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**Theme: Inland navigation, waterways, ports and terminals**

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### **The Importance of the U.S. Inland Transportation and Navigation System for the Panama Canal Grain Trade**

#### **Introduction- the U.S. Grain Trade and the Panama Canal**

Traditionally for the Panama Canal Authority, grain flows fight for the number one position in terms of commodities transiting the waterway, ranging between 33.4 and 53.2 million metric tons in the last five fiscal years and representing a significant 20% of total cargo tonnage on average<sup>1</sup>. At the same time, about 81% of the total grain trade through the Panama Canal originates in ports located along the U.S. Gulf, including export terminals in Corpus Christi, Houston/Galveston and several terminals along the Mississippi River, perhaps the most important export outlet for crops shipped out of the U.S. Midwest. As a matter of fact, only the U.S. Gulf to Asia represents 60% of total grain cargo flows through the waterway.

In 2016, about 31% of total U.S. grains exports, that is, 44.1 million metric tons out of a total of 141.4 million metric tons, transited through the Panama Canal. The main destination region for the U.S. Gulf grain trade is East Asia, mainly China, Japan, South Korea and Taiwan, although there are significant flows to ports located at both the West Coast of Central and South America. The U.S. Gulf trade, however, competes with grains originating in the U.S. Pacific Northwest (PNW) and from alternative grains sources such as Brazil, Argentina, Eastern Europe, Russia and Australia. In 2012, Brazil surpassed the United States as the main exporter to China (see figure below).

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<sup>1</sup> Based upon Panama Canal Authority Datawarehouse, comparing with USDA data.

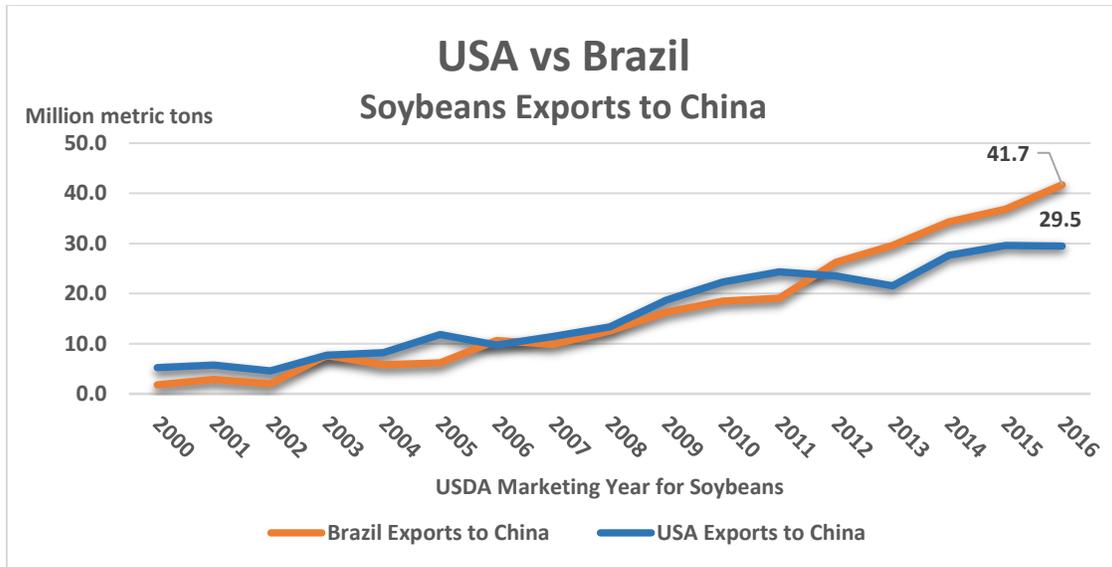


Figure 1. USA vs Brazil Soybeans Exports to China. Source: USDA and Secex Brazil data converted to U.S. marketing years.

In order for grains originating in the U.S. Midwest and transiting through the Panama Canal to remain competitive against the PNW and alternative sources in other countries, it is very important that the grain trade from this region have a reliable and economical means of transportation. This fact highlights the importance of a safe and reliable transportation system, including inland navigation waterways, railroads and port terminals.

