U.S. Containerized Grain and Oilseed Exports
- Industry Profile: Phase I -

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November 2001

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Executive Summary

Diversification of production agriculture has received much attention over recent years. As producers and customers adapt to technologically advanced production and marketing systems, it is important to consider opportunities available for adding value to raw grain through alternative handling and transportation options. One such opportunity that has been more widely recognized in recent years is marketing grain products via container. It has been estimated that this option is currently used in marketing about 1 percent of U.S. grain production, with growth to 3 percent expected over the next five years.

The objective of this report is to develop a profile of the U.S. containerized grain and oilseed export industry, including marketing activities, future expectations, information needs, and business practices. This report forms Phase I in a proposed two-phase analysis of the grain container industry. Information developed in this report regarding shipment origins, commodity volumes, and market destinations provides a base for conducting a survey of industry participants that might be used as a tool in development, planning, and enhancement of opportunities for containerized marketing of grain products.

Introduction

Competitive access to an array of agricultural markets is critical to agricultural shippers and rural economies. As producers and customers adapt to technologically advanced production and marketing systems, it is important to consider the potential the system offers for adding value to raw grain through alternative handling and transportation options. One sector that has garnered some attention in recent years is the sector delivering grain and oilseed products via container. Technological advancements in commodity shipping, grain production, crop handling, and communications, along with sophistication of buyer expectations and producer merchandising, and increasing container industry capacity may lend themselves to continued expansion of this sector.

It has been estimated that, currently, approximately 1 percent of the U.S. grain and oilseed production is marketed via container. The Bureau of Transportation Statistics reported that in 1997, 13.6 percent of freight shipments and 1.5 percent of grain shipments included multiple mode marketing channels. It also reports that, for the same year, 1.1 percent of all commodity shipments and cereal grain shipments were marketed via the truck/rail combination. The truck/rail combination would include container shipments (U.S. Census Bureau, 1999).

Domestic and international grain container trade is expected to grow. A recent survey of grain industry experts suggested that the volume of grain marketed via container could increase from the current estimate of less than 1 percent of all grain marketed to 3 percent of all grain over the next 5 years--an increase of more than 300 percent (Vachal, 2000). Survey respondents

attributed their outlook to an expected increase in use of the container marketing system to meet growth in demand for specialty products. Trends in Canada support survey results. Transport Canada estimates that 814,000 tons of fodder and feed including soybeans, 17 percent of total fodder and feed volume, was marketed via container in 1998. This volume represents a 107 percent increase in volume, compared to 1990 (Transport Canada, October 2000).

Although still rather small in comparison to overall grain movements[1] (considering major grains and soybeans) of more than 15 billion bushels per year, this volume may have important implications for future demands of the grain market infrastructure and public policy. This container volume converts to an expected increase in grain container traffic from 225,225 TEUs[2] per year to 675,676 TEUs per year. These shipments navigate a logistical system that is typically separate and unique from the traditional grain marketing channels.

Objective

Limited and rather disjointed information exists for profiling the grain container industry and identifying trends for regional and national logistical planning. The goal of this project is to develop a profile of the U.S. containerized grain and oilseed export industry, including marketing activities, future expectations, information needs, and business practices. This profile will be completed for a planned two-phase project. The first phase, to be completed in this

[1]This estimate includes barley, cottonseed, corn, flaxseed, oats, rye, sorghum, soybeans, sunflowers, and wheat (National Agricultural Statistics Service, USDA).

[2]TEU (20-foot equivalent unit)–commonly describes a 20-foot container.

report, provides an environmental scan of the grain container industry. The information is based on secondary data sources. Important characteristics, such as location of grain container shippers, commodity spectrum, export volumes by port and destination, and rates, are considered in the scan. The second stage of the project will be a survey of the industry. The survey will be used to enhance and update the industry profile created in this project.

Data

Several secondary data sources were employed to develop this preliminary profile of the U.S. grain container industry. The Bureau of Transportation Statistics databases provided the primary source of data regarding intermodal infrastructure. *Journal of Commerce* importer and exporter directory and database information provided information regarding the location of companies exporting grain via container. Two databases were used to assess the activity of shippers marketing grain by container, the U.S. Public Use Waybill and *Journal of Commerce* Port Import Export Reporting Services (PIERS).

Organization

The following report is composed of three sections. The initial section provides an overview of the U.S. container marketing network, considering infrastructure and market flows. The second section specifically addresses grain container shipping activities, considering volumes, commodities, origins, and destinations. The final section of the report summarizes the grain container industry profile developed in the report and makes recommendations regarding continuation into the second phase of the project.

Intermodal Network

Intermodal, as defined by Jones, et. al., is "the shipment of cargo and the movement of people involving more than one mode of transportation during a single, seamless journey" (Jones, et. al., 1999). For the purposes of this paper, intermodal will be more narrowly defined as containerized freight shipments. Approximately 13 percent of the world's trade volume was shipped by container in 1997; this represents a 44-percent increase in share of total volume since 1990 (Mueller, 1999). The prevalence of containers is consistent with industry investment as ocean container numbers grew from 3.8 million TEUs in 1983 to 10.9 million TEUs in 1999. These shipments may include movements on truck, rail, barge, and ocean vessel. As U.S. grain producers seek to access these marketing lanes, it is important to understand the related infrastructure. A network of intermodal facilities provides access for producers. Proximity to and capacities of these terminals are fundamental elements in understanding economics of marketing grain via container.

The network of intermodal facilities, as defined by the Bureau of Transportation Statistics of the U.S. Department of Transportation, includes 2,965 locations (figure 1). The facilities are designated by primary mode: highway, port, rail, or water. Considering rail ramps for intermodal shipments specifically, approximately 370 facilities remain from the more than 1,700 that were operating in the late 1970s (Mueller, 1999).

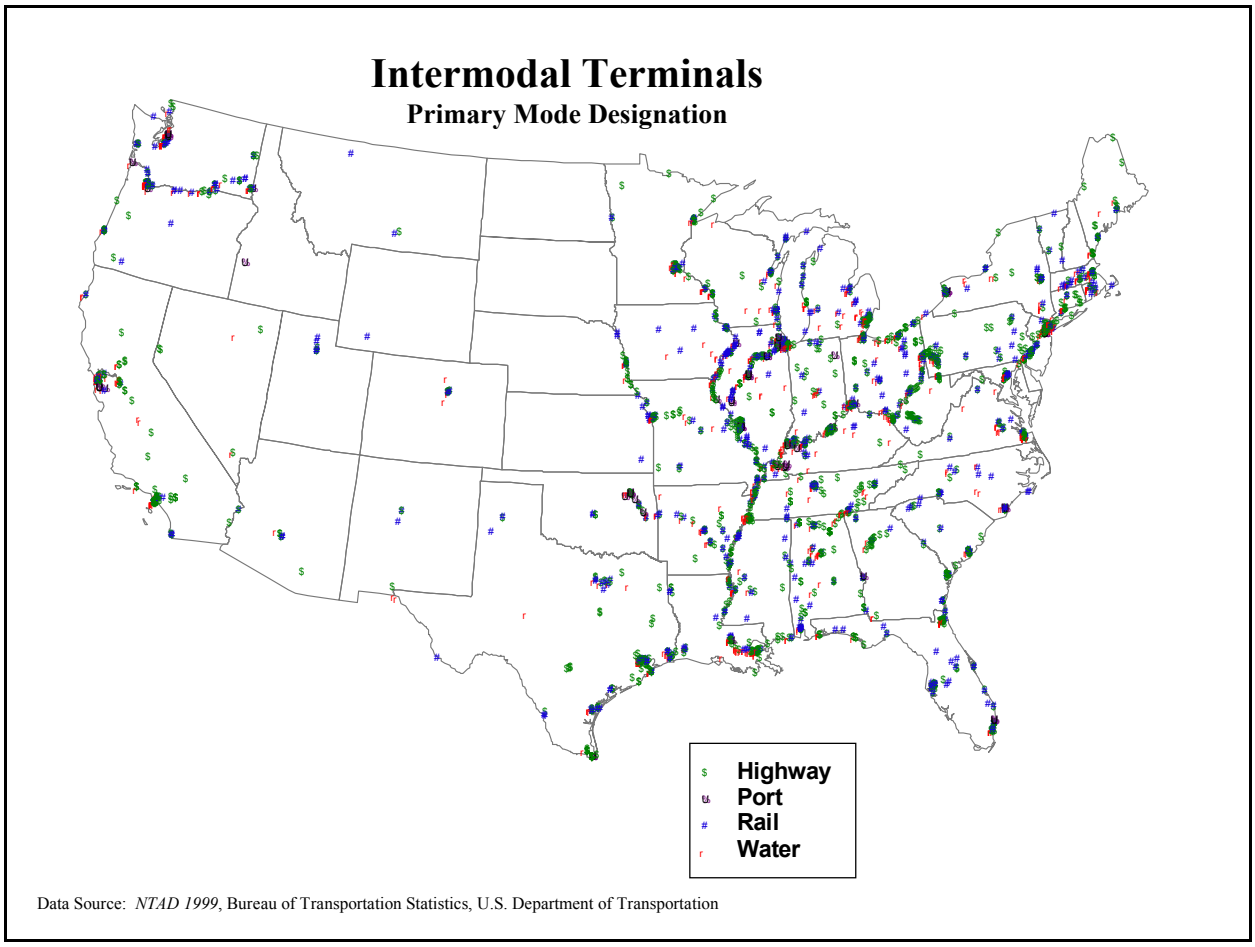

Figure 1. Intermodal Terminal Locations

Over a million tons of U.S. grain production is marketed via container. Much of the grain production area in the United States is located some distance from export facilities. Thus, the least cost route for participating in this specialized grain export market may be entry into the network at some inland container handling facility. Proximity to container handling centers provides inherent information regarding shipping rates, equipment supply, drayage costs, and longer term viability.

The container system operates within major corridors and incidental feeder lanes. Primary markets for rail origin in container traffic, based on rail shipment information in the U.S. Public Use Waybill, are Bureau of Economic Analysis (BEA)[3] regions including Chicago, IL; Portland,

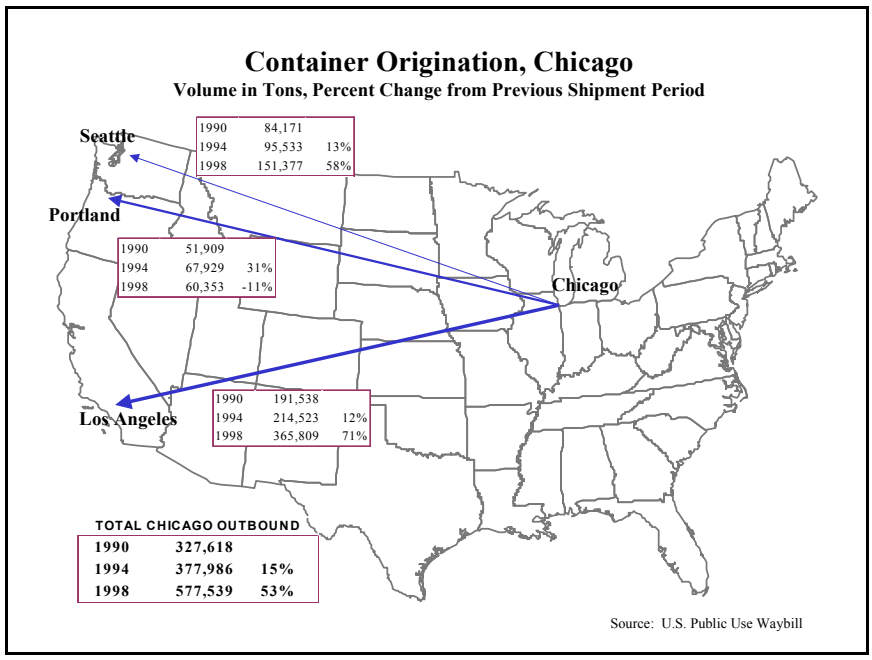

Figure 2. Container Origination, Chicago

OR; Seattle, WA; and Los Angeles, CA (figure 2). These BEAs accounted for an average of 47 percent of the all rail container originations in 1990, 1994, and 1998. The share for the four BEAs increased from 44 percent in 1990 to 50 percent in 1998 (U.S. Public Waybill, various years). The single largest terminal for container shipments is Chicago. Among the four largest facilities, Chicago accounted for approximately 43 percent of rail container originations in 1998 (U.S. Public Use Waybill). The primary destination for container rail shipments originating in

[3]BEAs are regions defined by the U.S. Census Bureau for economic analysis.

