Multimodal Issues

Chapter 15

Chapter 15: Multimodal Issues

The productivity and economic viability of U.S. agriculture relies on a vast national transportation system with its networks of highways, railroads, waterways, and ocean ports—a multimodal* transportation system that delivers agricultural products and food to domestic and international markets. The previous chapters of this study analyzed the importance of each freight mode and its sufficiency of competition, capacity, services, rates, facility investment, and its impact on rural economic development. This chapter synthesizes some of the crosscutting transportation issues that affect all modes and discusses the interrelationship of transportation modes. It examines these multimodal issues:

- Freight rates, fuel costs, and transportation choices
- Capacity and service
- Investment and funding

The final part of this chapter identifies some transportation issues affecting the agricultural sector and rural America. This analysis focuses on issues that may require coordinated efforts to support the competitive advantage of U.S. agriculture.

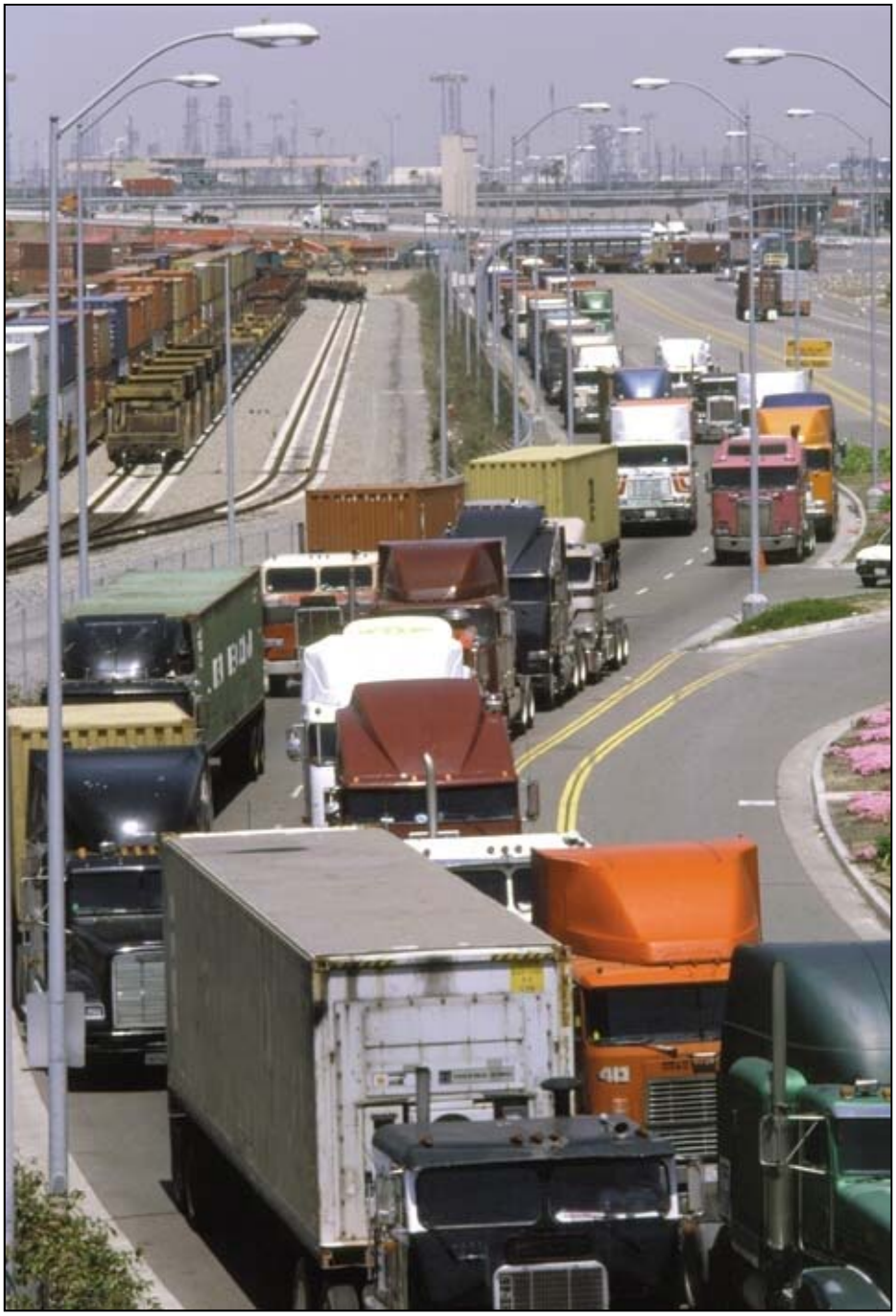
Freight Transportation Modes and Multimodal Issues

Each transportation mode has advantages and disadvantages for agricultural shippers. The truck industry takes pride in its flexibility of service, its competitive nature, and its status of being the primary mode for agricultural products in terms of tons moved (see Table 2-2, Chapter 2). On the other hand, long-distance trucking is not as efficient or environmentally friendly as other transportation modes and truck traffic is less welcome in congested metro areas. Rail and barge are more environmentally friendly than trucks, and are frequently more cost-effective methods of long-distance shipping when those services are available, but they rely on expensive terminals and fixed rail and river routes.

Ocean transportation depends on interior transportation. Many U.S. and world ports are working at or near capacity, and expanding them is problematic because of their urban locations. Improvements to port capacity and productivity must come not only through physical port expansion, but also through technological upgrades, on-dock rail service, and fluid highway access.

* In this study, the term *multimodal* refers to the total transportation system. *Intermodal* refers to containers carried by truck, rail, and ocean vessels.

Figure 15-1: Trucks, trains, and ships all work together to move America's goods.



Source: Federal Highway Administration

The U.S. transportation system is a "system of systems" made up of different transportation networks that need to work together. The system's statutory and regulatory framework is largely modal-based, providing our Nation with rules and regulations focused on singular modal solutions even though many of our challenges are associated with a multi-modal transportation system.[393]

Congress and the transportation industry have recognized the need for a multimodal or systems approach to freight transportation. Pending legislation—The Surface Transportation Authorization Act of 2009—calls for establishment of a new Office of Intermodalism at DOT, with an accompanying Under Secretary. This new mission area would be charged with developing and implementing a strategic plan to address the long-term needs of the surface transportation network. Shippers and carriers welcome this collaborative approach to find solutions at a system level. Both depend on multiple modes to serve their customers.

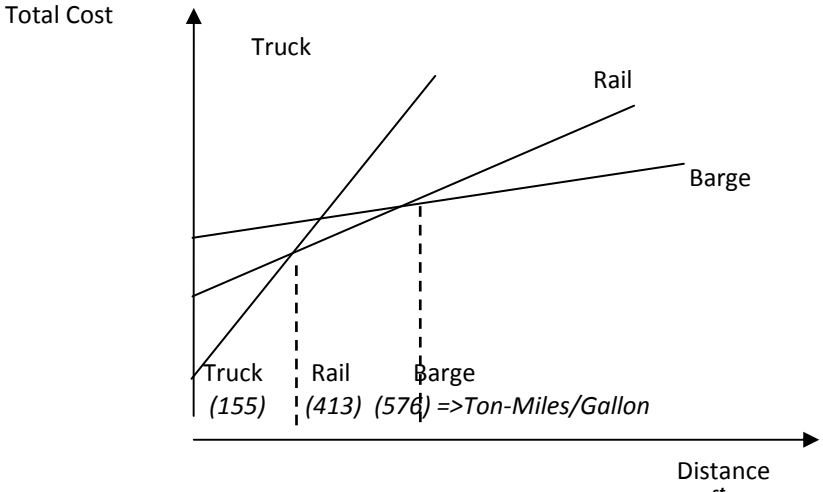
Freight Rates and Fuel Costs Help Determine Transportation Choices

Transportation costs, as expressed in freight rates, are a primary influence on shippers' choice of mode. Additional influencing factors include:

- The quality and frequency of transportation service
- The ability and willingness of the carrier to meet the shippers' needs
- The reliability of transit time
- The size and distance of the shipment
- The availability of capacity and intermodal connections
- The ability to serve both the origin and destination businesses

The supply chain for agricultural products often depends on multiple modes of transportation, each with its own price dynamics. Figure 15-2 illustrates the relative cost structure of each mode compared to the distance shipped, and the efficiencies of each mode. For example, on shorter hauls, trucks are less expensive than rail or barges. Where available, barge is the most fuel-efficient and cost-efficient mode for long-distance hauls; it moves 576 ton-miles per gallon of fuel. Rail is next most efficient, at 413 ton-miles, and truck is least, at 155 ton-miles.[394] Not all agricultural shippers, however, are located near the inland waterways or able to take advantage of the efficiency of barge transportation, and even grain shippers who use barge or rail transportation for most of the movement depend on trucks to get the grain to the elevator, barge or rail terminal.

