# RAIL GRAIN INDICATORS INDUSTRY SURVEY

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# ABSTRACT

Railroads are an important transport provider in the U.S. grain market. The purpose of this research is to gain insight into shipper rail grain marketing practices and decisions. A survey of rail grain facilities is used to collect primary information about facility characteristics, marketing practices, and market information sources. Differences in marketing practices and information usage is found among facility groups and by railroad. The knowledge gained is valuable to policymakers and others interested in interpreting current grain market phenomenon and understanding rail grain shippers information needs. In addition, findings may be valuable to industry in the broad overview and benchmark measures offered as a baseline for future investment and marketing decisions.

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# 1. INTRODUCTION

Railroads transport approximately one-third of U.S. grains and oilseeds from producing regions to domestic plants and export ports (U.S. Department of Agriculture, 2003). Grain production is generally consolidated by trucks at inland grain facilities and loaded into larger barge and rail shipments because of the economies of scale in administration and operations for handling this bulky, natural-resource based commodity. The purpose of this survey is to ascertain information regarding management of rail service by grain shippers. A survey pool is queried regarding service levels, service prices, ordering practices, and the information used in managing rail grain service.

## 1.1 Industry Overview

Inland agri-service facilities are dispersed through the grain producing region. A national list of locations is not compiled, but approximately 8,000 facilities were licensed to purchase grain in 2000 (Vachal and Bitzan, 2001). Considering the resources available and the focus of this study, elevators located on two primary western U.S. railroads are selected as the survey pool for this rail indicators project. These two carriers, the Burlington Northern and Santa Fe (BNSF) and Union Pacific (UP), account for 70 percent of U.S. Class I railroad grain car loadings (U.S. Department of Agriculture, 2004). Approximately 2,400 grain-handling facilities are estimated to be located throughout the geography of these two railroads based on grain elevator directories published by the rail carriers.

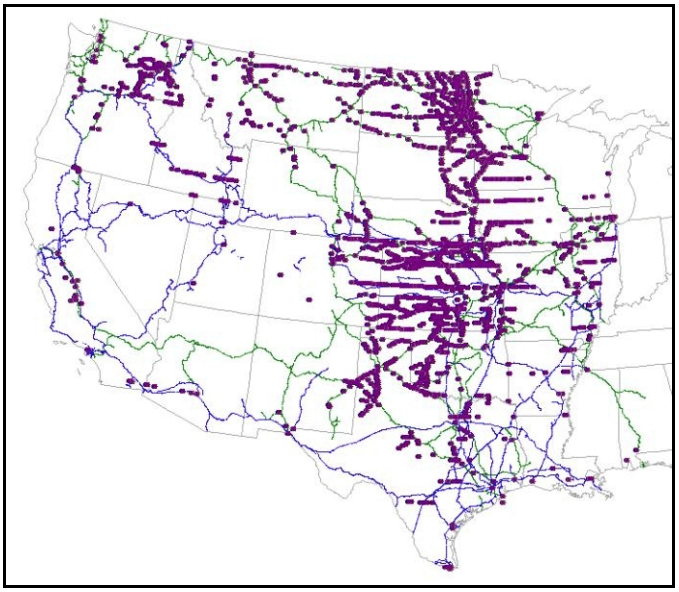

**Figure 1**. Estimated Grain Facility Locations on the BNSF and UP Railroads

## 1.2 Survey Development and Administration

A review of previous industry surveys and recent market information was conducted in preparation for survey design ( Clark et al., 2003; Iowa State University, 2001;Vachal and Bitzan, 2001; Vachal and Tolliver, 2002; Fuller, et al., 2001; Kansas Agricultural Statistics Service, 2002; Wilson and Train, 2004). The final survey is comprised of three sections focused on facility characteristics, rail marketing activity, and rail market information. Surveys were mailed to 2,358 elevators in 27 states. Approximately 10 percent of the survey, 238, were returned as undeliverable due to invalid mailing addresses. The large number of invalid address returns was not unexpected, as it may be attributed to elevator closures or mergers since the facility information was entered into the directories. The most recent updates of the facility information ranged from 2001 to 2004. The more expensive alternative was to contact each facility to confirm its continuing operation and mailing address before to the survey mailing.