Chicago is Los Angeles. The proportion of traffic bound for Los Angeles grew significantly between 1990 and 1998.

Between the Pacific Northwest ports, Portland has become a less important destination for Chicago while Seattle has expanded its share as a recipient of Chicago-originated traffic. Los Angeles is second in volume among rail container origins, handling approximately one-third of the volume among the four leading volume facilities. Chicago was the destination for more than half of the containers that the railroads carried out of this origin region. The volume from Los

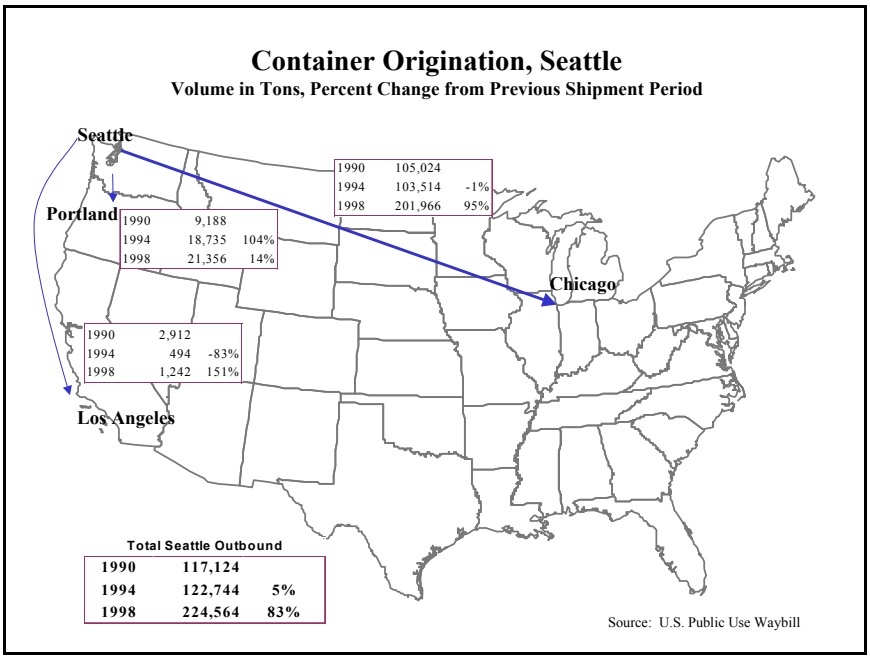

Figure 3. Container Origination, Seattle

Angeles to Portland was nearly eight times the volume from Los Angeles to Seattle. The volume to Seattle has increased significantly as compared from 1994 to 1998, while the shipments from Los Angeles to Portland declined slightly between 1994 and 1998 (Figures 3, 4, and 5).

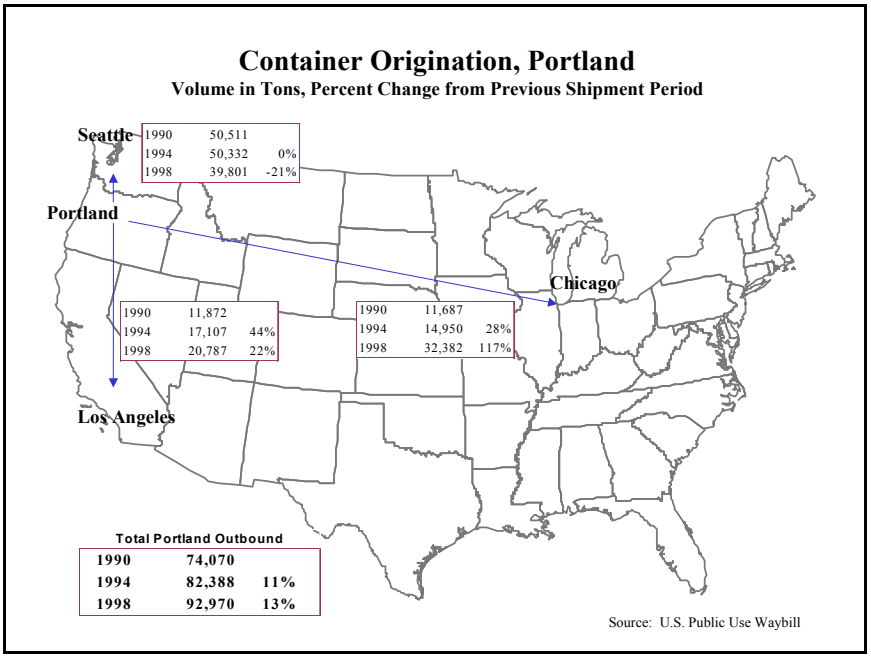

Figure 4. Container Origination, Portland

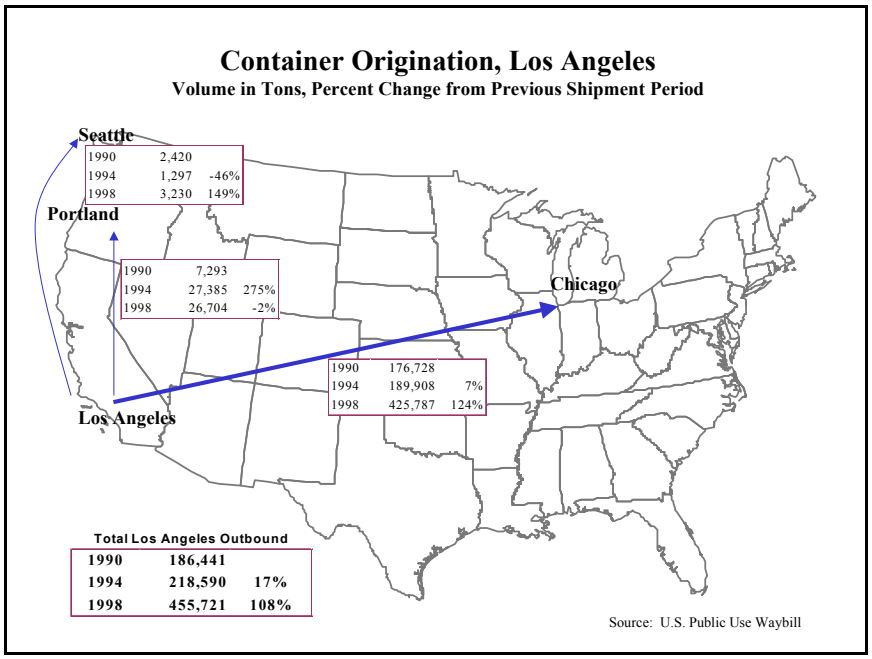

Figure 5. Container Origination, Los Angeles

Among the four largest rail container origin regions, Seattle and Portland handle substantially less of the volume than the other two. Seattle is attributed an average of 16 percent of the volume for the 3 years considered: 1990, 1994, and 1998, with Portland picking up the remaining 9 percent. Rail container shipments from the Seattle BEA nearly doubled between 1990 and 1998. Chicago is the primary termination region for shipments originating in Seattle, as it was the recipient of nearly 90 percent of the traffic originated in the Seattle region in 1998.

The rail container volume originated from the Portland BEA expanded by 26 percent between 1990 and 1998. In relative terms, the volume railroads originated from this BEA remains small and is growing at a slower pace than volume from the other three major rail container origins. The relative strength of each hub, and the volumes among the major corridors, have important implications for shippers considering grain container marketing because the future viability, stability, equipment supply, and rate structures may be favorable for routes with greater traffic density.

Based on container field crop volume,[4] major BEA origins for grain container shipments are Memphis, TN; Lubbock, TX; Portland, OR.; Dallas, TX; and Los Angeles, CA (figure 6). Three of these origins coincide with locations identified as the five largest volume container origins, considering all commodities, as Memphis, Portland, and Los Angeles are important origin regions for grain and for the larger rail-container industry.

[4]Based on a summary of commodities included in the "011 Field Crops" Standard Commodity Classification Code (STCC). The STCC is used for the commodity designation in the U.S. Public Use Waybill.

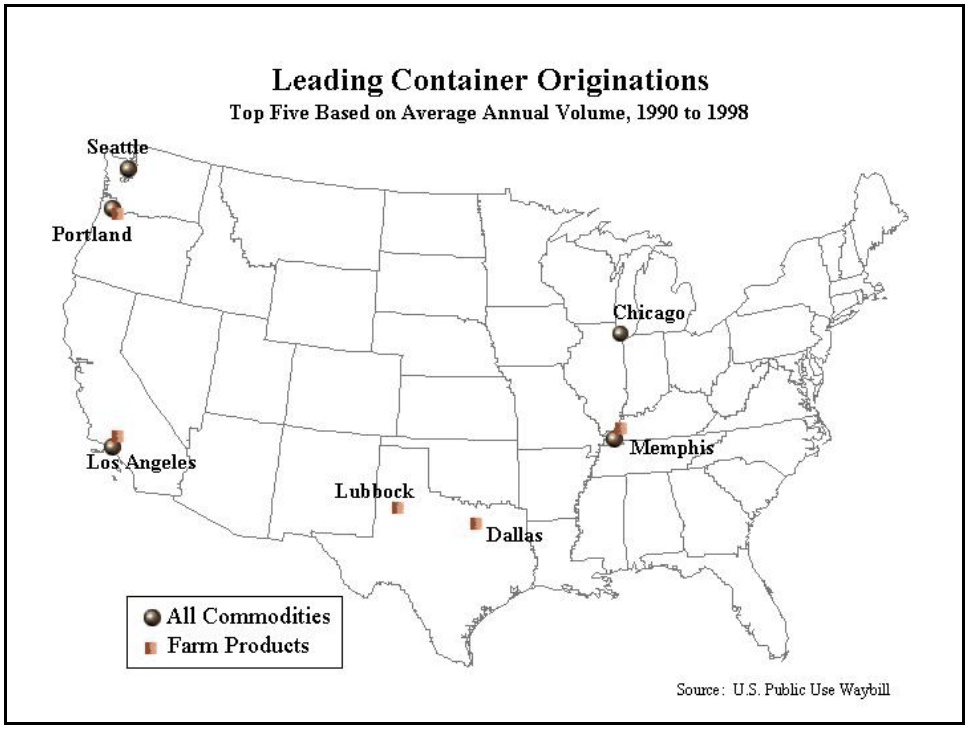

Figure 6. Location of Leading Container Origins

Shipper Population

A fundamental piece of information in discussing any product is identification of the suppliers and buyers that define the market. This project is concerned with the supplier component marketing grain via container in the export market. Two information sources were used in compiling information regarding the location of grain container shippers, the *Journal of Commerce 1999 Mid-Year Reference Directory of United States Importers* and monthly information received from PIERS for 2000.

