# U.S. Grain and Soybean Exports to Mexico—A Modal Share Transportation Analysis

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## Summary

Information on transportation systems and patterns of trade is important to U.S. grain exporters. Due to its geographic location, Mexico's market is unique and can be served by overland truck and rail as well as maritime transportation. An analysis of the transportation of U.S. grain exports by mode provides information about changes in competitiveness and relative efficiencies among the modes. This report analyzes the current U.S.–Mexico grain and soybean trade patterns, followed by a description of modal shares for corn, sorghum, wheat, and soybeans.

In the last 5 years, transportation of the commodities considered in this study (corn, sorghum, wheat, and soybeans) has shifted from maritime to overland. Rail is the major overland transportation mode for all grains but sorghum. Sorghum is shipped by truck because of the proximity of the production areas in Texas' Rio Grande Valley to the border. Shippers (defined as producers and exporters for the purpose of this analysis) along the border have the advantage of proximity unless there are no local railroads available within about 350 miles, when they must ship by truck.

Trucking dominates freight shipments on hauls of fewer than 300 miles. Recent data indicate that the average length of grain haul on Class I railroads is more than 900 miles—reaching 980 miles in 2005. Shippers located in Corpus Christi, TX, and Monterrey, Nuevo Leon, Mexico, are captive shippers. The distance to the border town of Laredo from either Corpus Christi or Monterrey is approximately the same—141 miles. The lack of rail service in the border region could lead to a concentration of regional transportation demand, causing shippers to consolidate their operations in joint shipments. Consolidation would give them more bargaining power with the Class I railroads, which find less profitability in short-haul service. The impact of railroad consolidation in the border area deserves further investigation.

## Introduction

Transportation costs comprise 20 to 45 percent of the landed cost of shipping U.S. grain and oilseeds to Mexico, making information on the transportation system and patterns of trade of vital interest to grain exporters. Due to its geographic location, Mexico's market is unique in that it is served both overland—by truck and rail—and by ship. Overland transportation has several advantages over maritime shipping:

- The grain does not require transfer upon entry into the country, so there is less damage than to grain shipped by vessel.
- Smaller lot sizes allow more specialized purchasing, with less variation in shipment quality.
- Inventory costs are lower because smaller lots are purchased more frequently.
- Supplies for some commodities are less costly because of improved access.[1]

Analysis reveals changes in competitiveness and in relative efficiencies among the modes.[2] This report analyzes the current U.S.–Mexico grain and soybean trade patterns, including a description of the modal share for corn, sorghum, wheat, and soybeans.

## Grain Transportation Conundrum

Shippers along the border, in both countries, have the obvious advantage of their proximity to Mexico. However, this proximity results in fewer transportation services, making the physical advantage an economic disadvantage in areas without short-line or regional railroad[3] services. Captive shippers[4] in these areas are forced to ship by truck. Shippers located in Corpus Christi, TX, and Monterrey, Nuevo Leon, Mexico, are captive shippers. Both Corpus Christi and Monterrey are about 141 miles from the border town of Laredo.

Under optimal conditions, railroads can be 6 times more energy efficient than trucks, and barges about 8 times more efficient.[5] A gallon of fuel can carry a ton of grain 70 miles by truck, 420 miles by rail, and 530 miles by barge. In

[1] Klindworth and Martinsen, 1995.
[2] Marathon, VanWechel, and Vachal, 2006.
[3] Local railroads operate less than 350 miles of track and regional railroads operate with at least 350 route miles (AAR, 2006).
[4] Captive shippers are shippers located in areas lacking competitive rail services, that is, no service or only one railroad.
[5] U.S. Army Corps of Engineers, 2007.

addition, it is more efficient at the border to clear a train hauling 10,000 tons of grain than a truck carrying 20–30 tons.

The lack of rail service in the border regions could lead to some degree of concentration in the regional transportation demand. Shippers might cooperate in joint shipments to put together unit or shuttle trains and gain more bargaining power with the Class I railroads,[6] which find less profitability in local short-haul service. Railroads would rather ship shuttle[7] trains to Mexico than either single cars or unit trains with at least 52 cars. Trucks compete with rail for shipments between 300 and 600 miles (USDA 1998). However, according to the Association of American Railroads (AAR), since 2003 Class I railroads' average length of grain haul is more than 900 miles,[8] so shippers in areas below the average haul lengths are often limited to truck shipping. Trucks are the mode of choice when freight shipments weigh less than 50,000 pounds and travel fewer than 300 miles.[9]

Class I railroads serving the border region are Union Pacific Railroad (UP), Burlington Northern Santa Fe (BNSF), and Kansas City Southern (KCS) on the United States side, and Ferrocarril Mexicano (FERROMEX) and KCS de Mexico on the Mexican side. Consolidating shipments would make it economically feasible to build shuttle train facilities. Shippers in that region could consolidate enough cargo to fill two or three shuttle trains per week. Shippers in the border areas are aware of this. In Mexico, grain importers in this area are consolidating imports of agricultural inputs, grains, and other products, and building a shuttle train facility that will be used at full capacity. This conundrum of proximity to the border being a location advantage but an economic transportation disadvantage should be further investigated by looking at the impact of railroad consolidation in the border area.

## Methodology and Sources of Data

### Modal Share

Modal share is the portion of tonnages of grain moved by each mode of transport.[10] Rail, truck, and ocean shares are presented as percentages.