The 188 responses included facilities in 18 states for a response rate of 9 percent. This response rate is similar to the 2001 regional elevator survey (Vachal and Tolliver, 2001). The results provide a statistical representation of the elevator population at the 95 percent confidence level, allowing for a 7 percent error margin. Regarding geographical stratification of the responses, the sample responses are within 3 percent of the population mailing list geography considering state location with the exception of North Dakota. North Dakota is over-represented in the geographic stratification by 9 percent because of a higher response rate. It also should be noted that the number of responses does under-represent the number of facilities. Based on information included on two survey responses, a single company response can account for the activity of up to 10 facilities. Each of the 10 facilities in a company may have received the survey in the mailing, as names were not specified. For example, a company may manage many grain facilities from a single business office. Although the survey response rate is rather low, results are acceptable given the representative geographic strata and substantial volume handled by these facilities. Important insight is gained regarding shipper rail management practices in the U.S. grain market as detailed in the subsequent sections.

# 2. SURVEY RESULTS

Survey respondents handle an estimated 5.3 billion bushels based on the 174 businesses that reported average annual grain throughput. This volume represents about 23 percent of total U.S. grain usage in domestic and export markets. The average volume for all facilities was 8.1 million bushels. The 50 shuttle facilities accounted for approximately 69 percent of all shipments and 80 percent of rail shipments in the survey response group.

Modal usage among the facilities averaged 57 percent for rail and 27 percent for truck, with the remaining 16 percent marketed via barge, based on a weighted average of annual shipments. Shuttle facilities, as expected, exhibited the greatest utilization of rail (Figure 2). These facilities shipped 65 percent of the grain they marketed via this mode. Rail share for shipments from multicar and unit train facilities represented about 40 percent of the total traffic originated from these facilities. Single car grain facilities reportedly market about one in three bushels via rail.

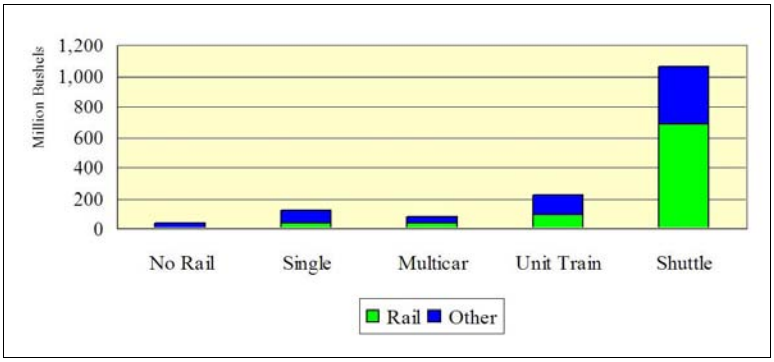


**Figure 2**. Annual Grain Shipments, by Facility Group

## 2.1 Grain Facility Rail Characteristics

Regarding rail carrier service available to these grain shippers, 88 percent of respondents report service from a single rail carrier. Approximately 11 percent are served by two carriers, and only 1 percent have access to three or more railroads. About 56 percent of respondents identify the Burlington Northern Santa Fe (BNSF) as their primary rail carrier and 23 percent name the Union Pacific (UP). Three percent of respondents are served by both the BNSF and the UP, as primary carriers. The remaining respondents are served primarily by a carrier other than the BNSF or UP. Seven percent of the respondents report they no longer have rail access, which may be due to rail line abandonment or long-term embargoes.

A mix of investment levels for rail shipping capacity are represented in responses from grain facilities. For the rail capacity measure, facilities are characterized by the number of rail cars that can be loaded without a railroad switch, and whether or not they participate in their railroads 'shuttle' program. The shuttle program is a high-efficiency program, with requirements such as

large trains, high-capacity car loading, and electronic payment. A single car facility is defined by track space from one to 24 cars. A multiple car shipper can load 25 cars or more without a rail switch. The unit train facility has track space for at least 49 cars. Shuttle shippers are those facilities that reported they participate in their railroad's shuttle program.

Thirty-seven percent of respondents have single car shipping capacity, and 17 percent have multicar shipping capabilities. These shipment types are typically destined for domestic markets. About 17 percent of respondents are equipped to handle unit train shipments. Unit train shipments are typically bound for large-volume domestic processors and export ports. Approximately 29 percent of respondents reported that they are shuttle program participants. The shuttle train configuration is largely used in serving the shipload volumes destined for export ports, but also does have a role in the domestic market as these large-origin trains may be segmented into smaller units near their destination to serve several customers.