Based on information from these sources, more than 2,000 companies from 743 cities were identified as active grain container shippers. Active grain container shippers were those shippers that originated more than 10 TEUs during the year (1999 or 2000, depending on the source).

The location of grain container shippers identified through the two data sources is provided in the map illustrated in figure 7. The map includes locations of rail intermodal facilities to show the proximity of shippers accessing the existing intermodal infrastructure from inland grain-

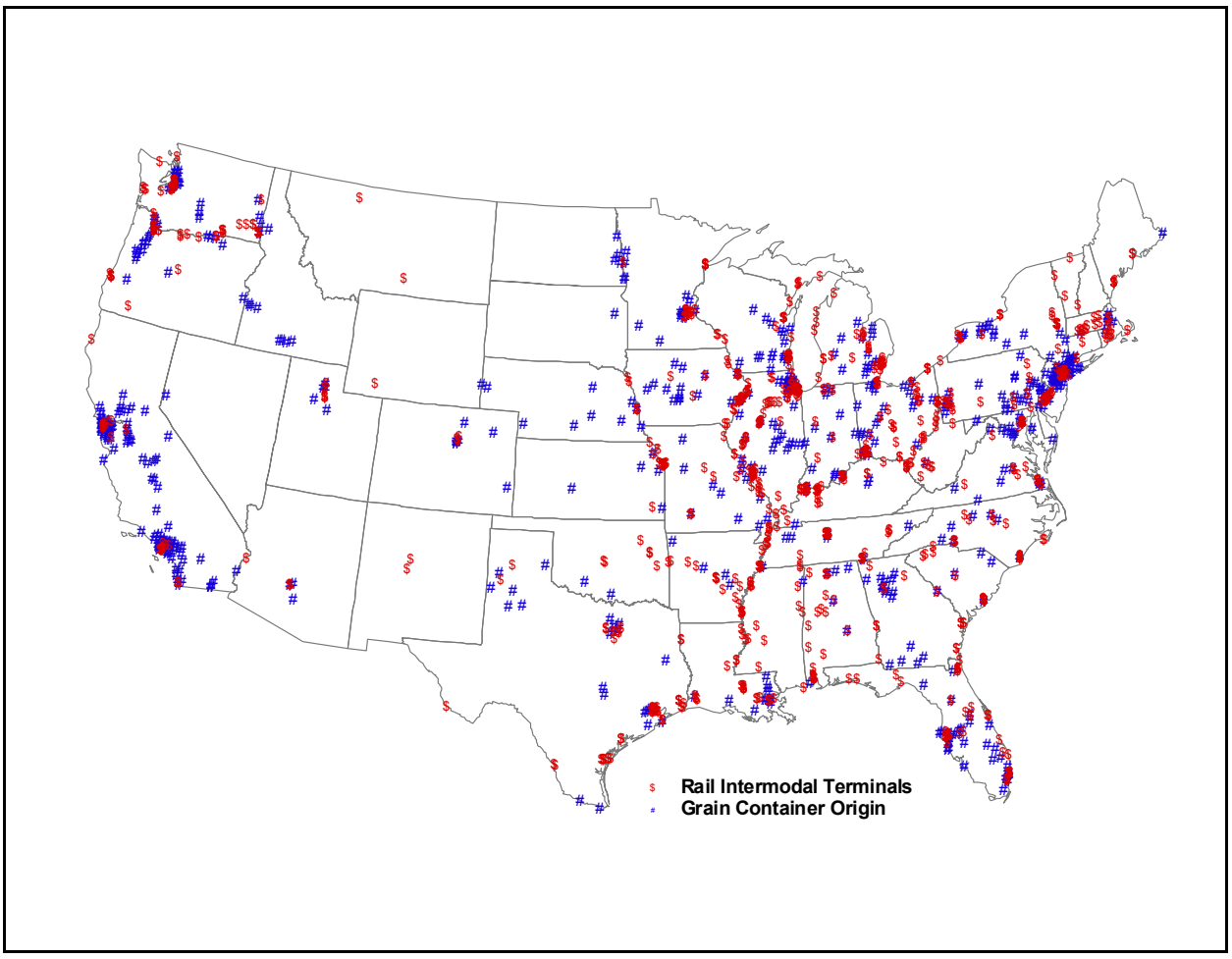

Figure 7. Location of Grain Container Shippers

producing regions.

Grain Container Shipments

The grain container business seems to be a global industry. The aforementioned Canadian volume, along with reports with reference to wheat container exports from Argentina, Australia, and the European Union, suggest suppliers are dispersed globally (Lyons, 2000). Identifying and quantifying U.S. producer participation in the market is not a simple task. Two data sources were used to estimate total volume, trends, and timing of shipments. These data sources were the *Journal of Commerce* PIERS reporting data and the U.S. Public Use Waybill. The U.S. Census Bureau was contacted regarding information from the Shipper Export Document (SED), but data were not publicly available to distinguish grain container shipments from bulk grain shipments.

Each of these data sources has limitations. One limitation for all sources is that the shipper listed in the documentation may refer to either the address of the originating shipper or the address of a third-party marketing firm. In addition, rebilling of a shipment for a portion of the trip may cause some double counting of shipments, particularly in the rail Waybill data. For instance, if a shipment originated in Wisconsin and was bound for Oregon, it may be billed to Chicago and then rebilled to Oregon, thus appearing as originating in both Chicago and Oregon. In considering comparisons between the two data sets, note that the commodity designation for the two databases uses different classification systems. The U.S. Public Use Waybill data utilize the Standardized Transportation Commodity Classification code, while the PIERS data are based on Harmonized Shipping codes. Understanding limitations and unique characteristics of each data source, these were determined to be the most consistent, yet economical, sources of market data.

These data are valuable in comprehending the scope and activity of the grain container export market at aggregate and dissaggregate levels.

Volume

U.S. Public Use Waybill data are employed to estimate trends in farm product container shipments. Although the Waybill information does not provide the best source for estimating export grain container shipments, due to domestic deliveries and deliveries of containers to port via truck, it does provide information regarding trends in this shipment type. A strong upward trend exists, as expected, in total rail container shipments (figure 8). The trend in rail farm product container shipments appears to be declining over recent years. Between 1990 and 1994, the volumes averaged more than 840,000 tons, compared to an average 584,000 over the 5 most recent years for which data were available, 1994 to 1998. The decline in grain container volumes may be attributed to factors such as its relative sensitivity to container shipping rates, due to the relative low value of the commodity compared to products such as automobiles, increasing foreign competition, or changes in the rail container rates/access.

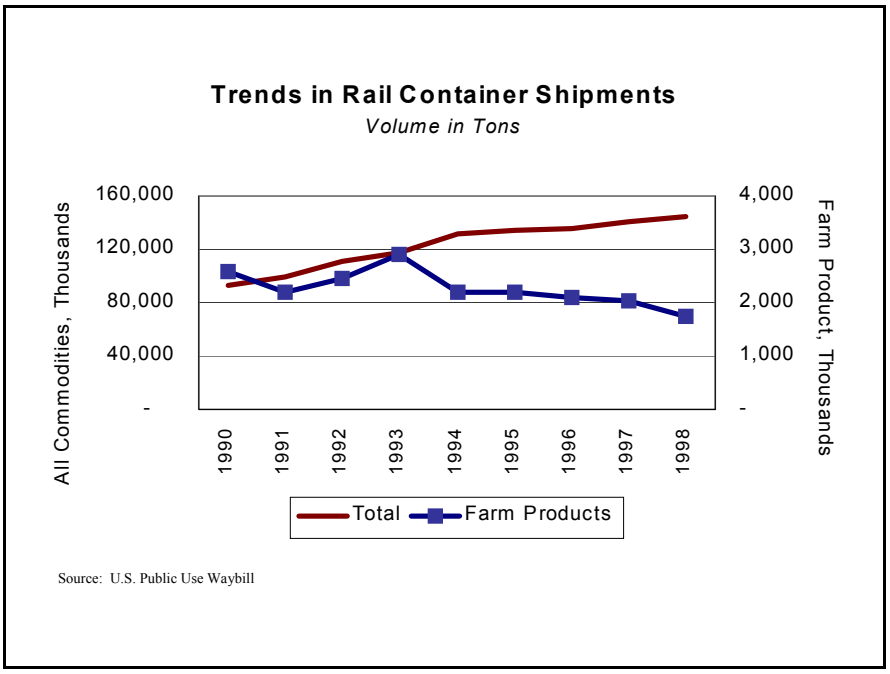

Figure 8. Trend in Rail Container Shipments of Farm Products

Origins

PIERS and U.S. Public Use Waybill data are used to gather information regarding the origin of grain container shipments. The PIERS data identify shipper location as the origin for the physical shipment. The Waybill and many other data sources use the billing address (i.e., broker) as the shipment origin.

Based on a summary of PIERS data for grain product shipments in 1999 and 2000, California leads all states in origination of container exports, averaging 17,122 containers per year for the past 2 years (figure 9). Washington, New York, and Minnesota form the next tier of States in volume of grain containers shipped during 1999 and 2000. These States each shipped more than 8,000 containers, individually accounting for 8 percent market shares in the grain