Regarding the main transportation modes for U.S. grain exports, about 48% is transported on barges, 36% through rail and 16% is mobilized through trucks<sup>2</sup>. Soybeans and corn cargo movements are dominated by barges, followed by rail. Wheat is highly dominated by rail, then followed by barges. In terms of sorghum, this grain is mostly transported by rail and trucks<sup>3</sup>. Any transportation mode needs to be competitive and is highly depended on crop location. For example, corn and soybeans are highly concentrated in the Midwest region, including Iowa, Minnesota, Illinois, Wisconsin, Missouri, Nebraska and North and South Dakota. From the same source and in terms of train carloads participation by main port region, the Pacific ports receive the majority of the grain shipments for exports, followed distantly by Texas and the Mississippi River port regions. In other words, some grain flows on trains move to export terminals along the Mississippi River. On the other hand, corn and soybeans represent the majority of grain movements through the Mississippi River System. These movements include grains through Mississippi Lock 27 (Granite City, IL), Ohio River Lock 52 and Arkansas River Lock 1<sup>4</sup>. Soybeans and corn are mostly exported through the Mississippi Gulf port region. Likewise, wheat is mostly exported through the Pacific and Texas. Because of the growing investment in export elevators in the PNW, shuttle trains and biotechnology, a growing number of corn and soybeans are also exported through this port region.

<sup>2</sup> Based upon *Transportation of U.S. Grains : A Modal Share Analysis* (Oct 2017 update)- USDA- AMS

<sup>3</sup> Ibid.

<sup>4</sup> USDA- GTR Dataset (Table 10: Barge Grain Movements). Weekly data from USDA- GTR was converted to calendar years.

In simple words, corn and soybeans are mostly transported through barges and exported through the Mississippi River port system while wheat is mostly transported by trains to PNW and Texas Gulf export terminals. Sorghum is transported by rail, - and to a lesser extend trucks- to export terminals in Texas. Nonetheless, it is very important to keep in mind the growing amount of corn and soybeans transported by rail, especially to the PNW and some deliveries destined to the U.S. Gulf. At the same time, the availability of weekly data from the U.S. Department of Agriculture regarding rail deliveries to ports, grains inspections, grain barges unloaded in the New Orleans region and vessel loading activity in port provides an opportunity to attempt a forecast of weekly grain transits through the Panama Canal. This possibility will be discussed during the final presentation for PIANC 2018 in May 2018.

### Geographical Approximation- Gulf versus Pacific Northwest

Most of the grains exported through the PNW from the U.S. hinterland involve railroads while grains exported through the U.S. Gulf from the hinterland involve barges or railroads in some areas. Depending on the location of an American farmer, he may decide to sell his grain to a local elevator, delivering it by trucks. Otherwise, if the basis and grain prices are advantageous, the same farmer may sell his grain directly or indirectly to a grain elevator with access to a railroad yard that can reach either or both the U.S. Gulf ports or the Pacific Northwest<sup>5</sup>, or may sell his grain to an elevator that reach barge terminals connecting to export elevators located on the Mississippi River. To keep it simple, this interaction is dictated by the relative prices that a grain producer may receive for his product and by the cost of transportation from origin to destination.

Grains can be delivered to inland barge terminals located in regions such as Twin Cities, Mid-Mississippi, Lower Illinois River, Saint Louis, Cincinnati, Lower Ohio and the Cairo- Memphis area<sup>6</sup>. Depending on supply and demand conditions during the marketing year, barge rates may fluctuate during a time span. For example, the following table presents weekly barge rates for November 14, 2017, in the middle of the 2017/18 harvest season, and for January 9, 2018 in the lower part of the same harvest season:

Table 1. Weekly Barge Rates: Southbound Only

	Twin Cities*	Mid-Mississippi*	Lower Illinois River	St. Louis	Cincinnati	Lower Ohio	Cairo-Memphis
Nov. 14, 2017	\$25.26	\$19.58	\$17.63	\$10.17	\$22.04	\$18.99	\$7.38
Jan. 9, 2018	-	-	\$18.19	\$10.97	\$13.46	\$11.59	\$5.90

Source: USDA-GTR Table 9: Weekly Barge Freight Rates: Southbound Only. In \$/short tons. \* Locks closed for winter.

Barge rates may fluctuate depending on the month of the year, supply and demand for barges in particular locations, and issues related to the navigability of barges through the system. Those barge rates represent price approximations for grains that are to be delivered into the New Orleans port region. Many of these inland barge terminals may receive grains, either through trucks or short haul railroads. Depending on the basis point, that is, the difference

<sup>5</sup> Examples of such locations are Minneapolis, MN and Council Bluff, Iowa. Source: USDA-GTR, Table 7: Tariff Rail Rates for Unit and Shuttle Trains.