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[6] There are 7 Class I railroads, ranging in size from just over 3,000 to nearly 33,000 miles of track operated.
U.S. Class I railroads in 2006: Burlington Northern Santa Fe (BNSF) Railway, CSX Transportation (CSXT), Grand Truck Corporation (GTC): includes almost all Canadian National (CN) operations in the U.S., Kansas City Southern Railway Company (KCS), Norfolk Southern Combined Railroad Subsidiaries (NS), Soo line Railroad Company (SOO): It is included under Canadian Pacific Railway, and Union Pacific Railroad (UP) (AAR 2005 and 2006). Two Canadian railroads, Canadian National (CN) and Canadian Pacific Railway, and two Mexican railroads, Ferrocarril Mexicano (FERROMEX) and Kansas City Southern de Mexico (KCS de Mexico), have enough revenue that they would be U.S. Class I railroads if they were U.S. Companies (AAR 2006).
[7] Unit trains have at least 52 cars. Shuttle trains have 75–110 cars and meet railroad efficiency requirements. A railroad car carries about 100 tons (90.72 metric tons). Corn weighs 56 pounds per bushel; wheat and soybeans 60 pounds each.
[8] AAR, 2007.
[9] AMS, 1998.
[10] Marathon, VanWechel, and Vachal, 2006.

Transport modes are determined from major export terminals to Mexico. The reported modal shares are based on total quantities exported to Mexico.

**Total Exports**

Total export data were obtained from a website of USDA's Foreign Trade Statistics, published by the USDA/Foreign Agricultural Service (FAS), entitled *U.S. Trade Exports—FATUS Commodity Aggregations* <http://www.fas.usda.gov/ustrade>. The data on the FAS website come from the U.S. Department of Commerce's *Foreign Trade Statistics*, a publication of the U.S. Census Bureau.

**Ocean Exports**

Ocean tonnages represent grain inspected for export by the USDA Grain Inspection, Packers and Stockyards Administration (GIPSA).

**Rail Exports**

Rail totals were estimated using the same method as Marathon, VanWechel, and Vachal 2006. Rail movements for 2002 to 2006 were obtained from the Surface Transportation Board's (STB) Carload Waybill Sample, 2001-2006. The STB's Waybill Sample is a stratified random sample of carload waybills for terminated shipments by railroad carriers. The STB collects operating statistics on U.S. railroads, which can be used to estimate rail traffic volumes and railroad characteristics. Total tonnages are derived from the weight-in-tons variable from the Waybill Sample by multiplying them by an expansion factor to obtain tonnages for all grain movements by all railroads. The expansion factor is calculated for each waybill according to the formula shown below. The expansion factor is used to expand the car, ton, trailer/container, and revenue statistics to 100 percent levels.

*Factor = (Population count / Sample count)*

Export regions are defined by five-digit Federal Information Processing Standards (FIPS) codes (table 1). Rail shipments are considered direct movements of grain from United States origins to destinations in Mexico. The remaining export regions are border crossing points for grain movements from the United States to Mexico. Shipments to those regions are assumed to be transported by rail to the border then interchanged to a different railroad and moved into Mexico. Total tonnages exported are then calculated using the designated export regions. To avoid double-counting, the following movements are not considered:

- Movements originated and terminated in the same FIPS region;
- Grain shipments that are rebilled from one railroad to another's terminal markets.

**Table 1–FIPS regions included in rail export tonnages***

| State | FIPS code | County |
|---|---|---|
| Arizona | 4023 | Santa Cruz |
| California | 6025 | Imperial |
| California | 6073 | San Diego |
| Texas | 48061 | Brownsville |
| Texas | 48141 | El Paso |
| Texas | 48323 | Eagle Pass |
| Texas | 48479 | Laredo |

* FIPS: Federal Information Processing Standards

### Truck Exports

Total truck tonnages are estimated by subtracting total rail and ocean from total exports tonnages.

### Model for Estimating Modal Tonnages and Share

*(1) Total Exports from Department of Commerce, U.S. Census Bureau, Foreign Trade Statistics.*

*(2) Truck Exports = Total Exports - (Ocean Exports + Rail Exports).*

## United States–Mexico Agricultural Trade

Mexico is the second largest destination, after Canada, of U.S. agricultural exports, estimated in 2007 to be $12.3 billion. U.S. agricultural exports to Mexico are forecast to increase to $14.5 billion in 2008 due largely to increased exports of wheat, soybeans (including products), dairy products, and fresh fruit (ERS 2007a). Bulk commodities accounted for 63 percent of the total 28.9 million metric tons (mmt) of U.S. agricultural products exported to Mexico in 2006 (FAS 2007a), and coarse grains 57 percent of the bulk agricultural shipments. Soybeans and wheat accounted for 20 and 12 percent of the 18.3 mmt of bulk exports, respectively. On January 1, 2003, under NAFTA, Mexico eliminated tariffs on agri-food products with the exception of poultry, eggs, dairy, and sugar. However, corn and dry beans were still subject to Tariff Rate Quotas (TRQs) until January 1, 2008 (Ag-

Canada 2006), when all tariffs and TRQs were eliminated for the products mentioned above.

## Corn Exports to Mexico

Mexico is the fifth largest world corn producer, after the United States, China, the European Union (EU-27), and Brazil. However, it is the world's second largest corn importer, after Japan and the Republic of Korea. Mexico processes much of its production of white corn into food products. Approximately 30 percent of Mexico's corn is imported, almost all of it from the United States. It consists of yellow corn for livestock feed to support increased meat production (FAS 2007a and ERS 2007b).