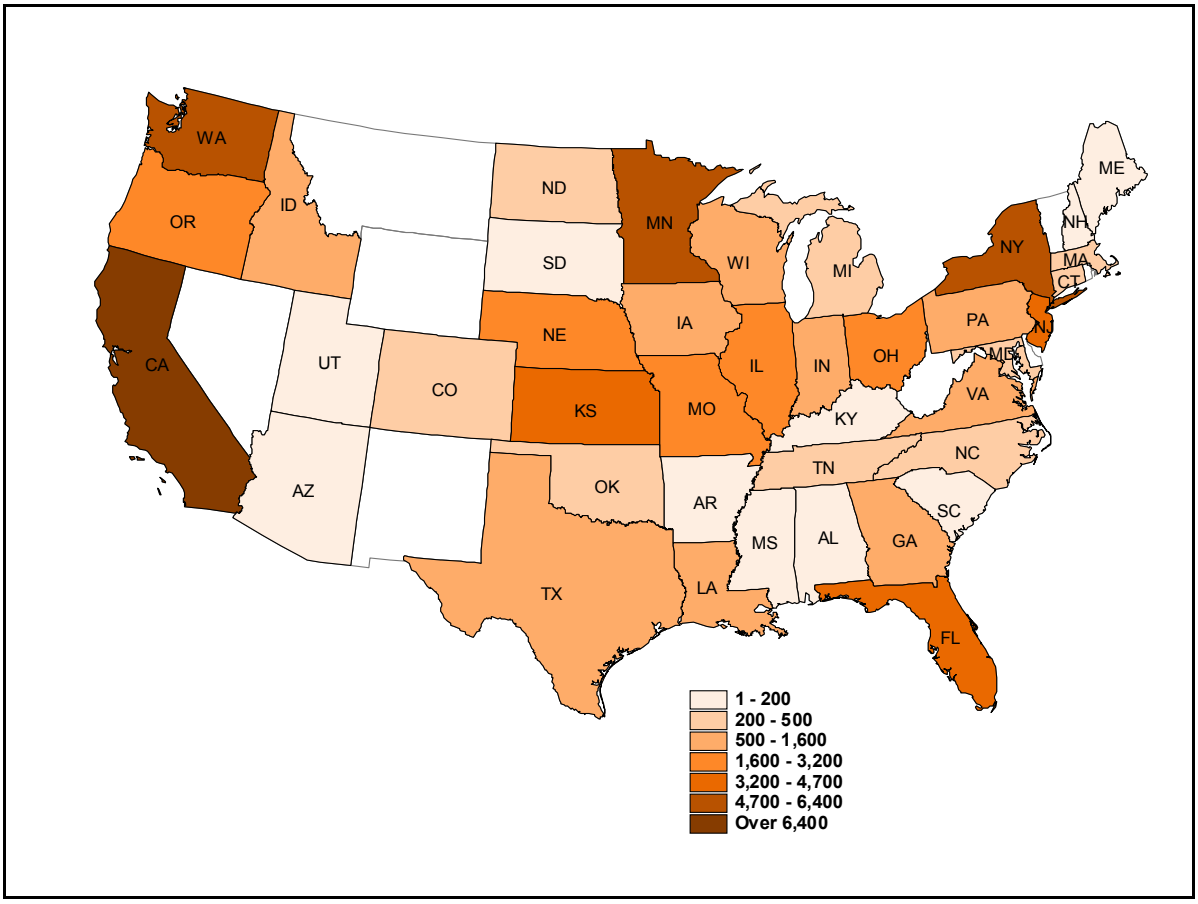

Figure 9. Grain Container Shipments, Average 1999-2000

container export market and accounting for 22 percent of total grain container shipments, as reported by PIERS. Florida, Kansas, and New Jersey each shipped around 4,000 containers per year. Their market shares were 6, 5, and 5 percent, respectively, in the grain container market. Oregon, Nebraska, and Illinois each attributed 4 percent to the market, shipping 3,236, 3,223, and 2,974 containers, respectively. The remaining 21 percent of the grain container market is distributed among 37 States. The volumes and market share for each of the States are presented in table 1.

Table 1. Grain Container Shipments by PIERS Shipper Origin

State	Average TEUs 1999-2000	Share of Grain Container Traffic
California	17,122	22%
Washington	6,434	8%
New York	6,421	8%
Minnesota	6,028	8%
Florida	4,736	6%
Kansas	4,227	5%
New Jersey	3,881	5%
Oregon	3,236	4%
Nebraska	3,223	4%
Illinois	2,974	4%
Ohio	2,607	3%
Missouri	2,203	3%
Texas	1,648	2%
Pennsylvania	1,380	2%
Iowa	1,198	2%
District of Columbia	1,144	1%
Idaho	1,047	1%
Louisiana	915	1%
Indiana	884	1%
Georgia	783	1%
Wisconsin	732	1%
Virginia	698	1%
North Dakota	539	1%
Michigan	494	1%
Colorado	358	<1%
Maryland	357	<1%
Oklahoma	355	<1%
Tennessee	348	<1%
Massachusetts	280	<1%
North Carolina	257	<1%
Connecticut	255	<1%
Kentucky	220	<1%
Arkansas	197	<1%
Arizona	154	<1%
Utah	106	<1%
South Carolina	91	<1%
Alabama	72	<1%
Hawaii	38	<1%
South Dakota	19	<1%

Delaware	11	<1%
Nevada	4	<1%
Mississippi	3	<1%
New Hampshire	3	<1%
Rhode Island	2	<1%
Vermont	2	<1%
Maine	1	<1%
West Virginia	1	<1%
Montana	-	
New Mexico	-	
Wyoming	-	

The U.S. Public Use Waybill also provided an estimate of container originations at the BEA level. Between 1990 and 1998, an average 34,968 TEUs of grain container shipments were carried annually by U.S. railroads. Considering the U.S. Public Use Waybill summary, the BEA origins the five largest volume grain container shipments, Memphis, TN.; Lubbock, TX; Dallas, TX; Portland, OR; and Los Angeles, CA, supplied an average 35 percent of the rail grain container shipments between 1990 and 1998. Among these markets, Memphis was the largest supplier, attributing more than 35 percent of the grain container shipments among the five BEAs between 1990 and 1998. The two Texas BEAs are second and third, with Lubbock and Dallas BEAs accounting for 21 and 16 percent of the top five market share, respectively. Two BEAs that encompass the West Coast ports of Portland and Los Angeles complete the top five. These BEA regions contributed 15 and 12 percent, respectively, of the grain container shipments among the five largest volume BEAs.

In 1994, two trends can be identified in the BEA data provided in Appendix A and the summary in table 2. Shipments declined in the most recent 5 years, and shipments became more

concentrated among the origins. This concentration is reflected in fewer BEA origins identified as having originated grain containers, more than 20 BEAs in 1993, compared to just 7 in 1998. The "Other" BEA accounts for shipments must be combined as a region to protect confidentiality of shippers due to the limited number of competitors in the market. This volume grew as a proportion of total shipments, accounting for 29 percent of the shipments in 1990 and 69 percent of the shipments in 1998, making origin identification more difficult in recent years.

Table 2. Grain Container Freight by BEA, Volume in TEUs

Market Share of Origin Rail BEAs: Five Largest Volume, 1990-1998 = 35%

	1990-1993	1994-1998	1990-1998	Market Share Among Top 5
Memphis, TN	6,902	2,750	4,595	37%
Lubbock, TX	1,655	3,405	2,627	21%
Dallas, TX	2,985	692	2,002	16%
Portland, OR	1,195	2,197	1,821	15%
Los Angeles, CA	2,992	276	1,483	12%
Other - Origin Specified	15,480	2,002	7,992	
Other - Origin Unspecified	11,211	18,131	15,055	
	42,420	29,453	35,577	

Source: Bureau of Transport Statistics, U.S. Public Use Waybill

Commodity

Regarding the composition of the grain container industry, the U.S. Public Use Waybill and PIERS data were employed to determine estimates of container shipping among commodities. Within the larger context of field crops, the U.S. Public Use Waybill data suggest that the cotton industry was the single largest user of containers based on average annual shipments between 1990 and 1998. The cotton industry accounted for approximately 29 percent of all field crop container shipments. Corn and hay comprised 22 percent of the total, each attributing 11 percent

of the annual volume of field crop container shipments handled by the major U.S. railroads. Including the 9 percent of field crop container volume credited to the potato industry, the five largest volume field crop commodities accounted for 50 percent of the total field crop volume between 1990 and 1998. The remaining field commodities with discernible container volumes are sorghum, wheat, lawn grass seed, field seed, and barley. Each of these commodities accounted for 4 to 7 percent of the average annual total field crop container shipments handled by U.S. rail carriers between 1990 and 1998.

Of specific interest is activity in the sector of field crops typically marketed as commodity-based, bulk grain shipments. The U.S. Public Use Waybill and PIERS data sets are considered. As mentioned earlier, both provide conservative estimates of activity in the grain container industry. Corn is the single largest volume commodity in terms of grain container shipments, based on U.S. Public Use Waybill data from 1990 to 1998 (figure 10). It accounted for more than one-third of the total grain container shipments. Sorghum and wheat container volumes are similar, attributing 22 and 20 percent, respectively, of the grain container shipments reported by U.S. railways. These three grains accounted for over three-quarters of the grain containers handled by railroads annually between 1990 and 1998. Barley, fourth among commodity grains, was the commodity in 13 percent of the rail grain container shipments. Rice, soybeans, and oats complete the commodity grains picture, accounting for 5, 5, and 1 percent, respectively, of annual rail grain container shipments.

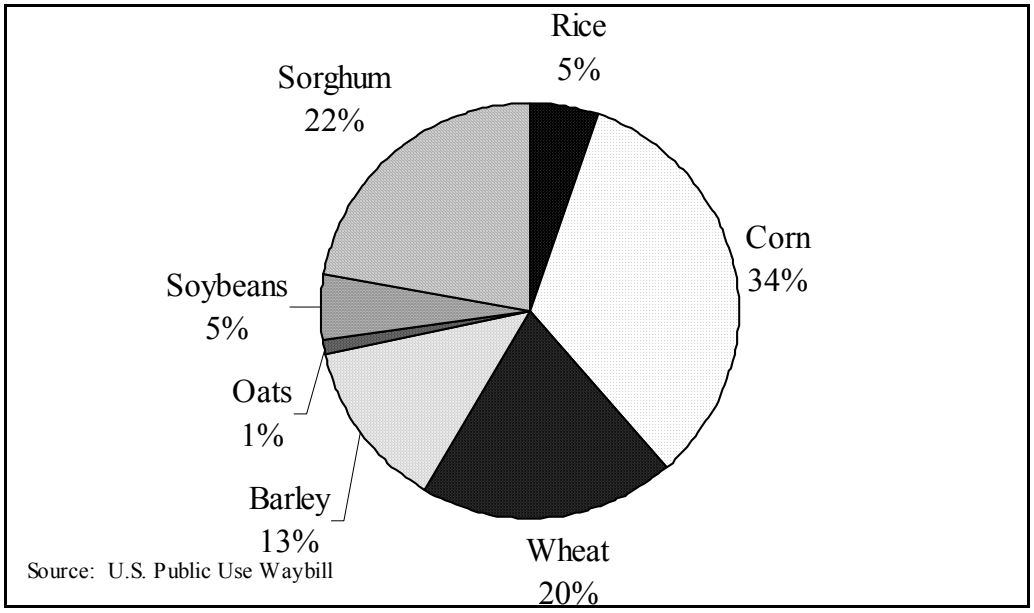

Figure 10. Composition of Grain Container Shipments Handled by Railroads

PIERS data summaries provide the best source of grain container marketing information that can be identified. Table 3 provides an estimate of export container shipments, considering field commodities and related animal feed products. The average annual containerized exports of field commodities through U.S. ports were 91,328 TEUs or approximately 1,826,000 tons for 1999 and 2000. Prepared animal feed (not including retail packaged dog and cat food) was the largest export commodity among the field commodity and feed products. It was attributed with more than one-third of the total grain product container shipments. Soybeans constituted the single largest volume among the field grain commodities, traditionally marketed from field to customer through the traditional bulk marketing system.

Table 3. Export Grain Product Container Shipments, 1999 and 2000

Harmonized Shipping Classification	Average TEUs
Animal Feed Prep. (Except Dog or Cat Food, Retail Package)	33,584
Soybeans, Whether or Not Broken	14,967
Residues of Starch Manufactured and Similar Residues	6,881
Beans Nesoi, Dried Shelled, Including Seed	6,075
Corn, Other than Seed Corn	5,763
Wheat or Meslin Flour	4,744
Lentils, Dried Shelled, Including Seed	3,936
Peas, Dried Shelled, Including Seed	3,649
Wheat (Other than Durum Wheat) and Meslin	3,364
Groats and Meal of Corn (Maize)	2,085
Kidney Beans and White Pea Beans, Dried Shelled, Including Seed	1,053
Malt, Not Roasted	993
Corn (Maize) Flour	914
Oats	576
Grain Sorghum	517
Buckwheat	459
Barley	329
Groats and Meal of Wheat	326
Cereals (Not Corn) in Grain Form, Prepared	275
Rye in the Grain	230
Hop Cones, Ground, Powdered, or in Pellets; Lupulin	166
Wheat Gluten, Whether or Not Dried	134
Groats and Meal of Oats	120
Groats and Meal of Cereal	106
Grains of Cereal, Worked	44
Bran Sharps and Othet Residues Derived from Milling Corn	20
Cereal Flours, Nesoi	15
Grains Worked (Hulled, Pearled, Sliced, Kibbled) of Barley	3
Total	91,328

Source: *Journal of Commerce*, PIERS

Specifically considering the grains and oilseeds, approximately 18 million were delivered to foreign ports via container, based on PIERS data summaries. Eight commodities are considered to comprise grain and oilseed shipments. The commodities include: barley, buckwheat, corn, oats, rye, sorghum, soybeans, and wheat. Among these commodities, soybeans comprise a majority, 57 percent, of the grain container export shipments. Based on the PIERS data for 1999 and 2000, approximately 14,967 TEUs or nearly 10 million bushels of soybeans were marketed via container. Corn is second among field commodities marketed via container, accounting for 22 percent of all grain container shipments. Wheat provides the other notable volume, with more than 2 million bushels marketed internationally via container. Smaller quantities of oats, sorghum, barley, and rye combine to form the remaining 6 percent of the containerized grain and oilseed export volume identified in PIERS analysis (figure 11).