Approximately 44 percent of all respondents manage and purchase their freight in-house. Within the facility groups, the proportion of shippers handling their own freight deck is 50, 62, and 52 percent for the multicar, unit, and shuttle facilities, respectively. Only 26 percent of the single car shippers manage freight in-house.

As previously mentioned, 57 percent of the grain handled by the respondents was marketed via rail. BNSF facilities report shipping 61 percent of their annual volume via rail when individual facility responses are weighted by average annual bushels handled. Approximately 30 percent of the grain handled by UP facilities is moved outbound by rail. For facilities served by both the BNSF and the UP, more than 90 percent of grain is marketed via rail. Shippers served by other carriers market about 54 percent of the grain they handle via rail. The differences in the use of rail in marketing may be attributed to a variety of factors such as modal competition, facility capabilities, and market proximity. The dominance of rail in this study is expected given the industry survey group of BNSF and UP grain facilities and the propensity for facilities utilizing rail to respond given their interest in survey findings.

In addition to variance among railroads, propensity to use rail also varies among grain facility groups. As expected, facilities with larger investments in rail capacity tend to market more grain via this mode. A significant correlation does exist between rail shipping capacity, as measured by the track space variable, and percent marketed via rail ($r$=.43, $p$=.000). The difference in average rail shares among the grain facility groups also varies significantly (F=0.16, $p$=.00 ). Shuttle facilities market 73 percent of their grain via rail. Facilities capable of shipping unit trains market an average of 63 percent via rail. On average, single car and multiple car shippers report using rail in 31 and 46 percent of their annual outbound shipments, respectively.

When these modal shares are weighted by average annual handle within the facility groups to reflect actual volume moved, the differences between the shuttle facilities and those equipped to handle smaller rail shipments are notable. Approximately 30, 41, and 42 percent of grain originated by single, multicar, and unit train facility groups, respectively, is marketed via rail. The rail share in shipments from the shuttle facility group is 64 percent.

## 2.2 Prices and Reliability

Rail freight may be ordered directly from the railroad under the general tariff service program that offers no guarantee for delivery of cars or through alternative guaranteed rail service markets. The guaranteed service markets are generally defined as longer-term and shorter-term purchases made directly from the railroad through contracts or periodic service product offerings made by the railroad through auctions and nearby or spot purchases made in the secondary freight market from brokers, grain companies, or other agents. In the survey, examples were provided for the services purchased directly from the railroad. Longer-term examples included shuttle and smaller- unit year-long service contracts. Shorter-term railroad purchases were defined to include the BNSF Certificate of Transportation (COT) and Union Pacific Guaranteed Car Allocation System (GCAS) type auction programs.

In regard to grain volumes moved under each of the rail freight programs, the longer-term shuttle and service contracts are dominant. These programs accounted for nearly half of all rail shipments made by respondents in 2004, with individual responses weighted by average annual rail volume (Figure 3). The spot market was second among the rail programs, accounting for about one-quarter of 2004 grain shipments. The shorter-term auction programs account for about 17 percent of the rail grain volume marketed by respondents; and tariff the smallest share at 9 percent.

Each of these programs has its own rewards and risks in terms of reliability, railroad/shipper non-performance penalties, and cost. Individual shippers assess the value and risk associated with each of these rail freight markets on a continuous basis. Information regarding two factors, price and reliability, were collected in the survey. Respondents were queried regarding the average price, in terms of the average premium or discount for cars, and the reliability, in terms of any days in the delay in placement of the cars at the facility beyond the requested delivery date, for cars shipped during 2004.

