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

Prepared by

Kimberly Vachal
Upper Great Plains Transportation Institute
North Dakota State University

and

Heidi Reichert
Shipper and Exporter Assistance
United States Department of Agriculture
Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the information presented herein. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. The U.S. government assumes no liability for the contents or use thereof.
CONTENTS

EXECUTIVE SUMMARY ................................................................. v

INTRODUCTION ........................................................................ 1
  Objective ............................................................................. 2
  Data .................................................................................... 3
  Organization ........................................................................ 3

INTERMODAL NETWORK .......................................................... 4

SHIPPER POPULATION ............................................................. 10

GRAIN CONTAINER SHIPMENTS .................................................. 12
  Volume .................................................................................. 13
  Origins ................................................................................. 14
  Commodity ............................................................................ 18
  Seasonality ............................................................................ 23
  Rates ..................................................................................... 24
  Marketing Channels ............................................................. 29
    U.S. Ports ........................................................................... 30
    Foreign Ports ...................................................................... 36

SUMMARY ................................................................................... 40

APPENDIX A: Rail Grain Container Freight by BEA ................... 42

APPENDIX B: Harmonized Shipping Codes and Classification Considered
  in the PIERS Summaries ....................................................... 44

APPENDIX C: Grain Container Shipments from All U.S. Ports, Average 1999-2000 . 45

APPENDIX D: Destination for Grain Container Shipments from All U.S. Ports ........ 47

REFERENCES ............................................................................. 50
LIST OF FIGURES

Figure 1. Intermodal Terminal Locations ................................................. 5
Figure 2. Container Origination, Chicago ................................................. 6
Figure 3. Container Origination, Seattle ................................................... 7
Figure 4. Container Origination, Portland .................................................. 8
Figure 5. Container Origination, Los Angeles .......................................... 8
Figure 6. Location of Leading Container Origins ...................................... 10
Figure 7. Location of Grain Container Shippers ....................................... 11
Figure 8. Trend in Rail Container Shipments of Farm Products ................. 14
Figure 9. Grain Container Shipments, Average 1999-2000 ......................... 15
Figure 10. Composition of Grain Container Shipments Handled by Railroads . 20
Figure 11. Composition of Containerized Grain and Oilseed Exports, Annual Average 1999-2000 .......................................................... 22
Figure 12. Monthly Containerized Shipments, Waybill Average from 1990 to 1998 .... 23
Figure 13. Sample Rates for Containerized Soybeans in Major U.S./Asian Trade Routes ........ 24
Figure 14. Sample Rates for Containerized Soybeans in Major U.S./Asian Trade Routes .... 26
Figure 15. Sample Rates for Containerized Corn in Major U.S./Asian Trade Routes ........ 26
Figure 16. Average Rates for Containerized Corn from the United States to Selected Ports, July 2001 ............................................................. 28
Figure 17. Average Rates for Containerized Soybeans from the United States to Selected Ports, July 2001 ............................................................. 28
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Grain Container Shipments by PIERS Shipper Origin</td>
<td>16</td>
</tr>
<tr>
<td>Table 2</td>
<td>Grain Container Freight by BEA</td>
<td>18</td>
</tr>
<tr>
<td>Table 3</td>
<td>Export Grain Product Container Shipments, 1999 and 2000</td>
<td>21</td>
</tr>
<tr>
<td>Table 4</td>
<td>Top 10 U.S. Grain and Grain Product Container Ports, Average Volume 1999-2000</td>
<td>31</td>
</tr>
<tr>
<td>Table 5</td>
<td>U.S. Port Origins for Grain Container Shipments</td>
<td>32</td>
</tr>
<tr>
<td>Table 6</td>
<td>Composition of Grain Container Shipments for Five Largest Volume U.S. Ports</td>
<td>35</td>
</tr>
<tr>
<td>Table 7</td>
<td>Destination for U.S. Grain and Grain Product Container Exports, 1999-2000</td>
<td>37</td>
</tr>
<tr>
<td>Table 8</td>
<td>Top 10 Volume Foreign Port Destinations for U.S. Grain Container Shipments</td>
<td>38</td>
</tr>
<tr>
<td>Table 9</td>
<td>Distribution of Grain Container Shipments Among Foreign Ports by Commodity</td>
<td>39</td>
</tr>
</tbody>
</table>
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 currently is 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, which comprise 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 typically is 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 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,

\(^1\)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.
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

More than one 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) regions including Chicago, IL; Portland, Ore.; Seattle, Wash.; and Los Angeles (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

---

\(^3\)BEAs are regions defined by the U.S. Census Bureau for economic analysis.
in 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 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 3. Container Origination, Seattle
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 three 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, major BEA origins for grain container shipments are Memphis, Tenn.; Lubbock, Texas; Portland, Ore.; Dallas, Texas; and Los Angeles (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.