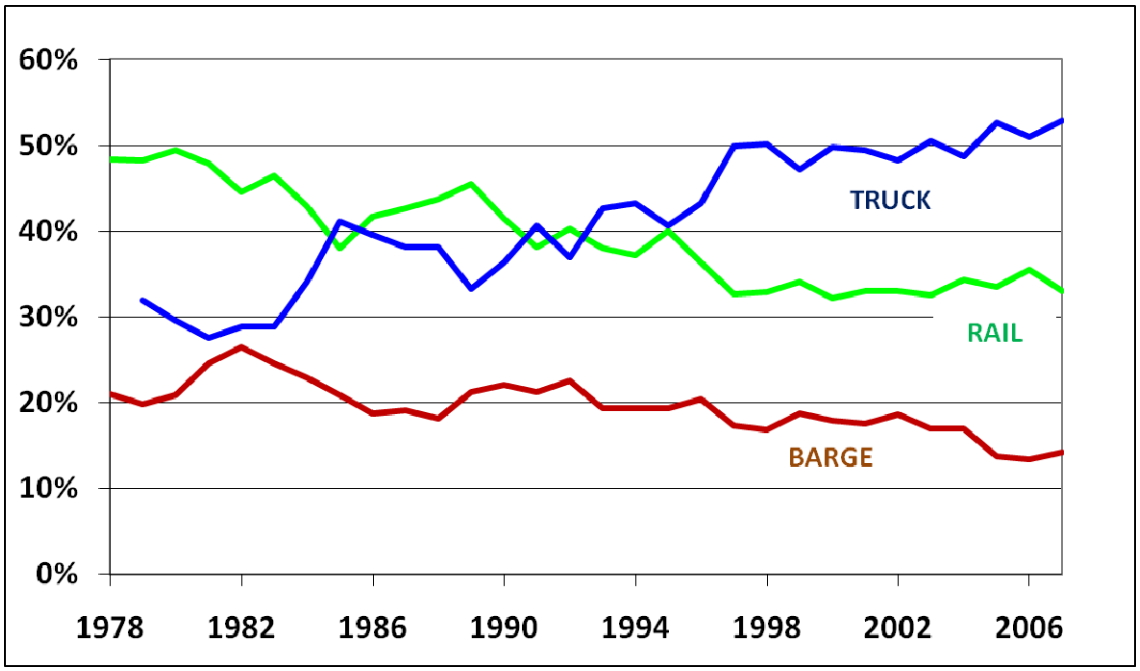
Figure 15-2: Modal costs related to distance and relative fuel efficiency



Source: USDA, *Agricultural Transportation Challenges for the 21st Century*, and Modal Fuel Efficiency: Texas Transportation Institute

Rail is the best transportation choice for grain shippers unable to access barge transportation for long distance movements, both from the economic and environmental impact perspectives. However, the recent escalating rail rates and declining service for some shippers has pushed more grain transportation onto trucks in recent years (see figure 15-3). Many high-value agricultural products depend on refrigerated trucking because of their service and rapid delivery.

Figure 15-3: Grain modal shares, 1978-2007

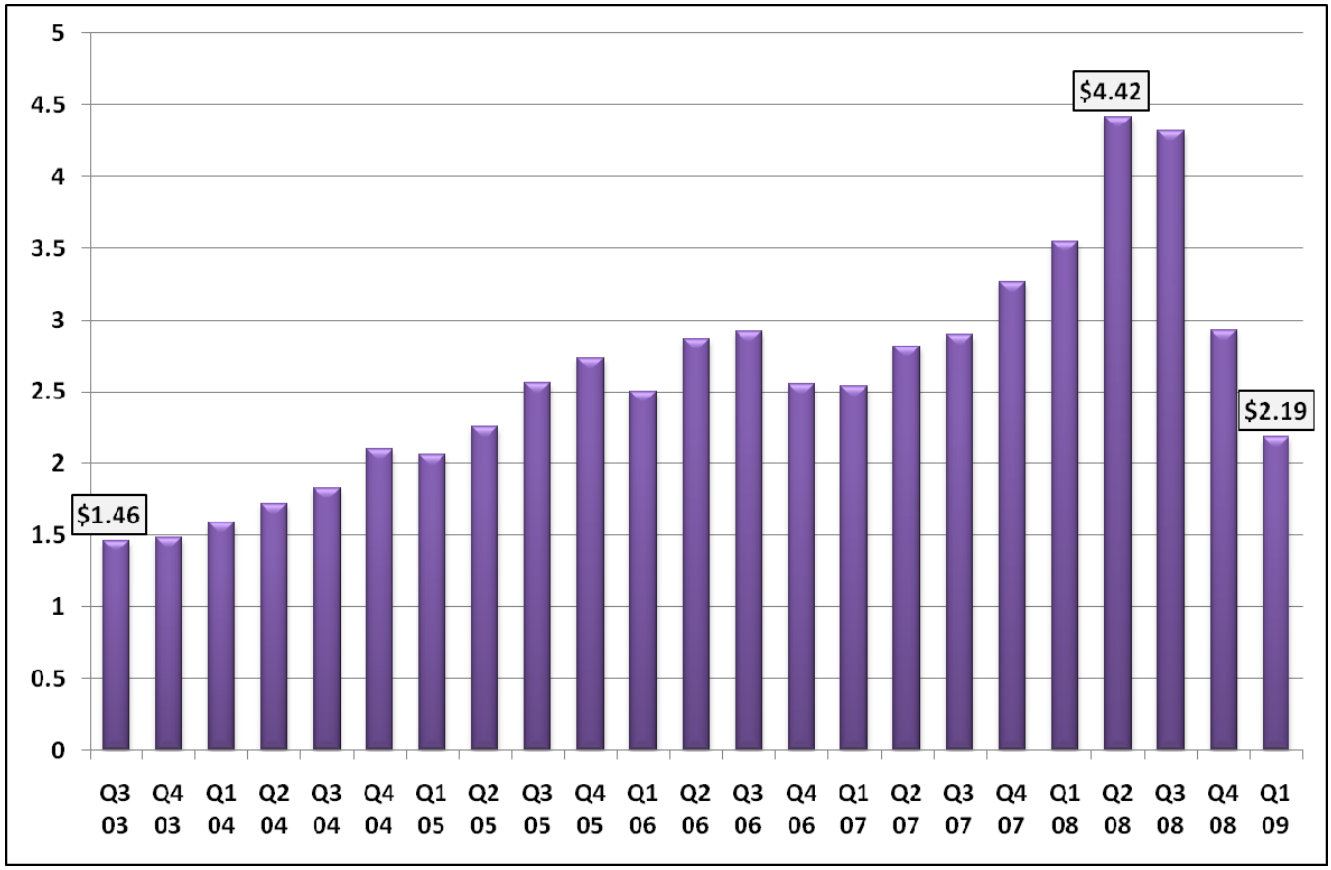


Source: AMS, *Transportation of U.S. Grains: A Modal Share Analysis, 1978-2006* (not yet published as of printing)

Fuel Costs Affect Freight Rates

Increases in fuel costs affect rates in all freight modes, although to varying extents. Diesel fuel prices increased significantly from the third quarter of 2003, peaked in the second quarter of 2008 and then fell rapidly during the last quarter of 2008. By the first quarter of 2009, however, fuel prices remained 49 percent above prices seen at the end of 2003 (Figure 15-4). A variety of factors has pushed up the freight rates of all transportation modes since the end of 2003—the earliest year for which freight rate data are available (see Table 15-1). Although fuel costs affect all freight rates, the extent of the correlation varies. Agricultural shippers need stability in transportation costs because it helps fiscal planning and improves transportation and marketing decisions.