When corn tariffs were eliminated in 2008, Mexico's imports of kibble or cracked corn, which were free of tariff because they were processed, began to be replaced by imports of whole-grain corn (Hoffman et al 2007). During 2006, United States corn exports to Mexico increased 34 percent from the previous year, totaling 7.83 mmt. More than half of the U.S. corn exported to Mexico in 2004 was used as feed (Adcock, Rosson, and Varela 2007). Thirty-seven percent was made into corn starch and 9.4 percent was used for flour, cereals, and snack foods. U.S. corn was shipped to 24 destinations in Mexico. Jalisco was the most frequent destination, followed by Queretaro, Estado de Mexico, Sonora, Durango, and Veracruz.

## Corn Modal Share

Most corn shipped from major export facilities to Mexico is moved by ocean vessel (tables 1 and 2, and figure 1). From 2002 to 2006, ocean vessels moved 44 percent of U.S. corn to Mexico, rail hauled 30 percent, and trucks carried 26 percent. Texas is the major entry point for rail corn shipments to Mexico, via Brownsville, Eagle Pass, Laredo, and El Paso. The Port of Veracruz is the major entry point for ocean vessels (figures 2 and 3, and table 4). All U.S. corn shipped by ocean originates from ports along the U.S. Gulf[11] (table 2 and figure 3). More than 80 percent of the corn shipped to Mexico by ocean travels down the Mississippi River. Over the last 5 years, trucks have gained market share at the expense of ocean and rail carriers. Figure 4 shows that 45 percent of U.S. corn exports occurred during the last quarter of the year and reached a peak during December (21 percent).

[11] U.S. Gulf includes East Gulf, Mississippi River, North Texas, and South Texas.

**Table 2–Tonnages (MT) and modal share for U.S. corn exports to Mexico**

| Year/type of movement | Mode of transport | | | | | | Total U.S. exports to Mexico |
|---|---|---|---|---|---|---|---|
| | Ocean (U.S. Gulf) | | Rail | | Truck | | |
| | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage | |
| 2002 | 2,922,617 | 55 | 2,404,138 | 45 | 0 | 0 | 5,326,755 |
| 2003 | 2,536,128 | 45 | 2,244,009 | 40 | 809,508 | 14 | 5,589,645 |
| 2004 | 2,177,339 | 39 | 1,437,018 | 26 | 1,999,437 | 36 | 5,613,794 |
| 2005 | 2,356,096 | 40 | 1,569,814 | 27 | 1,915,925 | 33 | 5,841,835 |
| 2006 | 3,191,020 | 41 | 1,108,978 | 14 | 3,534,855 | 45 | 7,834,853 |
| **Average 02-06** | **2,636,640** | **44** | **1,752,791** | **30** | **1,651,945** | **26** | **6,041,376** |

Source: USDA/GIPSA, STB Carload Waybill Sample, and Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics

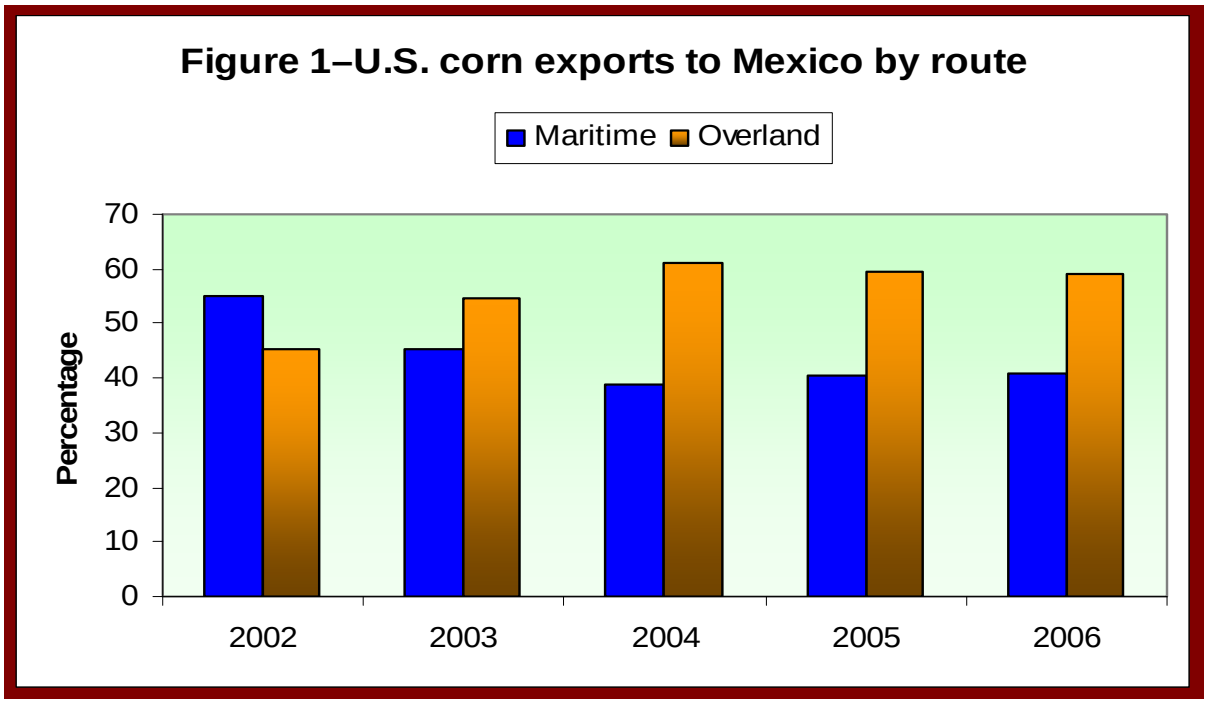


**Table 3–U.S. corn exports to Mexico by route, 2002-2006 (MT)**

| Route | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| **Maritime:** | | | | | | |
| U.S. Gulf | East Gulf | 0 | 0 | 0 | 14,000 | 16,950 |
| | Mississippi River | 2,907,033 | 2,314,520 | 2,119,617 | 2,005,811 | 1,362,821 |
| | North Texas | 15,584 | 221,608 | 52,222 | 336,285 | 1,811,249 |
| | South Texas | 0 | 0 | 5,500 | 0 | 0 |
| Total | | 2,922,617 | 2,536,128 | 2,177,339 | 2,356,096 | 3,191,020 |
| Maritime as % of total exports | | 55 | 45 | 39 | 40 | 41 |
| **Overland** | | 2,404,138 | 3,053,517 | 3,436,455 | 3,485,739 | 4,643,833 |
| Overland as % of total exports | | 45 | 55 | 61 | 60 | 59 |
| **Total U.S. Exports** | | **5,326,755** | **5,589,645** | **5,613,794** | **5,841,835** | **7,834,853** |

Source: Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics and USDA/GIPSA

**Figure 2–Major rail entry points to Mexico**

**Table–4 U.S. grain and soybean exports to Mexico by port, 2006**

| Port | Corn | Sorghum | Soybeans | Wheat |
|---|---|---|---|---|
| | Percentage share | | | |
| Veracruz | 63.3 | 57.5 | 79.5 | 76.8 |
| Tuxpan | 14.8 | 2.1 | 0 | 8.1 |
| Progreso | 10.6 | 33.0 | 19.3 | 4.2 |
| Altamira | 9.9 | 0 | 10.8 | 0 |
| Tampico | 0.7 | 0 | 0 | 0 |
| Coatzacoalcos | 10.6 | 7.4 | 1.2 | 11.0 |

Source: Secretaría de Comunicaciones y Transporte (SCT), Mexico

**Figure 3–Major origin-destination shipments of U.S. grains and soybeans to Mexico by ocean**

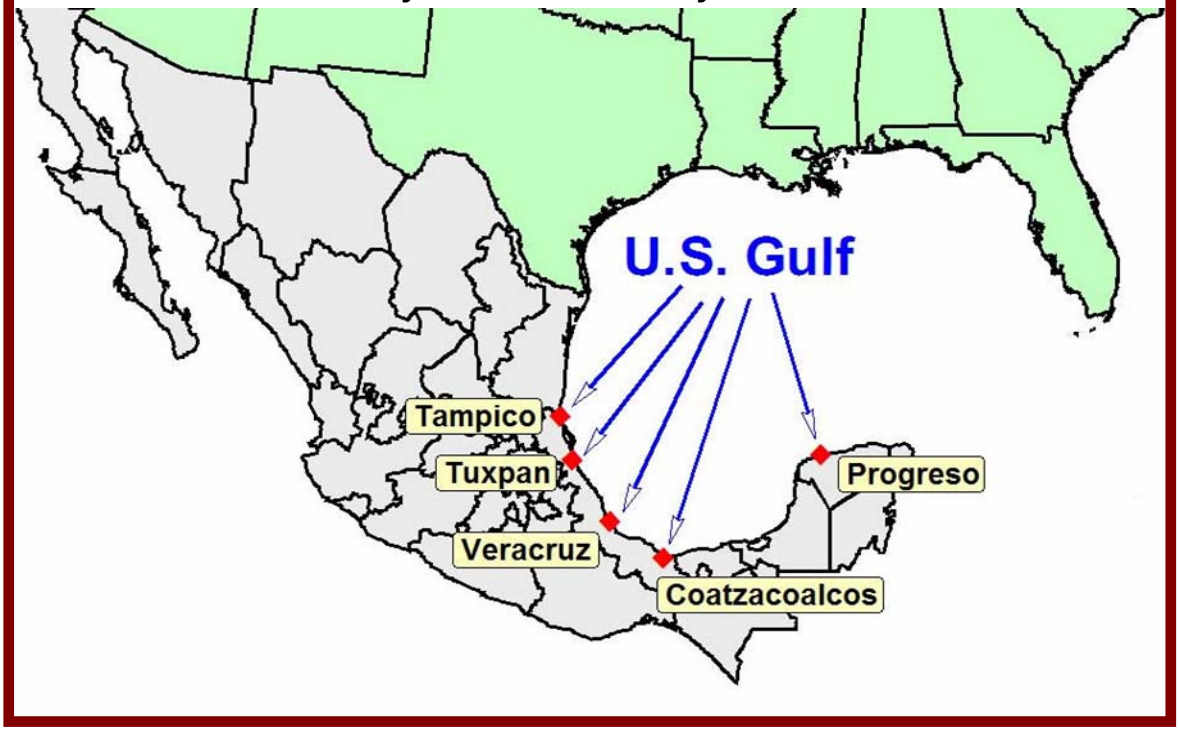
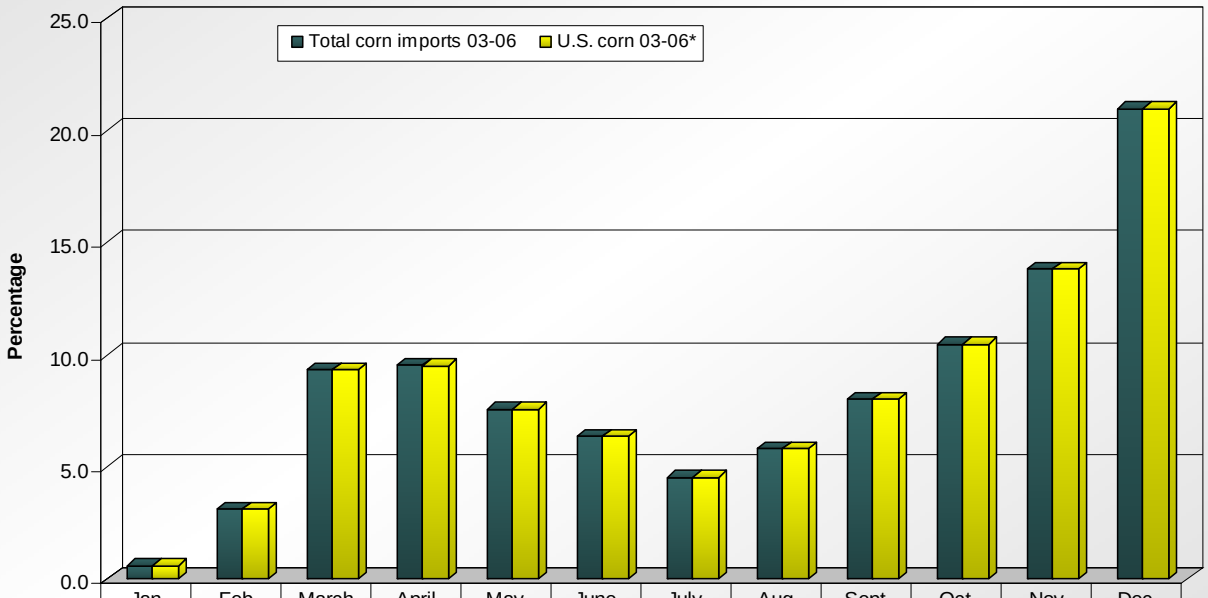