<sup>6</sup> USDA-GTR, Table 9: Weekly Barge Freight Rates: Southbound Only.

between the price of grains in the local market and price in the next future market, this is an indicator to either buyers or sellers as to the best time to engage in a delivery transaction<sup>7</sup>.

In terms of trucks, and also taking into consideration the basis point of a particular delivery location, many times they are the initial transportation mode for grain exports. For instance, grains delivered to elevators with shuttle trains services to export terminals begin with a truck haul. Also, trucks may be the primary delivery mode for inland barge terminals along the Mississippi River. Then those barge terminals along the Mississippi River may deliver grains to export terminals located in the New Orleans region. According to Mike Steenhoek, executive director of the Soy Transportation Coalition<sup>8</sup>, “The average rail haul for soybeans and grain is 900 miles. “Trucking is mostly utilized to feed into the long-haul modes — like rail and barge — vs. competing with them”<sup>9</sup>. According to the same source, this is a consequence of the business model adopted by railroads in which long haul transportation of commodities is a priority.

There are information tables that compare short and long haul rates for truck deliveries, based on vehicles with 80,000 lbs. gross vehicle weight limit and assuming a truck carrying 55,000 lbs or 25 metric tons of grain<sup>10</sup>. The same source explains that rates per metric ton per mile can be calculated from rates per truckload. This same information is used by the U.S. Department of Agriculture as part of the calculation of landed costs to export destinations.

Table 2. U.S. Grain Truck Market, 4th Quarter 2017

	<b>25 Miles</b>	<b>100 Miles</b>	<b>200 Miles</b>
North Central Region	\$4.90	\$3.59	\$3.29
Rocky Mountain	NA	NA	NA
South Central	\$4.50	\$3.21	\$3.10
West	NA	NA	NA
National Average	\$4.64	\$3.49	\$3.15

<sup>7</sup> Based upon *Understanding Basis*. Chicago Board of Trade. <https://www.gofutures.com/pdfs/Understanding-Basis.pdf>

<sup>8</sup> The Soybean Transportation Coalition (STC) is an organization consisting of representatives from the United Soybean Board (USB), the American Soybean Association and 12 state soybean boards, striving to make U.S. transportation more effective, reliable and competitive as it is essential to the success of U.S. soybean farmers.

<sup>9</sup> The Trucker.Com. <https://www.thetrucker.com/News/Story/Soycoalitionwantsheaviertrucksallowedoninterstates>

<sup>10</sup> Grain Truck and Ocean Rate Advisory: Quarterly Updates. USDA-AMS.

Table 3. U.S. Grain Truck Market, 1st Quarter 2017

	<b>25 Miles</b>	<b>100 Miles</b>	<b>200 Miles</b>
North Central Region	\$3.98	\$2.78	\$2.54
Rocky Mountain	NA	NA	NA
South Central	\$4.18	\$3.04	\$2.71
West	NA	NA	NA
National Average	\$4.12	\$2.95	\$2.61

Note: Rate per mile, per truckload.

Truck rates for grain deliveries are a function of the delivery distance, fuel price (diesel), truck availability and utilization as well as expectation on future truck usage<sup>11</sup>. The distances afforded by trucks are an important component of the inland transportation system. For example, inland barge terminals and grains elevators with shuttle trains services may be fed by trucks as far as 200 miles away. This is an important component in the eventual competition among export terminals along the U.S. Gulf and Pacific Northwest regions. It also gives an idea of the range within the U.S. grain hinterland in the competition between elevators with shuttle trains services and inland barge terminals.

What could be the contested area for grains moving from the U.S. hinterland to either U.S. Gulf or Pacific Northwest grain export elevators? To answer that question, it is important to understand the truck range for delivery into the Mississippi River system. From the truck tables we can infer that inland barge terminals along the Mississippi River can be fed by trucks in a 200 miles radius east and west of the Mississippi River. This explain the possibilities of inland barge terminals along the Mississippi River obtaining grains from most part of the state of Iowa, Minnesota and Missouri, states that are located west of this river system. Inland barge terminals can also obtain grains 200 miles east of the Mississippi River from the states of Illinois, Wisconsin, Kentucky, Tennessee and parts of Indiana. Those states east and west of the river rank among the main producers of corn and soybeans in the United States.