Figure 15-4: Average quarterly diesel fuel prices



Source: EIA

Truck Rates Correlate with Fuel Prices

Fuel costs are a large part of the total costs in trucking, more so than in any other mode; operating expenses in the trucking industry are 95 percent of gross revenue. Consequently, truck freight rates correlate strongly with fuel prices. Between the third quarter of 2003 and the first quarter of 2009, truck rates evidenced a strong correlation with fuel prices with a coefficient of 0.93 (see Table 15-1).*

Truck rates are more volatile than rail or ocean rates. They tend to fluctuate more frequently because the railroads are required to provide a 20-day advance notice of tariff rate and fuel surcharge changes, and the contractual nature of the ocean container market dampens its volatility. When fuel prices were increasing rapidly, truck rates also increased, remaining 68 percent higher during the first quarter of 2009 than during the first quarter of 2003. However, truck rates did not rise as much as fuel costs during the rapid fuel price rise in 2008. Truck rates increased 91 percent by the second quarter of 2008, while fuel prices almost tripled during the same time. Because of the competitive nature of the trucking sector, some trucking companies' profit margins were squeezed and others went out of business or declared bankruptcy (see Table 15-1, Figure 15-5, and Chapter 13).

Table 15-1: Fuel price and freight rate changes by mode[395]

	Freight Rates			Correlation to the Fuel Price	Rank 1 = most 5 = least	Standard Deviation† or Variability	Rank 1 = most 5 = least
	Q3 2003	Q1 2009	Change				
Diesel Fuel ($/gal)	1.46	2.19	49%			13.2	
Truck ($/mile)	2.03	3.41	68%	0.93	1	9.0	3
Rail (tariff + fuel surcharge)	2,489	3,722	50%	0.86	2	2.5	5
Bulk Ocean ($/mt)	33.35	45.34	36%	0.67	3	27.8	2
Barge (St. Louis Index)	163	289	77%	0.64	4	54.0	1
Container ($/TEU)	839	1,200	43%	0.37	5	6.5	4

* Correlation indicates the strength of a relationship between two variables. A perfect correlation would be 1.0. A coefficient of .93 shows the relationship is very close.

† Standard deviation is a measure of the spread of data around the mean. A high standard deviation shows the data spread widely from the mean; a low standard deviation shows they are grouped close to it. The higher the number, the more variable the correlation between freight rates and fuel price.

Figure 15-5: Percent change in fuel prices and grain rates for container, rail, and truck [396]

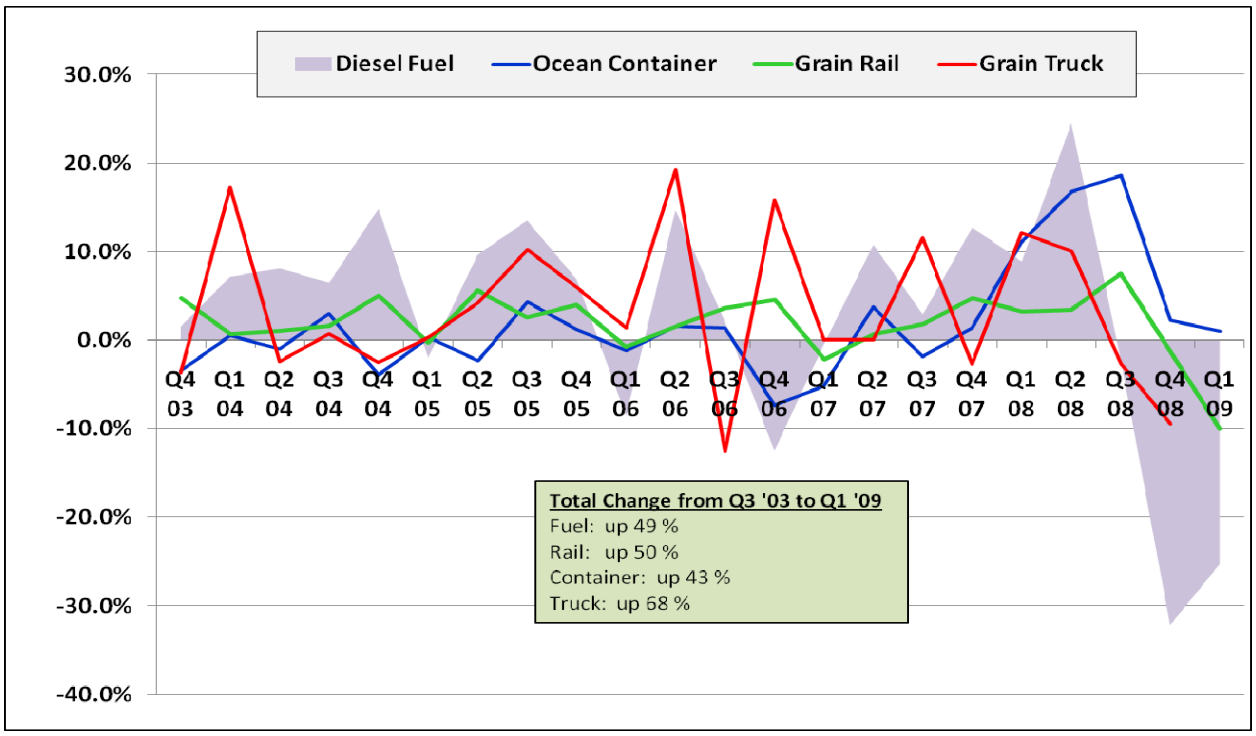
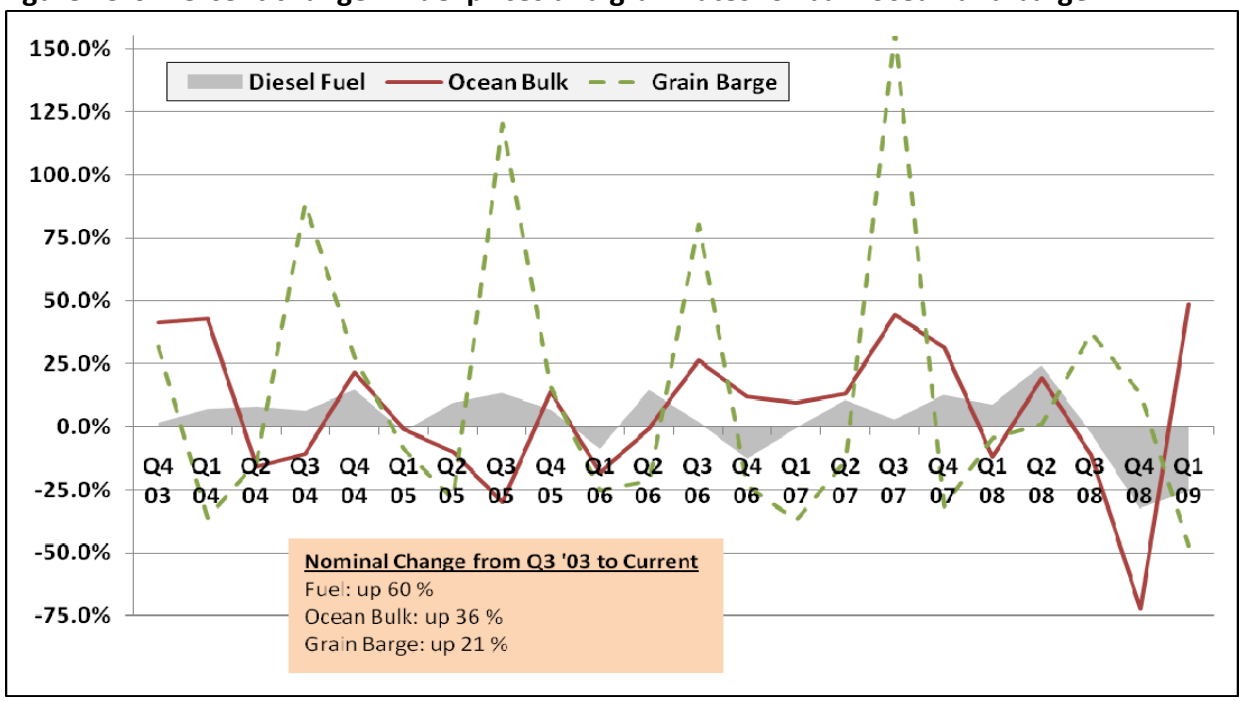