---

4Based 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.
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-producing regions.

Figure 7. Location of Grain Container Shippers
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. Between 1990 and 1994, the volumes averaged more than 840,000 tons, compared to an average 584,000 over the five 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 two 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
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>
<thead>
<tr>
<th>State</th>
<th>Average TEUs 1999-2000</th>
<th>Share of Grain Container Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>17,122</td>
<td>22%</td>
</tr>
<tr>
<td>Washington</td>
<td>6,434</td>
<td>8%</td>
</tr>
<tr>
<td>New York</td>
<td>6,421</td>
<td>8%</td>
</tr>
<tr>
<td>Minnesota</td>
<td>6,028</td>
<td>8%</td>
</tr>
<tr>
<td>Florida</td>
<td>4,736</td>
<td>6%</td>
</tr>
<tr>
<td>Kansas</td>
<td>4,227</td>
<td>5%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>3,881</td>
<td>5%</td>
</tr>
<tr>
<td>Oregon</td>
<td>3,236</td>
<td>4%</td>
</tr>
<tr>
<td>Nebraska</td>
<td>3,223</td>
<td>4%</td>
</tr>
<tr>
<td>Illinois</td>
<td>2,974</td>
<td>4%</td>
</tr>
<tr>
<td>Ohio</td>
<td>2,607</td>
<td>3%</td>
</tr>
<tr>
<td>Missouri</td>
<td>2,203</td>
<td>3%</td>
</tr>
<tr>
<td>Texas</td>
<td>1,648</td>
<td>2%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1,380</td>
<td>2%</td>
</tr>
<tr>
<td>Iowa</td>
<td>1,198</td>
<td>2%</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>1,144</td>
<td>1%</td>
</tr>
<tr>
<td>Idaho</td>
<td>1,047</td>
<td>1%</td>
</tr>
<tr>
<td>Louisiana</td>
<td>915</td>
<td>1%</td>
</tr>
<tr>
<td>Indiana</td>
<td>884</td>
<td>1%</td>
</tr>
<tr>
<td>Georgia</td>
<td>783</td>
<td>1%</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>732</td>
<td>1%</td>
</tr>
<tr>
<td>Virginia</td>
<td>698</td>
<td>1%</td>
</tr>
<tr>
<td>North Dakota</td>
<td>539</td>
<td>1%</td>
</tr>
<tr>
<td>Michigan</td>
<td>494</td>
<td>1%</td>
</tr>
<tr>
<td>Colorado</td>
<td>358</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Maryland</td>
<td>357</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>355</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Tennessee</td>
<td>348</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>280</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>North Carolina</td>
<td>257</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Connecticut</td>
<td>255</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>220</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Arkansas</td>
<td>197</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Arizona</td>
<td>154</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Utah</td>
<td>106</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>South Carolina</td>
<td>91</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Alabama</td>
<td>72</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Hawaii</td>
<td>38</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>19</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
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, Tenn.; Lubbock, Texas; Dallas, Texas; Portland, Ore.; and Los Angeles, 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 five 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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Among Top 5</td>
</tr>
<tr>
<td>Memphis, TN</td>
<td>6,902</td>
<td>2,750</td>
<td>4,595</td>
<td>37%</td>
</tr>
<tr>
<td>Lubbock, TX</td>
<td>1,655</td>
<td>3,405</td>
<td>2,627</td>
<td>21%</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>2,985</td>
<td>692</td>
<td>2,002</td>
<td>16%</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>1,195</td>
<td>2,197</td>
<td>1,821</td>
<td>15%</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td>2,992</td>
<td>276</td>
<td>1,483</td>
<td>12%</td>
</tr>
<tr>
<td>Other - Origin Specified</td>
<td>15,480</td>
<td>2,002</td>
<td>7,992</td>
<td></td>
</tr>
<tr>
<td>Other - Origin Unspecified</td>
<td>11,211</td>
<td>18,131</td>
<td>15,055</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42,420</td>
<td>29,453</td>
<td>35,577</td>
<td></td>
</tr>
</tbody>
</table>

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 this 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 more than 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.
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

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

Source: *Journal of Commerce, PIERS*
Approximately 18 million bushels of grains and oilseeds 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 ($t=2.29$, $p=.02$) 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 Soybeans in Major U.S./Asian Trade Routes

Figure 15. Sample Rates for Containerized Corn 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. The trade imbalance is the greatest for the calendar year in this period, 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, Wash., verses Los Angeles and Long Beach, Calif., 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 clustering 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. 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. Several U.S. ports were identified as being active in the grain container industry. Among these ports, four West Coast ports — Seattle, Wash.; Long Beach, Calif.; Los Angeles; and Tacoma, Wash. — 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).