In the case of regions more than 200 miles away west of the Mississippi River, railroad services are part of the delivery equation. The following table from the U.S. Department of Agriculture published in the Grain Transportation Report provides monthly train rates from particular routes, many origins beyond the reach of the inland barge system on the Mississippi River<sup>12</sup>. We are only including some in order to have an idea of the possible contested area between U.S. Gulf versus Pacific Northwest. The table includes the train service, rail rates (in \$ per metric tons) and the grain type transported.

<sup>11</sup> Ibid.

<sup>12</sup> Based on Table 7: Tariff Rail Rates for Unit and Shuttle Train Shipments, USDA-GTR. The information is voluntarily provided by Class I railroads.

Table 4. Tariff Rail Rates for Unit and Shuttle Train Shipments

<b>Origin</b>	<b>Destination</b>	<b>Train Service</b>	<b>Grain Type</b>	<b>Nov. 2017 Rate (\$/mt)</b>	<b>Jan. 2018 Rate (\$/mt)</b>
Minneapolis, MN	New Orleans, LA	Unit Train	Soybeans	\$37.32	\$37.61
Council Bluff, IA	New Orleans, LA	Shuttle Train	Soybeans	\$49.03	\$49.38
Lincoln, NE	Galveston/Houston, TX	Shuttle Train	Corn	\$36.74	\$36.74
Wichita, KS	Galveston/Houston, TX	Shuttle Train	Wheat	\$41.42	\$41.42
Amarillo, TX	Los Angeles, CA	Unit Train	Wheat	\$51.75	\$52.15
Grand Island, NE	Portland, OR	Shuttle Train	Soybeans	\$58.98	\$59.47
Sioux Falls, SD	Tacoma, WA	Shuttle Train	Corn	\$49.26	\$49.26
Fargo, ND	Tacoma, WA	Shuttle Train	Soybeans	\$54.62	\$54.62
Grand Forks, ND	Portland, OR	Shuttle Train	Wheat	\$55.72	\$55.72

Although not perfect in terms of including all trains services from the U.S. hinterland to export elevators, the tariff rail rates table for unit and shuttle train shipments provides a good approximation of the contested area for grains in the interior of the United States. Thanks to this table, we are able to draw a map with the approximated area in which U.S. Gulf *competes* for grain shipments against the Pacific Northwest. The contested area is about the size of Ecuador, that is, 295,605 km<sup>2</sup>. Railroads also adjust rates according to supply and demand for services, and take into consideration U.S. Gulf- Pacific Northwest freight rate differential to Asia and barge rates<sup>13</sup>. The same source also mentions studies related to barge and rail competition, stating that without competition between barge and railroads, grain exporters may pay higher railroad rates, especially the farther exporters are from the inland waterway system.

<sup>13</sup> A Reliable Waterway System is Important to Agriculture. USDA-AMS. February 2017.



Figure 2. Map showing the approximate contested area between U.S. Gulf vs PNW in the U.S. hinterland. Drawing and calculations from Google Maps.

### The importance of the Mississippi River System to the Panama Canal Grain Trade

According to *A Reliable Waterway System Is Important to Agriculture* developed by the U.S. Department of Agriculture, “Agriculture will provide a \$21.5 billion trade surplus to the American economy” and “Exports are responsible for 20 percent of U.S. farm income, also driving rural economic activity and supporting more than one million American jobs on and off the farm”.<sup>14</sup> In other words, world trade is key to the agricultural sector of the United States, representing one of the economic activities in which the United States has a competitive advantage compared to other countries. Given the importance of the U.S. Gulf as the main origin of grains to the Panama Canal, -the U.S. Gulf to Asia is the main grain route-, it is very important to discuss the importance of the Mississippi River Inland System to the Panama Canal Grain Trade. The main export elevators along the Mississippi system include terminals between Baton Rouge and the Delta of the Mississippi River such as Belle Chase, Convent, Darrow, Ama, Paulina, Destrehan, Reserve, Port Allen and Westwego and are controlled by large trading firms such as Cargill, Archer Daniels Midland (ADM), Bunge, Louis Dreyfus, CHS and Zen-Noh.

Previously, we mentioned that corn, soybeans and sorghum are the main grain flows through the waterway and that the majority of the corn and soybean exports through the Mississippi River port system are transported through barges. However, it is important to recognize that the Mississippi River system, -the older operating locks in the United States belong to the Kentucky

<sup>14</sup> Ibid. USDA, February 17, 2017.

