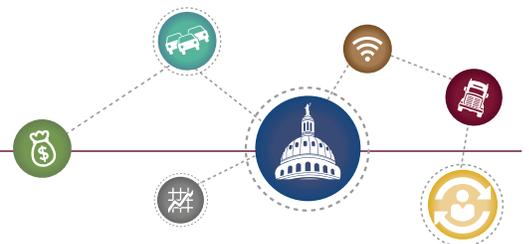




# Moving Texas Exports

Examining the role of transportation in the cotton supply chain



**Moving Texas Exports**  
 Examining the role of transportation in  
 the cotton supply chain  
*by*

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**CONTENTS**

**Introduction** ..... 1  
     Background .....2  
     Cotton Export Supply Chain .....4

**Transportation Issues** ..... 7  
     Equipment Shortages .....7  
     Truck Driver Shortages .....7  
     Empty Backhauls .....8  
     Cotton Warehouse Restrictions .....8  
     Condition and Funding of Rural Connectors .....9  
     Overweight Regulations .....10  
     Intermodal Rail .....12  
     Border Crossings .....13  
     West Coast Port Labor Issues .....14  
     Chassis Pools .....14  
     Port Gate Congestion .....14  
     Panama Canal Expansion .....15

**Key Findings** ..... 16

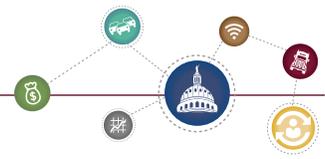
**References** ..... 16

**FIGURES**

**Figure 1.** Planted Cotton Acres in Texas in 2012.....3  
     **Figure 2.** Supply Chain for Texas Cotton .....6

**TABLES**

**Table 1.** Legal Axle Limits on Highways in Texas .....9  
     **Table 2.** Fees Assessed Based on the Number of Counties the Trucking  
         Company Operates in .....9  
     **Table 3.** Legal Axle Limits on Highways in Louisiana .....10  
     **Table 4.** Accommodated Ship Dimensions Before and After Panama  
         Canal Expansion .....14



## Introduction

In 2014, U.S. exports of goods and services amounted to \$2.34 trillion, with Texas accounting for \$289 billion of that amount (1). Furthermore, in 2013, Texas' exports supported approximately 1.1 million jobs (2). There is no doubt that Texas' transportation system—its roads, rail, ports, pipelines, airports, and border crossings—facilitates export trade.

The freight transportation system of a state has a direct and indirect impact on international trade. The mode of transportation has a direct impact on the cost, efficiency, and reliability of moving export products to overseas markets. So too does the capacity of the transportation infrastructure. Freight infrastructure investments that increase system capacity could reduce travel times and costs, which can translate into increased economic productivity, as well as enhanced labor and market access. Better labor and market access, in turn, could contribute to increased economic competitiveness (3), which can result in increased exports. The Organization for Economic Cooperation and Development reported that

most countries with high-quality infrastructure rank high in the world index for overall competitiveness (4). Specifically, quality infrastructure is a key indicator of international economic competitiveness because it determines the scale, volume, and efficiency of international trade.

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**The objective of this series of papers is to describe the supply chains for six of Texas' major export commodities and identify the role of transportation in the supply chain.**

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The objective of this series of papers is to describe the supply chains for six of Texas' major export commodities and identify the role of transportation in the supply chain. The study examined the transportation concerns of exporters, transportation policies and regulations affecting the costs of exports, and infrastructure concerns. This is the first paper in the series and documents the role of transportation in the cotton export supply chain and key transportation issues and concerns that were shared with the study team.





## Background

Cotton has been cultivated in Texas since 1745, and Texas has played a prominent role in the farming and distribution of cotton since the 1800s. Texas' cotton production is concentrated in the Panhandle and West Texas, with the most production of cotton occurring in Hale County in the Panhandle. Smaller-scale production occurs in the Rio Grande Valley and along the Gulf Coast (see Figure 1).

Texas farmers plant about 6 million acres of cotton a year. The Texas cotton industry produces two harvests a year:

- In the Rio Grande Valley, farmers plant in February and harvest in July.
- In the Panhandle, farmers plant in June and harvest in December.

Texas leads the nation in cotton production. In 2010, Texas produced 45.3 percent of all U.S. cotton (5). In 2012, cash receipts from cotton produced in Texas totaled \$2.2 billion. Furthermore, in 2012, cotton and cottonseed

exports totaled \$1.6 billion and accounted for almost 25 percent of Texas' agricultural exports (6) and 25 percent of all U.S. cotton exports (2).

The three largest export markets for U.S. cotton are:

- Asia (specifically China with 4.9 million bales in 2010).
- Turkey (2.1 million bales in 2010).
- Mexico (1.4 million bales in 2010).