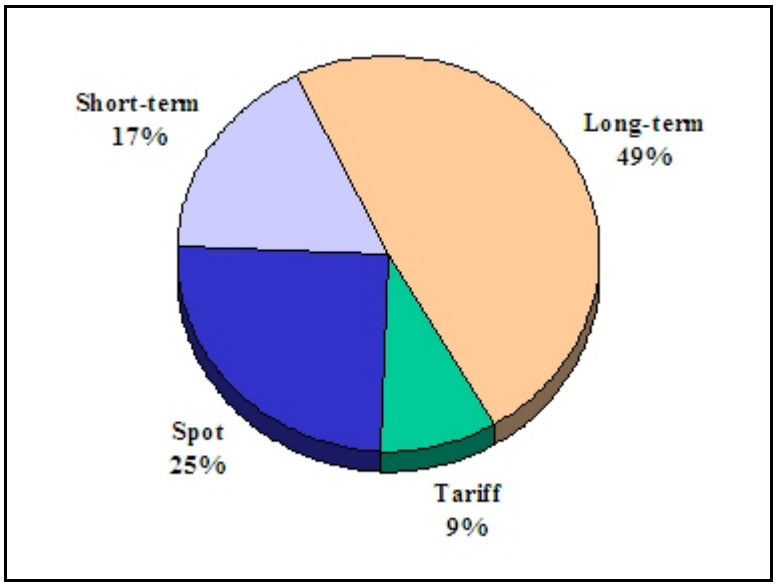


**Figure 3**. Grain Rail Service Program Usage, Respondent Volumes in 2004

Overall, respondents paid an average premium of $49 per car for guaranteed rail service for grain shipping in 2004, using a weighted average for responses based on average annual rail grain volumes. A simple average is calculated to be 26 percent higher at $62 per car. The premiums paid ranged from $0 to $350 for the year. The average delay on the guaranteed service was reportedly 10 days in 2004, with responses weighted by rail volume. The delay ranged from zero to 56 days. The simple average delay was 14 days. The difference between the weighted and simple average indicates that some larger-volume shippers were able to secure service at relatively lower prices that was delivered in a more reliable or timely manner.

**Table 1.** Rail Service Price and Reliability for 2004, by Grain Facility Group

| Grain Facility Group | Tariff, Placement Delay | Guaranteed Rail Service Price | Guaranteed Rail Service Reliability, Placement Delay |
|---|---|---|---|
| | *Days* | *Dollars per Car** | *Days** |
| Single | 19<br>(20...60) | 57<br>(0...350) | 6<br>(0...30) |
| Multicar | 28<br>(0...45) | 62<br>(0...190) | 18<br>(3...36) |
| Unit Train | 23<br>(0...60) | 63<br>(0...350) | 19<br>(0...40) |
| Shuttle | 17<br>(0...40) | 46<br>(0...200) | 8<br>(0...56) |

*Days and price are weighted average based on average annual rail handle.
Response Range provided as (...).

The difference in price and reliability between the BNSF and UP are not found to be statistically significant for 2004. Table 2 does provide the average delay and price for tariff and guaranteed service by carrier. Tariff delivery delay average 25 days on the BNSF and 17 days on the UP. The price reported for guaranteed service was similar at $55 for BNSF shippers, compared to $49 for UP shippers. Although not statistically significant, the delivery delay on the UP of 16 days is twice that reported by BNSF shippers. Considering reliability, a distinct difference is noticed between the BNSF tariff and guaranteed rail service based on average delay days at 25 compared to 8 days. In comparison, UP shippers report little difference with an average 17 delay days for tariff and 16 delay days for guaranteed orders.

Beyond differences between the tariff and guaranteed freight rail service programs, distinctions also exist among the guaranteed freight service programs. For instance, each program has its own contract parameters and market liquidity characteristics that affect value. The value is dynamic as it is continually influenced by fluid market supply and demand. For example, a shuttle contract has rather fixed standards for service, but the announcement of large increases in projected U.S. grain exports (demand) or discontinuation of future COT auctions (supply) will affect shuttle service values.

**Table 2.** Rail Service Price and Reliability for 2004, by Railroad

| Grain Facility Group | Tariff, Placement Delay | Guaranteed Rail Service Price | Guaranteed Rail Service Reliability, Placement Delay |
|---|---|---|---|
| | *Days* | *Dollars per Car** | *Days** |
| BNSF | 25<br>(0...60) | 55<br>(0...350) | 8<br>(0...40) |
| UP | 17<br>(0...40) | 49<br>(0...150) | 16<br>(0...56) |
| BNSF/UP** | *n.a.* | 35<br>(0...45) | 9<br>(0...44) |
| Other** | 5<br>(0...30) | 78<br>(20...171) | 12<br>(0...27) |

*Price and days are weighted average based on reported annual rail handle.
**Provided for informational purposes, not statistically reliable due to small sample size.
Response Range provided as (...).

