Rock, AR is 3500 acres located at Arkansas River mile 112.8

C. **Transportation Costs of Existing Systems**

The following section discusses the cost of moving corn, soybeans and agricultural products by bulk barge on the inland waterway system to export elevators in the Center Gulf and of moving these same products to the West Coast by container on rail. All moves begin at a local elevator.

1. Barge Movement

Over 58 percent of U.S. corn, soybean, SBM and DDGS exports are through Center Gulf export grain terminals as dry bulk delivered by barge. These shipments begin with the delivery of corn and soybeans from local elevators. SBM and DDGS are delivered from crush plants and ethanol processors to river terminals either by truck or rail. For the purposes of this report, all scenarios assume that commodities are sourced within 100 miles of the terminal. Barges on the upper Mississippi River were assumed to be loaded to 1,500 short tons while barges on the lower Mississippi River can be loaded to 2,000 short tons.

Bulk barge freight rates for the last 5 years were examined as shown in Exhibit 45. Minimum and maximum barge rates were identified for each location. For comparison purposes, Informa looked at the average during the peak months of October through January. Informa took these rates and combined them with other costs to develop the cost of transportation from elevator to destination market as shown in Exhibit 46.

The load in charge from truck into elevator of grain at the river terminal was estimated at a conservative $5.44 per metric ton (or equivalent to $6.00 per short ton). Similarly, the load out charge from the river elevator to a barge was estimated at the same $5.44 per metric ton. Demurrage assumes three days free time, with charges for holding barges at $300 per day.

Truck transportation costs to a barge loading elevator was set at 100 miles at $2.25 per mile and 50,000 pounds per truckload.

Handling fees at the export elevator were calculated using the CIF-FOB spread (cost, insurance and freight of barge to export elevator less free on board from export elevator to ocean going dry bulk vessel). Cost, Insurance and Freight (CIF) means the seller pays costs, freight and insurance against the buyer's risk of loss or damage in transit to destination. In a nutshell, this is the cost of the commodity on the river side of the export elevator. Free on Board (FOB) contracts relieve the seller of responsibility once the goods are shipped. After the goods have been loaded

– technically, “passed the ship’s rail,” – they are delivered into the control of the buyer. The spread is a good indication of the cost of moving through the export elevator, and oftentimes referred to as the “gross margin” or fobbing margin of the export elevator.

Ocean freight rates are based on daily dry bulk ocean freight rates for the past 12 months. Rates from the U.S. Gulf to China are included in the calculation.

Exhibit 45: Bulk Barge Freight Costs from Key Locations to New Orleans, LA (US$ per Metric Ton and US$ per Bushel)

	Peoria, IL (Metric Ton)			Davenport, IA (Metric Ton)			Memphis, TN (Metric Ton)			Cincinnati, OH (Metric Ton)			St. Louis, MO (Metric Ton)			Minneapolis, MN (Metric Ton)		
	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg
Peak Shipping Cost	$ 14.55	$ 24.77	$ 19.94	$ 16.79	$ 28.24	$ 25.63	$ 5.92	$ 14.35	$ 9.43	$ 10.43	$ 24.59	$ 17.81	$ 8.78	$ 18.37	$ 13.54	$ 12.31	$ 36.44	$ 30.53
Load In	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44
Load Out	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44
Demurrage	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.54	$ 0.54	$ 0.54	$ 0.73	$ 0.73	$ 0.73	$ 0.54	$ 0.54	$ 0.54	$ 0.73	$ 0.73	$ 0.73
Total Cost	**$ 26.16**	**$ 36.38**	**$ 31.55**	**$ 28.41**	**$ 39.85**	**$ 37.24**	**$ 17.35**	**$ 25.78**	**$ 20.86**	**$ 22.04**	**$ 36.20**	**$ 29.42**	**$ 20.21**	**$ 29.80**	**$ 24.97**	**$ 23.92**	**$ 48.05**	**$ 42.14**

	Peoria, IL (Corn Bushel)			Davenport, IA (Corn Bushel)			Memphis, TN (Corn Bushel)			Cincinnati, OH (Corn Bushel)			St. Louis, MO (Corn Bushel)			Minneapolis, MN (Corn Bushel)		
	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg
Peak Shipping Cost	$ 0.46	$ 0.75	$ 0.64	$ 0.49	$ 0.83	$ 0.78	$ 0.20	$ 0.44	$ 0.33	$ 0.40	$ 0.77	$ 0.59	$ 0.28	$ 0.57	$ 0.45	$ 0.26	$ 0.98	$ 0.93
Load In	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17
Load Out	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17	$ 0.17
Demurrage	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02
Total Cost	**$ 0.82**	**$ 1.11**	**$ 1.00**	**$ 0.85**	**$ 1.19**	**$ 1.14**	**$ 0.56**	**$ 0.79**	**$ 0.68**	**$ 0.76**	**$ 1.13**	**$ 0.95**	**$ 0.64**	**$ 0.93**	**$ 0.80**	**$ 0.62**	**$ 1.34**	**$ 1.28**