**Figure 4–Mexico's average monthly corn imports**




| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total corn imports 03-06 | 0.6 | 3.1 | 9.3 | 9.5 | 7.6 | 6.4 | 4.5 | 5.8 | 8.0 | 10.5 | 13.8 | 21.0 |
| U.S. corn 03-06* | 0.6 | 3.1 | 9.3 | 9.5 | 7.6 | 6.4 | 4.5 | 5.8 | 8.0 | 10.5 | 13.8 | 21.0 |

*The U.S. share of total Mexican corn imports is almost 100 percent.
Source: SIAP/SAGARPA

## Sorghum Exports to Mexico

Mexico is the world's third largest sorghum producer after Nigeria and the United States and the second largest world consumer after Nigeria. In 2006, Mexico imported 28 percent of its sorghum from the United States (FAS 2007a). Sorghum is used exclusively for animal feed in Mexico (Adcock, Rosson, and Varela 2007). Mexican feeders are accustomed to feeding sorghum because corn imports have been limited by Mexican government policies (Hoffman et al 2007). U.S. sorghum exports to Mexico declined 8 percent in 2006 from a year earlier. This trend is expected to continue in 2008 with the elimination of corn TRQs. The top Mexican destinations for U.S. Sorghum in 2004 were Puebla, Yucatan, Jalisco, Veracruz, San Luis Potosi, and Nuevo Leon (Adcock, Rosson, and Varela 2007).

### Sorghum Modal Share

The United States is the only sorghum supplier to Mexico. Over the last 5 years, half of U.S. sorghum exports to Mexico were shipped by ocean

through the U.S. Gulf, mostly from North Texas, South Texas, and the Mississippi River (tables 5 and 6, and figure 5). The port of Veracruz is the major ocean point of entry. On average, trucks moved 30 percent and rail hauled 19 percent of sorghum shipped to Mexico. Truck is the primary overland transport mode due to the location of the major production areas along the border in the Rio Grande Valley of Texas. The top rail destinations for U.S. sorghum exports to Mexico in 2005 were Nuevo Leon, Veracruz, Estado de Mexico, Jalisco, and Guanajuato (Adcock, Rosson, and Varela 2007). Texas (Laredo and El Paso) and Arizona (Santa Cruz) are the main rail entry points (figure 2). The ports of Veracruz and Progreso are the major entry points by vessel (table 4 and figure 3). Half of the year's sorghum exports to Mexico occur between January and May, reaching a peak in April (figure 6).

**Table 5–Tonnages (MT) and modal share for U.S. sorghum exports to Mexico**

| Year/type of movement | Mode of transport | | | | | | Total U.S. exports to Mexico |
|---|---|---|---|---|---|---|---|
| | Ocean (U.S. Gulf) | | Rail | | Truck | | |
| | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage | |
| 2002 | 2,507,699 | 60 | 1,281,842 | 31 | 365,727 | 9 | 4,155,268 |
| 2003 | 1,564,878 | 55 | 775,186 | 27 | 495,369 | 17 | 2,835,433 |
| 2004 | 1,421,573 | 47 | 563,689 | 19 | 1,061,539 | 35 | 3,046,801 |
| 2005 | 1,394,923 | 49 | 162,400 | 6 | 1,313,129 | 46 | 2,870,452 |
| 2006 | 1,182,147 | 45 | 275,358 | 10 | 1,181,688 | 45 | 2,639,193 |
| **Average 02-06** | **1,614,244** | **51** | **611,695** | **19** | **883,490** | **30** | **3,109,429** |