---

5Refer 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

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

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

\(^1\) 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, N.C.; Oakland, Calif.; Portland, Ore.; and Jacksonville, Fla., 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

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

1 Commodities averaging at least 20 TEUs per year are reported.

**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.

---

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

Source: *Journal of Commerce, PIERS, 1999-2000*
Table 8. Top 10 Volume Foreign Port Destinations for U.S. Grain Container Shipments

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

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

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 more than one 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, Wash.; Long Beach, Calif.; Los Angeles; and Tacoma, Wash, — 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**

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brownsville, TX</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td>6,040</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>738</td>
</tr>
<tr>
<td>Great Falls, MT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5,695</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>633</td>
</tr>
<tr>
<td>Norfolk, VA</td>
<td></td>
<td></td>
<td></td>
<td>3,840</td>
<td></td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td>516</td>
</tr>
<tr>
<td>Albany, GA</td>
<td>2,640</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>293</td>
</tr>
<tr>
<td>Spokane, WA</td>
<td></td>
<td></td>
<td>1,840</td>
<td></td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>293</td>
</tr>
<tr>
<td>Jackson, MS</td>
<td></td>
<td></td>
<td>1,842</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>205</td>
</tr>
<tr>
<td>Philadelphia, PA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td>924</td>
</tr>
<tr>
<td>Detroit, MI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>924</td>
<td>103</td>
</tr>
<tr>
<td>Columbus, OH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>921</td>
<td>102</td>
</tr>
<tr>
<td>Sacramento, CA</td>
<td>882</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Little Rock, AR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>880</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>89</td>
</tr>
<tr>
<td>St. Louis, MO</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>67</td>
</tr>
</tbody>
</table>

**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

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

*(HS Code: Harmonized Shipping Codes)*
<table>
<thead>
<tr>
<th>U.S. Port</th>
<th>Average TEUs</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle, WA</td>
<td>23,332</td>
<td>18%</td>
</tr>
<tr>
<td>Long Beach, CA</td>
<td>13,993</td>
<td>11%</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td>11,159</td>
<td>8%</td>
</tr>
<tr>
<td>Tacoma, WA</td>
<td>10,299</td>
<td>8%</td>
</tr>
<tr>
<td>Norfolk, VA</td>
<td>10,267</td>
<td>8%</td>
</tr>
<tr>
<td>New York, NY</td>
<td>9,073</td>
<td>7%</td>
</tr>
<tr>
<td>Charleston, SC</td>
<td>8,982</td>
<td>7%</td>
</tr>
<tr>
<td>Oakland, CA</td>
<td>7,402</td>
<td>6%</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>7,173</td>
<td>5%</td>
</tr>
<tr>
<td>Jacksonville, FL</td>
<td>5,721</td>
<td>4%</td>
</tr>
<tr>
<td>Houston, TX</td>
<td>5,684</td>
<td>4%</td>
</tr>
<tr>
<td>Miami, FL</td>
<td>3,263</td>
<td>2%</td>
</tr>
<tr>
<td>West Palm Beach, FL</td>
<td>3,046</td>
<td>2%</td>
</tr>
<tr>
<td>Port Everglades, FL</td>
<td>2,339</td>
<td>2%</td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>1,632</td>
<td>1%</td>
</tr>
<tr>
<td>Pensauken, NJ</td>
<td>1,582</td>
<td>1%</td>
</tr>
<tr>
<td>Gulf Port, LA</td>
<td>1,386</td>
<td>1%</td>
</tr>
<tr>
<td>Lake Charles, LA</td>
<td>878</td>
<td>1%</td>
</tr>
<tr>
<td>Philadelphia, PA</td>
<td>859</td>
<td>1%</td>
</tr>
<tr>
<td>Savannah, GA</td>
<td>807</td>
<td>1%</td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>761</td>
<td>1%</td>
</tr>
<tr>
<td>Newport News, VA</td>
<td>446</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>San Juan, PR</td>
<td>364</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Freeport, TX</td>
<td>328</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>San Francisco, CA</td>
<td>309</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Fernandna Beach, CA</td>
<td>293</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Ponce, PR</td>
<td>269</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Wilmington, DE</td>
<td>240</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Salem, NJ</td>
<td>238</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Wilmington, NC</td>
<td>223</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Honolulu, HI</td>
<td>127</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Gloucester, NJ</td>
<td>99</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>City</td>
<td>Volume</td>
<td>Percent</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Tampa, FL</td>
<td>95</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Mobile, AL</td>
<td>90</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>31</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Mayaguez, PR</td>
<td>23</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Brownsville, TX</td>
<td>16</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Texas City, TX</td>
<td>15</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Pascagoula, MI</td>
<td>10</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Dutch Harbour, AK</td>
<td>7</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Fajardo, PR</td>
<td>3</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Chester, PA</td>
<td>2</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Sandy Point, ME</td>
<td>1</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Galveston, TX</td>
<td>1</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