	Peoria, IL (Soybean Bushel)			Davenport, IA (Soybean Bushel)			Memphis, TN (Soybean Bushel)			Cincinnati, OH (Soybean Bushel)			St. Louis, MO (Soybean Bushel)			Minneapolis, MN (Soybean Bushel)		
	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg	Min	Max	5 Year Avg
Peak Shipping Cost	$ 0.49	$ 0.80	$ 0.69	$ 0.53	$ 0.89	$ 0.83	$ 0.22	$ 0.47	$ 0.35	$ 0.43	$ 0.83	$ 0.63	$ 0.31	$ 0.62	$ 0.48	$ 0.28	$ 0.83	$ 0.99
Load In	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18
Load Out	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18	$ 0.18
Demurrage	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.02
Total Cost	**$ 0.88**	**$ 1.18**	**$ 1.07**	**$ 0.91**	**$ 1.27**	**$ 1.22**	**$ 0.60**	**$ 0.85**	**$ 0.73**	**$ 0.81**	**$ 1.21**	**$ 1.02**	**$ 0.68**	**$ 0.99**	**$ 0.86**	**$ 0.67**	**$ 1.21**	**$ 1.38**

Exhibit 46: Transportation Cost Analysis to Final Market Position (US$ per Metric Ton)

$/Metric Ton	Memphis, TN	St. Louis, MO	Little Rock, AR	Kansas City, MO	Joliet, IL	Peoria, IL	Davenport, IA (Quad Cities)	Cincinnati, OH	Minneapolis, MN
Bulk Barge									
Truck Freight Cost	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92
Downbound Freight includes Load-In/Load-Out/Demurrage									
Barge Freight	$ 9.43	$ 13.54	$ 9.43	$ 25.63	$ 21.42	$ 19.94	$ 25.63	$ 17.81	$ 30.53
Load In at river terminal	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44
Load Out at export port	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44	$ 5.44
Demurrage	$ 0.54	$ 0.54	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73
Export Port Expense									
Export Elevator Grain Handling Charges	$ 9.05	$ 9.05	$ 9.05	$ 9.05	$ 9.05	$ 9.05	$ 9.05	$ 9.05	$ 9.05
Bulk Ocean Freight	$ 35.86	$ 35.86	$ 35.86	$ 35.86	$ 35.86	$ 35.86	$ 35.86	$ 35.86	$ 35.86
Total	$ 75.69	$ 79.80	$ 75.87	$ 92.07	$ 87.87	$ 86.38	$ 92.07	$ 84.26	$ 96.97

2. Intermodal Rail Movements to U.S. West Coast

Containerized exports of corn and soybeans account for roughly four percent of total U.S. export inspections. The grain, soybeans and products are sourced from an elevator whether from an on-farm location or off-farm position, or a soybean crush plant or ethanol plant, similar as the movement to a bulk barge loading position. The grains, soybeans and products are moved to a container transload facility where the commodity is transloaded from one mode of transportation to another. One transload example is truck movement of grains from an elevator to the transload facility where the truck load is transferred into a container.

In this section Informa reviewed the cost of moving corn, soybeans, SBM and DDGS by container to West Coast ports. For the costs analysis of intermodal moves to the West Coast, the truck move to a transloader facility assumes the same 100-mile transportation cost that was used for the bulk barge move and is summarized in Exhibit 47.

Transloader operators charge an all-inclusive rate to transfer agricultural commodities into containers. The rate includes the drayage or hauling an empty container by truck between the container yard and transload facility, unloading the inbound covered hopper railcar or bulk truck of the grains, soybeans or products, inspecting the container, preparing the "grain door" on the container, loading the container, having a phytosanitary inspection by a Department of Agriculture representative, sealing the container, and draying it back to the container terminal. The analysis assumes a cost of $375 per container for the transload activity.

The intermodal rail rate between key transload locations and ports was available that includes all intermodal activity including the loading of the container onto rail for shipment, the rail move to a port, and unloading the container from the intermodal train. The Ports of Los Angeles and Long Beach complexes are used as the export load port, except for containers transloaded in Minneapolis and Omaha where the containers would ship to the Pacific Northwest (PNW). Once at the port, there is a drayage fee of $300 per container moving the container from a container yard into the port. A Lift On/Lift Off rate of $350 per container was used for lifting the container off rail and also for lifting the container onto the ocean vessel. This rate was not discounted but could be depending on ownership of the container.

A mix of TEUs and FEUs was assumed for the movements. Expenses for the movement of both are shown. FEUs account for 85% of containers moved, therefore a blended rate of 85 percent

FEU and 15 percent TEU was used in order to determine transportation costs from key origins in the U.S. to final destination in China.