Figure 15-6: Percent change in fuel prices and grain rates for bulk ocean and barge[397]



Sources for both figures: **Rail, barge, and bulk ocean rates: AMS Grain Transportation Report**
Container ocean rates: Containerization International
Truck rates: AMS Grain Transportation Quarterly Updates Truck Advisory
Fuel Prices: EIA

Rail Rates Remain Above Average

Grain rail freight rates have increased rapidly since 2003, reacting to increased fuel and other costs, and to a shortage of capacity. Although the recession has produced excess rail capacity, grain rail rates are still 50 percent higher in the first quarter of 2009 than they were in third quarter of 2003. Total rail freight rates (tariff rates plus fuel surcharge) have shown a high level of correlation with fuel prices, as shown by a coefficient of 0.86 since the third quarter of 2003—second only to trucks (see Table 15-1). In fact, rail fuel surcharge rates peaked in September 2008 and have decreased with the price of fuel (see Figure 7-10 in Chapter 7).

Grain Barge Rates Exhibit Highest Volatility

By the first quarter of 2009 grain barge rates in St. Louis had increased 77 percent from the third quarter of 2003 (see Table 15-1). Grain barge rates have also experienced the greatest volatility during this period, ranking first among the four major modes, as a result of higher demand, network disruptions, and higher fuel and labor costs. Barge rates are not as closely correlated with fuel prices as rail and truck, but still exhibit a correlation coefficient of 0.64. The age and size of the barge fleet help determine rates. New barges are built each year in response to demand. When tax advantages brought many new barges into the fleet in the early 1980s, the surplus depressed rates. Because barges are designed to last 25 to 30 years, the surplus has lasted a long time. However, as barges reached their life expectancy and were retired, they have not been replaced, contributing to increasing rates in recent years.

Since 2003, barge rates have experienced the greatest volatility due to a variety of factors, including water levels, weather-related disruptions to the network, and demand from non-grain shippers (see Figure 15-6). Interestingly, the variability of barge rates was more than 6 times that of truck, and bulk ocean was nearly three times that of truck—indicating the high volatility in barge and bulk ocean freight rates. Barge rates are volatile because they react quickly to sudden changes in export demand, weather constraints on the rivers, or larger-than-expected crops. Some shippers react to high rates by postponing shipments until rates go down or by choosing an alternate transportation mode.

Bulk and Container Ocean Rates Face Different Market Dynamics

Bulk ocean freight rates increased in the summer of 2007 because an increase in global trade pushed demand for ocean service and to a smaller degree, because fuel prices increased. As fuel prices rose, so did rates, resulting in a correlation coefficient of 0.67, slightly higher than the barge correlation (see Table 15-1). As bulk rates increased, grain exporters increased their use of containers (either at inland points or transloading from railcars to containers at the ports), which is usually a more expensive method of exporting grain. Even when bulk rates began to decline at the end of 2007 in comparison to container rates, the convenience and higher quality grain delivered at destination encouraged many exporters to continue using containers.

In 2008, both bulk and container ocean rates increased, peaking in the summer of 2008 because of record demand for bulk shipping by China. Containerized grain rates were also pulled up by demand for U.S. agricultural products; surprisingly, they had a low correlation with

fuel price changes and low volatility (see Table 15-1). By the end of that year, however, bulk ocean rates had fallen much below container rates, and most traditional bulk grain exporters switched back to bulk shipments. Grain exporters that can use either bulk or container ocean service will continue to compare container to bulk ocean rates to discover the least expensive of the two shipping options.

Multimodal Rate Analysis Conclusions

When it comes to transportation, agricultural producers are almost always price takers—their transportation options for moving their products to market are limited, but their buyers often have many sources from which to select. This market structure results in producers paying most of the transportation costs, which directly affects their incomes.

Increases in fuel costs raise transportation costs for all modes**:** trucking, rail and, to a lesser degree, barge and ocean. As expected, movement in grain truck and rail rates has the greatest correlation to movement in fuel prices, but the relationship sometimes weakens due to variations in supply, demand, and capacity. Changes in ocean rates—both bulk and container—and barge rates do not correlate as closely with changes in fuel prices. In addition to higher fuel efficiency, these sectors are more heavily influenced by global shipping market dynamics. Agricultural shippers have become sensitive to fuel price fluctuations and their impact on overall transportation costs. Their transportation and marketing decisions are made more difficult in situations where fuel surcharges are higher and last longer than the actual fuel price swing.

Transportation Capacity and Service

Transportation capacity and the quality of service are influenced by the regulatory and market structures of the transportation sector, the seasonality of the agricultural production cycles, unpredictable weather, and economic cycles. Transportation needs peak during and immediately after the grain harvest, from mid-September through October.

Disruptions and challenges to transportation service since 2002 have included port congestion, tight capacity along rail and barge networks, equipment and driver shortages in the trucking industry, and consolidation among ocean common carriers.

From 2002 to 2006, for the first time in recent history, all transportation modes serving agriculture were strained. This was a period of strong economic growth, mushrooming global trade, and record grain harvests, all of which increased the demand for transportation. Capacity was reduced in 2002 when labor contract disputes shut down West Coast ports. In 2003, early retirement of train crews caused a shortage of trains; almost immediately, rail rates increased rapidly as railroads began to ration available crew. At the same time, fuel prices skyrocketed.

Over the same 5-year period, barge capacity was increasingly constrained as the demand for barge service from imported cement and steel grew to feed the growing construction and manufacturing industries. The increased upriver barge traffic and slower turnaround of barges

strained grain movements to export points. Agricultural shippers in many regions had trouble finding trucks and drivers. Larger ocean carriers acquired smaller ones, reducing the number of ships. Many agricultural shippers struggled to find vessel capacity because ships called less frequently. And the U.S. transportation system was tested by two major hurricanes in 2005.

Regulatory Structures Impact Service and Rates

Railroads and ocean carriers have specific antitrust exemptions. When an industry is economically regulated, competition is not an important control on rates because the government acts to provide a stable market for carriers and reasonable rates for shippers. When an industry is deregulated, however, competition and antitrust enforcement are the major forces protecting the consumer from unfair business practices. Decreased competition combined with antitrust immunity can lead to the unrestrained use of market power, especially in highly concentrated industries such as railroads and, increasingly, ocean carriers. This situation can cause some agricultural shippers to lose service and pay higher rates.

The use of market power by carriers can result in unnecessarily high freight rates and a limitation on the number of markets available for shippers. Most farmers receive a price net of transportation, so higher rail and ocean rates and reduced market selection cuts their income. The preservation and protection of competition in transportation is vital for the economic prosperity of agricultural producers and shippers, the rural communities they support, and the markets they serve.

Seasonality

Agriculture especially needs transportation during planting and harvest, when capacity depends not only on having enough railcars, barges, trucks, and containers, but on their location and turnaround cycles. Capacity is sometimes a local problem because agricultural production is concentrated in several high-producing States (see Chapter 2 surplus-deficit maps). In addition, some products need specialized forms of transport—refrigerated railcars, specialty grain railcars, containers, and refrigerated trucking. Consistent and dependable transportation, especially seasonally, is critical for agriculture.