Source: USDA/GIPSA, STB Carload Waybill Sample, and Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics

**Table 6–U.S. sorghum exports to Mexico by route, 2002-2006 (MT)**

| Route | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| **Maritime:** | | | | | | |
| U.S. Gulf | East Gulf | 0 | 0 | 0 | 0 | 0 |
| | Mississippi River | 704,784 | 415,171 | 294,219 | 278,948 | 106,980 |
| | North Texas | 1,298,527 | 933,591 | 690,250 | 761,129 | 946,231 |
| | South Texas | 504,388 | 216,116 | 437,104 | 354,846 | 128,936 |
| Total | | 2,507,699 | 1,564,878 | 1,421,573 | 1,394,923 | 1,182,147 |
| Maritime as % of total exports | | 60 | 55 | 47 | 49 | 45 |
| **Overland** | | 1,647,569 | 1,270,555 | 1,625,228 | 1,475,529 | 1,457,046 |
| Overland as % of total exports | | 40 | 45 | 53 | 51 | 55 |
| **Total U.S. Exports** | | **4,155,268** | **2,835,433** | **3,046,801** | **2,870,452** | **2,639,193** |

Source: Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics and USDA/GIPSA

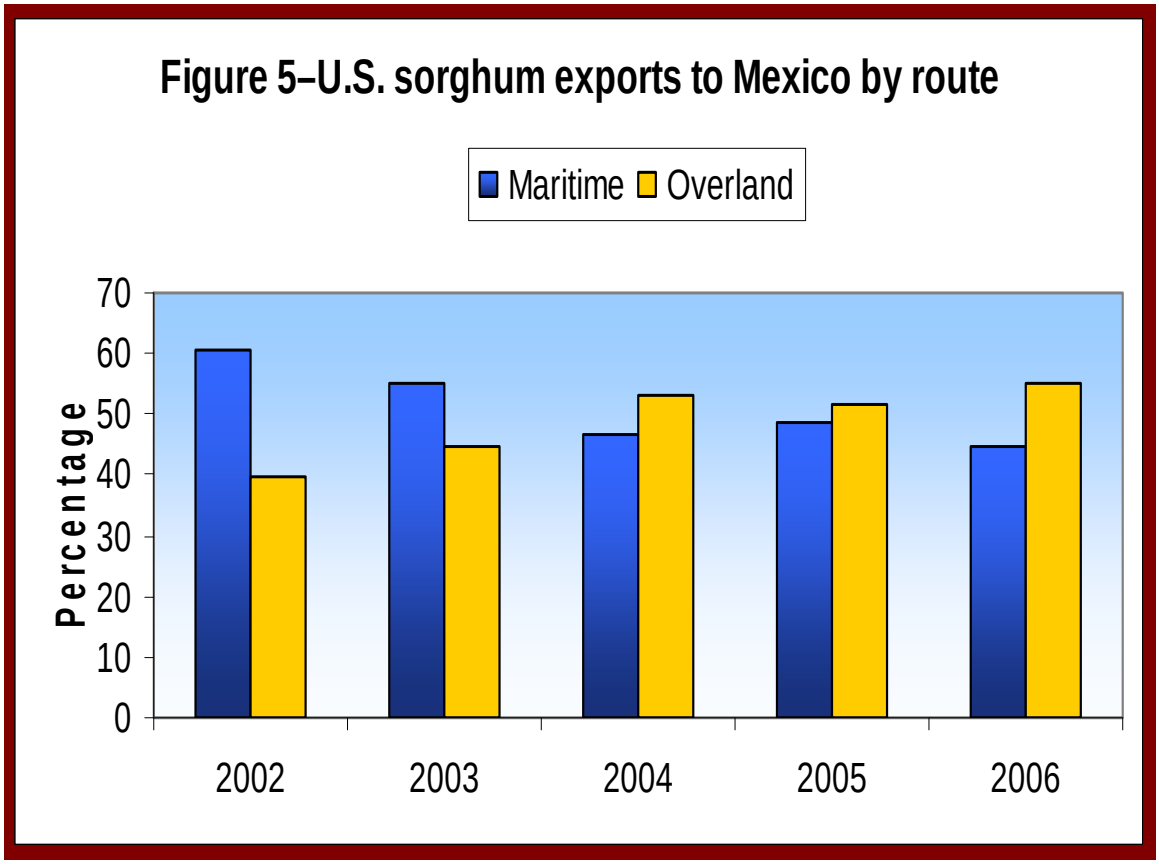
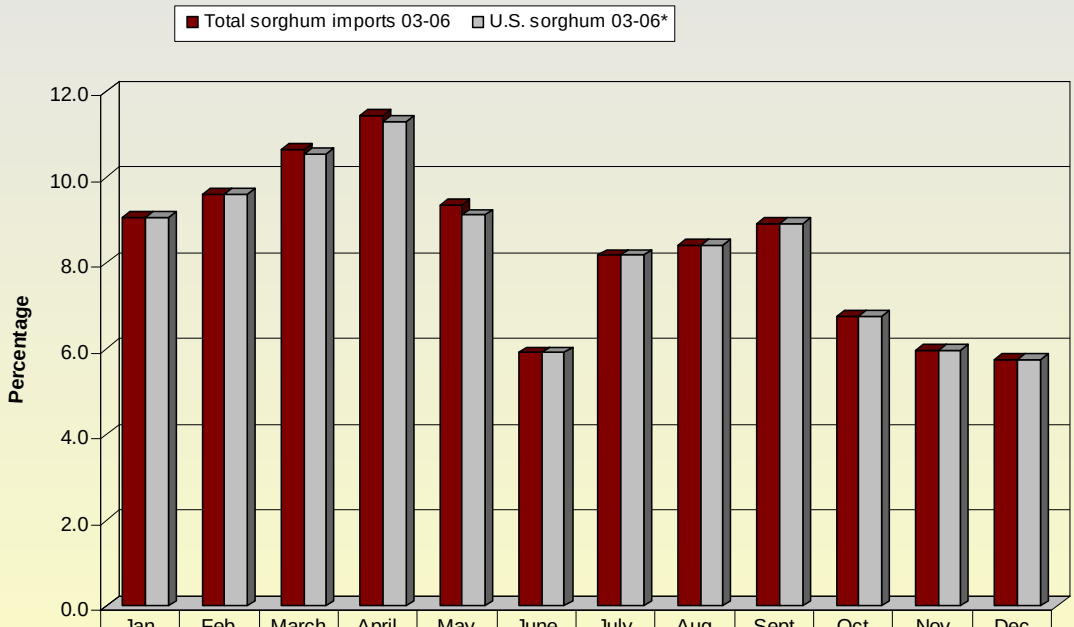