Containers shipped on intermodal service may be fully loaded to weight limits of 47,999 pounds, or 21.8 metric tons, for TEUs and 59,040 pounds, or 26.8 metric tons, for FEUs and meet railroad weight requirements. The analysis assumes that the containers will only be loaded to weights that allow the container to meet road weight limits. Road weight limits are 38,200 pounds (17.3 metric tons) for TEUs and 40,500 pounds (18.4 metric tons) for FEUs.

Exhibit 47: Container Transportation Costs through West Coast Ports by Select Origins, $ per Metric Ton

	Memphis to LAX			St. Louis to LAX			Chicago to LAX			Kansas City to LAX		
$ per Metric Ton	20'	40'	Blended	20'	40'	Blended	20'	40'	Blended	20'	40'	Blended
Truck Freight from Elevator to Containerization Location	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92
Transloading (dray of empty, stuffing, dray to intermodal)	$ 21.64	$ 20.41	$ 20.60	$ 21.64	$ 20.41	$ 20.60	$ 21.64	$ 20.41	$ 20.60	$ 21.64	$ 20.41	$ 20.60
Rail rate per container including all intermodal ramp activity	$ 62.33	$ 73.49	$ 71.81	$ 80.80	$ 95.26	$ 93.09	$ 56.56	$ 66.68	$ 65.16	$ 73.87	$ 87.10	$ 85.11
Drayage into Port	$ 17.31	$ 16.33	$ 16.48	$ 17.31	$ 16.33	$ 16.48	$ 17.31	$ 16.33	$ 16.48	$ 17.31	$ 16.33	$ 16.48
Lift Off Rail	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20
Lift On Ocean Carrier	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20
Ocean Freight for Container to China	$ 15.01	$ 17.69	$ 17.29	$ 15.01	$ 17.69	$ 17.29	$ 15.01	$ 17.69	$ 17.29	$ 15.01	$ 17.69	$ 17.29
Freight Rate from Elevator to Port in China	$ 166.61	$ 178.24	$ 176.50	$ 185.08	$ 200.01	$ 197.77	$ 160.84	$ 171.44	$ 169.85	$ 178.15	$ 191.85	$ 189.79

	Louisville to LAX			Minneapolis to PNW			Omaha to PNW		
$ per Metric Ton	20'	40'	Blended	20'	40'	Blended	20'	40'	Blended
Truck Freight from Elevator to Containerization Location	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92
Transloading (dray of empty, stuffing, dray to intermodal)	$ 21.64	$ 20.41	$ 20.60	$ 21.64	$ 20.41	$ 20.60	$ 21.64	$ 20.41	$ 20.60
Rail rate per container including all intermodal ramp activity	$ 101.57	$ 119.76	$ 117.03	$ 55.40	$ 65.32	$ 63.83	$ 43.86	$ 51.71	$ 50.54
Drayage into Port	$ 17.31	$ 16.33	$ 16.48	$ 17.31	$ 16.33	$ 16.48	$ 17.31	$ 16.33	$ 16.48
Lift Off Rail	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20
Lift On Ocean Carrier	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20	$ 20.20
Ocean Freight for Container to China	$ 15.01	$ 17.69	$ 17.29	$ 27.70	$ 32.66	$ 31.92	$ 27.70	$ 32.66	$ 31.92
Freight Rate from Elevator to Port in China	$ 205.85	$ 224.51	$ 221.71	$ 172.38	$ 185.04	$ 183.14	$ 160.84	$ 171.44	$ 169.85

V. OVERVIEW OF AMERICAN PATRIOT HOLDINGS CONTAINER ON VESSEL SYSTEM AND ESTIMATED TRANSPORT COST

A. **Proposed American Patriot Holdings Container On Vessel System**

American Patriot Holdings, LLC (APH) has designed a self-propelled container vessel for operation on the Mississippi River that can transport up to 2,500 TEUs (twenty-foot equivalent units). The vessel can operate at over 13 mph upriver allowing a seven-day round-trip transit from Plaquemines Parrish in Louisiana to Memphis and an eleven-day round-trip transit to St. Louis. APH has also designed a hybrid vessel that can operate on the inland shallow draft, locking rivers, such as the Illinois, Ohio, Missouri and Arkansas Rivers extending the reach of their service. The hybrid vessel can be loaded with and move 1,270 TEUs.

APH has entered an exclusive agreement with Plaquemines Port Harbor and Terminal District (PPHTD) to develop a specially-designed gateway terminal at mile marker 55 on the Lower Mississippi River. The PPHTD location has a 55-foot draft that will accommodate large, ocean-going vessels. PPHTD offers less marine traffic and 50% less ocean carrier navigation time to other upriver locations. The port is at the widest and deepest part of the Mississippi River making it capable of servicing the largest ocean carriers (20,000 plus TEU vessels).