Performance During Network Disruptions

The U.S. transportation system has been tested in a variety of natural and man-made disasters since 2002. The West Coast port shutdown in 2002 due to a labor dispute led to a prolonged disruption in rail and truck service throughout the country. Major hurricanes, which struck the Gulf Coast in 2005, disrupted barge and rail transportation. Upper Midwest floods in 2008 caused logistical problems for rail and barge transportation for several months. Economic cycles could also be classified as a test of the transportation system's resiliency—its ability to respond to disruptions and keep traffic flowing.

Disruptions Caused by Natural Disasters

The transportation system is fluid—when one mode is disrupted, freight shifts to other modes, pushing up their cost with the additional demand. For example, when river traffic in New Orleans was halted by Hurricane Katrina, freight rates along the river system and other modes reacted immediately—barge, rail, and truck rates surged. Barge rates spiked to more than 900

percent of tariff on the St. Louis index and averaged more than 500 for the remainder of 2005. They decreased as the Gulf recovered, but remained higher than the pre-Katrina levels throughout most of 2006 because of higher fuel and labor costs and reductions in the size of the barge fleet.

Ocean port facilities are most often directly impacted by major weather events such as hurricanes. Depending on the severity of the storm, ports can be operational within hours after the storm or, as in the case of the ports hit by Hurricane Katrina, some are still recovering 4 years later. Ocean port disruptions typically require ships and cargo to be redirected to other ports resulting in a significant logistical burden and transportation expense.

Extreme weather events such as hurricanes can be especially damaging to transportation infrastructure. The Chicago and New Orleans rail interchanges are particularly important; they have recently shown how quickly local weather events can increase freight rates, decrease railcar availability, and reduce train speeds to the entire country as choke points—locations prone to delays because of congestion and lack of capacity—build up. Approximately 60 percent of rail traffic passes through Chicago, creating periods of congestion during network disruptions. Hurricane Katrina, a devastating hurricane that hit New Orleans in August 2005, severely disrupted all modes of transportation. Recovery included railroad and highway reconstruction, refloating barges and recovering submerged infrastructure, rebuilding terminal warehouses and dock facilities, and significant clean up operations. All of these efforts cost the shippers and carriers time and money to

Katrina and the Price of Grain

A clear example of how delays and closures in the river system can cost farmers revenue can be seen in the aftermath of Hurricane Katrina. The Mississippi Gulf port area depends on barges for grain delivery. When the river became impassable, traffic switched to truck and rail and the cost of shipping grain increased.

High transportation costs translated into lower farm-level prices as evidenced by the drop or widening in basis in the major production areas of the interior Midwest and a surge in the basis at the Gulf.[*] Prior to the hurricanes, the weekly corn basis in Illinois averaged 20 cents per bushel below the futures. It dropped another 20 cents per bushel after the hurricanes, effectively reducing the local price by the same amount. At the same time, the export basis surged to almost 70 cents per bushel above the futures, indicating a strong export demand, and reflecting the higher transportation costs. The drop in cash prices triggered the mechanism of counter-cyclical payments, in which farmers received subsidies in the form of price support. By the end of 2005, transportation disruptions were resolved and prices in both markets gradually returned to normal patterns.[†]

[*] For agriculture, and especially for grain, *basis* is the difference between the futures price for a commodity and the local cash price offered by grain buyers—typically below the futures price. The futures price used for determining basis depends on the commodity. For some types of wheat, the futures price is from the Kansas City Board of Trade or the Minneapolis Grain Exchange. For corn, soybeans, and other types of wheat, the Chicago Board of Trade is used. Basis is quoted in cents per bushel as the difference between prices in the two locations—the futures exchange and the local market.

[†] AMS, Grain Transportation Report, Basis and Transportation Cost Primer, July 2, 2009.

redirect cargo and facilitate the logistics to ensure the flow of commerce continued. In addition, there was a spike in demand for rail transportation of bulk commodities because navigation on the lower Mississippi River was impaired for a month following Hurricane Katrina.

On the positive side, the major weather events that have tested the U.S. transportation system have also created opportunities to improve logistical operations of shippers and carriers. Subsequent events have shown a quicker recovery due to better planning and coordination.

Disruptions Due to Cyclical Economic Conditions

Unexpected changes in the growth rates of global or domestic economies due to macroeconomic conditions can disrupt the transportation system. When the global economy experienced a period of unprecedented economic growth from 2000 to 2007, transportation capacity was constrained and freight costs increased rapidly. In December 2007, the United States entered into recession and by the end of 2008 railroad traffic in intermodal, construction, and new automobiles decreased sharply. Truck, barge, and ocean freight volumes also plummeted. On the positive side, transportation capacity constraints began to ease. Rail and barge traffic congestion subsided, truck freight capacity constraints decreased, and ocean carriers had unused vessel capacity.

Intermodal Shipping

Export containers can be loaded from railcars or trucks near the port or at inland locations. Commodities that are moved this way include grain, meat, poultry, and frozen food.
Import container shipments destined for local delivery, multiple stops, or to parts of the country where rail service is not practical are off-loaded or transloaded into larger trucks or larger domestic containers at distribution centers, consolidated with other cargo, and shipped out to inland distribution centers and retail outlets.

Some carriers do not want their containers to go to inland destinations, and require that they be off-loaded in proximity and returned to the port. With the decline in U.S. imports and downward pressure on freight rates since 2007, exporters have had difficulty obtaining containers.

Agricultural products are not as sensitive to economic cycles as consumer products, and the soft demand elsewhere in the economy for transportation services benefited agriculture. Carriers responded to the economic slump by parking equipment and cutting labor expenses. However, transportation capacity has quickly become strained again as the economy has returned to normal, creating conditions similar to the tight capacity years between 2004 and 2006.

Intermodal Services

Many U.S. agricultural exporters of specialty grains and high-value products rely on intermodal transportation service—containers that are moved by truck, rail, and ocean vessels. The reliability of this transportation service has a direct impact on the balance of agricultural trade. High-value agricultural products accounted for 37 percent of the $115 billion in U.S. agricultural exports in calendar year 2008.

Container Availability

Because demand for U.S. agricultural exports remains strong, the need for available containers to move these products is essential. The use of near-port distribution centers by large importers has reduced the number of containers available to agricultural exporters at interior locations. Exporters rely on import containers to supply an available container pool. When imports are down, exporters at inland locations are unable to find a sufficient number of containers.

During these difficult economic times, carriers have decreased vessel calls, reducing the container pool for exporters. Containerized agricultural exporters continually report container availability as their most difficult challenge. In the United States, container availability is determined by the ocean carrier that owns or leases the containers because ocean carrier transport of third-party or shipper-owned containers is uncommon. Ocean carriers contend that rail costs are too high relative to the revenue earned to send many containers to inland destinations to serve the agricultural community. Containers are plentiful at ocean ports, particularly in California. Apart from the coastal port areas, agricultural exporters must rely on the major inland transportation hubs such as Chicago, Kansas City, Dallas, and Memphis as sources of empty containers.

Investment and Funding

Investment in transportation infrastructure has been specific to each mode, with sources of funding varying by mode. A January 2005 CRS report said "Analyzing transportation investment from a supply chain perspective can lead to a more coordinated or integrated approach. However, an integrated strategy is difficult to develop because transportation is still operated, administered, and funded along modal lines."[398] Although current economic conditions have eased supply chain issues, transportation constraints are expected to reappear as the economy recovers.

The supply chain is only as effective as its weakest link. A system-wide viewpoint could focus attention on the weakest links such as rail access, locks and dams, dredging, port capacity, or highway congestion and strengthen them, freeing the entire system to handle the growing transportation demand.

Better Data, Better Decisions

Policy and business decision-making can benefit from more and better data on transportation activity, rates, and infrastructure needs. In the United States, the Federal government is responsible for gathering economic data that can answer transportation sector questions, and then setting an appropriate course of action for national infrastructure planning and funding.* DOT provides a vast array of transportation statistics and USDA provides select reports on agricultural transportation. However, there are still gaps. More data, quantitative research, and analysis can improve decision-making for the transportation sector.