Between 2003 and 2010, the following gateways were the top five exporters of cotton:

1. Los Angeles, California.
2. Savannah, Georgia.
3. Long Beach, California.
4. Houston, Texas.
5. Laredo, Texas.

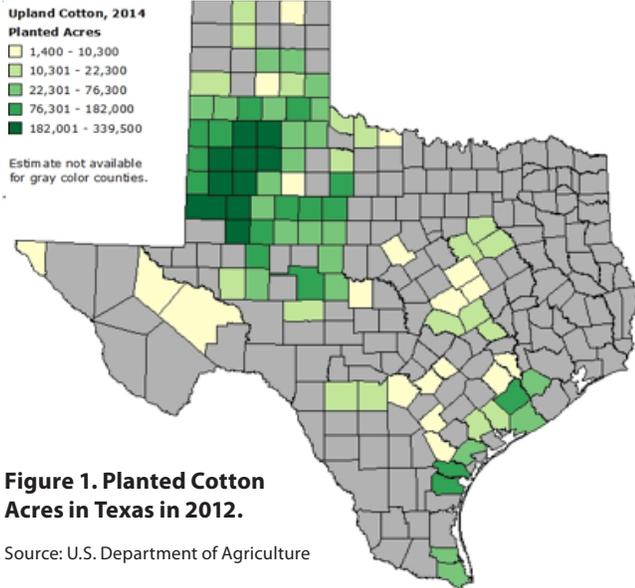
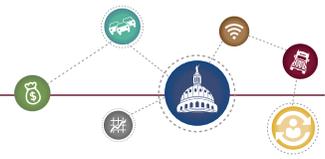
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## Texas leads the nation in cotton production. Texas farmers plant about 6 million acres of cotton a year.

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Between 2003 and 2010, the West Coast Ports of Los Angeles and Long Beach consistently accounted for more than 40 percent of all U.S. cotton exports. Most of the cotton exported through Los Angeles and Long Beach is destined for Asia (specifically China).

Cotton exports through the Port of Houston peaked in 2005 at 2.2 million bales but averaged around 1.6 million bales between 2007 and 2010. The top international recipients of U.S. cotton from the Port of Houston are Turkey (1.7 million bales in 2010), South America,



**Figure 1. Planted Cotton Acres in Texas in 2012.**

Source: U.S. Department of Agriculture

and Pakistan/India. These countries accounted for 90 percent of cotton exports through the Port of Houston in 2009 and 2010 (5).

Cotton exports to Mexico crossing at Laredo remained in the 900,000 to 1.1 million bales range annually between 2003 and 2010 (5). Mexico is a substantial market for cotton produced in the Panhandle area. This is partially attributed to relatively low transportation costs (7). Hidalgo, Texas, has also emerged as a crossing location for cotton exports destined for Mexico. Approximately 296,000 bales crossed at Hidalgo in 2009 and 2010. These cotton exports have largely been diverted from crossing in Brownsville, Texas, because of newer infrastructure and less congestion in Hidalgo (5).



**Cotton exports to Mexico crossing at Laredo have remained in the 900,000 to 1.1 million bale range annually between 2003 and 2010. Mexico is a substantial market for cotton produced in the Panhandle area.**





## Cotton Export Supply Chain

The cotton export supply chain starts at the cotton farm in Texas. The inputs (i.e., cotton seeds and chemical fertilizers) are transported by truck to cotton farms over Texas' highway network. Cotton is a seasonal commodity and is harvested in July in the Rio Grande Valley and December in the Panhandle.

Typically, 4 acres of irrigated land can produce 10 bales of cotton (approximately 10 tons including both the lint and seed), which is hauled predominantly by a single truck (i.e., module truck) within 20 to 30 miles to a cotton gin (8). At the cotton gin, the cotton sticks and seeds are separated from the cotton fibers. The separated materials are handled as follows:

- The cotton fibers are baled (typically into 500-lb bales).
- The sticks are used for livestock feed and for composting material.
- The seeds are used in one of two ways:
  - o A cotton seed oil mill (about 50 percent) uses the seed to produce cotton oil that is used in the snack food industry.
  - o A dairy farm uses the seeds as feed for dairy cows (9).

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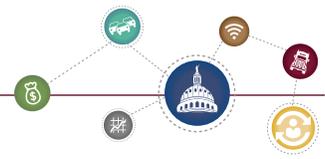
**The cotton export supply chain starts at the cotton farm in Texas. The inputs (i.e., cotton seeds and chemical fertilizers) are transported by truck to cotton farms over Texas' highway network.**

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From the gin, the baled cotton is typically transported to a local warehouse by truck (typically flatbed trucks) over relatively short distances. Local warehouses are typically owned by farmer cooperatives, independent warehouse operators, and in some cases merchants. From the local warehouse, the baled cotton destined for the global market can be shipped in several ways (10). For example:

- Baled cotton destined for Mexico is loaded on flatbed trailers and moved to a warehouse (e.g., a freight-forwarding or trucking company facility) in Laredo. Cotton exports to Mexico move mainly by truck (10).
- Baled cotton destined for Asia is moved to an export warehouse in Dallas/Fort Worth one of two ways:
  - o Loaded on flatbed trailers (10).
  - o Loaded into containers and moved by rail or truck.

From the export warehouse in Dallas/Fort Worth, baled cotton is typically loaded into containers and then released to cotton merchants that purchased the cotton for export to buyers overseas. The containerized cotton can be moved:



- By rail to the Ports of Los Angeles or Long Beach for export to Asia.
- By truck to Mexico or the Port of Houston (11).
- By rail to the Port of Houston (11).