*Source: Journal of Commerce, PIERS, 1999-2000*
### Appendix D: Destination for Grain Container Shipments from All U.S. Ports

<table>
<thead>
<tr>
<th>Foreign Port</th>
<th>1999</th>
<th>2000</th>
<th>Average</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yokohama, Japan</td>
<td>3,060</td>
<td>3,406</td>
<td>3,233</td>
<td>15%</td>
</tr>
<tr>
<td>Tokyo, Japan</td>
<td>3,075</td>
<td>3,232</td>
<td>3,154</td>
<td>15%</td>
</tr>
<tr>
<td>Kobe, Japan</td>
<td>1,669</td>
<td>2,235</td>
<td>1,952</td>
<td>9%</td>
</tr>
<tr>
<td>Nagoya, Japan</td>
<td>1,242</td>
<td>2,038</td>
<td>1,640</td>
<td>8%</td>
</tr>
<tr>
<td>Busan, S. Korea</td>
<td>1,572</td>
<td>1,191</td>
<td>1,382</td>
<td>7%</td>
</tr>
<tr>
<td>Tomakomai, Japan</td>
<td>417</td>
<td>897</td>
<td>657</td>
<td>3%</td>
</tr>
<tr>
<td>Osaka, Japan</td>
<td>648</td>
<td>664</td>
<td>656</td>
<td>3%</td>
</tr>
<tr>
<td>Calcutta, India</td>
<td>831</td>
<td>431</td>
<td>631</td>
<td>3%</td>
</tr>
<tr>
<td>Hong Kong, China</td>
<td>537</td>
<td>649</td>
<td>593</td>
<td>3%</td>
</tr>
<tr>
<td>Kaohsiung, Taiwan</td>
<td>390</td>
<td>626</td>
<td>508</td>
<td>2%</td>
</tr>
<tr>
<td>Hakata, Japan</td>
<td>471</td>
<td>529</td>
<td>500</td>
<td>2%</td>
</tr>
<tr>
<td>Mumbai, India</td>
<td>836</td>
<td>110</td>
<td>473</td>
<td>2%</td>
</tr>
<tr>
<td>San Juan, Puerto Rico</td>
<td>296</td>
<td>507</td>
<td>402</td>
<td>2%</td>
</tr>
<tr>
<td>Bangkok, Thailand</td>
<td>311</td>
<td>365</td>
<td>338</td>
<td>2%</td>
</tr>
<tr>
<td>Novgorod, Croatia</td>
<td>-</td>
<td>637</td>
<td>319</td>
<td>2%</td>
</tr>
<tr>
<td>Kaliningrad, Russia</td>
<td>-</td>
<td>622</td>
<td>311</td>
<td>1%</td>
</tr>
<tr>
<td>Puerto Cabello, Venezuela</td>
<td>184</td>
<td>395</td>
<td>290</td>
<td>1%</td>
</tr>
<tr>
<td>Taichung, Taiwan</td>
<td>177</td>
<td>349</td>
<td>263</td>
<td>1%</td>
</tr>
<tr>
<td>Manila, Philippines</td>
<td>273</td>
<td>236</td>
<td>255</td>
<td>1%</td>
</tr>
<tr>
<td>Moji, Japan</td>
<td>236</td>
<td>241</td>
<td>239</td>
<td>1%</td>
</tr>
<tr>
<td>Guatemala City, Guatemala</td>
<td>359</td>
<td>102</td>
<td>231</td>
<td>1%</td>
</tr>
<tr>
<td>Haina, Dominican Republic</td>
<td>225</td>
<td>224</td>
<td>225</td>
<td>1%</td>
</tr>
<tr>
<td>Singapore</td>
<td>301</td>
<td>141</td>
<td>221</td>
<td>1%</td>
</tr>
<tr>
<td>San Salvador, Honduras</td>
<td>213</td>
<td>132</td>
<td>173</td>
<td>1%</td>
</tr>
<tr>
<td>Port Kelang, Malaysia</td>
<td>153</td>
<td>174</td>
<td>164</td>
<td>1%</td>
</tr>
<tr>
<td>Vishakhapatna, India</td>
<td>114</td>
<td>203</td>
<td>159</td>
<td>1%</td>
</tr>
<tr>
<td>Santo Domingo, D.R.</td>
<td>306</td>
<td>7</td>
<td>157</td>
<td>1%</td>
</tr>
<tr>
<td>Puerto Cortes, Honduras</td>
<td>280</td>
<td>27</td>
<td>154</td>
<td>1%</td>
</tr>
<tr>
<td>San Jose, Costa Rico</td>
<td>151</td>
<td>151</td>
<td>151</td>
<td>1%</td>
</tr>
<tr>
<td>Mombasa, Kenya</td>
<td>296</td>
<td>2</td>
<td>149</td>
<td>1%</td>
</tr>
<tr>
<td>Sissa, Indonesia</td>
<td>145</td>
<td>121</td>
<td>133</td>
<td>1%</td>
</tr>
<tr>
<td>Inchon, S. Korea</td>
<td>190</td>
<td>71</td>
<td>131</td>
<td>1%</td>
</tr>
<tr>
<td>Aarhus, Denmark</td>
<td>25</td>
<td>220</td>
<td>123</td>
<td>1%</td>
</tr>
<tr>
<td>Dubai, United Arab Emirates</td>
<td>95</td>
<td>149</td>
<td>122</td>
<td>1%</td>
</tr>
<tr>
<td>Jakarta, Indonesia</td>
<td>166</td>
<td>76</td>
<td>121</td>
<td>1%</td>
</tr>
<tr>
<td>Keelung, Taiwan</td>
<td>118</td>
<td>120</td>
<td>119</td>
<td>1%</td>
</tr>
<tr>
<td>Puerto Limon, Costa Rica</td>
<td>110</td>
<td>128</td>
<td>119</td>
<td>1%</td>
</tr>
<tr>
<td>Buenos Aires, Argentina</td>
<td>98</td>
<td>134</td>
<td>116</td>
<td>1%</td>
</tr>
<tr>
<td>City</td>
<td>Imports</td>
<td>Exports</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>----</td>