The biggest gaps in transportation data, research, and analysis are in the areas of rates, commodity flows, and real-time information on container availability. Access to additional data that could improve transportation analysis includes:

- More timely data on commodity flows by transportation mode
- Closer to real-time information on container, railcar, and other equipment availability
- Better information on transportation rates in the trucking and ocean sectors

USDA reports provide some primary source data for transportation costs and volumes important to the agricultural sector, but more timely information on more commodities could be gathered by increased data collection through collaboration with shippers, carriers, and the government. Collecting individual pieces of information to reveal a bigger market picture could help policy makers and industry representatives develop better long-term infrastructure plans.

* Abraham, Katharine G. "What We Don't Know Could Hurt Us: Some Reflections on the Measurement of Economic Activity." Journal of Economic Perspective, Volume 19, Number 3, Summer 2005.

Such a perspective could take into account the interdependent role of public and private sectors, drawing on all available resources to maintain and improve the transportation part of the supply chain. Public and private sectors could usefully work together to identify and prioritize the needs.

The supply-chain perspective might logically begin at a national level, with funding focused on critical regions, where transportation infrastructure improvements would benefit the rest of the nation. For example, a national overview of the rail network could identify critical chokepoints, and funding to free them would be based on the interrelationship of that region's rail needs with the nation's highways, waterways, and ports.

The U.S. agricultural supply chain is a major user of the nation's transportation system, so its needs, especially in rural areas, could be taken into account in this planning process. A system-wide perspective could improve the efficiency of the entire transportation system and ensure that the United States maintains its competitive advantage in the global marketplace.

Growth in Transportation Demand

Recent research predicts substantial growth in freight transportation demand, although estimates of the rate of growth differ. For example, the Freight Analysis Framework (FAF) Version 2.2 projects total freight volumes to increase 93 percent from 2007 to 2035.[399] A similar study performed by the American Association of State Highway and Transportation Officials predicts that total freight will grow 67 percent from 2000 to 2020, domestic tonnage will increase 57 percent and import-export tonnage 99 percent.[400] These projections may be overestimated because they were made before the recent recession, but transportation activity is considered to be the leading indicator of economic recovery, so it will rise as the economy lifts. As the economy begins to recover, demand pressure on the U.S. transportation system will resurface.

Agricultural production and trade is projected to continue to increase as world economic recovery, population growth, and higher incomes increase demand for high-quality U.S. agricultural commodities and food products. In addition, the rapid expansion of biofuels that currently move along a few key corridors, will require a corresponding expansion in transportation and distribution infrastructure. Investment in the transportation system will benefit U.S. agriculture, and additional biofuel distribution infrastructure will help achieve the energy policy objectives of our country.

Investment Needs

The National Chamber Foundation released a study in April 2008 called *The Transportation Challenge: Moving the U.S. Economy* that concluded more investment in the transportation system is needed to support the growth of trade and population in the United States.[401] According to the report, underinvestment contributes to congestion and is costing U.S. businesses and consumers time and money.

Funding sources usually address the needs of individual transportation modes. Highways and waterways are supported by federal funding. Railways are privately owned, with 18 percent of their revenue being spent on capital expenditures. The railroad industry contends that public funding of infrastructure for barge and truck transportation puts rail at a competitive disadvantage and provides a precedent for governmental funding of rail capacity. Funding for transportation infrastructure would benefit from a systems-based approach.

Railroads

Any increase in demand will require substantial investment in rail system capacity. Using FAF projections of freight demand, Cambridge Systematics estimated that U.S. railroads would need to invest $148 billion by 2035 to handle projected freight demand.[402] Of this amount, Class I railroads would need to invest $135 billion and smaller railroads $13 billion. Despite investing record amounts in infrastructure the last several years, Class I railroads estimate that they would be able to invest only $96 billion of the required $135 billion, leaving a shortfall of $39 billion.

Christensen Associates, in their Supplemental Report, noted that the Cambridge study probably overestimated railroad demand and investment needs because its projections of grain and coal movements exceeded those of USDA and the Energy Information Administration.[403] In addition, the Cambridge study did not take into account the current economic downturn. According to Christensen, using a lower projection of grain and coal movements could lead to a lower estimate of projected investment needs and the resulting investment shortfall. Whatever the shortfall in railroad funding, the railroad industry suggests that it be covered from railroad investment tax incentives, public-private partnerships, or other sources.

Those arguing against governmental funding of rail infrastructure say that access to the rail system is controlled by the owner of the track, with the owner being able to limit access, restrict competition, and charge excessive rates, especially in areas where competition from other modes is sparse. In contrast, access to highways and inland waterway systems is open to all, so the benefits from governmental support of highways and waterways flows directly to the public, whereas private parties benefit from rail infrastructure improvements.

Public-private funding of rail infrastructure projects, to the degree the public benefits, has been an accepted practice. For example, the Alameda Corridor has eliminated several highway crossings and benefitted both the public (by eliminating waiting time and increasing safety) and railways (by speeding the movement of freight). Another example is public investment to preserve railroad branch lines, which prevents the additional cost of highway maintenance and the increased accidents that would occur if the lines are abandoned.

Public Benefits of Rail Transportation

Here are some arguments put forth for public support of railroads:*

Less Demand for Foreign Fossil Fuels

On average, railroads are three times as fuel efficient as trucks. In 2007, U.S. railroads moved a ton of freight an average of 436 miles per gallon of fuel. If 10 percent of the freight that currently moves by truck moved by rail instead, more than one billion gallons of fuel would be saved each year, reducing our nation's demand for foreign fossil fuels.

Less Highway Congestion

Highway congestion costs the U.S. more than $87.2 billion a year in wasted fuel and time. A single train can carry the freight of 280 or more trucks. Moving freight by rail reduces highway congestion, the costs of maintaining existing highways, and the pressure to build more highway capacity.

Fewer Greenhouse Gas Emissions

Moving freight by rail instead of truck reduces greenhouse gas emissions by at least two-thirds.

Less Pollution

According to the Environmental Protection Agency, a typical truck emits three times more nitrous oxides and particulates per ton-mile of freight than a locomotive.

Increased Safety

Rail freight experiences about 12 percent of the fatalities and 6 percent of the injuries that trucks do per ton-mile. In addition, 99.99 percent of fertilizer and hazardous materials shipments arrive without accident—by far the highest rate of any transportation mode.

* Association of American Railroads, Tax Incentives for Investments to Revitalize Freight Railroad Infrastructure, January 2009.

Inland Waterways

The inland waterways provide the most fuel-efficient mode, point to point, for transporting commodities such as grain, grain products, oilseeds, fertilizer and coal. Our Nation has 191 active locks with 237 lock chambers.* As facilities grow older, the need for repairs and preventative maintenance increases, and eventually some facilities need to be replaced or undergo major rehabilitation.

Agricultural shippers rely heavily on the Upper Mississippi River system. Without this shipping alternative, more grain would need to be shipped by rail or truck to the section of the river below the locks, because most of the grain exported through the Gulf travels there by barge. The grain barge industry and agricultural shippers would benefit by investments to increase the capacity and efficiency of this system.

Funding mechanisms for new construction and major rehabilitation of inland waterway navigation structures are specified by law, which directs the cost of navigation improvements to be paid from the general fund of the U.S. Treasury with a matching amount from the Inland Waterways Trust Fund (IWTF). The funding source for the IWTF is the tax imposed on fuel for commercial vessels using the system. The current tax is 20 cents per gallon. Expenditures from the IWTF have increased from 2002 to present, causing the 2008 end-of-year balance to fall to $44.6 million from an average of $352.8 from 1995 to 2004. Unless an additional funding is found, the IWTF could face a deficit in the immediate future.

Highways

Food and agricultural producers rely heavily on trucking to move products from the farm or processing facility to market. Improvements in the Nation's highways increase the efficiency of agricultural transportation and reduce costs to producers and consumers.