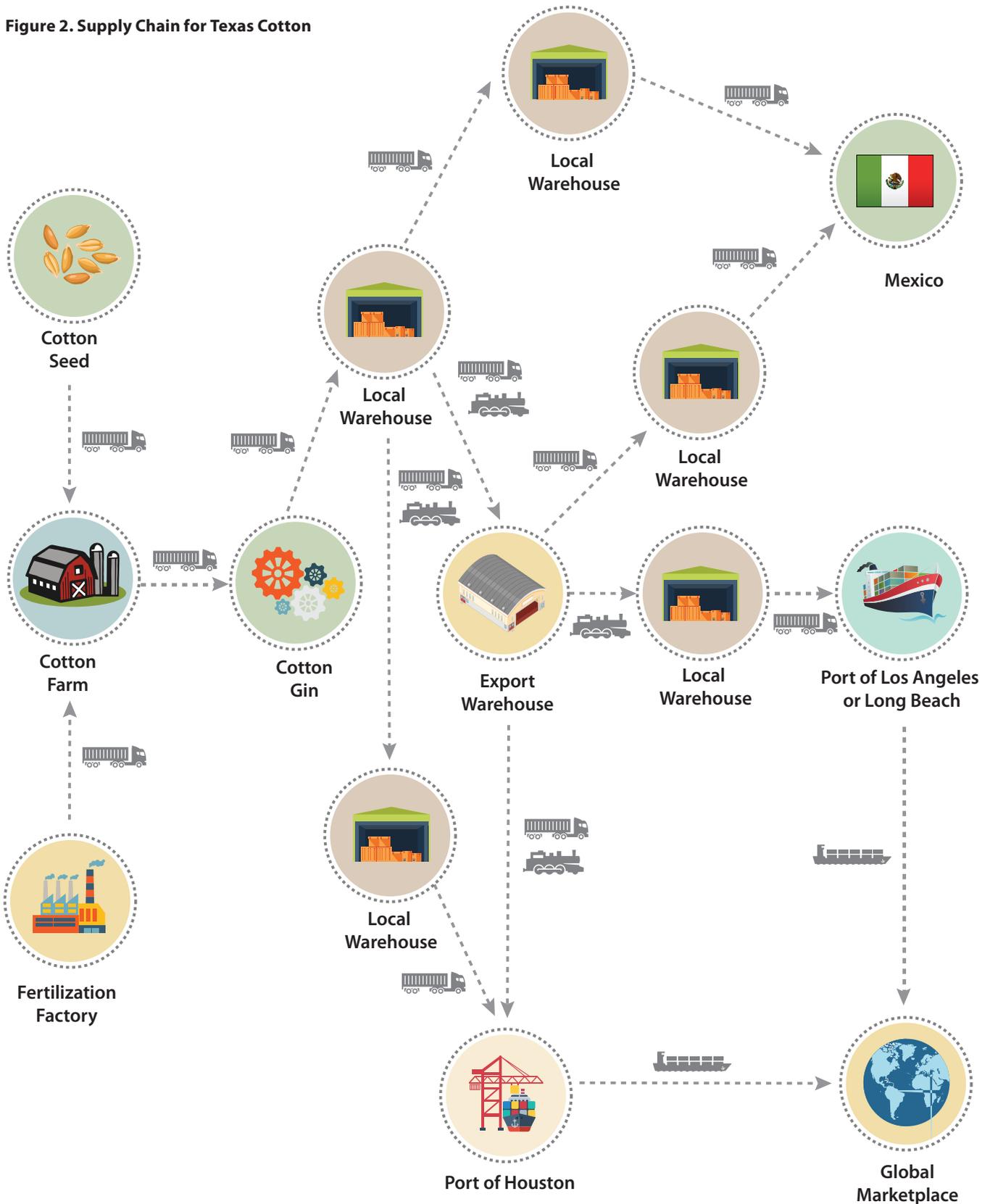
In some cases, baled cotton destined for Turkey or South America is loaded into containers and moved by truck or rail to the Port of Houston for export.

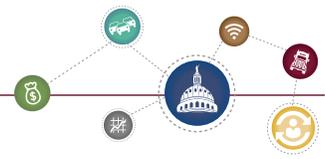
Typically, the export containers are delivered to a local warehouse (e.g., a freight-forwarding or trucking company facility) near the border crossing or sea port. From the local warehouse, the export container is typically drayed across the border or from the local warehouse to the port terminal (from where it will be loaded on a ship). The dray movement to the port terminal requires access to a chassis that is rented from a chassis pool.

Figure 2 illustrates the different components of the export supply chain.



Figure 2. Supply Chain for Texas Cotton





## Transportation Issues

Figure 2 shows that transportation is a major component of the cotton export supply chain. For the United States and Texas to remain competitive in the global cotton market, it is increasingly important that cotton shipments are delivered in a timely and cost-effective manner (5). This section of the document highlights a number of transportation concerns expressed by industry that may add costs to the cotton export supply chain.

### Equipment Shortages

Cotton is a seasonal commodity, resulting in the demand for containers, trucking capacity, and railcars peaking during the harvest season in July (in the Rio Grande Valley) and December (in the Panhandle). In the past, there have been concerns about railcar shortages<sup>1</sup> during the harvest season and a lack of containers in the Panhandle region.