The guaranteed service markets characterized can be discussed in terms of relative price and reliability. The spot market, which is subject to the most volatility in its dynamic trading characteristics, is the most costly source for rail freight in terms of price and reliability, according to survey responses. The average premium reported by shippers was $96 per car and the average delivery delay was 22 days. These numbers compare to an average $35 premium and 9 delay days for longer-term auctions or contracts.

**Table 3.** Guaranteed Rail Service Price and Reliability for 2004, by Program

| | Price | Reliability |
|---|---|---|
| | *Dollars per Car** | *Days Delay** |
| Nearby Freight Purchased in Spot or Secondary Market | 96 (0...150) | 22 (0...90) |
| Shorter-Term Railroad 'Auction' Purchases | 60 (0...300) | 13 (0...90) |
| Longer-Term Railroad Auction or Contract Purchases | 35 (0...45) | 9 (0...44) |

*Price and days delay are weighted average based on reported annual rail handle. Response Range provided as (...).

Additional information regarding rail service programs usage by grain facility group and by primary rail carrier may also provide insight regarding rail service value and risk management in grain transportation. Table 4 details the rail shipments for 2004 considering rail program usage by the four grain facility groups. Shuttle train facilities acquired the majority, 55 percent, of their rail freight through longer-term contracts in 2004. Given the rail utilization and volumes that underlie the economics of these facilities, this is expected. Multicar and unit train groups had about the same level of tariff rail freight in their 2004 shipments, at about one in every five bushels. Unit train and multicar facilities most often accessed the shorter-term rail freight market for rail shipments. Single-car shippers secure the largest portion of their rail service in the spot market, as this program accounted for 47 percent of the volume originated by this group in 2004. The multicar facilities do report higher use of longer-term contracts; these contracts may be associated with periodic supplies to domestic processors over annual term agreements.

**Table 4.** Average Rail Service Program Usage, by Grain Facility Group in 2004*

| | Facility Group | | | |
|---|---|---|---|---|
| | Single Car | Multicar | Unit Train | Shuttle |
| Tariff | 26% | 20% | 21% | 6% |
| Spot | 47% | 13% | 22% | 26% |
| Shorter-term | 21% | 41% | 42% | 13% |
| Longer-term | 6% | 25% | 15% | 55% |

*Weighted average based on reported annual rail handle.

Table 5 presents a delineation of the rail service program usage by rail carrier for facilities where the BNSF or UP were identified as the primary railroad. The longer-term rail service markets accounted for the largest volume originated by each railroad, at 44 and 53 percent on the UP and BNSF, respectively. Tariff usage is noticeably higher in the UP volumes at 22 percent, compared to 12 percent for the BNSF. BNSF facilities appear to use the spot market more often, in securing
a form of guaranteed freight, than those served primarily by the UP. Approximately 25 percent of the volume moved on the BNSF was ordered in the spot market, compared to 9 percent for the UP, based on survey responses.

**Table 5.** Average Rail Service Program Usage, by Rail Carrier in 2004*

| | Primary Railroad | |
|---|---|---|
| | BNSF | UP |
| Tariff | 12% | 22% |
| Spot | 25% | 9% |
| Shorter-term | 19% | 16% |
| Longer-term | 44% | 53% |

*Weighted average based on reported annual rail handle.

## 2.3 Ordering Practices

The two final aspects of rail freight management considered are the timing of orders in creating the freight deck and the information sources used in managing rail freight for grain shipments. Overall, approximately 29 percent of rail grain freight is ordered 12 months or more before the shipment date (Figure 4). This proportion is based on distribution of order volumes reported by respondents among four shipment ordering periods of 1 month or less, 2 to 3 months, 4 to 11

months, and 12 months or more prior to shipment date. An equal share, 29 percent, is ordered within a month of the shipment date. Approximately 25 percent is ordered 2 to 3 months prior to the shipment date, with only about 12 percent ordered in 4 to 11 months prior to the shipment date.