River locks 1 and 2 and were built in 1839<sup>15</sup>, is in dire need of repairs. There are 29 on the Upper Mississippi River and maintenance is performed by the U.S. Army Corps of Engineers. Most of the locks were built in the 1920's and 1930's, thus exceeding their lifespan. According to Walter Kemmsies of Moffatt and Nichol, there have been an increase in the number of unscheduled lock outages and unscheduled breakdowns in the system<sup>16</sup>. One example of unscheduled incidents occurred on October 11, 2011, when a 280-foot section of the Lockport Wall in Illinois collapsed into the river<sup>17</sup>. Scheduled and unscheduled closures for repairs are costly both in terms of money spent and reliability of the system<sup>18</sup>. Furthermore, some studies estimate that disruptions at Mississippi River Lock 25 and Illinois River LaGrange Lock could result in 7,000 jobs loss and a negative impact of \$2.4 billion in economic activity<sup>19</sup>. Given the importance of the Mississippi River System to the U.S. grain trade and other commodities, several trade associations advocate for upgrading the inland system.

Advocacy groups such as the Soy Transportation Coalition have released a list of top ten priorities of infrastructure work. This list includes improvements in bridges, roads, rail tracks and waterway systems and the recommendations are the following<sup>20</sup>:

- Maintenance and rehabilitation of locks and dams to significantly reduce the potential for unexpected, widespread, and prolonged failure. Priority should be devoted to ensuring the reliability of locks and dams along the nation's inland waterways. Available funding for new construction of locks and dams should be directed first to locks and dams 20-25 on the Mississippi River.
- Dredging the lower Mississippi River between Baton Rouge, Louisiana, to the Gulf of Mexico to 50 ft.
- Ensuring the Columbia River shipping channel from Portland, Oregon, to the Pacific Ocean is maintained at no less than 43 ft.
- Permit six axle, 91,000 lbs. semis to operate on the interstate highway system.
- Increase the federal tax on gasoline and diesel fuel by ten cents a gallon and index the tax to inflation. Ensure rural areas receive proportionate, sufficient funding from the fuel tax increase.
- Provide greater predictability and reliability of funding for the locks and dams along the inland waterway system.
- Provide block grants to states to replace the top twenty most critical rural bridges.

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<sup>15</sup> United States Army Corps of Engineers: *The U.S. Waterway System- Transportation Facts*, page 4. December 2005.

<https://web.archive.org/web/20070703141148/http://www.iwr.usace.army.mil/ndc/factcard/fc05/factcard.pdf>

<sup>16</sup> Presentation in the *Ag Transportation Summit 2015*, Rosemont, Illinois, August 4-5 2015.

<sup>17</sup> Waterways Council Inc. <http://waterwayscouncil.org/key-issues/improve-system-reliability-through-infrastructure-maintenance/>

<sup>18</sup> Presentation in the *Ag Transportation Summit 2015*, Ibid.

<sup>19</sup> The Agricultural Transportation Working Group, May 2017. <http://www.nopa.org/wp-content/uploads/2017/05/5.1.17-ATWG-Inland-Waterways-and-Port-Priorities-.pdf>

<sup>20</sup> American Soybean Association. <https://soygrowers.com/soy-transportation-coalition-releases-top-10-wanted-list-infrastructure-priorities/>

- Provide grants to states to implement rural bridge load testing projects to more accurately diagnose which bridges are sufficient and which bridges are deficient.
- Ensure full utilization of the Harbor Maintenance Trust Fund for port improvement initiatives.
- Permanent (or at least multi-year) extension of the short line railroad tax credit.

According to the Soybean Transportation Coalition, the appropriate maintenance and overhaul of locks and dams will greatly reduce the potential for unexpected and prolonged breakdowns of the system. The coalition notes that “Priority should be devoted to ensuring the reliability of locks and dams along the nation’s inland waterways”<sup>21</sup>. They also point out that funding priority for new construction of locks and dams shall prioritize Locks 20-25 on the Mississippi River. According to the coalition, “These lock and dam sites are among the most widely utilized by the soybean and grain industries”; consequently, any failure or quagmire in these locks during harvest could severely impact the competitiveness and reliability of the U.S. grain industry. Any event that may result in risk for the movement of grains, -including other commodities through the Mississippi River Locks System-, will have an effect on the grain flows through the Panama Canal, impacting grains destined to Asia and the West Coast of Central and South America. Failure in the Mississippi River System may favor alternative sources of grains such as the U.S. Pacific Northwest, Brazil, Argentina and others. Therefore, a reliable and competitive grain transportation system is beneficial for both American farmers and for Panama Canal grain trade.