This is further exacerbated by the fact that transporting energy products, particularly in the Eagle Ford Shale, yields higher pay for drivers, creating a lack of incentive for drivers to be contracted for cotton transport (12). When the energy sector is booming, the cotton industry experiences difficulty securing trucking capacity (specifically flatbed trucks) to transport cotton. Flatbed trucks are very versatile and are used to move, for example, drill pipe and equipment, for the energy sector. Flatbed truck shortages are aggravated by the recent harvesting trend to round bales<sup>2</sup> (rather than square bales), which have to be moved in flatbed trucks (as opposed to the traditionally used cotton module trucks).

### Truck Driver Shortages

The trucking industry is challenged with high driver turnover and low driver retention. Cotton exporters are concerned about the declining number of trucking companies and drivers available to haul cotton. As the economy improves, it is felt that this situation will deteriorate even further because younger generations are not interested in hauling cotton. The average age of a long-haul truck driver is currently more than 50 years (13).

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**The first transportation leg of the export cotton supply chain is exclusively conducted by truck.**

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<sup>1</sup> Union Pacific Railroad has, however, pointed out that the company made substantial investments in rail equipment between 2000 and 20014 to meet market demand. For example, in 2014 alone, UP purchased 261 new locomotives, 300 covered hoppers, 62 AutoFlex® auto racks, 50 refrigerated boxcars, and 5,000 domestic containers.

<sup>2</sup> Round balers replace several pieces of equipment (e.g., module builder), require less labor, and wrap the bales in plastic to protect the cotton against moisture.

## Federal Motor Carrier Safety Administration New Hours-of-Service Final Rule

The Federal Motor Carrier Safety Administration's final rule:

- "Limits the maximum average work week for truck drivers to 70 hours, a decrease from the current maximum of 82 hours;
- Allows truck drivers who reach the maximum 70 hours of driving within a week to resume if they rest for 34 consecutive hours, including at least two nights when their body clock demands sleep the most - from 1-5 a.m., and;
- Requires truck drivers to take a 30-minute break during the first eight hours of a shift.

The final rule retains the current 11-hour daily driving limit and 14-hour work day." (14).

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The new driver hour-of-service regulations that took effect on July 1, 2013 further reduced the trucking capacity because they limit the number of hours a driver can drive (14). These driver hour regulations impact the windows of shipment and delivery at warehouses. This adds cost to the export supply chain (13). Driver recruitment and retention are therefore key to trucking companies providing cotton exporters with a reliable and cost-effective transportation service.

## Empty Backhauls

In West Texas, there is an imbalance in the flow of commodities to the Panhandle. Flatbed trucks loaded with cotton destined for Dallas and Fort Worth often struggle to find a return load to the Panhandle. This results in the flatbed truck returning empty to the Panhandle. Empty backhauls increase the cost of truck transportation to cotton exporters (15).

## Cotton Warehouse Restrictions

The cotton order and restrictions on the type of truck used affect the loading of cotton at the warehouse. A cotton order destined for the export market involves the individual selection of cotton bales with specific quality attributes. This sometimes requires a driver to collect cotton bales from different warehouses to fulfill the export order, which can be very time consuming (16).

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**Empty backhauls increase the cost of truck transportation to cotton exporters (15).**

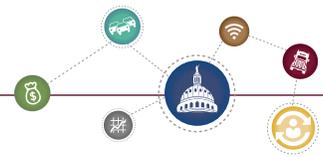
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## Federal Motor Carrier Safety Administration Hours-of-Service Regulations

The Federal Motor Carrier Safety Administration hours-of-service regulations specify:

- The number of hours a truck driver may drive.
- The number of hours the driver may be on duty before rest is required.
- The minimum rest time.
- The number of on-duty hours in a work week.

The rationale behind the hours-of-service regulations is to reduce truck driver fatigue and thereby improve the safety of highway and road users (14).



Typical Dry Van

Some cotton warehouses do not allow flatbeds to receive/pick up cotton shipments. The reason is that the loading of a flatbed trailer is more complicated than the loading of a dry van because the load has to be secured (taking approximately 30 minutes) and covered with a tarp. In comparison, a dry van takes approximately 15 minutes to load. The type of truck (or trailer) used affects the capacity of the warehouses since the warehouse can accommodate fewer flatbed trucks than dry vans during its operating hours. In Texas flatbeds are used predominantly (e.g., 56 percent of the loads) to transport cotton and there is a concern that more warehouses will refuse to serve flatbeds (13).



### Condition and Funding of Rural Connectors

The first transportation leg of the export cotton supply chain (from the field to the cotton gin) is exclusively conducted by truck. These first miles are predominantly on county roads and farm-to-market/ranch-to-market roads. The condition and funding of these rural connectors and the farm-to-market/ranch-to-market road system are of major concern to the industry. These roads were never designed for the number or weight of current truckloads and therefore are deteriorating under current truckloads. The perception exists that available highway funding is prioritized to address metropolitan mobility needs at the expense of maintaining and improving rural connectors. Industry feels it is critically important that funding be allocated for these first miles to ensure an efficient cotton export supply chain.



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## Overweight Regulations

### Weight Limits

The federal government mandates the maximum size and weights of trucks in an effort to preserve (i.e., prevent damage to) the highway and road infrastructure. While industry clearly benefits from more productive (i.e., heavier) trucks, these benefits have to be balanced against the costs to rehabilitate and maintain a state’s highway and road infrastructure. Currently, federal regulations limit trucks to a maximum gross vehicle weight of 80,000 lb. Table 1 provides the legal axle weight limits for trucks operating on Texas’ highways.