**Figure 6–Mexico's average monthly sorghum imports**



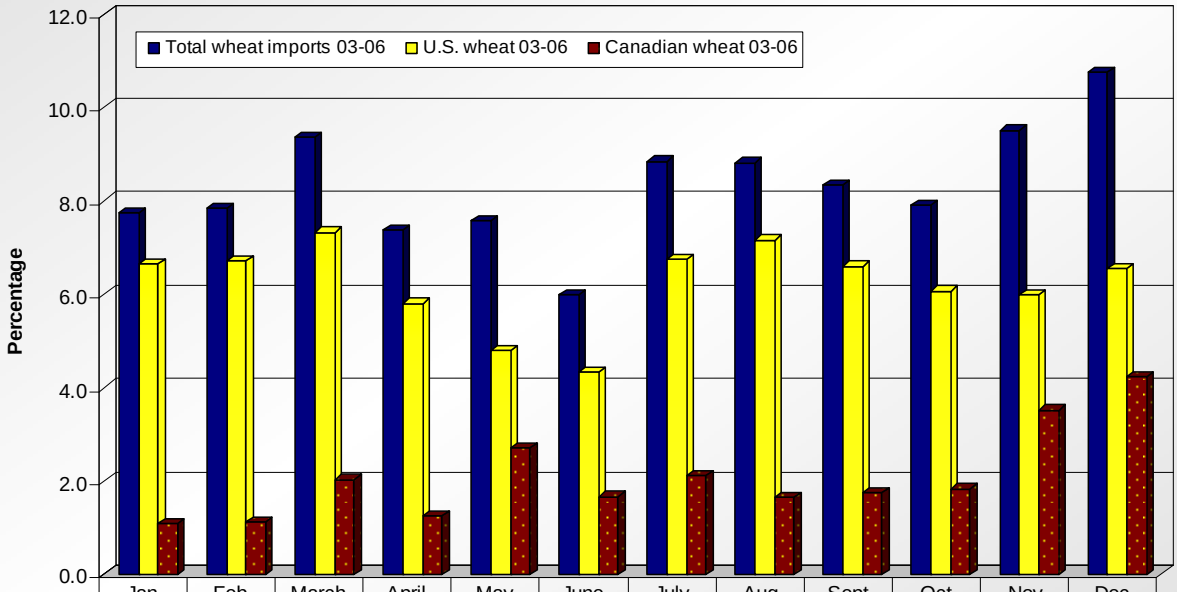

| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total sorghum imports 03-06 | 9.1 | 9.6 | 10.6 | 11.4 | 9.4 | 5.9 | 8.2 | 8.4 | 8.9 | 6.7 | 6.0 | 5.8 |
| U.S. sorghum 03-06* | 9.1 | 9.6 | 10.5 | 11.3 | 9.1 | 5.9 | 8.2 | 8.4 | 8.9 | 6.7 | 6.0 | 5.8 |

*The United States share of total sorghum imports is almost 100 percent
Source: SIAP/SAGARPA

## Wheat Exports to Mexico

Mexico grows some wheat, but it relies on imports to satisfy its demand. The United States and Canada are its major suppliers (figure 7). The U.S.' share of Mexico's wheat market varies from year to year because of Canadian competition (figures 7 and 8), which is based on quality and price (SIAP/SAGARPA 2007). Wheat exports consist mostly of hard red winter (HRW) wheat due to the proximity of the HRW-wheat-growing areas in the southern Plains to the Mexican border. The wheat is milled to make bread, cookies, cakes, and prepared flours (Ag-Canada 2006). As a result of NAFTA, there are no tariffs on U.S. and Canadian wheat exports to Mexico. Wheat exports to Mexico declined 18 percent in 2006 to 2.2 mmt from 2.7 mmt in 2005. They are used almost entirely for human consumption (Adcock, Rosson, and Varela 2007).