APH is working to develop terminals along the inland waterway system that will allow for rapid unloading and loading of its vessels for a quick turn-around. APH and PPHTD currently have Memorandums of Understanding with ports in Memphis, the St. Louis region, Kansas City and Little Rock.

The proposed APH system claims to have a significant advantage over containerized intermodal rail movements to the West Coast. A dedicated terminal at PPHTD and dedicated terminals along the inland waterway system allow for fewer delays due to rail movements and delays at West Coast ports due to large container traffic. Reduced costs for operating this system over rail movements is a key advantage that will ultimately benefit farmers. Lower operational and freight costs of the APH system will allow it to source farther from the river system expanding the amount of agricultural product available for export.

APH envisions transporting containers with high-value dry goods and products upriver and a mixture of containers containing agricultural products or dry goods and commodities back to PPHTD as well as empty containers.

The liner service will operate between PPHTD, Memphis and St. Louis. APH is initially looking at hybrid service between PPHTD and Little Rock, Cincinnati, Kansas City, the Quad Cities and Chicago.

B. Potential Cost of Commodity Movements on APH System

The total freight cost transporting commodities using the APH vessel system were compiled similar to those for bulk barge and rail container moves and are summarized in Exhibit 48. Grains, soybeans and products are assumed to be sourced 100 miles from the transloading facility resulting in the same transportation cost. Transloading costs are $375 per container in both the APH system and rail container moves.

The analysis assumes that containers loaded to the APH vessel will be loaded to road weight limits of 17.3 metric tons as containers may be transloaded at a facility other than the port. APH supplied Informa with Lift On costs of $200 per container at river terminals. Informa assumed an 85 percent FEUs and 15 percent TEUs container load factors to determine a blended cost of $10.99 per metric ton for the Lift On to the APH vessel. Lift Off at PPHTD and the lift to the ocean carrier were also provided. At $250 per container lift, or approximately $13.73 per metric ton.

Containers may be loaded heavy at terminals and unloaded dockside with no ground transportation where container weights may exceed road weight limits. A fully loaded TEU has a maximum cargo weight of 47,999 pounds or 21.8 metric tons. Corn and soybeans will reach this maximum weight before filling the container. A fully loaded FEU has a maximum cargo of 59,040 pounds or 26.8 metric tons. SBM and DDGS are typically carried in FEUs. SBM will reach the weight limit before filling the container. DDGS which is less dense will fill a FEU before reaching the maximum weight. Only 16.3 metric tons of DDGS will fit into a FEU. Loading to the maximum container weight reduces the cost per metric ton by 21%.

Rates for moving containers on the APH system were provided by APH. The rates assume that APH will move dry loaded containers upriver and agricultural commodities downriver. Vessel deadweight restrictions will not allow for all containers to be loaded with agricultural

commodities. There will be a mix of loaded and empty containers to maximize revenue. This balancing allows for a downbound freight savings on the APH system.

Exhibit 48: Transportation Cost Shipping on the American Patriot Holdings Container On Vessel System to Plaquemines Port Harbor & Terminal District, $ per Metric Ton

Logistics Functions	Liner Vessel Memphis	Liner Vessel St. Louis	Hybrid Vessel Little Rock	Hybrid Vessel Kansas City	Hybrid Vessel Joliet
Truck Freight from Elevator to Containerization Location	$ 9.92	$ 9.92	$ 9.92	$ 9.92	$ 9.92
Transloading (dray of empty, stuffing, dray to intermodal)	$ 20.60	$ 20.60	$ 20.60	$ 20.60	$ 20.60
Lift On	$ 10.99	$ 10.99	$ 10.99	$ 10.99	$ 10.99
Freight - Origin to PPHTD	$ 13.85	$ 19.91	$ 20.78	$ 34.34	$ 34.63
Lift Off	$ 13.73	$ 13.73	$ 13.73	$ 13.73	$ 13.73
Lift to Ocean Carrier	$ 13.73	$ 13.73	$ 13.73	$ 13.73	$ 13.73
Ocean Freight for Container to China	$ 24.24	$ 24.24	$ 24.24	$ 24.24	$ 24.24
Freight Rate from Elevator to Port in China	$ 107.06	$ 113.12	$ 113.98	$ 127.54	$ 127.83

C. **Inland Terminal Operations**

The inland terminals performance will be a critical component to the overall success of the APH container on vessel operation. In order for the speed and efficiency of the vessels to be fully realized, they must be able to be unloaded and loaded at the inland terminals with an operation that compliments the same speed and efficiency at the port of entry and exit at the PPHTD.

The liner vessel configuration has a maximum capacity of 2,500 TEUs. With the assumption that 85 percent of the containers will be FEUs, each with a two TEU equivalent value, the average picks (or lifts) per vessel totals 1,427.5 (1,062.5 FEUs plus 375 TEUs). The crane cycle time is expected to be two minutes per lift. When utilizing three cranes per vessel at the inland terminal, the total time to unload a vessel is 16 hours. For this type of operation, it is expected to run two, eight-hour shifts per vessel calling. It is expected that there will be minimal differences between the required time to load the vessel compared to the time required to unload. Each phase of the dock side operation (for example Unload or Load phase) is expected to be completed in one day. Given the assumptions and calculations above, the total time for a vessel to be at the inland terminal dock is two days.