**Table 1. Legal Axle Limits on Highways in Texas.**

AXLES	NON-INTERSTATE (POUNDS)	INTERSTATE (POUNDS)
Single Axles	20,000	20,000
Tandem Axles*	34,000	34,000
Tridem Axles**	42,000	42,000
Quadrum Axles***	50,000	50,000

\* Two consecutive axles extending across the full width of the vehicle at a spacing of 48 inches.  
 \*\* Three consecutive axles extending across the full width of the vehicle at a spacing of 48 inches.  
 \*\*\* Four consecutive axles extending across the full width of the vehicle at a spacing of 48 inches.

These axle limits result in a maximum gross vehicle weight of 80,000 lb on both interstate and non-interstate highways in Texas. States may, however, grant special use permits to commercial vehicles for being oversize/overweight on the non-interstate highway system.

In Texas, cotton (not baled) qualifies as an agricultural commodity under HB 1547, which allows trucks transporting cotton to exceed:

- The maximum allowable axle weight by 12 percent on one single axle or tandem axle, and by 10 percent on all remaining single axles or tandem axles.
- The allowable gross vehicle weight by 5 percent.

This results in a maximum weight of 22,400 lb on a single axle and 38,080 lb on a tandem axle, and a gross vehicle weight of 84,000 lb. The trucking company must, however, purchase an over-axle/over-gross weight tolerance permit to take advantage of this exception (17).

### Overweight Permit Fees

The base fee for the over-axle/over-gross weight tolerance permit is \$90, and the administrative fee is \$5. These fees are added to the county fee, which is a function of the number of counties the trucking company intends to operate in (see Table 2) (18).

**Table 2. Fees Assessed Based on the Number of Counties the Trucking Company Operates In.**

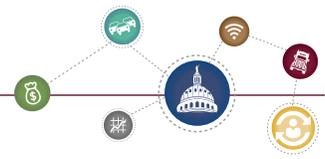
NUMBER OF COUNTIES	COUNTY FEE (\$)	TOTAL OVERWEIGHT PERMIT FEE (\$)
1-5	175	270
6-20	250	345
21-40	450	545
41-60	625	720
61-80	800	895
81-100	900	995
101-254	1,000	1,095

The over-axle/over-gross weight tolerance permit allows a truck to operate on all state and county roads, including farm-to-market roads and the U.S. highway system in Texas. The permit, however, does not authorize trucks to operate on the interstate system with these heavier loads (17).

## Industry has expressed concern about the ability to ensure that trucks meet the weight restrictions.

### Enforcement

Industry has expressed concern about the ability to ensure that trucks meet the weight restrictions—specifically, the lack of scales in the field to weigh trucks transporting harvested cotton from the field to the gin. Scales in the field are not a feasible option, and without scales in the field, it is very difficult to determine the individual axle group loads and the gross vehicle weight of the vehicle. Industry expressed concern that some law enforcement officials target trucks that come from the field to weigh them, which delays these shipments and adds cost (19).



### Neighboring States

A related concern is industry’s view that neighboring states allow heavier trucks to travel on their state-maintained and interstate systems. Louisiana was offered as an example of a state that is more lenient in terms of its overweight allowances. The maximum non-permitted weights for trucks using non-interstate and interstate highways are stated in the Louisiana Regulations for Trucks, Vehicles and Loads (see Table 3) (20).

**Table 3. Legal Axle Limits on Highways in Louisiana.**

AXLES	NON-INTERSTATE (POUNDS)	INTERSTATE (POUNDS)
Single Axles	22,000	20,000
Tandem Axles	37,000	34,000
Tridem Axles	45,000	42,000
Quadrum Axles	53,000	50,000

These axle limits result in a maximum gross weight of 80,000 lb on both interstate and non-interstate highways within the state on trucks without a tridem or quadrum axle. For trucks with either a tridem or quadrum axle, the maximum gross weight increases to 88,000 lb for non-interstate highways and 83,400 lb for interstate highways. The difference in the maximum non-permitted weight for interstate travel (above the federal limit of 80,000 lb) appears to be a result of the application of the Federal Bridge Formula applied to six-axle trucks<sup>3</sup>. The document Louisiana Regulations for Trucks, Vehicles and Loads also states that the state can issue a special permit to allow for

heavier loaded trucks moving agricultural products on the state-maintained highway system (20).

In Louisiana, the cotton module permit costs \$50 per year and applies to three-axle vehicles that haul cotton modules. The permit is valid for one year and allows a maximum weight of 24,000 lb on a single axle and 48,000 lb on a tandem axle. Cotton module permits are valid for travel on any state-maintained highway with the exception of the interstate. Similarly, a “harvest season or natural forest products” permit is available for \$10 per year to “haul farm or forest products in their natural state, grass sod, seed cotton modules or cotton from the field to the gin or from the gin to the mill, and exceed the legal limitations on weight.” These permits allow a maximum weight of 24,000 lb on a single axle or 48,000 lb on a tandem axle, and a maximum gross vehicle weight of 120,000 lb (18).