</tr>
<tr>
<td>Tegucigalpa, Honduras</td>
<td>159</td>
<td>57</td>
<td>108</td>
<td>1%</td>
</tr>
<tr>
<td>Callao, Peru</td>
<td>126</td>
<td>83</td>
<td>105</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Ashdod, Israel</td>
<td>80</td>
<td>128</td>
<td>104</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Chinnampo, N. Korea</td>
<td>208</td>
<td>-</td>
<td>104</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Douala, Cameroon</td>
<td>205</td>
<td>-</td>
<td>103</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Naha, Japan</td>
<td>60</td>
<td>143</td>
<td>102</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Sendai, Japan</td>
<td>94</td>
<td>104</td>
<td>99</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Felixstowe, United Kingdom</td>
<td>55</td>
<td>138</td>
<td>97</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Abidjan, Ivory Coast</td>
<td>188</td>
<td>-</td>
<td>94</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Buenaventura, Colombia</td>
<td>62</td>
<td>118</td>
<td>90</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Kingston, Jamaica</td>
<td>102</td>
<td>70</td>
<td>86</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Managua, Nicaragua</td>
<td>81</td>
<td>85</td>
<td>83</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Constanza, Romania</td>
<td>162</td>
<td>-</td>
<td>81</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Port Kaiser, Jamaica</td>
<td>-</td>
<td>161</td>
<td>81</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Corinto, Nicaragua</td>
<td>156</td>
<td>-</td>
<td>78</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Jeddah, Saudi Arabia</td>
<td>38</td>
<td>114</td>
<td>76</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Cartagena, Colombia</td>
<td>48</td>
<td>90</td>
<td>69</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Nanjing, China</td>
<td>2</td>
<td>135</td>
<td>69</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Penang, Malaysia</td>
<td>65</td>
<td>71</td>
<td>68</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Shimizu, Japan</td>
<td>79</td>
<td>55</td>
<td>67</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Santo Tomas, Guatemala</td>
<td>39</td>
<td>93</td>
<td>66</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Arica, Chile</td>
<td>36</td>
<td>94</td>
<td>65</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Surabaya, Indonesia</td>
<td>94</td>
<td>29</td>
<td>62</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Kwangyang, S. Korea</td>
<td>121</td>
<td>-</td>
<td>61</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Colombo, Sri Lanka</td>
<td>120</td>
<td>-</td>
<td>60</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Rotterdam, Netherlands</td>
<td>64</td>
<td>53</td>
<td>59</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Conakry, Guinea</td>
<td>115</td>
<td>-</td>
<td>58</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Turku, Finland</td>
<td>60</td>
<td>50</td>
<td>55</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Panama City, Panama</td>
<td>58</td>
<td>47</td>
<td>53</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Tamatave, Madagascar</td>
<td>-</td>
<td>99</td>
<td>50</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Hodeida, Yemen</td>
<td>35</td>
<td>62</td>
<td>49</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Tocoa, Honduras</td>
<td>91</td>
<td>-</td>
<td>46</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Pasir Gudang, Malaysia</td>
<td>53</td>
<td>36</td>
<td>45</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Antwerp, Belgium</td>
<td>40</td>
<td>44</td>
<td>42</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Port of Spain, Trinidad</td>
