Railroads and Grain

ASSOCIATION OF AMERICAN RAILROADS

MAY 2019

Summary

Railroads are critical to grain transportation. In 2018, U.S. Class I railroads originated 1.49 million carloads of grain (5.0 percent of total carloads) carrying 147.2 million tons (8.9 percent of total tons). Grain is also a key commodity for scores of short line and regional freight railroads. Railroads also haul large amounts of grain-related food products, such as soybean cake and meal, corn syrup, flour, prepared animal feed, and dried distillers grains.

Overview of Grain

The United States is the world’s biggest grain producer — average annual U.S. grain production from 2009 to 2018 was 578 million tons — but what crops are grown, where, and in what quantities, and how, when, and to where they are transported, are determined by a complex interaction of factors. These factors include weather and soil conditions, but also a complicated interplay of many entities — including farmers, various transportation modes and providers, elevator operators, grain marketing companies, grain consumers large and small (both in the United States and abroad), as well as local, national, and foreign governments.

Most grain, of course, is eaten, usually by animals that are later eaten by humans (e.g., cows, pigs, and chickens) or by humans directly. Grain is often processed in one way or another before being consumed — wheat milled into flour, soybeans crushed to produce soybean oil and soybean meal, corn milled to produce corn starch that is further processed to produce corn syrup, and so on.

Some aspects of the grain market are generally predictable — e.g., poultry farms in the southern United States will always need large and more or less steady amounts of grain for feed — but many aspects of the grain market are more volatile. For example, large fluctuations in grain production are common from one year to the next. Just from 2012 to 2016, U.S. grain production ranged from 483 million tons to 653 million tons.

Individual types of grain are characterized by volatility too. Corn, for example, is grown mainly in the Midwest. It accounted for 65 percent of U.S. grain production, on average, from 2009 to 2018. However, because the amount of corn produced can change significantly from year to year, corn’s share of U.S. grain production ranged from 62 percent to 67 percent over this period, with the highest volume year 123 million tons higher than the lowest volume year. Corn consumption patterns change too, depending on global and domestic markets.
Soybeans, meanwhile, accounted for 19 percent of U.S. grain production from 2009 to 2018, far less than corn, with the soybean share varying from 17 percent to 22 percent. Over that period, exports accounted for 49 percent of soybean utilization — three and a half times the export share for corn (14 percent). Most soybeans that weren’t exported was crushed at processing plants throughout the country to produce soybean oil and soybean meal. Soybeans are generally grown in large quantities in the same states that produce large quantities of corn.

Wheat, on the other hand, is grown mainly (depending on the type of wheat) in the northern tier of U.S. states, including the Dakotas, Montana, and Idaho, or the plains of Kansas, Oklahoma, and Texas. Wheat accounted for 11 percent of U.S. grain production from 2009 to 2018. Over this period, 46 percent of U.S. wheat utilization was exports, a bit lower than for soybeans but far more than corn. Wheat that is not exported is usually processed to produce food for human consumption, including bread, pastries, and pasta.

Major grains do not necessarily follow similar production patterns. For example, U.S. soybean production fell in 2012 from 2011, then rose from 2013 to 2015. U.S. wheat production, meanwhile, rose in 2012 from 2011, then was lower again from 2013 to 2015. Production of soybeans rose in 2017 over 2016 but production of corn and wheat fell. Hot dry spells or floods may suppress grain yields in one region, while other regions might be enjoying average or exceptional growing conditions at the same time.

Further complexity in grain markets comes from the difficulty in forecasting crop size, even when the forecasts are made close to harvest time. This makes planning that much more difficult for those involved in grain logistics. Timing adds more complexity. Those who have grain to sell want to sell it to the highest bidder. At harvest, a farmer might choose to sell his or her crop immediately — perhaps to a local processor or elevator — or the farmer might decide to store all or part of the crop in anticipation of a better price later. Likewise, an elevator might choose to sell the grain to, say, an overseas buyer, or it could instead decide to store the grain in anticipation of a better price later on.

Like U.S. grain production, U.S. grain exports fluctuate because they are a function of many different factors. For exports, these include crop yields in competing grain exporting countries, economic conditions in importer countries, exchange rates, grain prices, government policies, and ocean freight rates. All of these can change significantly from one year to the next or even from month to month, resulting in grain exports that can vary tremendously. Total U.S. grain exports averaged 141 million tons per year from 2009 to 2018, but during this period exports ranged from 113 million tons to 164 million tons.

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<thead>
<tr>
<th>U.S. Grain Production by Type of Grain</th>
<th>(millions of tons)</th>
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<tbody>
<tr>
<td>Barley</td>
<td>5.5</td>
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<tr>
<td>Corn</td>
<td>366.6</td>
</tr>
<tr>
<td>Oats</td>
<td>1.5</td>
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<tr>
<td>Rice</td>
<td>10.8</td>
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<tr>
<td>Rye</td>
<td>0.2</td>
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<tr>
<td>Sorghum</td>
<td>10.7</td>
</tr>
<tr>
<td>Soybeans</td>
<td>100.8</td>
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<tr>
<td>Wheat</td>
<td>66.5</td>
</tr>
<tr>
<td>Total</td>
<td>562.6</td>
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</tbody>
</table>

Source: USDA
Grain Transportation

The nature of U.S. grain production and consumption patterns means that the grain logistical chain in the United States must be complex and resilient. As noted above, grain production, movement to storage, and movement out of storage to domestic and export markets depend on a variety of interconnected factors.