### Roads Leading to Ports

Finally, industry expressed the specific need for higher weight tolerances on roads that provide access to Texas ports (i.e., the last mile). Given current weight limits, trucking companies can currently load 88 cotton bales in a container and 90 bales on a flatbed truck. Most loads from the warehouse to the ports involve 88-bale loads that are transloaded to heavier containers at the port. Industry believes that heavier loaded containers (i.e., 96 bales) would reduce the number of truckloads for a given cotton supply, potentially reducing trucking costs (5).



<sup>3</sup> The maximum non-permitted weight of six-axle trucks operating on the interstate highway system in Texas is 80,000 lb.

### Intermodal Rail

Currently, cotton grown in the Texas Panhandle destined for Asian markets is trucked from the Panhandle about 335 miles to Dallas and Fort Worth for assembling (i.e., loaded into containers) and loaded on unit trains. These unit trains then move back through the Panhandle to the West Coast ports. This is partly attributable to the fact that rail rates from the Dallas/Fort Worth area to the Ports of Los Angeles and Long Beach are discounted. The reason for this is the imbalance in trade between West Coast ports and the Dallas/Fort Worth area, resulting in a substantial number of empty containers in the Dallas/Fort Worth area (21). If the containers are not loaded with cotton, they would have to be shipped back empty to the West Coast ports. To prevent an empty backhaul, a favorable rail rate is offered to cotton exporters for rail shipments between Dallas/Fort Worth and the West Coast ports.

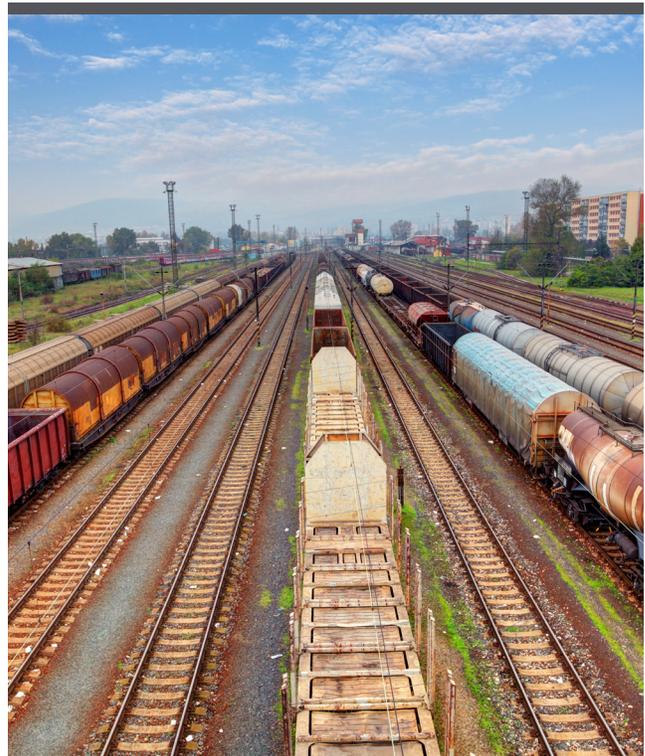
A number of stakeholders pointed to this inefficiency in the export supply chain of cotton and recommended rail companies invest in an intermodal container terminal to handle cotton in West Texas as a potential option to remedy the situation. Fuller et al. (22) explored the feasibility of locating an intermodal container terminal in West Texas that could facilitate the movement of almost 30 percent of Texas' cotton production (i.e., 2 million bales). The study reported that an intermodal container terminal in West Texas is a feasible alternative that would result in reduced truck travel on state highways with associated reductions in pavement maintenance expenditures and truck emissions. For the cotton exporter, the potential exists to save time by eliminating the truck trip to Dallas/Fort Worth with associated lower truck transportation costs. On the other hand, the railroad would have to relocate empty containers from the Dallas/Fort Worth area to the intermodal container terminal in West Texas, which would partially reduce the truck transportation cost savings. It is also unclear if the rail rate would be adjusted if the cotton is transported from West Texas to the West Coast ports as opposed to from Dallas/Fort Worth to the West Coast ports. In other words, it is unclear if there would be a substantial difference in the freight transportation costs incurred by the cotton exporter.

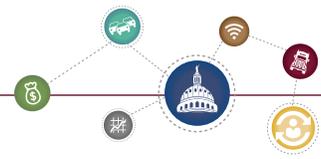
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**Union Pacific Railroad (UP) has said that it is committed to making investments that support Texas business growth and accommodate intermodal growth.**

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Union Pacific Railroad (UP) has said that it is committed to making investments that support Texas business growth and accommodate intermodal growth. Between 2005 and 2014, UP invested more than \$1.2 billion on intermodal infrastructure improvements in the United States. This includes corridor improvements (i.e., double-tracking of key main lines), terminal expansions to support high-growth markets, and new intermodal ramps to expand service to support customers' growth. Furthermore, between 2005 and 2015, UP invested more than \$355 million on intermodal terminal infrastructure in Texas. New intermodal terminals in San Antonio and Dallas are two examples (23). It is, however, unclear whether cotton exporters specifically will benefit from these investments in intermodal terminal infrastructure in Texas.