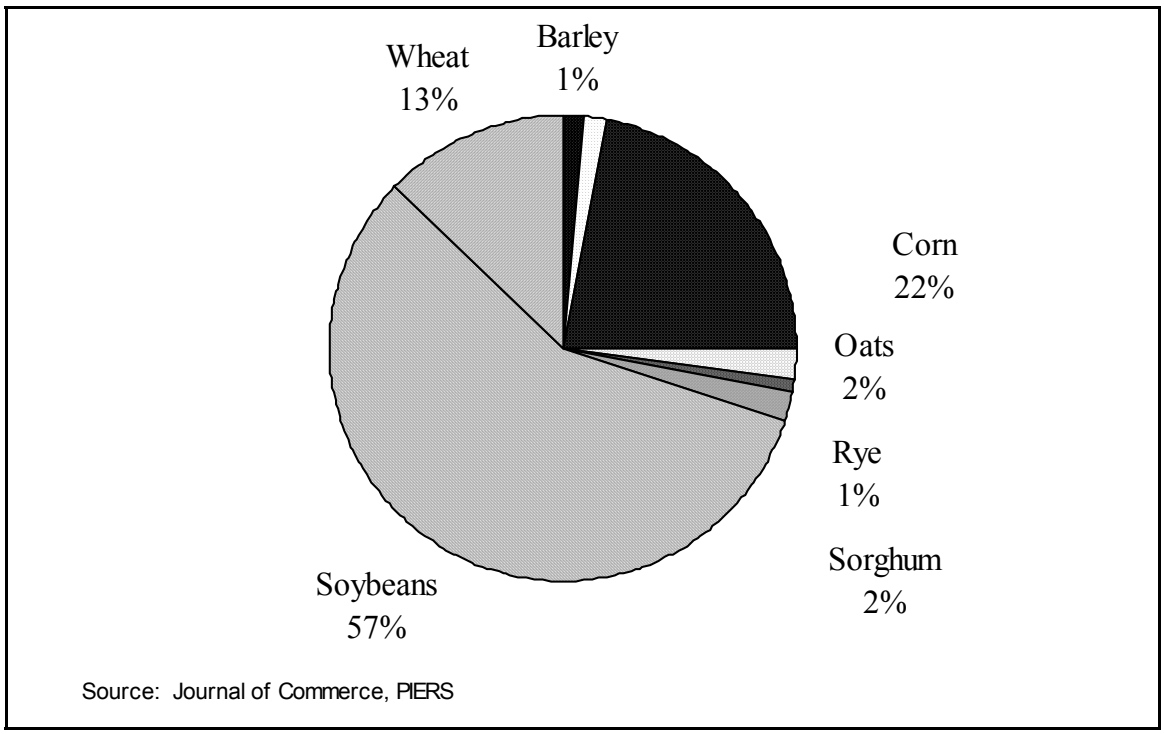

Figure 11. Composition of Containerized Grain and Oilseed Exports, Annual Average 1999-2000

Seasonality

Beyond volume and commodity, another important characteristic in understanding a market is the distribution of shipments across time. The Waybill and PIERS data are summarized to illustrate temporal distribution of shipments. The Waybill distribution is illustrated in figure 12. It is based on Public Use Waybill information from 1990 to 1998. Monthly shipments of all commodities trends upward from February to November, then falls off after the holiday season. Although grain container shipments spike in January and December, a statistically significant variation (t=2.29, %=.02) in the temporal aspect of grain container shipments was not found.

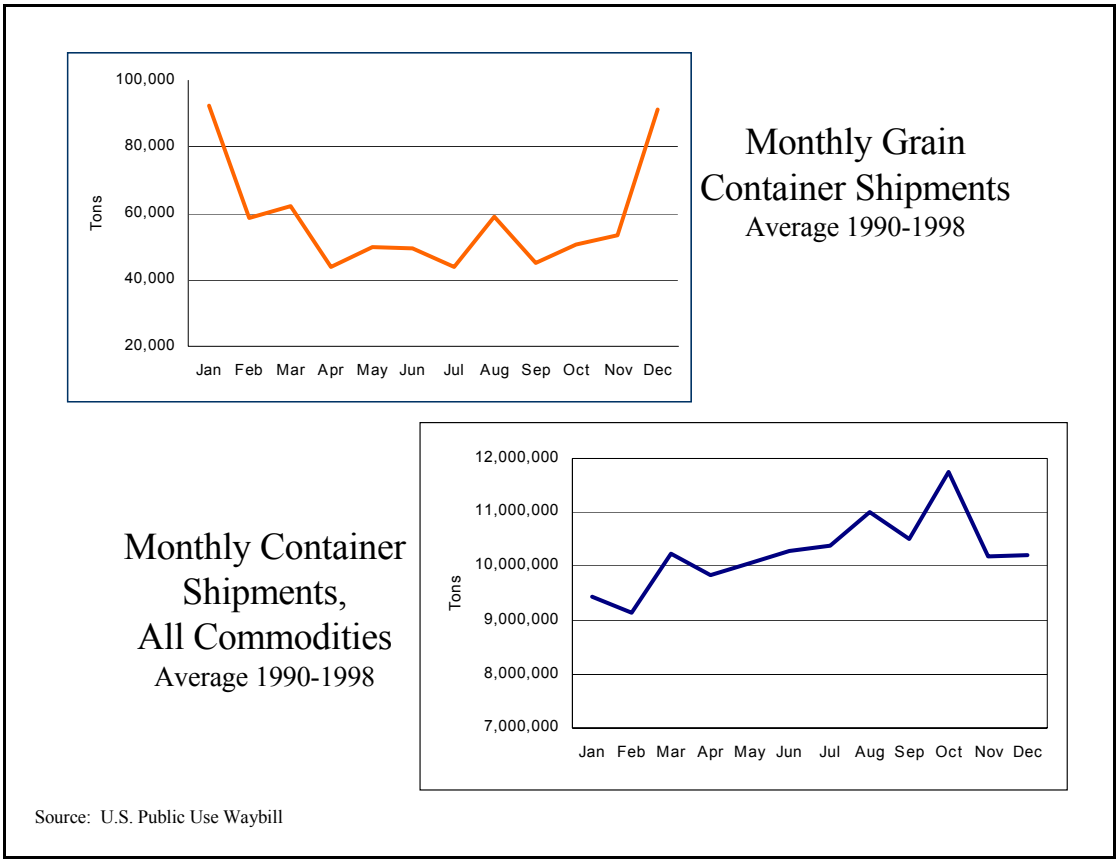

Figure 12. Monthly Containerized Shipments, Waybill Average from 1990 to 1998

According to a summary of more recent PIERS data from 1994 to 2000, export shipments of containerized grain tend to peak in the winter months (November-February) and drop off during the summer months (figure 13). The trend for all containerized agricultural commodities differs mainly in that during the holiday season, a more prominent decline in exports is evident. This peak season for shipping containerized grain is not surprising, as it coincides with the harvest and shipping season of the grain industry as a whole.

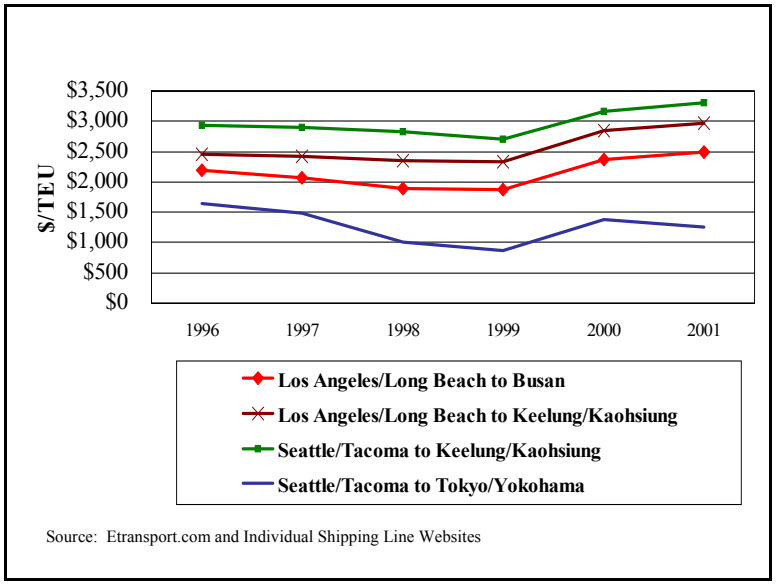

Figure 13. Sample Rates for Containerized Soybeans in Major U.S./Asian Trade Routes

Rates

Container rates are based on factors such as activity and capacity within trade lanes, carrier competition, and commodity value. Although some market controls, such as antitrust immunity, still exist in the ocean shipping industry, recent shipping laws have been passed to further encourage ocean container freight rates to fluctuate according to market demand. Certain rates

for agricultural commodities, such as higher valued refrigerated commodities, may fluctuate in response to peak seasons and demand. However, since the containerized grain industry holds only a minute market share in the ocean shipping industry, rates for grain are based more on the ocean industry as a whole than for this particular commodity.

In recent years, rates for U.S. exports to Asia have been most heavily affected by the Asian economic crisis. When economic difficulties began in 1997, demand for U.S. agricultural products also declined. As the imbalance between imports from Asia and U.S. exports to Asia increased, so did the imbalance in container supply. Ocean carriers had to ship many containers back to Asia empty, absorbing their repositioning costs to meet demand. To avoid moving empty containers to Asia, ocean carriers dropped rates dramatically, hoping to increase container shipments to this market.

Due to the low volume of exports, much of the competition between carriers was for lower valued, agricultural commodities, such as hay, cotton, feed, grain, and oilseeds, which typically are moved at lower rates than other agricultural commodities, such as fruit and meat. As a result, ocean container rates for grain exports fell from 1997 to 1999 by as much as 50 percent (figures 14 and 15). U.S. Department of Agriculture's *Agricultural Ocean Transportation Trends Report*, June 2000, reported that rates had "hit bottom" and have now begun to recover. As the Asian economies continue to improve, so does the demand for U.S. exports of agricultural products. Thus, as of July 2001, many container rates had bounced back to and, in some cases, above the rates reported nearly five years ago.