Over half of the Federal-aid highways are in less-than-good condition and more than one-quarter of the Nation's bridges are structurally deficient or functionally obsolete.[404] The National Surface Transportation Infrastructure Financing Commission stated in February 2009 that the average annual Federal, State, and local revenue needed for maintenance of highway and transit systems was $172 billion per year, and another $42 billion per year was needed for improvements.[405] Based on these revenue needs, the commission estimated the average annual gaps in funding are $96 billion for maintenance and $42 billion for improvements. The commission recommended increasing fuel taxes and alternative ways of raising revenue to address the backlog of road, bridge, and transit system maintenance and improvement needs.

* Some locks are equipped with more than one chamber, adding capacity. Many of the aging locks are in a constant state of maintenance. The extra chamber allows traffic to continue if the other chamber is out of operation for repairs, instead of stopping all barge traffic. Of the 37 locks on the UMR-IW, only 3 have more than one chamber, but all of the 20 locks on the Ohio River have two chambers.

Figure 15-7: Highway construction. Improvements to the highway system makes transportation faster and less expensive.

Source: Caltrans

In the short term, the Omnibus Appropriations Act of 2009 authorized up to $41.44 billion in spending from the Highway Trust Fund. Longer term, the funding for maintenance and improvements to the Nation's highways and bridges will likely be addressed by Congress when it considers the next highway authorization bill. The House Transportation and Infrastructure Committee proposed $337.4 billion for highway construction investment over six years, including at least $100 billion for the National Highway System, $50 billion to reduce congestion, and $25 billion for projects that focus on goods movement and freight mobility.[406] The Administration requested that Congress focus on an 18-month reauthorization that will replenish the Highway Trust Fund.[407] On August 7, the President signed H.R. 3357 to restore $7 billion to the Highway Trust Fund.

Ports

U.S. ports are the doorway to the world, the forefront of world trade, affecting the efficiency and competitiveness of the U.S. economy, including agriculture. A recent report by the American Society of Civil Engineers stated that "Although U.S. ports are currently comparable to foreign ports in terms of overall port infrastructure, more effort needs to take place in terms of dockside infrastructure, i.e., larger and more substantial berths, newer and larger cranes, and improved intermodal access to inland transfer areas."[408] Although the Federal government

has paid for much of the transportation infrastructure of the U.S. highways and airports, ocean ports and marine terminals have mostly been financed by local taxes or the private sector. Many container ports in the U.S. continue to develop new terminals and implement projects to reduce port congestion and accommodate bigger ships. However, some ports and terminals are not able to enlarge because they are in urban areas without space to expand.

The maintenance of ship channels is the responsibility of the Army Corp of Engineers through the Harbor Maintenance Tax assessed on import cargo and some domestic shipments and deposited in the Harbor Maintenance Trust Fund (HMTF). The American Association of Port Authorities states that, "As a result of federal under-investment, the 59 most utilized federal channels only have authorized widths and depths available for the center half of the channel 30–40 percent of the time. This limits efficient use of our waterways and increases transportation costs." Inadequate depths can lead to higher transportation costs because vessels cannot be loaded to capacity. When harbor channels are at less than authorized depths, S-Class container vessels lose 320 tons of cargo capacity per inch, Panamax bulk grain carriers lose 179 tons per inch, and Great Lakes ocean-bound vessels lose 115 tons per inch.

Because of the multimodal and interdependent nature of the U.S. transportation system, efficiency in one mode has an impact on other modes. The extent to which ports are able to utilize their capacity most effectively has a direct impact on the efficiency of inland transportation; imports and exports move through the Nation's ports to be carried by interior railroads, highways, and waterways.

The Ports of Los Angeles and Long Beach, the nation's busiest port complex, have proposed per-container fees to pay for improvements to their port facilities. They worked with the California Air Resources Board to adopt the San Pedro Bay Ports Clean Air Action Plan (CAAP) in November 2006. This Plan includes components for truck, rail, and vessel traffic. Proposed financing would be with per-container fees.

Figure 15-8: Truck gate at the Port of Los Angeles

Source: ©Port of Los Angeles

Environment stewardship is important, although the associated requirements and per-container fees increase costs and create logistical challenges for agricultural shippers. These fees, charged to importers and exporters, range from $15 to $100 per container (see Chapter 14 for more details). This type of fee distributes the cost evenly throughout the trade, but imposes a greater burden on low-valued cargo such as agricultural shipments. When the value of the import or export and revenue derived from it are taken into consideration, the lower-valued cargo absorbs a greater burden from a flat per-container fee than from a value-based cargo fee.

Transportation Issues Affecting Agricultural Shippers

Agriculture—the largest U.S. industry that relies on the transportation system—could benefit from more holistic multimodal transportation policies. This study has brought to light several transportation system issues affecting agriculture and rural America**:**

- The modal focus of transportation planning and funding
- Carrier antitrust exemptions
- Railroad practices that reduce competition
- Availability of containers and transport equipment
- Compliance-driven cost increases
- Trucking hours of service exemptions for agriculture

Changing the Focus of Transportation Planning and Funding

Because the overall transportation system consists of connected networks, choke points on one network caused by inefficiencies in logistics or infrastructure reverberate throughout the system. The agricultural supply chain starts at a farm and may end as far away as the other side of the globe. It relies on a transportation system that starts with a rural road, continues along highways, railways, and waterways to a port and, after an ocean voyage, ends at a consumer's table overseas. Choke points and other impediments to the smooth and efficient working of this interlocked transportation system hamper access to the global market for U.S. food and agricultural products.

Federal transportation policy and funding could benefit from a supply-chain perspective that includes all modes. The benefits of each mode could be taken into account, as could their linked relationship to other modes in servicing production supply chains, and the infrastructure of each network funded with consistent, long-term funding sources.

Reevaluating Carrier Antitrust Exemptions

Railroads and ocean carriers arguably benefit from exemptions from antitrust laws. Antitrust exemptions permit ocean carriers to coordinate service and discuss market conditions and rates. If not for the exemptions, collective actions among competing companies that, on balance, harm competition could be in violation of the U.S. antitrust laws. Improving competition by reevaluating these exemptions could help agricultural shippers by reducing transportation costs.

Ocean Container Carrier Antitrust Exemptions

Under the Shipping Act, ocean container carriers are given an antitrust exemption that allows them to discuss market conditions, share vessels, and establish rate guidelines. This exemption weakens the industry's competitive environment, decreasing the power of competition to moderate rates. Container unavailability and some recent volatility in rates have caused agricultural shippers to question these exemptions. Further analysis of the effects of antitrust exemptions would help determine whether this exemption decreases competitive options for agricultural importers and exporters and whether its benefits in preserving service levels compensate for any adverse effects on competition. The Federal Maritime Commission (FMC) is currently studying the effect of Europe's 2008 repeal of its block antitrust exemption for ocean carrier conferences.

Railroad Antitrust Exemptions

Antitrust regulations in the United States require that mergers and acquisitions be reviewed to determine if the resulting larger company would increase its market power and that of its competitors to a level that could harm consumers. Railroad mergers and acquisitions are reviewed and allowed by the Surface Transportation Board (see Chapter 6).

U.S. antitrust laws prohibit collusive behavior. In a market with as few as two sellers, there may be inadequate competition to produce effective rail-to-rail competition. Even with multiple carriers competing in a single market, if they collude or tacitly cooperate, prices could be

expected to be higher than when competition is open.[409] It is increasingly being argued that today's environment of reduced competition is giving cause for a reexamination of the antitrust exemptions for railroads.

Railroad Practices Reduce Competition

Some railroad practices impede the efficiency and effectiveness of the U.S. agricultural sector, domestically and in global trade. Prior to deregulation, the railroad industry was characterized by open interchange and cooperation among railroads in the interests of serving the shipper. The rapid consolidation of the industry through mergers has resulted in a decrease in the uninhibited interchange of traffic, routing choices, and cooperation among railroads. Some of these changes that decrease the competition and efficiency of the rail industry are discussed below.

Railroads Restrict Interchange

Since railroad consolidation, railroads have closed many gateways, terminated interchange agreements with other railroads, and closed lanes. The net result has been decreased rail-to-rail competition and the elimination of shipper's rail access to some markets. Railroad policies often limit the routes and destinations shippers can select when only one railroad serves their origin, even when other lines are connected to the originating railroad. Such limits on competition increases rates and reduces the efficiency of the transportation system.