## Border Crossings

Cotton exports to Mexico rely predominantly on trucking to move cotton from the U.S./Texas origin to the textile mill in Mexico. Rail is viewed as too slow to meet delivery requirements (5) and too expensive, and most textile mills are not located near a railroad line. The diversion from rail to road for cotton exports was caused by the textile mills adopting just-in-time (JIT) manufacturing. Textile mills moved away from infrequent large orders to more frequent shipments of cotton JIT. The move to low inventories and specific time appointments for cotton deliveries proved problematic for the railroads (13). On the other hand, truck border crossings are also increasingly viewed as bottlenecks that are slowing cotton deliveries (5). Delays are imposed by documentation requirements, the number of agencies involved, and the available number of customs and inspection staff<sup>4</sup>. The sidebar documents the process for crossing cotton from Texas into Mexico using a load sold by the Plains Cotton Cooperative Association as an example (7).

### Cotton exports to Mexico rely predominantly on trucking to move cotton from the U.S./Texas origin to the textile mill in Mexico.

Specifically, industry mentioned that southbound cotton exports are often delayed as a result of inefficient inspections required by Mexico's Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food. Mexico's electronic systems are also frequently inoperative, impacting the filing of the electronic manifest. This can cause considerable delays in crossing cotton (13).



<sup>4</sup> This concern has been on the Texas legislative agenda several times. More recently, the Texas Senate passed Senate Bill 797, amending the current law relating to a grant program to reduce wait times for agricultural inspections of vehicles at ports of entry along the Texas-Mexico border by the Texas Department of Agriculture.

## Crossing Cotton from the Panhandle to Mexico

The process for crossing cotton into Mexico starts in the Panhandle with the exporter. The following example follows cotton from the exporter, the Plains Cotton Cooperative Association (PCCA):

- The Mexican buyer provides PCCA with payment arrangements.
- PCCA issues shipping instructions to the PCCA warehouse in Texas where the load originates.
- PCCA secures a U.S. trucking company to move the load from the warehouse to Laredo.
- PCCA sends the documents required for customs clearance to a freight forwarder in Laredo prior to the cotton being delivered to Laredo.
- The U.S. trucking company collects the cotton and delivers the load to the freight forwarder or the carrier's facility.
- The cotton is loaded onto a Mexican trailer.
- The freight forwarder inspects the cotton received and matches the customs clearance documents with the load.
- The freight forwarder files the required customs clearance documents and pays the required duties and fees.
- A Mexican drayage company (typically) moves the Mexican trailer across the border.

The documents required include a commercial invoice, phytosanitary certificate, shipper's export declaration, and North American Free Trade Agreement certificate of origin for each truckload. The Mexican textile mill must also provide the freight forwarder with power of attorney to use the import permit that contains the mill's Registro Federal de Causantes (RFC) number (the Mexican equivalent of an Internal Revenue Service number), corporate physical address, and corporate seal.



### West Coast Port Labor Issues

Since a significant share of Texas’ cotton exports exit the United States from the Ports of Los Angeles and Long Beach, the Texas cotton supply chain can be significantly disrupted by port congestion and labor disputes at West Coast ports. The consequences are delayed shipments and oftentimes loss of revenue, in addition to impacts on business relationships with overseas buyers. Cotton exporters’ preferred delivery time for cotton from the export warehouse to the mill overseas is typically 30 to 45 days (with a preference at times for less than 30 days). The reason for the requirement for fast delivery is financial. Cotton exporters receive payment when the cotton is loaded on the ship, and cotton buyers prefer the shortest ocean transit time for cash flow reasons. Significant delays (e.g., due to labor issues) may therefore result in losses that could impact Texas’ cotton industry (11).

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**Cotton exporters’ preferred delivery time for cotton from the export warehouse to the mill overseas is typically 30 to 45 days. The reason for the requirement for fast delivery is financial.**

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### Chassis Pools

In the past, steamship lines owned chassis that drivers used to transport the steamship line’s containers. This required large pools of chassis for each steamship line. In recent years, the steamship lines have removed themselves from the chassis business as they entered into alliances with each other. Chassis pools managed by leasing companies emerged.

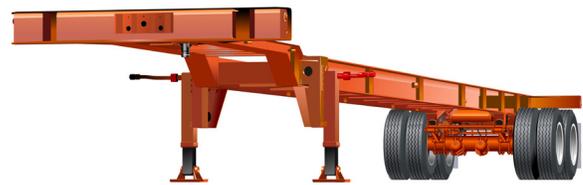


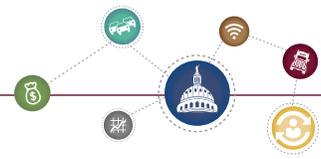
Photo of a Steamship Chassis

The concern expressed by industry is that with the emergence of chassis pools, there is a shortage of chassis at Texas ports, and the available chassis are not well maintained. Responsibility for chassis tires, for example, is contentious (13). Poor chassis maintenance impacts the drayage operations (last-mile delivery) at Texas ports because drayage drivers are delayed when pulled over by law enforcement and ticketed for infractions.



### Port Gate Congestion

Concern has been expressed about congestion at the Port of Houston gates, resulting in waiting times of two to three hours. Congestion affects the number of dray trips a driver can make in a day and ultimately the cost of the drayage operations (i.e., last-mile delivery) (13).