## **Conclusion**

Historically speaking, cargo to and from the U.S. Gulf are very important to the Panama Canal. Grains, mostly originating from the U.S. Gulf region, will remain as one of the most important commodities for the waterway, fighting for the number one spot with petroleum products and containerized cargo. However, in order for the Panama Canal to remain relevant to the U.S. grain trade, it is important that the United States authorities provide the necessary funding for the improvements of the U.S. inland waterway system, mainly the Mississippi River locks system. This system of locks and dams, which govern traffic on the Ohio River and the Mississippi north of St. Louis, is aging. Lock failures could cripple river traffic and drag down the U.S. economy with it. Without competitive and reliable grain flows from the U.S. hinterland to export terminals located on the U.S. Gulf to final destination in Asia, the grains flows through the Panama Canal will be severely impacted. Therefore, further investment in transportation infrastructure is necessary and will be positive to the Panama Canal. The Mississippi waterway system is an important artery for grains coming from the U.S heartland to the world market. If the United States wants to remain the supermarket to the world, this country needs to take action before it is too late.

Advocate groups such as the Soy Transportation Coalition and the Waterways Council have put forward a list of top infrastructure priorities for the U.S. to remain a viable competitor in the world market. They are keeping an eye on competition, especially Brazil, a country that, although still behind the United States in terms of infrastructure, has managed to displace the former as the number one soybean supplier to the Chinese market. Greater investment in the U.S inland waterway system will not only provide benefits to grains but will also be positive for other

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<sup>21</sup> Soy Transportation Coalition. [http://www.soytransportation.org/newsroom/Top10MostWantedListSummary\(1-29-18\).pdf](http://www.soytransportation.org/newsroom/Top10MostWantedListSummary(1-29-18).pdf)

commodities such as coal, iron and steel, chemicals, petroleum products, project cargo and containers. Likewise, further dredging on the lower Mississippi River between Baton Rouge, Louisiana, to the Gulf of Mexico is an extra benefit for the competitiveness of U.S. exporters. Definitely, America's economy benefits from the cost efficiencies barge transport provides compared to transport by truck or rail. Finally, it is important to remember the amount of jobs dependent on the inland waterways, which, according to Tim Parker, CEO and President of Parker Towing Company and Chairman of the Waterways Council is around 541,000 jobs.<sup>22</sup> Finally, it is worth mentioning the benefits to the U.S. construction industry in terms of a regular maintenance program, and the positive impact on the U.S. energy renaissance as a result of the fracking revolution.

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<sup>22</sup> Waterways Council Inc. Ibid.

## Preferred Bibliography

- Ag Transportation Summit 2015, Rosemont, Illinois, August 4-5 2015. Presentation by Walter Kemmsies of Moffatt and Nichol.
- American Soybean Association. <https://soygrowers.com/soy-transportation-coalition-releases-top-10-wanted-list-infrastructure-priorities/>
- A Reliable Waterway System is Important to Agriculture. USDA-AMS. February 2017.
- Grain Truck and Ocean Rate Advisory: Quarterly Updates. USDA-AMS.
- Understanding Basis. Chicago Board of Trade. <https://www.gofutures.com/pdfs/Understanding-Basis.pdf>
- United States Army Corps of Engineers: The U.S. Waterway System- Transportation Facts, page 4. December 2005. <https://web.archive.org/web/20070703141148/http://www.iwr.usace.army.mil/ndc/factcard/fc05/factcard.pdf>
- USDA-GTR Dataset Table 7: Tariff Rail Rates for Unit and Shuttle Trains.
- USDA-GTR, Table 9: Weekly Barge Freight Rates: Southbound Only.
- USDA- GTR Dataset (Table 10: Barge Grain Movements).
- The Agricultural Transportation Working Group, May 2017. <http://www.nopa.org/wp-content/uploads/2017/05/5.1.17-ATWG-Inland-Waterways-and-Port-Priorities-.pdf>
- The Trucker.Com. <https://www.thetrucker.com/News/Story/Soycoalitionwantsheaviertrucksallowedoninterstates>
- Soy Transportation Coalition. [http://www.soytransportation.org/newsroom/Top10MostWantedListSummary\(1-29-18\).pdf](http://www.soytransportation.org/newsroom/Top10MostWantedListSummary(1-29-18).pdf)
- Transportation of U.S. Grains: A Modal Share Analysis (Oct 2017 update)- USDA- AMS
- Waterways Council Inc. <http://waterwayscouncil.org/key-issues/improve-system-reliability-through-infrastructure-maintenance/>