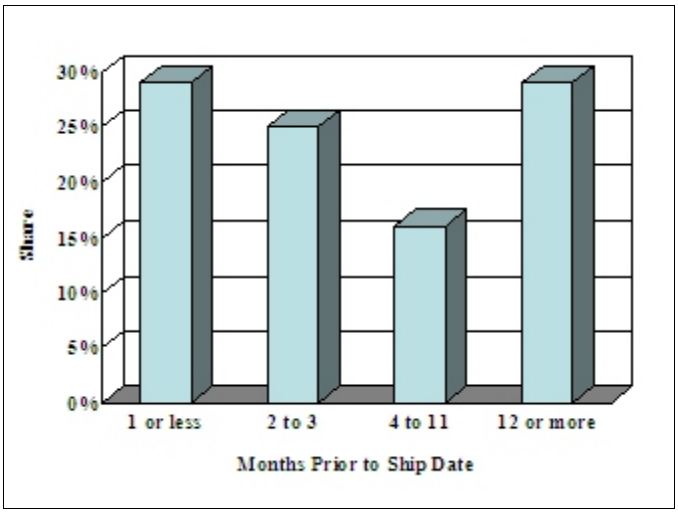


**Figure 4**. Timing of Rail Grain Freight Orders, Average in 2004

The chronology of rail freight orders made by grain facility group are presented in Table 6. A statistically significant difference in purchasing patterns of the facilities groups is confirmed at the 99$^{th}$ percentile moving out over time from 2 months to a year or more (F=4.166, p=.00; F=7.801,p=.00; F=3.966, p=.00). An exception is the nearest ordering period of one month or less for which differences are significant at the 90$^{th}$ percentile (F=2.162, p=.09). The largest segment of single car facility volumes are for rail purchases made within a month of the shipment date. Unit train facilities also move a large volume of their grain, 51 percent, through rail freight orders made within a month of the shipment date. Among the groups, multicar facilities move a larger share of their volume with freight purchased 2 to 11 months prior to shipment date. Shuttle facilities move more than one in three bushels under rail orders placed a year or more in advance of shipment date. This share is substantially larger than for either the multicar or unit train group, which order less than 10 percent of their rail freight over a year prior to shipment date. The information on chronology of shipment order dates shows that single and unit train facilities are rather dependent on nearby freight orders, as single car facilities place 85 percent of orders within 3 months of shipment and unit train facilities place 73 percent within 3 months of shipment based on survey responses. The differences in the ordering practices, with regard to timing, may be related to markets served, rail carrier program parameters, and past shipper experiences.

**Table 6.** Timing of Rail Freight Orders, by Grain Facility Group in 2004*

| Months Prior to Shipment | Facility Group | | | |
|---|---|---|---|---|
| | Single Car | Multicar | Unit Train | Shuttle |
| 1 month or less | 47% | 11% | 51% | 28% |
| 2 to 3 months | 38% | 42% | 22% | 13% |
| 4 to 11 months | 15% | 41% | 18% | 25% |
| 12 or more months | 0% | 7% | 9% | 34% |

*Weighted average based on reported annual rail handle.

The timing of rail ordering practices is presented based on primary rail carrier in Table 7. A statistically significant difference is found for orders made within one month ($F=5.873$, $p=.00$), and for orders made 12 months or more ($F=2.452$, $p=.06$) in advance of the shipment date. It is evident that ordering practices on the UP are heavily skewed toward the nearby shipping periods as 65 percent of the volume is moved under orders made within three months of the shipment date. In addition, the BNSF has approximately 25 percent of its orders in place 12 months or more prior to shipment date. These orders may lend themselves to power and equipment planning. The UP, in comparison, had knowledge regarding only 4 percent of its rail grain orders a year in advance. It is apparent that differences among the facility groups' ordering practices may be related to railroad program parameters and rail carrier-based equipment allocation practices.

**Table 7.** Timing of Rail Freight Orders, by Rail Carrier in 2004*

| Months Prior to Shipment | Primary Railroad | |
|---|---|---|
| | BNSF | UP |
| 1 month or less | 20% | 41% |
| 2 to 3 months | 21% | 24% |
| 4 to 11 months | 33% | 16% |
| 12 or more months | 25% | 4% |

*Weighted average based on reported annual rail handle.