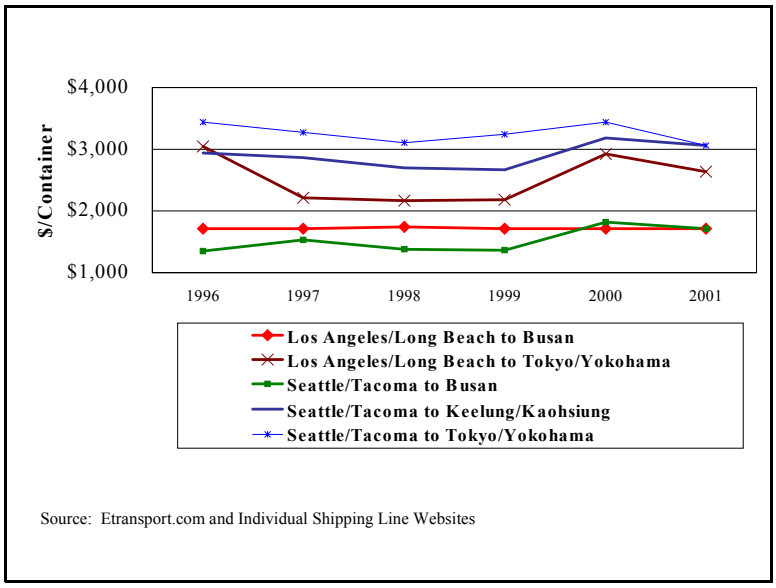

Figure 14. Sample Rates for Containerized Corn in Major U.S./Asian Trade Routes

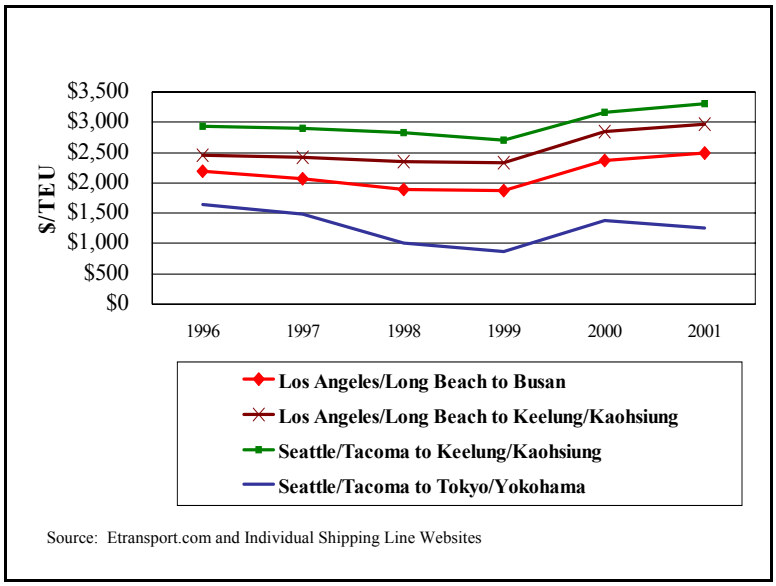

Figure 15. Sample Rates for Containerized Soybeans in Major U.S./Asian Trade Routes

When imports exceed exports, rates for U.S. exports also may respond. The case of the imbalance in container supply mentioned above is a good example of this. In addition, the utilization of capacity in the westbound trade to Asia was only at 51 percent in the first quarter of 2001. This is down from 57.78 percent in 1999 (Dekker, 2001). However, eastbound cargo is at 75 percent utilization. With capacity so high and utilization so low, rates are not expected to increase during the peak season of 2001. Further, the U.S. peak period for imports from Asia is late summer/early fall (July-October), when retailers are preparing for the holiday shopping season. During this period, the trade imbalance is the greatest for the calendar year, and ocean carriers struggle to supply containers to the Asian market. Often ocean carriers will charge peak-season surcharges to importers to make up the cost of supplying empty containers. They also may charge reduced rates to exporters to avoid moving empty containers overseas.

Activity in trade lanes is another factor that affects ocean rates for containerized shipments. A trade lane where activity and competition among carriers is greater will find rates to be lower. For example, shipments to Asia from the West Coast of the United States are significantly lower than rates for the same commodity from the East Coast. Since traffic to Asia is busier along the West Coast and trips to Asia more frequent, carriers can offer lower rates, as seen for soybeans to Japan (figure 16). This also explains the slight difference that generally exists in rates from Seattle and Tacoma, WA, verses Los Angles and Long Beach, CA, for soybean and corn (figures 16 and 17). Los Angeles and Long Beach are the two busiest ports in the United States with a combined traffic volume of 9.48 million TEUs; whereas, Seattle and Tacoma had a combined volume of only 2.86 million TEUs in 2000 (*Journal of Commerce*

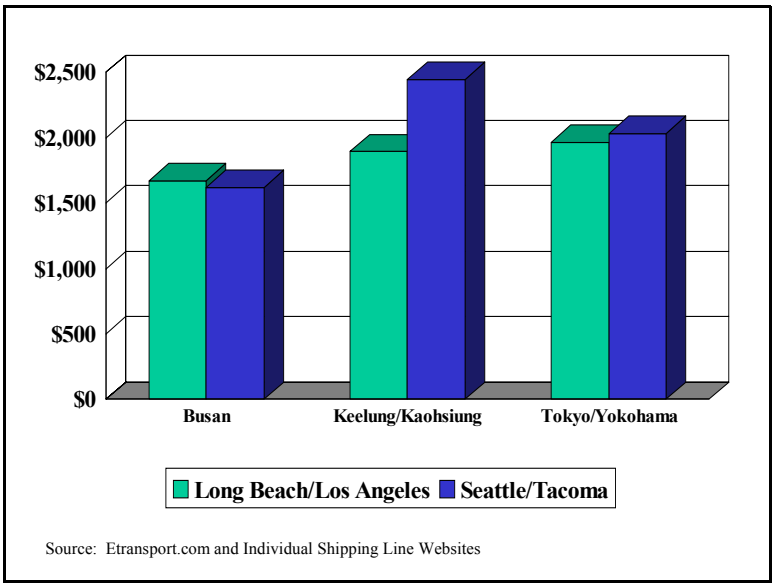

Figure 16. Average Rates for Containerized Corn from the United States to Selected Ports, July 2001

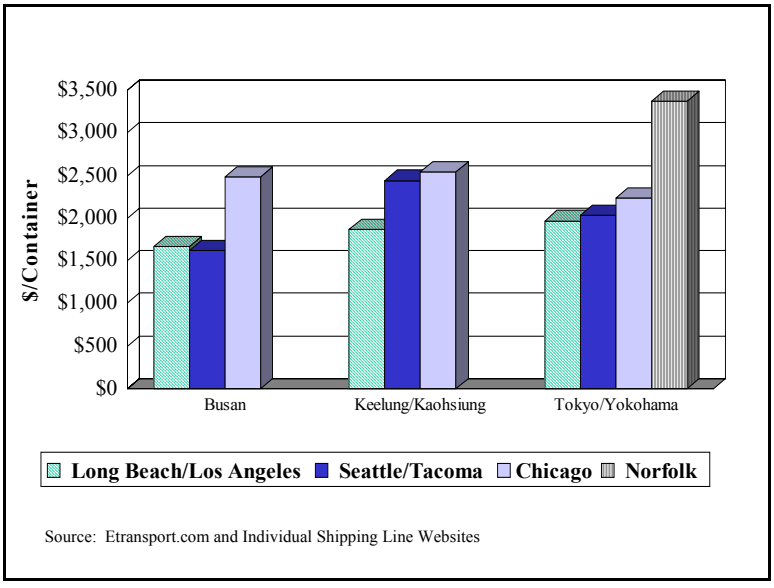

Figure 17. Average Rates for Containerized Soybeans from the United States to Selected Ports, July 2001

Week, 2001). Although Seattle and Tacoma handle more containerized grain shipments than Los Angeles and Long Beach (table 4), overall activity at the ports seems to be a more significant determinant for rates. Rates from intermodal points, such as Chicago, are not much higher than those from the major West Coast ports to markets such as Japan and Taiwan (figure 17). Despite the extra inland transportation costs incurred by the carrier, rates for inland points of departure typically do not vary much from those rates offered for ocean port departures. This is most likely due to the ocean carriers' desire to increase utilization of empty slots on outbound ships. Unlike the traditional channel for marketing bulk grain, ocean container rates can dictate the containerized grain export market. Since the value of grain and oilseeds is relatively low, high freight rates can be prohibitive for container shipments.

Marketing Channels

The final topic considered in the profile of the U.S. grain container industry is marketing channels. Recognizing that there may be some efficiencies gained through the clustering of activities, understanding current distribution networks may be beneficial in predicting and participating in the future of this sector. Origin information was provided in previous sections. This section will concentrate on the distribution networks employed to deliver containerized products to foreign buyers. Analysis of PIERS data was conducted to generate information included in this section.

Containerized products are delivered to port via truck or rail, depending on the cost effectiveness of the modal alternatives, considering factors such as time, product integrity, and equipment availability. For the purposes of this report, a discussion of the inland segment of grain container marketing is not expanded beyond origin identification. The economics of the inland portion should be carefully addressed for disaggregate analysis of containerized grain shipping. This analysis may be used in conjunction with the broader port to foreign market information provided in this report.

U.S. Ports

Field products (grain and grain products) typically are a backhaul commodity for shipments with the alternative product having a higher value, such as automobile parts or furniture. Therefore, identifying ports where grain and grain product containers currently are part of the commodity mix may offer insights into the relative feasibility of such shipments among ports.[5] Several U.S. ports were identified as being active in the grain container industry. Among these ports, four West Coast ports--Seattle, WA; Long Beach, CA; Los Angeles, CA; and Tacoma, WA--were attributed with 45 percent of the grain and grain product container shipments originated by U.S. ports during 1999 and 2000 (tables 4 and 5).

[5]Refer to Appendix B for a list of the commodities included in the summation of grain and grain products.

Table 4. Top 10 U.S. Grain and Grain Product Container Ports, Average Volume 1999-2000

U.S. Port	Average TEUs	Share of Total U.S. Port Volume
Seattle, WA	23,332	18%
Long Beach, CA	13,993	11%
Los Angeles, CA	11,159	8%
Tacoma, WA	10,299	8%
Norfolk, VA	10,267	8%
New York, NY	9,073	7%
Charleston, SC	8,982	7%
Oakland, CA	7,402	6%
Portland, OR	7,173	5%
Jacksonville, FL	5,721	4%

Source: *Journal of Commerce,* PIERS, 1999-2000

Table 5. U.S. Port Origins for Grain Container Shipments

U.S. Port	1999	2000	Average	Bushel Equivalent[1]
		TEUs		*Bushels*
Seattle	7,027	8,892	7,960	5,306,333
Tacoma	2,671	4,019	3,345	2,230,000
Long Beach	2,624	2,160	2,392	1,594,667
Los Angeles	2,441	1,779	2,110	1,406,667
Norfolk	1,308	1,890	1,599	1,066,000
Houston	1,055	1,398	1,227	817,667
Oakland	1,226	1,146	1,186	790,667
Portland	933	1,174	1,054	702,333
Charleston	1,490	469	980	653,000
New York	1,056	800	928	618,667
New Orleans	567	333	450	300,000
Lake Charles	658	16	337	224,667
Miami	225	352	289	192,333
Jacksonville	256	265	261	173,667
Gulfport	197	233	215	143,333
Freeport	131	200	166	110,333
Pt. Everglades	111	122	117	77,667
Newport News	34	135	85	56,333
Baltimore	41	78	60	39,667
Pennsauken	12	77	45	29,667
Savannah	23	55	39	26,000
San Francisco	4	55	30	19,667
Wilmington	18	35	27	17,667

[1] Estimate based on commodity weight of 60 pounds per bushel.
Source: *Journal of Commerce*, PIERS, 1999-2000

Seattle accounted for the largest share of containerized grain shipping, with 23,332 TEUs or approximately 39 million tons. Long Beach was second in ports, considering volume of containerized grain and grain product handled, originating 11 percent of the volume. Los Angeles and Tacoma were third and forth among U.S. ports in containers of grain and grain products, with each port accounting for 8 percent of total U.S. port containerized grain shipments.