A terminal operator will be required to make a significant investment at each inland terminal facility. The estimated total capital for terminal development and equipment is $58.2 million as listed in Exhibit 49.

The values in the Exhibit 49 are only estimates and should be treated as an indication of an order of magnitude for expected costs. Each potential site will be unique and have different development requirements based on the operational scenario developed for this project anticipates the use of a combination of both Taylor type lifts and yard trucks with chassis' (Hostler) for the handling of containers to and from laydown areas to the dock.

In addition to the upfront capital costs, there will be a significant investment required for staffing. Informa estimates that this terminal operation will require approximately a 45-employee head count to be properly staffed. There may be some sharing of support staff if a single company were to operate multiple inland terminal facilities, but the cost savings would be minimal.

The total per container rate is estimated to be $200, based on these operational assumptions, anticipated variable and fixed expenses, and the estimated capital costs in Exhibit 49. This per

container rate includes a load on and off for container. This is calculated with the following assumptions:

1. 75 vessels per year
2. 1,437.5 picks per vessel
3. 15 percent or greater unlevered internal rate of return post tax on a 10-year look
4. Exit value of 1 X EBITDA in year 10
5. 10-year straight line depreciation

Exhibit 49: Inland River Container Terminal Capital Cost Estimate to Support Container On Vessel System

Unit	Item		Unit Cost	Item Total
3	Crane		$10,000,000	$30,000,000
9	Taylor Lift		$ 250,000	$ 2,250,000
10	Hostlers + Chassis		$ 75,000	$ 750,000
2	Scales		$ 80,000	$ 160,000
1	Site Improvements		$10,000,000	$10,000,000
8	Mooring Dolphins		$ 125,000	$ 1,000,000
1	Admin Building		$ 3,000,000	$ 3,000,000
1	Maintenance Bldg		$ 1,000,000	$ 1,000,000
1	General Conditions		$ 100,000	$ 100,000
	Contingency Non-Rolling Stock	30%		$ 4,578,000
			Sub Total	$52,838,000
6.80%	Working Capital	Months	18	$ 5,389,476
	Total			$58,227,476

A potential terminal operator will want to maximize dock usage to increase overall profitability. In the scenario of 75 APH vessels per year, this would only account for approximately 150 working days per year. The terminal operator would seek additional barge customers to fill the remaining 100 days per year. Various non-containerized break bulk commodities could be handled utilizing the existing equipment with minimal additional cost for conversion, such as hot rolled steel coils, lumber, dry bulk supersacks, steel pipe, and dimensional structural steel, to name a few. This could lead to dock congestion that would impact the turn time for the APH vessels. It would be important for APH to have a priority clause established in the contract documents with the terminal operator.

There are various potential risks or issues that are difficult to capture quantifiably but are worthy of further exploration:

River Height Level	The height of the river can greatly vary throughout the year. Memphis, TN, for example can vary between 35 feet in a typical year. Low water levels will increase the distance from the ship deck to the final resting position on the dock, this will in turn impact the cycle times of the cranes.
Inclement Weather	The unpredictability significant weather events can cause delays in vessel turn time. Some cranes have operating parameters that limit or outright prevent operation above a certain wind speed threshold.
Government Regulation	Various agencies such as the US Coast Guard or Department of Homeland Security may classify the inland terminal facilities as a TWIC facility (Transportation Worker Identification Credential). This would add additional operation and administrative costs to the terminal, as well as change the requirements of non-terminal employees on site, e.g. drivers that are draying containers in and out of the terminal.