As noted previously, many sources of information are tapped in managing rail freight. A list of information items was compiled based on a scan of existing publications and discussions with industry experts. Respondents were asked to rank the value of alternative data sources based on a scale of one to five with one indicating not useful to five indicating very useful. A summary of the responses is provided in Table 8. The items are sorted based on ranking by annual rail volume handled as included in the right-hand column.

Information regarding secondary rail market premiums is identified as the most valuable information item in managing rail freight. Another source of pricing information, railroad grain service auction results, is second in the ranking of information sources. The selection of these items as most valuable in managing rail freight is expected and provides reinforcement for previous decisions to collect and disseminate the information in public forums to increase the market transparency needed for an efficient market. Other valuable information in the top half of the ranking include grain production, sales, and exports. The rail-specific information, including number of hopper cars, dwell times, and deliveries to port are seen as useful, but less valuable in managing rail freight.

The distribution of responses across the five-number ranking is also detailed in Table 8. This frequency includes all responses, regardless of rail volume and in-house/external rail freight management. A difference is evident in the rankings between all respondents and that of the average rankings weighted by grain handle. The high ratio of greater-than-average value, 4 or 5, of 45 percent for all respondents compared to the low-weighted value for average rankings based on shipments indicates that smaller shippers perceive more value from an industry survey. This finding is not a surprise considering that these smaller shippers may see the potential to gain insights from the larger shippers. Larger shippers, however, may perceive that they already have access to this as a form of tacit knowledge that is already present in experiences, their day-to-day activities, and existing relationships. Survey respondents also listed shuttle activity level, barge freight rates, power supply, ocean rate spreads, rail power supply, and truck supply figures as other valuable information items. Only the periodic survey of industry experts is ranked with less than average usefulness. It should be noted that because the survey is the single information item that is not currently available the ranking is a perceived or expected value rather than one based on current management practices.

**Table 8.** Ranking of Information Sources Used in Managing Rail Freight

| Information Item | Response Frequency for All Respondents *1=Not Useful to 5=Very Useful* 1 | 2 | 3 | 4 | 5 | Response 4 or 5 | Overall Ranking* | Rail Shipper Ranking** |
|---|---|---|---|---|---|---|---|---|
| Secondary Rail Market Premiums | 16% | 16% | 25% | 28% | 15% | 43% | 3.2 | 4.0 |
| Railroad Grain Service Auctions | 18% | 14% | 29% | 29% | 9% | 38% | 3.0 | 3.8 |
| U.S. Grain Production and Stocks | 15% | 15% | 33% | 27% | 10% | 37% | 3.0 | 3.5 |
| U.S. Export Sales | 15% | 14% | 34% | 22% | 14% | 36% | 3.7 | 3.5 |
| Hopper Car Fleet Size | 15% | 24% | 43% | 13% | 5% | 18% | 3.3 | 3.4 |
| Grain Fleet Turn/Dwell Times | 17% | 19% | 36% | 21% | 8% | 29% | 3.3 | 3.3 |
| Rail Deliveries to Port | 19% | 24% | 33% | 18% | 6% | 24% | 3.4 | 3.3 |
| Periodic Industry Experts Survey | 11% | 11% | 33% | 33% | 12% | 45% | 2.5 | 2.7 |

*All respondents, weighted by average annual grain volume handled.
**Respondents who reportedly purchase rail freight in-house, weighted by average annual rail volume.

# 3. SUMMARY

A survey of grain handling facilities on the BNSF and UP railroads was conducted to gain insight into facility shipping characteristics and rail freight management practices. Investment in rail capacity is found to be a strong positive indicator for facility rail usage in outbound grain. Rail service, purchases and price and reliability, did not vary significantly for shippers served by the BNSF and the UP. The type of rail freight ordered, considering tariff and three forms of guaranteed freight, did vary significantly by facility group, as characterized by rail shipping capabilities, but not by railroad. A difference does exist in the ordering practices, with regard to chronology for rail purchases. BNSF shippers show more proclivity to place orders a year in advance, while UP shippers rely heavily on freight ordered within three months of the desired placement date. In considering market information available for making these rail grain service purchases, data on pricing in the secondary market and railroad auctions is deemed most valuable. Broader grain market information, such as stocks, export sales, and production, are also identified as relatively valuable information. These findings provide a greater understanding of how rail grain shippers function in complex grain market. This knowledge is valuable in enhancing an environment for effective decisions and market efficiency in the grain industry.

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