Three East Coast ports fill the fifth, sixth, and seventh spots for containerized agricultural products. Norfolk, Vir., handled an average 10,267 TEUs annually during 1999 and 2000. New York and Charleston, S.C., each accounted for 7 percent of the grain container shipments made from U.S. ports. Two ports from each coast are included in the four ports that round out the top 10 U.S. ports for container grain shipments. Charleston, NC; Oakland, CA; Portland, OR; and Jacksonville, FL, originated nearly 20 million TEUs per year for 1999 and 2000. The ports are attributed with 7, 6, 5, and 4 percent, respectively, of average annual grain container shipments handled by U.S. ports. A complete overview of the volumes of containerized grain handled by each of the U.S. ports shipping more than one TEU per year for 1999 and 2000 are provided in Appendix C.

Activities of individual U.S. ports are identified by adding commodities totals for the five largest volume handlers of grain containers (table 6). As expected, soybeans are an important grain container commodity for a majority of the ports. Four of the five largest volume grain container handling ports attribute their largest grain container commodity to soybean shipments. Soybeans

account for 79 percent of the commodity shipments originated from the Port of Seattle. Corn is second in volume among the grain container shipments handled at Seattle, with the remaining container shipments composed of wheat, buckwheat, and oats. Eighty-seven percent of the grain containers originated by Tacoma contain soybeans, with 7 and 4 percent of the containers containing corn and wheat, respectively. An average of 1,842 TEUs of soybeans were exported through the Port of Long Beach during 1999 and 2000. The second California port in the top five, Los Angeles, exported an average of 973 TEUs of soybeans over the two-year period. Norfolk, the lone East Coast port among the five, attributed a majority of its grain shipments to corn.

Table 6. Composition of Grain Container Shipments for Five Largest Volume U.S. Ports

U.S. Port	Commodity[1]	1999	2000	Average	Composition
			TEUs		
Seattle					
	Soybeans	5,672	6,915	6,294	79%
	Corn	980	986	983	12%
	Wheat	90	684	387	5%
	Buckwheat	231	219	225	3%
	Oats	23	64	44	1%
Tacoma					
	Soybeans	2,193	3,652	2,923	87%
	Corn	179	290	235	7%
	Wheat	253	22	138	4%
Long Beach					
	Soybeans	2,096	1,588	1,842	77%
	Corn	460	370	415	17%
	Wheat	18	174	96	4%
	Sorghum	36	5	21	1%
Los Angeles					
	Soybeans	1,012	933	973	46%
	Corn	313	717	515	24%
	Wheat	840	66	453	21%
	Rye	140	-	70	3%
	Sorghum	45	49	47	2%
	Oats	85	4	45	2%
Norfolk					
	Corn	299	1,145	722	45%
	Soybeans	783	466	625	39%
	Oats	2	256	129	8%
	Wheat	220	-	110	7%

[1]Commodities averaging at least 20 TEUs per year are reported.
Source: *Journal of Commerce,* PIERS, 1999-2000

Foreign Ports

The foreign port provides another important piece of information in understanding the flow of containerized grain and grain product trade. The flexibility and wide application of container shipping is evident in viewing distribution of containerized grain and grain products. Considering those foreign ports receiving an average of at least 20 TEUs for 1999 and 2000, 320 foreign ports were identified as destinations for U.S. shipments of grain and grain products.[6] Thirty-one ports received at least 1,000 TEUs from U.S. port origins for the years considered. These largest volume foreign port recipients handled 62 percent of the total containerized U.S. grain and grain product shipments for 1999 and 2000. The largest single port is Tokyo, Japan. It imported 10,963 or 8 percent of containerized grain and grain products from U.S. ports. San Juan, Puerto Rico, and another Japanese port, Yokohama, are the second and third largest volume receivers, handling 6 and 5 percent, respectively. The distribution of the grain and grain product container shipments among other foreign ports is presented in table 7. Table 8 lists the top 10 destinations for container shipments by volume.

[6]Source: *Journal of Commerce*, PIERS, 1999-2000

Table 7. Destination for U.S. Grain and Grain Product Container Exports, 1999-2000

Foreign Port	Country	TEUs	
Tokyo	Japan	10,963	8%
San Juan	Puerto Rico	7,210	6%
Yokohama	Japan	6,108	5%
Kobe	Japan	5,034	4%
Busan	Korean Republic	4,162	3%
Kaohsiung	Taiwan	3,810	3%
Nagoya	Japan	3,765	3%
Osaka	Japan	3,153	2%
Taichung	Taiwan	2,736	2%
Bangkok	Thailand	2,434	2%
Port Kelang	Malaysia	2,154	2%
Hakata	Japan	2,139	2%
Nassau	Bahamas	2,101	2%
Haina	Dominican Republic	2,035	2%
Hong Kong	China	1,965	2%
Yamato	Japan	1,800	1%
Manila	Philippines	1,797	1%
Buenos Aires	Argentina	1,686	1%
Santos	Brazil	1,489	1%
Puerto Cabello	Venezuela	1,406	1%
Callao	Peru	1,335	1%
Rotterdam	Netherlands	1,329	1%
Felixstowe	United Kingdom	1,260	1%
Valencia	Spain	1,203	1%
Bremerhaven	Germany	1,196	1%
Antwerp	Belgium	1,182	1%
Tomakomai	Japan	1,165	1%
Guatemala City	Guatemala	1,143	1%
Bar	Yugoslavia	1,112	1%
Thessaloniki	Greece	1,106	1%
Keelung	Taiwan	1,088	1%

Source: *Journal of Commerce*, PIERS, 1999-2000

Table 8. Top 10 Volume Foreign Port Destinations for U.S. Grain Container Shipments

Foreign Port	1999	2000	Average	Bushel Equivalent[1]	Share of Total U.S. Grain Container Exports
		TEUs		*Bushels*	
Yokohama	3,060	3,406	3,233	2,155,333	15%
Tokyo	3,075	3,232	3,154	2,102,333	15%
Kobe	1,669	2,235	1,952	1,301,333	9%
Nagoya	1,242	2,038	1,640	1,093,333	8%
Busan	1,572	1,191	1,382	921,000	7%
Tomakomai	417	897	657	438,000	3%
Osaka	648	664	656	437,333	3%
Calcutta	831	431	631	420,667	3%
Hong Kong	537	649	593	395,333	3%
Kaohsiung	390	626	508	338,667	2%

[1] Estimate based on commodity weight of 60 pounds per bushel.
Source: *Journal of Commerce,* PIERS, 1999-2000

Regarding shipments of traditional bulk grain commodities via container, a subset of the previous grain and grain product summary shows the distribution of U.S. ports' container grain shipments among foreign ports. Two Japanese ports, Yokohama and Tokyo, account for nearly one-third of the grain containers received from U.S. ports among the foreign port destinations. Yokohama and Tokyo each received more than 2 million bushels via container from U.S. ports annually, on average, during 1999 and 2000. The distribution of U.S. container grain shipments among foreign ports is presented in appendix D. To gain greater insight into the flows for individual commodities, the leading volume foreign port destinations are identified for each of the grains (table 9).

Table 9. Distribution of Grain Container Shipments Among Foreign Ports by Commodity

Barley	Tokyo	160
	Osaka	75
Buckwheat	Yokohama	199
	Tokyo	53
	Tomakomai	52
	Nagoya	42
	Novosibirsk	26
Corn	Busan	761
	San Juan	300
	Guatemala City	200
	Tokyo	193
	Puerto Cabello	191
	Kaliningrad	185
	Bangkok	182
	San Salvador	163
	San Jose	145
	Manila	143
	Puerto Cortes	142
	Dubai	122
	Hong Kong	119
	Aarhus	115
	Port Limon	111
	Kobe	106
	Yokohama	100
Oats	Kaliningrad	126
	Kingston	81
	Haina	48
	San Juan	39
	Puerto Cabello	30
Rye	Tokyo	74
	Busan	60
	Hakata	25
	Jebel Ali	23
Sorghum	Rio Grande Do Sud	22
	Port Kaiser	81
	Puerto Cabello	59
	Buenos Aires	51
	Arica	29
Soybeans	Yokohama	2,878
	Tokyo	2,615
	Kobe	1,775
	Nagoya	1,553
	Tomakomai	580
	Osaka	565
	Busan	545
	Kaohsiung	447
	Hakata	425
	Novgorod	319
	Taichung	258
	Moji	238
	Singapore	171
	Bangkok	135
	Port Kelang	135
	Sissa	131
	Chinnampo	104

Source: *Journal of Commerce*, PIERS, 1999-2000

Summary

Approximately 13 percent of the world's trade volume was shipped by container in 1997. U.S. grain producers participate in this market, as it is estimated that over a million tons of U.S. grain production is marketed via container annually. As U.S. grain producers seek to access logistical resources in growing this value-added marketing option, it is important to understand the existing infrastructure and market flow patterns. This information will be valuable in using existing resources and in future policy and investment decisions related to the grain container sector.

The goal of this two-phase project is to develop a profile of the U.S. containerized grain and oilseed export industry, including marketing activities, future expectations, information needs, and business practices. The first phase, completed in this report, is an environmental scan of the U.S. grain container industry based on secondary data sources. This information provides the background for developing and applying an industry survey in Phase Two of the project. Fundamental to understanding the grain container industry is definition of the market in terms of suppliers, product, and marketing patterns. This market is considered in terms that are broad in that the economics of the container industry depend heavily on marketing channel synergies of unrelated products and, specifically, in the unique characteristics of the grain container sector.

More than 2,000 companies from 743 cities were identified as active grain container shippers. California leads all States in origination of container exports. Washington, New York, and Minnesota are next among the States as origins for grain container shipments. Corn is the single

largest volume commodity in terms of grain container shipments, accounting for more than one-third of the total grain container shipments. Sorghum and wheat container volumes are next in the grains marketed via container.

Container shipping rates are based on factors such as activity and capacity in trade lanes, carrier competition, and commodity value. Since the containerized grain industry volume is tiny in the scope of ocean shipping activities, rates for grain are based more on the industry as a whole than on this particular commodity. Four U.S. ports were identified as particularly active in grain containers, these ports--Seattle, WA; Long Beach, CA; Los Angeles, CA; and Tacoma, WA--were attributed with 45 percent of the grain and grain product container shipments originated by U.S. ports during 1999 and 2000. Regarding the destinations for grain containers, two Japanese ports, Yokohama and Tokyo, account for nearly one-third of the grain container volume originated by U.S. ports.

The basic industry information included in this report provides a profile of the U.S. grain container industry. It is useful in identifying data voids that exist in addressing future needs and interests of this sector of the U.S. grain market. As U.S. producers seek to add value to their product through logistics and marketing, the container market provides many opportunities and challenges. Phase Two of this project will provide an opportunity to integrate the industry into data collection and distribution efforts with regard to the grain container industry. The communication between the industry, policy authors, and investment makers is critical in ensuring efficient and effective resource allocation for this sector of the grain industry.