<td>46</td>
<td>37</td>
<td>42</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Bremerhaven, Germany</td>
<td>38</td>
<td>44</td>
<td>41</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Guayaquil, Ecuador</td>
<td>21</td>
<td>57</td>
<td>39</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Damman, Saudi Arabia</td>
<td>23</td>
<td>51</td>
<td>37</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Pago Pago, Samoa</td>
<td>45</td>
<td>29</td>
<td>37</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Hiroshima, Japan</td>
<td>65</td>
<td>7</td>
<td>36</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Vizagapatam</td>
<td>72</td>
<td>-</td>
<td>36</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Laem Chabang, Thailand</td>
<td>2</td>
<td>69</td>
<td>36</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Location</td>
<td>GDP 1999</td>
<td>GDP 2000</td>
<td>GDP 2001</td>
<td>Change</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>Sydney, Australia</td>
<td>45</td>
<td>22</td>
<td>34</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>La Guaira, Venezuela</td>
<td>45</td>
<td>19</td>
<td>32</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Reykjavik, Iceland</td>
<td>30</td>
<td>29</td>
<td>30</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Barranquilla, Colombia</td>
<td>26</td>
<td>30</td>
<td>28</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Tema, Ghana</td>
<td>55</td>
<td>1</td>
<td>28</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Kotka, Finland</td>
<td>26</td>
<td>28</td>
<td>27</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Haifa, Israel</td>
<td>50</td>
<td>3</td>
<td>27</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Novosibirsk, Iceland</td>
<td>-</td>
<td>52</td>
<td>26</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Riyadh, Saudi Arabia</td>
<td>10</td>
<td>41</td>
<td>26</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Freetown, Sierre Leone</td>
<td>2</td>
<td>48</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Jebel Ali, U.A.E.</td>
<td>4</td>
<td>46</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Mersin, Greece</td>
<td>21</td>
<td>29</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Nassau, Bahamas</td>
<td>28</td>
<td>22</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>San Pedro Sul, Honduras</td>
<td>19</td>
<td>31</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Oslo, Norway</td>
<td>25</td>
<td>24</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Piraeus, Greece</td>
<td>14</td>
<td>35</td>
<td>25</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Cape Town, S. Africa</td>
<td>21</td>
<td>26</td>
<td>24</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Hamburg, Germany</td>
<td>31</td>
<td>15</td>
<td>23</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Rio Grande, Brazil</td>
<td>31</td>
<td>15</td>
<td>23</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>La Spezia, Italy</td>
<td>44</td>
<td>1</td>
<td>23</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Hsinkang, China</td>
<td>24</td>
<td>20</td>
<td>22</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Istanbul, Turkey</td>
<td>5</td>
<td>39</td>
<td>22</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Papeete, French Polynesia</td>
<td>37</td>
<td>6</td>
<td>22</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Xiamen, China</td>
<td>10</td>
<td>33</td>
<td>22</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Beirut, Lebanon</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Source: *Journal of Commerce, PIERs, 1999-2000*
REFERENCES


National Agricultural Statistics Service, United States Department of Agriculture, Washington, DC, Online Data Retrieval.