VI. COMPARISON OF PROPOSED LINER SERVICE TO EXISTING SERVICES

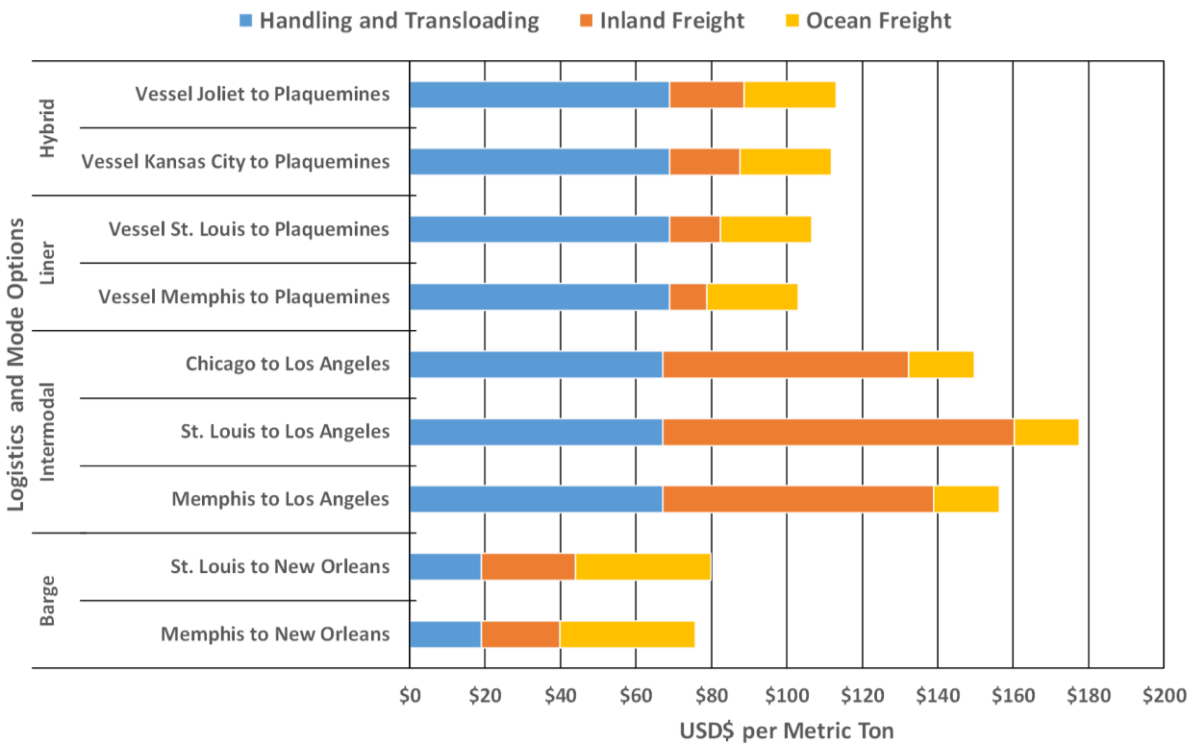
A. Freight Comparison of Modes

The freight rates from elevators in key origins to final destinations in China that were previously developed are summarized in Exhibit 50. Bulk movements by barge on the Mississippi River have the lowest transportation costs as would be expected given the volume moved by bulk barge. Intermodal moves through the West Coast to China have the highest freight costs. Freight comparisons are narrowed down in Exhibit 51 to origins identified by APH as their initial focus.

Exhibit 50: Comparison of Bulk and Container Service Freight Costs, $ per Metric Ton

Logistics and Mode Option	Handling and Transloading	Freight	Subtotal	Ocean Freight	Total
Barge Memphis to New Orleans to China	$ 18.97	$ 20.86	$ 39.83	$ 35.86	$ 75.69
Barge St. Louis to New Orleans to China	$ 18.97	$ 24.97	$ 43.94	$ 35.86	$ 79.80
Barge Little Rock to New Orleans to China	$ 18.97	$ 21.04	$ 40.01	$ 35.86	$ 75.87
Barge Kansas City to New Orleans to China	$ 18.97	$ 37.24	$ 56.21	$ 35.86	$ 92.07
Barge Joliet to New Orleans to China	$ 18.97	$ 33.03	$ 52.00	$ 35.86	$ 87.87
Barge Peoria to New Orleans to China	$ 18.97	$ 31.55	$ 50.52	$ 35.86	$ 86.38
Barge Davenport to New Orleans to China	$ 18.97	$ 37.24	$ 56.21	$ 35.86	$ 92.07
Barge Cincinnati to New Orleans to China	$ 18.97	$ 29.42	$ 48.39	$ 35.86	$ 84.26
Barge Minneapolis to New Orleans to China	$ 18.97	$ 42.14	$ 61.11	$ 35.86	$ 96.97
Intermodal Memphis to Los Angeles to China	$ 67.20	$ 71.81	$ 139.01	$ 17.29	$ 156.30
Intermodal St. Louis to Los Angeles to China	$ 67.20	$ 93.09	$ 160.29	$ 17.29	$ 177.57
Intermodal Chicago to Los Angeles to China	$ 67.20	$ 65.16	$ 132.36	$ 17.29	$ 149.65
Intermodal Kansas City to Los Angeles to China	$ 67.20	$ 85.11	$ 152.31	$ 17.29	$ 169.60
Intermodal Louisville to Los Angeles to China	$ 67.20	$ 117.03	$ 184.22	$ 17.29	$ 201.51
Intermodal Minneapolis to Los Angeles to China	$ 67.20	$ 63.83	$ 131.03	$ 31.92	$ 162.95
Intermodal Omaha to Los Angeles to China	$ 67.20	$ 50.54	$ 117.73	$ 31.92	$ 149.65
Liner Vessel Memphis to Plaquemines to China	$ 68.97	$ 13.85	$ 82.82	$ 24.24	$ 107.06
Liner Vessel St. Louis to Plaquemines to China	$ 68.97	$ 19.91	$ 88.88	$ 24.24	$ 113.12
Hybrid Vessel Little Rock to Plaquemines to China	$ 68.97	$ 20.78	$ 89.74	$ 24.24	$ 113.98
Hybrid Vessel Kansas City to Plaquemines to China	$ 68.97	$ 34.34	$ 103.31	$ 24.24	$ 127.54
Hybrid Vessel Joliet to Plaquemines to China	$ 68.97	$ 34.63	$ 103.59	$ 24.24	$ 127.83