## Panama Canal Expansion

A major development that could potentially impact the export cotton supply chain is the Panama Canal expansion. Table 4 provides the ship dimensions that the expanded Panama Canal can accommodate. Today, the Panama Canal can only transit container ships with a total capacity of 4,800 twenty-foot equivalent units (TEUs). The \$5.25 billion canal expansion project will allow the canal to handle ships with a capacity of 12,600 TEUs (25).

**Table 4. Accommodated Ship Dimensions Before and After Panama Canal Expansion.**

	LENGTH (M)	BEAM (M)	DRAFT (M)	AIR DRAFT (M)
Before Expansion	289.6	32.31	12.04	57.91
After Expansion	366.0	49.0	15.2	57.91

Source: Amdal and Howlett, 2014

Using the expanded Panama Canal will decrease the distance from the Gulf Coast ports to Asia by approximately 9,000 miles<sup>5</sup>, with associated decreases in ocean line costs that would potentially be passed on to exporters in the form of lower ocean freight rates (11). It is therefore believed that Gulf Coast ports could see an increase in cotton shipments to Asia as a result of the Panama Canal expansion. Rosson et al. (5) predicted that a 10 percent reduction in ocean freight rates would result in increased cotton exports to Asia via some Gulf and Atlantic ports<sup>6</sup> through the Panama Canal. The Ports of Savanna and Houston were predicted to see large increases in cotton exports to Asia. Specifically, the Port of Houston was predicted to see a 30.4 percent increase in cotton exports to Asia if ocean freight rates reduce by 10 percent (5). The Port of Houston is well positioned to take advantage of an expanded Panama Canal with existing service to the major cotton trade lanes: China, Vietnam, Turkey, and South America (11).

<sup>5</sup> As opposed to the longer Magellan Route around South America.

<sup>6</sup> The exceptions were Gulfport (Mississippi) and Mobile (Alabama), which were predicted to see a decrease in cotton shipments to Asia.



On the other hand, Hidalgo-Brownsville (i.e., land crossings into Mexico) and the land bridge to the West Coast ports (i.e., rail to the West Coast) were predicted to see a reduction in cotton exports. Hidalgo-Brownsville is predicted to see a 40 percent reduction in cotton exports, and the West Coast ports (i.e., Los Angeles and Long Beach) are predicted to see a 40 percent reduction in cotton exports if ocean freight rates decrease by 10 percent (5). Cotton exports to Mexico are foreseen to cross at Laredo, with Laredo-El Paso seeing a 12 percent increase in cotton exports (5).

## Cotton exporters will ultimately choose the least expensive and fastest route to the export destination.

Cotton exporters will ultimately choose the least expensive and fastest route to the export destination. The ultimate route and the impacts of the Panama Canal expansion will only become clearer once the Panama Canal toll rates have been established. Also, some industry experts have noted that post-Panamax vessels — containerships that exceed the 32.2 m width length of the Panama Canal and that can transport up to 18,000 TEUs — would not traverse the Gulf but would rather trans-load in the Caribbean to smaller ships that would provide feeder services to Gulf Coast ports. The argument is that it would be too expensive for post-Panamax vessels to traverse the Gulf. Since it is unclear how a feeder service arrangement would impact freight rates, the impact of the Panama Canal on cotton exports through Gulf Coast ports is uncertain at this time.

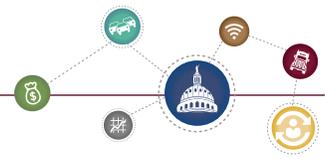
## Key Findings

The following are the key findings from this research:

- **Equipment shortages** (trucks, railcars, and containers) during the harvest season and when the energy sector is booming adversely impact the transportation of cotton.
- **Truck driver shortages** due to high driver turnover, low driver retention, and new driver hour regulations reduce the number of drivers available to haul cotton, thereby adding costs to the cotton export supply chain.
- An imbalance in the flow of commodities to the Panhandle results in **empty backhauls** that increase the cost of truck transportation to cotton exporters.
- **Cotton orders and warehouse restrictions** on the equipment (i.e., flatbeds) used can be time consuming or further impact the trucking capacity available to haul cotton.
- The deteriorating **condition and funding of rural connectors** (first mile) is a major concern to cotton exporters, specifically for moving cotton from the field to the cotton gin.
- Compliance with **overweight regulations** is problematic in the field, and more lenient overweight regulations in neighboring states (specifically Louisiana) may put Texas at a comparative disadvantage in terms of the cost of transporting cotton.
- **Border crossings** for cotton exports to Mexico are delayed due to documentation requirements, the number of agencies involved, and the level of customs and inspection staff.
- **West Coast port labor** issues and port congestion significantly disrupt cotton exports to Asia.
- **Chassis pools**, specifically the unavailability and poor maintenance of chassis, impact the drayage operations at Texas ports, affecting the last-mile delivery of containerized cargo to the port.
- **Port gate congestion** affects the number of dray trips a driver can make in a day and ultimately the cost of the drayage operations.
- The **Panama Canal expansion** will decrease the distance from the Gulf Coast ports to Asia by approximately 9,000 miles, with associated decreases in ocean line costs, but it is unclear how the expanded Panama Canal will ultimately impact Texas' cotton exports through Gulf Coast ports to Asia.

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