Rate Challenge Processes are not Cost-Effective

Agricultural shippers are affected by the less-than-cost-effective means for challenging rail rates that are currently provided. In 1996, Congress mandated that cost-effective small-rate-case procedures be available to small shippers. Current small-rate appeal procedures, although improved, still exclude a great many small agricultural shippers, which could be the reason no agricultural shipper has used them to appeal rail rates. When factoring in the probability of winning a rate-appeal case, the expected returns for these agricultural shippers would not cover their costs in most cases. In addition, most agricultural shippers serve multiple markets, making it less cost-effective to appeal rates to individual origin-destination pairs. The inability of agricultural shippers to appeal excessive rail rates is borne by farmers, who are paid prices for their grain that are net of shipping costs. Excessive rail rates, in turn, reduce the economic vitality of nearby rural communities.

Paper Barriers

Paper barriers* restrict the markets and rates available to agricultural shippers and producers, interfering with their ability to obtain the best price and increasing their transportation costs. They restrict the flow of interstate commerce and reduce the benefits arising from the rail network as a whole.

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* Paper barriers are agreements between two railroads that restrict the ability of one party, usually a short line or regional railroad, to exchange freight traffic with railroads that compete with the larger railroad.

Antitrust law generally prohibits businesses from selling assets with conditions that restrict the buyer as to whom they can do business with, how they conduct business, or how they price their services. When exceptions to antitrust law are allowed by the courts, they require barriers to be reasonable and as limited as possible, and the public benefits must outweigh the anticompetitive effects. Paper barriers lasting into perpetuity are difficult to defend, and the penalties for interchanging with competing railroads are often punitive, serving only to restrict competition. Many paper barriers are not transparent to shippers, who bear the increased costs of this practice.

Reciprocal Switching

Many railroads have cancelled reciprocal switching agreements with competing railroads prior to railroad mergers, and have cancelled reciprocal switching agreements with shippers. This has restricted shipper options and rail-to-rail competition. Switching rates have increased dramatically in recent years and now often exceed $500 per carload. Class I railroads frequently refuse to provide competitive rates and service to captive short line railroads, which provide essential rail service to rural communities that otherwise would have none. Canada sets mandatory reciprocal switching rates based upon costs for specific distances, preventing railroads from setting rates so high they restrict rail-to-rail competition.

Consistent Service and Rates to Captive Shippers

Lack of service at rural intermodal facilities forces agricultural shippers to truck empty containers long distances from urban intermodal yards and then haul the loaded containers back to those urban yards. In 2006, this practice added nearly $1,100 per 40 foot container to the cost of cotton shippers located near Lubbock, Texas. The higher trucking cost due to the lack of rail service hinders the ability of farmers to compete in domestic and international markets. Agricultural shippers need consistent rail service to rural intermodal facilities.

Bottleneck Decision

Bottleneck rates occur because of an STB ruling that restricts the ability of a shipper or receiver served by only one railroad to use that rail line serving its plant or facility to reach competitive services offered by other railroads. Under the ruling, railroads are not required to quote rates on the bottleneck portion of the movement unless the shipper first obtains a contract over the alternative route from the non-bottleneck railroad. Because most of the Nation is served by railroad duopolies that do not vigorously compete with each other, non-bottleneck railroads rarely agree to a contract over the alternative route.

The effect of the bottleneck ruling has been a loss of competition, an increase in rates, and a decrease in service. Economic efficiency also may be decreased; longer routes are used and more fuel consumed. One study has estimated the loss in annual efficiency caused by the bottleneck ruling at $1.3 billion with an increased consumption of more than 103 million gallons of fuel.[410]

Excessive Fuel Surcharges

Fuel surcharges are designed to allow railroad firms to recover the costs caused by abnormally high fuel prices; normal fuel costs have always been included in the rail rate determination. Fuel surcharges, however, have become profit centers for railroads. During September 2008, when fuel surcharges peaked, they varied from 46.58 cents per car mile to 87 cents, a difference of 87 percent. USDA has shown (in Chapter 7**:** Rail Rates) that the fuel surcharges railroads have collected exceed the additional cost of the fuel by 55 percent.

Figure 15-9: A locomotive refueling

Source: ©R. Franz

Increasing Awareness of Regulatory Costs

Regulations dealing with homeland security, environmental mitigation, and safety help the agricultural sector's long-term sustainability, but increase operating costs for carriers, adding to the transportation costs ultimately borne by agricultural producers. Increased awareness of the added costs these programs bring could help with the coordination of regulatory policy-making and raise awareness of the impacts on transportation options for rural America.

Port expansion plans face competing residential development issues and environmental concerns that limit expansion activities.[411] Because of the urban setting of many ports, space to expand is limited. Ports on the outskirts of town frequently find that available land is wetlands or other protected environment, so environmental concerns make expansion difficult, expensive, and time-consuming.

Recent security regulations such as the Transportation Workers Identification Credential (TWIC) and the new Foreign Trade Regulations have added to the cost of doing business for agricultural exporters. The TWIC program was formed to be sure persons needing unescorted access to maritime facilities were not a threat to those facilities, but has increased the cost for truck drivers and port employees.

The Foreign Trade Regulations that went into effect in 2008 also have added logistical burdens to agricultural exporters. The new regulations require carriers to have proof of export documentation filing in advance of the vessel sailing. Ocean carriers have interpreted this differently, sometimes imposing deadlines that are impossible for agricultural exporters to meet because their products are high perishable and the volatility of the international market.

Hours-of-Service Exemptions for Agriculture

During the busy planting and harvest seasons, farmers and retail farm suppliers spend substantial time on activities other than driving, necessitating the agricultural hours-of-service exemption. By law, as determined by each State, the agricultural exemption is limited to an area within a 100 air-mile radius from the source of the agricultural commodity or the distribution point for the farm supplies during the planting and harvest seasons. Without the exemption, farmers and suppliers would be required to go off duty, disrupting critical planting and harvest activities, especially for crops subject to volatile weather, crop maturity, and market conditions.

In 2005, Congress clarified the 100 air-mile radius agricultural exemption from the hours of service rules, first granted in 1995. It means that drivers transporting an agricultural commodity or farm supplies for agricultural purposes are exempt from the maximum driving and on-duty time provisions required of long-haul drivers. Because of agriculture's unique needs, exemptions from the hours-of-service rules are highly important.

Funding the Inland Waterways

The Nation's locks and dams are generally reliable, but many of them were built in the 1930s. As they have aged, repairs and maintenance have become more frequently necessary and more expensive. Repairs and improvements have been authorized by Congress, but funding for new construction projects is nearly depleted and there is a growing gap to fund ongoing projects.

Barges offer the most economical and environmentally-friendly mode of transportation, keeping U.S. agricultural products competitive in the global economy. They carry 12 percent of agriculture's ton-miles. They offer competition to other long-haul modes, keeping rail rates competitive. Moving more bulk commodities on barges could free capacity of other transportation modes, reducing congestion. A consensus on the best way to tackle inland waterway funding issues is needed.

Conclusions

The supply chain for agricultural products often depends on multiple modes of transportation, each with its own price dynamics and relative fuel efficiencies. In grain transportation, fuel costs have the greatest impact on truck and rail rates, followed by ocean and barge. Agricultural shippers pay most of the transportation costs and frequently have limited transportation options, because they are generally price takers in the transportation market. Transportation costs directly affect their incomes and access to destination markets.

Long-term economic trends indicate growing demand for freight transportation services, the largest user of which is the U.S. food and agriculture sector. To keep the U.S. economy competitive in the global economy and ensure that the transportation share of domestic food prices remains reasonable, transportation planning and investing needs to shift from its mode-centric approach to a supply-chain, multimodal, systems approach. Although each mode has its own characteristics, they interrelate to form an integrated system.

Some policies need to address mode-specific issues, such as antitrust exemption status and carrier practices related to rates and service; others can be directed at improving cargo flow by identifying remedies to network choke points.