Exhibit 51: Logistics and Mode Option Costs Moving Grains, Soybeans and Products to Market Position, US$ per Metric Ton



Bulk barge freight costs range from $39.97 per metric ton ($1.02 per bushel for corn or $1.09 per bushel for soybeans) less than the APH system with an origination in Joliet, IL on APH's hybrid vessel to $31.36 per metric ton ($0.80 per bushel for corn or $0.85 per bushel for soybeans) less expensive from Memphis, TN to PPHTD. The liner vessel is slightly less competitive from St. Louis to PPHTD at $33.31 per metric ton ($0.85 per bushel for corn or $0.91 per bushel for soybeans) more expensive. On average, bulk barge freight is $35.64 per metric ton ($0.91 per bushel for corn or $0.97 per bushel for soybeans) less expensive than container moves on APH's system. These comparisons do not consider any loss due to quality or during transfer from storage to vessels and assume heavy-loaded containers at APH terminals.

APH's proposed service on the Mississippi River has a significant advantage over intermodal container movements through the West Coast. The advantage ranged from as high as $84.66 per metric ton ($2.15 per bushel for corn or $2.30 per bushel for soybeans) for shipments originating in St. Louis to as low as $42.01 per metric ton ($1.07 per bushel for corn or $1.14 per bushel for soybeans) for shipments originating in Chicago and Joliet area. On average, APH's proposed system is $66.85 per metric ton ($1.70 per bushel for corn or $1.82 per bushel for soybeans) less

expensive than a container move to China through the West Coast. The differential between rail rates and the proposed APH rate was the most significant factor. It should also be noted that intermodal containers were restricted to road weight limits where APH containers were heavy loaded at the terminal.

Exhibit 52: Comparison of American Patriot Holdings Service to Bulk Barge and West Coast Container Movements, $ per Metric Ton

Origin	Bulk Barge	Container to West Coast	APH Service
Memphis, TN	$ 75.69	$ 176.50	$ 107.06
St. Louis, MO	$ 79.80	$ 197.77	$ 113.12
Little Rock, AR	$ 75.87	$ 189.89	$ 113.98
Kansas City, MO	$ 92.07	$ 189.79	$ 127.54
Joliet, IL (Chicago)	$ 87.87	$ 169.85	$ 127.83

B. Non-Financial Considerations for Container Movements

Bulk and rail movement of grain and soybeans are the major modes of transportation for export but containers do offer some advantages that these modes do not.

Identity preservation is an important reason to transport commodities by container. Purchasers may need food-grade or non-GMO varieties of soybeans. Regulation of GMO agricultural products may require the identity preservation (IP). IP products tend to demand a premium making the additional cost of transportation feasible.

It is believed that soybeans maintain higher quality levels when in a container versus shipping bulk. A study performed by Informa in 2013 for the Illinois Soybean Association was performed on a limited sampling of containers. The study had mixed results.

- Foreign matter was expected to remain the same as the containers were sealed. Tests showed both an increase and decrease in foreign matter as transportation is believed to cause it to settle in particular areas.
- The initial Protein Dispersibility Index (PDI) and Nitrogen Solubility Index (NSI) tests consistently showed lower results for the destination than for the origin samples in both modes, but especially for the bulk shipments.

- Perhaps the most important finding and the main focus of the project is that in all the shipments that returned a sample for lab testing, the overall quality was maintained during containerized shipment.

The quantity required by a purchaser may be limited or the purchaser may have limited storage capability. A bulk load would be too large for the purchaser to accept. It may also be a question of the purchaser's ability to finance a large shipment.

- There is a risk for the quantity needed to outgrow the container mode. Vietnam is a good example. Vietnam has seen a decline in container shipments since 2014.

C. **Transit Time Comparison**

The proposed APH system has an advantage over barge and intermodal service in transit time from elevator to export position. The APH system is approximately 7 days faster than bulk barge to the Gulf and 6 days faster than intermodal to Los Angeles.

APH has a ocean transit time advantage over bulk grain and agricultural moves of roughly 8 days as bulk moves will travel around the Cape of Good Hope and it assumed that container moves will transit the Panama Canal. Intermodal has an ocean transit advantage of 8 days over the APH route as it is a shorter route.
Overall, intermodal shipments have only a 2-day advantage over the APH system which has a 14.5 day advantage over bulk.