Appendix A: Rail Grain Container Freight by BEA

Tons

BEA Region	1990	1991	1992	1993	1994	1995	1996	1997	1998	Average
Other	196,529	199,214	238,675	262,436	309,600	424,440	310,836	440,497	327,737	301,107
Memphis, TN	158,563	120,040	146,693	126,882	72,960	63,169	53,968	57,167	27,724	91,907
Lubbock, TX	24,317	30,840	46,643	30,600	57,360	71,335	92,354	83,111	36,365	52,547
Portland, OR	18,560	19,759	33,360		45,444	2,720	36,360	60,233	74,976	32,379
Dallas, TX	15,601	179,318	24,956	18,920	9,840		31,176		481	31,144
Los Angeles, CA	62,713	87,048	52,635	36,980	3,320	9,368	8,866	3,521	2,521	29,664
Wichita, KS	62,594	51,158	39,420	89,303	3,120	3,777				27,708
Houston, TX	88,365			13,840	69,439	23,113	2,652		1,400	22,090
Grand Island, NE			6,234	129,031						15,029
Sioux City, IA				119,096						13,233
Chicago, IL			88,252		1,639			920		10,090
Grand Forks, ND	3,040		4,640	38,702	18,359	10,118	7,361	1,761		9,331
Lincoln, NE				71,016						7,891
Amarillo, TX		52,559	4,720			5,242		2,721		7,249
Omaha, NE				44,651		760	400			5,090
Yakima, WA	920	2,760	960	38,880						4,836
Peoria, IL			42,730							4,748
Fargo, ND	6,238	13,240	5,680	8,833	3,637	1,800		925		4,484
Kansas City, MO				38,510						4,279
Houston, TX	5,000	4,201					19,847	5,160		3,801
Minot, ND			5,523	24,945						3,385
Pocatello, ID	11,120	9,080	7,360			1,320				3,209
Minneapolis, MN	720	800		21,946	1,760				840	2,896
Chicago, IL	20,039									2,227
Salt Lake City, UT				19,882						2,209
Rochester, MN				13,789						1,532
Richland, WA	1,840	1,680	1,880	3,640	920					1,107
Brownsville, TX		600			6,040					738
Great Falls, MT				5,695						633

Norfolk, VA			3,840					800		516
Albany, GA	2,640									293
Spokane, WA			1,840		800					293
Jackson, MS			1,842							205
Philadelphia, PA							800		920	191
Detroit, MI								924		103
Columbus, OH					921					102
Sacramento, CA	882									98
Little Rock, AR		880								98
Phoenix, AZ		800								89
St. Louis, MO	600									67
Total	**680,281**	**773,977**	**757,883**	**1,157,577**	**605,159**	**617,162**	**564,620**	**657,740**	**472,964**	**698,596**

Source: Bureau of Transport Statistics, U.S. Public Use Waybill

Appendix B: Harmonized Shipping Codes and Classification Considered in the PIERS Summaries

HS Code	Classification
071310	Peas, Dried Shelled, Including Seed
071333	Kidney Beans and White Pea Beans, Dried Shelled, Including Seed
071339	Beans Nesoi, Dried Shelled, Including Seed
071340	Lentils, Dried Shelled, Including Seed
100190	Wheat (Other than Durum Wheat) and Meslin
100200	Rye in the Grain
100300	Barley
100400	Oats
100590	Corn (Maize), Other than Seed Corn
100700	Grain Sorghum
100810	Buckwheat
110100	Wheat or Meslin Flour
110220	Corn (Maize) Flour
110290	Cereal Flours, Nesoi
110311	Groats and Meal of Wheat
110312	Groats and Meal of Oats
110313	Groats and Meal of Corn (Maize)
110319	Groats and Meal of Cereal, Nesoi
110421	Grains Worked (Hulled, Pearled, Sliced) of Barley
110429	Grains Worked, Etc., of Cereal, Nesoi
110710	Malt, Not Roasted
110900	Wheat Gluten, Whether or Not Dried
120100	Soybeans, Whether or Not Broken
1210	Hop Cones, Fresh or Dried; Lupulin
121020	Hop Cones, Ground, Powdered, or in Pellets; Lupulin
190490	Cereals (Not Corn) in Grain Form, Prepared
230210	Bran Sharps and Other Residues Derived From Milling Corn
230310	Residues of Starch Manufactured and Similar Residues
230990	Animal Feed Prep. Except Dog or Cat Food, Retail Packaged

(HS Code: Harmonized Shipping Codes)

Appendix C: Grain Container Shipments from All U.S. Ports, Average 1999-2000

U.S. Port	Average TEUs	Share
Seattle, WA	23,332	18%
Long Beach, CA	13,993	11%
Los Angeles, CA	11,159	8%
Tacoma, WA	10,299	8%
Norfolk, VA	10,267	8%
New York, NY	9,073	7%
Charleston, SC	8,982	7%
Oakland, CA	7,402	6%
Portland, OR	7,173	5%
Jacksonville, FL	5,721	4%
Houston, TX	5,684	4%
Miami, FL	3,263	2%
West Palm Beach, FL	3,046	2%
Port Everglades, FL	2,339	2%
New Orleans, LA	1,632	1%
Pensauken, NJ	1,582	1%
Gulf Port, LA	1,386	1%
Lake Charles, LA	878	1%
Philadelphia, PA	859	1%
Savannah, GA	807	1%
Baltimore, MD	761	1%
Newport News, VA	446	<1%
San Juan, PR	364	<1%
Freeport, TX	328	<1%
San Francisco, CA	309	<1%
Fernandna Beach, CA	293	<1%
Ponce, PR	269	<1%
Wilmington, DE	240	<1%
Salem, NJ	238	<1%
Wilmington, NC	223	<1%
Honolulu, HI	127	<1%
Gloucester, NJ	99	<1%
Tampa, FL	95	<1%
Mobile, AL	90	<1%

Boston, MA	31	<1%
Mayaguez, PR	23	<1%
Brownsville, TX	16	<1%
Texas City, TX	15	<1%
Pascagoula, MI	10	<1%
Dutch Harbour, AK	7	<1%
Fajardo, PR	3	<1%
Chester, PA	2	<1%
Sandy Point, ME	1	<1%
Galveston, TX	1	<1%

Source: *Journal of Commerce*, PIERS, 1999-2000

Appendix D: Destination for Grain Container Shipments from All U.S. Ports

Foreign Port	1999	2000	Average	Share
		TEUs		
Yokohama, Japan	3,060	3,406	3,233	15%
Tokyo, Japan	3,075	3,232	3,154	15%
Kobe, Japan	1,669	2,235	1,952	9%
Nagoya, Japan	1,242	2,038	1,640	8%
Busan, S. Korea	1,572	1,191	1,382	7%
Tomakomai, Japan	417	897	657	3%
Osaka, Japan	648	664	656	3%
Calcutta, India	831	431	631	3%
Hong Kong, China	537	649	593	3%
Kaohsiung, Taiwan	390	626	508	2%
Hakata, Japan	471	529	500	2%
Mumbai, India	836	110	473	2%
San Juan, Puerto Rico	296	507	402	2%
Bangkok, Thailand	311	365	338	2%
Novgorod, Croatia	-	637	319	2%
Kaliningrad, Russia	-	622	311	1%
Puerto Cabello, Venezuela	184	395	290	1%
Taichung, Taiwan	177	349	263	1%
Manila, Philippines	273	236	255	1%
Moji, Japan	236	241	239	1%
Guatemala City, Guatemala	359	102	231	1%
Haina, Dominican Republic	225	224	225	1%
Singapore	301	141	221	1%
San Salvador, Honduras	213	132	173	1%
Port Kelang, Malaysia	153	174	164	1%
Vishakhapatna, India	114	203	159	1%
Santo Domingo, D.R.	306	7	157	1%
Puerto Cortes, Honduras	280	27	154	1%
San Jose, Costa Rico	151	151	151	1%
Mombasa, Kenya	296	2	149	1%
Sissa, Indonesia	145	121	133	1%
Inchon, S. Korea	190	71	131	1%
Aarhus, Denmark	25	220	123	1%
Dubai, United Arab Emirates	95	149	122	1%
Jakarta, Indonesia	166	76	121	1%
Keelung, Taiwan	118	120	119	1%
Puerto Limon, Costa Rica	110	128	119	1%
Buenos Aires, Argentina	98	134	116	1%
Tegucigalpa, Honduras	159	57	108	1%
Callao, Peru	126	83	105	<1%

Ashdod, Israel	80	128	104	<1%
Chinnampo, N. Korea	208	-	104	<1%
Douala, Cameroon	205	-	103	<1%
Naha, Japan	60	143	102	<1%
Sendai, Japan	94	104	99	<1%
Felixstowe, United Kingdom	55	138	97	<1%
Abidjan, Ivory Coast	188	-	94	<1%
Buenaventura, Colombia	62	118	90	<1%
Kingston, Jamaica	102	70	86	<1%
Managua, Nicaragua	81	85	83	<1%
Constanza, Romania	162	-	81	<1%
Port Kaiser, Jamaica	-	161	81	<1%
Corinto, Nicaragua	156	-	78	<1%
Jeddah, Saudi Arabia	38	114	76	<1%
Cartagena, Colombia	48	90	69	<1%
Nanjing, China	2	135	69	<1%
Penang, Malaysia	65	71	68	<1%
Shimizu, Japan	79	55	67	<1%
Santo Tomas, Guatemala	39	93	66	<1%
Arica, Chile	36	94	65	<1%
Surabaya, Indonesia	94	29	62	<1%
Kwangyang, S. Korea	121	-	61	<1%
Colombo, Sri Lanka	120	-	60	<1%
Rotterdam, Netherlands	64	53	59	<1%
Conakry, Guinea	115	-	58	<1%
Turku, Finland	60	50	55	<1%
Panama City, Panama	58	47	53	<1%
Tamatave, Madagascar	-	99	50	<1%
Hodeida, Yemen	35	62	49	<1%
Tocoa, Honduras	91	-	46	<1%
Pasir Gudang, Malaysia	53	36	45	<1%
Antwerp, Belgium	40	44	42	<1%
Port of Spain, Trinidad	46	37	42	<1%
Bremerhaven, Germany	38	44	41	<1%
Guayaquil, Ecuador	21	57	39	<1%
Damman, Saudi Arabia	23	51	37	<1%
Pago Pago, Samoa	45	29	37	<1%
Hiroshima, Japan	65	7	36	<1%
Vizagapatam	72	-	36	<1%
Laem Chabang, Thailand	2	69	36	<1%
Sydney, Australia	45	22	34	<1%
La Guaira, Venezuela	45	19	32	<1%
Reykjavik, Iceland	30	29	30	<1%
Barranquilla, Colombia	26	30	28	<1%
Tema, Ghana	55	1	28	<1%

Kotka, Finland	26	28	27	<1%
Haifa, Israel	50	3	27	<1%
Novosibirsk, Iceland	-	52	26	<1%
Riyadh, Saudi Arabia	10	41	26	<1%
Freetown, Sierre Leone	2	48	25	<1%
Jebel Ali, U.A.E.	4	46	25	<1%
Mersin, Greece	21	29	25	<1%
Nassau, Bahamas	28	22	25	<1%
San Pedro Sul, Honduras	19	31	25	<1%
Oslo, Norway	25	24	25	<1%
Piraeus, Greece	14	35	25	<1%
Cape Town, S. Africa	21	26	24	<1%
Hamburg, Germany	31	15	23	<1%
Rio Grande, Brazil	31	15	23	<1%
La Spezia, Italy	44	1	23	<1%
Hsinkang, China	24	20	22	<1%
Istanbul, Turkey	5	39	22	<1%
Papeete, French Polynesia	37	6	22	<1%
Xiamen, China	10	33	22	<1%
Beirut, Lebanon	21	21	21	<1%

Source: *Journal of Commerce*, PIERS, 1999-2000

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