Railroads, along with barges and trucks, are a critical part of the grain logistical chain. The fact that this chain generally functions smoothly is a testament to the tremendous efforts that transportation providers, including railroads, put forth in support of their grain-related customers.

Today, grain shippers benefit from strong competition among railroads, trucks, and barges. According to USDA data, the truck share of total U.S. grain transport was 61 percent in 2016 (the most recent year for which data are available at this writing), compared with 25 percent for railroads and 14 percent for barges (see the nearby chart). The fact that the truck share has been trending higher — it was 51 percent in 2006 — is evidence of the intensity of the competition railroads face for grain traffic.

<table>
<thead>
<tr>
<th>U.S. Grain Exports by Type of Grain (millions of tons)</th>
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<tbody>
<tr>
<td>Corn</td>
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<tr>
<td>Rice</td>
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<tr>
<td>Sorghum</td>
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<tr>
<td>Soybeans</td>
</tr>
<tr>
<td>Wheat</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: USDA
Much of the growth in the truck share of corn movements has been attributable to local shipments of corn to ethanol plants, but even for wheat and soybeans, railroads clearly face intense competition for their services.

**Overview of Railroads and Grain**

In 2018, Class I railroads originated 1.49 million carloads of grain (5.0 percent of total carloads) carrying 147.2 million tons (8.9 percent of total tonnage) and earning gross revenue of $5.8 billion (7.7 percent of total revenue). There is often significant year-to-year volatility in rail grain volumes.
In addition, grain-related food products — which consist of a wide variety of commodities such as flour, animal feed, soybean oil, and corn syrup — typically account for another 4 percent or so of rail tonnage and revenue.

U.S. freight railroads carry more corn than any other type of grain. From 2009-2018, corn accounted, on average, for 69.7 million tons (49 percent of total rail grain tonnage) and $2.29 billion in gross revenue (45 percent of total grain revenue), well ahead of wheat (34.6 million tons, $1.45 billion) and soybeans (25.7 million tons, $945 million).
The share of rail grain traffic by type of grain varies from year to year depending on a variety of market dynamics.

Top states for rail originations of grain include Illinois, Minnesota, Nebraska, and North Dakota, which together account for around half of all originated rail tons of grain. Top states in terms of rail terminations of grain include Washington, Texas, Illinois, and California, which together typically account for around half of all rail grain terminations.

**The Railroad Grain Car Fleet**

The amount of grain transported within a region or by an individual railroad can be highly cyclical and volatile from week to week. From January 2010 through April 2019, U.S. and Canadian railroads together originated an average of 30,093 carloads of grain per week, but the peak week (39,160 carloads) was 87 percent higher than the lowest week (20,968 carloads).

When demand is particularly high (often during or immediately following harvests), shortages of rail grain cars might occur. During these periods, not all grain shippers who want rail cars are able to obtain them easily. Conversely, during periods of relatively low demand, it is common for thousands of grain cars to sit idle, sometimes for long periods.

Railroads know that adequate grain car capacity is critical to efficient grain marketing and transportation, which is why they and other freight car providers work hard to provide a rail car fleet that is as large as can be justified economically. Moreover, when car shortages do occur, railroads and others work diligently to move as much grain as possible as quickly as possible. As
of year-end 2018, the North American railroad grain car fleet consisted of some 281,000 cars
(owned by railroads and non-railroads) with a capacity of 1.43 billion cubic feet.

In recent years, new grain cars have been added to the fleet. New cars generally can carry
more grain than the cars they replace. Moreover, because of improvements in utilization through
efficiency improvements, a rail grain car today typically moves more grain than in the past.

**Rail Service Options**

Railroads offer various service options (single car, multiple cars, trainload, or shuttle
trains) to grain shippers, and data show a clear trend toward more efficient grain movements.
Single car movements (typically defined as 1–5 cars) accounted for 22 percent of total U.S. grain
carloads in 1990; in 2017, they were 10 percent. Multiple car shipments (6–49 cars) fell from 40
percent in 1990 to 18 percent in 2017. Trains with 50 or more cars include conventional
trainload and shuttle trains; they rose from 39 percent in 1990 to 72 percent in 2017. Large,
more efficient long-hauls for grain drive down costs. The continuing trend toward such
shipments is driven by competition and reflects market forces that call for grain transportation to
be as efficient as possible.

**Continued Spending Back Into the Rail Network**

In the future, transportation demand will grow and new rail capacity will be needed.
Recent forecasts from the Federal Highway
Administration found that total U.S. freight
shipments will rise from an estimated 17.8 billion
tons in 2017 to 24.1 billion tons in 2040 — a 35
percent increase.

Freight railroads are preparing for this
future demand today. Unlike trucks, barges, and
airlines, which travel mainly on infrastructure that
the government provides and pays for, America’s
privately-owned freight railroads operate almost
exclusively on infrastructure that they own, build,
maintain, and pay for themselves. In recent
years, America’s freight railroads have been
putting more money back into their networks than ever before. From 1980 through 2018, they
spent more than $685 billion — their own funds, not taxpayer funds — on renewal,
maintenance, and expansion of their infrastructure and equipment. That’s more than 40 cents
out of every rail revenue dollar.

In the years to come, railroads will have to continue to maintain their existing capacity
and install new capacity to meet the needs of current and potential customers. Additional
spending on capacity can only be made if rail earnings are robust enough to attract the capital
needed to pay for it.