Exhibit 53: Transit Time in Days from Elevator to Destination for Each Mode

Logistics Functions	Bulk Barge	Intermodal	APH
Truck From Elevator to Terminal / Containerization	1.0	1.0	1.0
Barge Loading	5.0		
Barge to Gulf	8.2		
Transloading		0.5	0.5
Load to Rail or APH Vessel		1.0	3.0
Rail to West Coast		4.1	
APH Service to Gulf			1.9
Barge Unloading	5.0		
Lift Off Rail / APH Vessel		1.0	1.0
Export Elevator Handling	1.0		
Dwell Time		2.3	2.3
Bulk Vessel Loading	1.0		
Time at Export Position		8.0	2.0
Lift On Ocean Carrier		3.0	3.0
Transit Time Before Ocean Transit	21.2	20.9	14.7
Ocean Transit	30.0	14.0	22.0
Transit Time Elevator to Final Destination	51.2	34.9	36.7

D. **Basis Improvement**

Container movements account for less than five percent of all grain and soybean export movements. Bulk barge movements have a competitive advantage over container movements due to the differential in price. Bulk barge is expected to remain the predominant mode of transportation for the export of grain and soybeans. The proposed service to be offered by APH does have a price advantage over intermodal moves through the West Coast. On an overall scale of all grain and soybean exports and sales, the proposed APH system is unlikely to have an impact on local basis, yet providing more optionality and flexibility accessing key global markets.

The proposed APH system could have some limited basis impact depending on the location. Kansas City offers an opportunity for a basis impact. Currently, a move out of Kansas City is a rail move. The Missouri River has had limited barge traffic and has a potential for closure due to either low water or freezing. APH has the potential to begin service out of Kansas City as it will be competing with rail. The question is how rail will react to the introduction of APH's service and the reliability due to river conditions. APH would face similar issues if it began service out of the Quad City region near Davenport, IA as the river is closed due to freezing for portions of the year.

VII. CONCLUSIONS

The proposed APH system offers an alternative to current modes of transportation of grain, soybeans and agricultural products to export ports.

- The proposed APH system has a significant cost advantage over the current intermodal move to the West Coast.
  - Shipments out of the Gulf have about a one week disadvantage to Asian ports but is offset by the 10 to 12 day dwell or delay time in West Coast ports. The cost savings should cover any financing costs on the buyer's side though.
- APH expects to have grain shippers work with ocean carriers.
  - APH will be a service provider to ocean carriers, like rail, but servicing shippers at potentially lower rates.
  - APH anticipates seeing continued containerization growth through attractive rates to farmers and ocena carriers.
  - The proposed APH system adds area that has an option of container service.
- APH expects its system to grow due to the proposed "water routing" transportation being more competitive on export side which currently moves at significant discounts to Asia.
  - APH expects ocean carriers to support its system due to the higher savings which will result on the import side.
- APH is limited to 490 TEUs with 21.8 metric tons per TEU or 10,682 metric tons. One APH liner load is equivalent to 6.7 barges assuming 1,700 short tons of grain or oilseeds per barge.
- Need to negotiate with ocean carriers and large grain companies and merchants. Farmers will be for any system that offers the potential for increased sales or cost savings, but they do not control the transportation network nor have contact with the ultimate customer overseas.
- The incoming or head haul is the most profitable container move for carriers and covers the return trip of the container. Back hauls are typically at a significant discount. Carriers lower rates in order to cover as much of the cost of the return of the container as possible. If the container is returned empty, there is no revenue.
- APH must compete with established service to the West Coast. This competition is further complicated by container balancing. A railroad will restrict the movement of containers to

the route that it came into the market with limited exceptions. Moves to balance needs in certain locations will allow for a limited diversion from the original route.

- APH will be well positioned to provide a strategic repositioning service of containers for the ocean carriers.
- Railroads are not expected to further drop intermodal rates of export grain containers from Mid-West to West Coast due to the financial impact to other freight revenue.

- APH must develop relationships with terminal operators who will be willing to make a significant investment in order to meet the load rates proposed in the APH system.
  - APH / PPHTD has established relationships with upriver terminal operators (MOUs signed) that are willing to make a significant terminal investment to meet the load rates proposed in the APH system.
- This study has been limited to corn, soybeans, SBM and DDGS but there are other commodities that offer opportunities to APH. On the agricultural side, cotton is a prime example. Each bale of cotton is identified. Container shipments of cotton offer identity preservation as well as helping to preserve the quality of the cotton. Service out of Memphis and Little Rock would be the main areas of focus for cotton.
- Recommended next steps include the following:
  - Establishing planning groups and working groups consisting of APH, ocean carriers, grain originators and agricultural associations.
  - A continued push and review for a 50-foot draft in order to allow for increased ocean carrier traffic is recommended.
  - Continued monitoring of the container market.

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