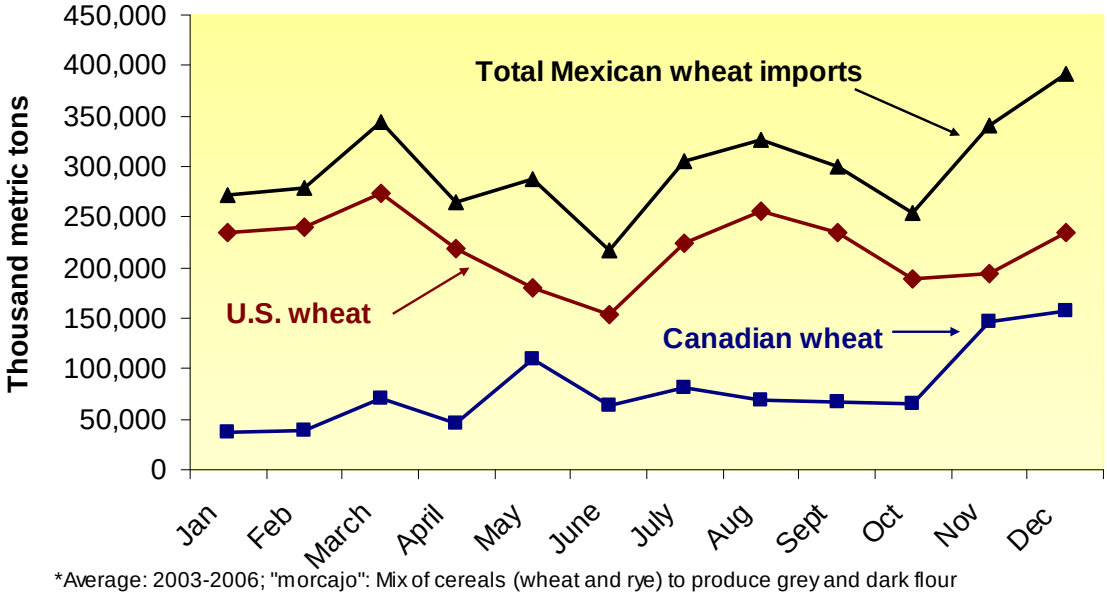
**Figure 7–Mexico's average wheat and "morcajo" monthly imports**




| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total wheat imports 03-06 | 7.7 | 7.8 | 9.4 | 7.4 | 7.6 | 6.0 | 8.8 | 8.8 | 8.3 | 7.9 | 9.5 | 10.8 |
| U.S. wheat 03-06 | 6.6 | 6.7 | 7.3 | 5.8 | 4.8 | 4.3 | 6.7 | 7.2 | 6.6 | 6.1 | 6.0 | 6.5 |
| Canadian wheat 03-06 | 1.1 | 1.1 | 2.0 | 1.3 | 2.7 | 1.7 | 2.1 | 1.7 | 1.7 | 1.8 | 3.5 | 4.2 |

"morcajo": Mix of cerals (wheat and rye) to produce grey and dark flour
Source: SIAP/SAGARPA

**Figure 8–Mexico wheat and "morcajo" 3 year average* monthly imports**




*Average: 2003-2006; "morcajo": Mix of cereals (wheat and rye) to produce grey and dark flour
Source: SIAP/SAGARPA

## Wheat Modal Share

From 2002 to 2006, ocean vessels were the major transport mode for shipping U.S. wheat to Mexico (tables 7 and 8), but this trend is changing. Rail has gained a greater share of the market (figure 9) as more shuttle train facilities have been built along the border and in major distribution centers. During this period, rail hauled 36 percent and truck 11 percent of U.S. wheat to Mexico. Estado de Mexico was the major rail destination of U.S. wheat exports by rail, followed by the D.F., Nuevo Leon, Jalisco, Puebla, Coahuila, Guanajuato, and Queretaro (Adcock, Rosson, and Varela 2007). Texas (Laredo, El Paso, Eagle Pass, and Brownsville) and Santa Cruz, Arizona, were the major entry points of wheat by rail (figure 2).

In 2006, almost 96 percent of U.S. wheat shipped by ocean originated in the Gulf, mostly from the Mississippi River and North Texas regions (table 8). The ports of Veracruz and Coatzacoalcos were the major points of entry into Mexico (figure 3 and table 4). Figure 7 shows that 54 percent of Mexico's wheat imports occurred during the second half of the year, reaching a peak from November through December. The majority of U.S. wheat exports to Mexico (39 percent) occurred during the fourth quarter of the year.

**Table 7–Tonnages (MT) and modal share for U.S. wheat exports to Mexico**

| Year/type of movement | Mode of transport | | | | | | Total U.S. exports to Mexico |
|---|---|---|---|---|---|---|---|
| | Ocean (U.S. Gulf) | | Rail | | Truck | | |
| | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage | |
| 2002 | 1,523,135 | 65 | 715,593 | 31 | 86,918 | 4 | 2,325,646 |
| 2003 | 1,644,499 | 63 | 712,237 | 27 | 243,100 | 9 | 2,599,836 |
| 2004 | 1,288,797 | 46 | 941,399 | 33 | 587,424 | 21 | 2,817,620 |
| 2005 | 1,223,705 | 45 | 1,375,127 | 51 | 107,107 | 4 | 2,705,939 |
| 2006 | 1,058,575 | 48 | 821,422 | 37 | 339,369 | 15 | 2,219,366 |
| **Average 02-06** | **1,347,742** | **53** | **913,156** | **36** | **272,784** | **11** | **2,533,681** |

Source: USDA/GIPSA, STB Carload Waybill Sample, and Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics

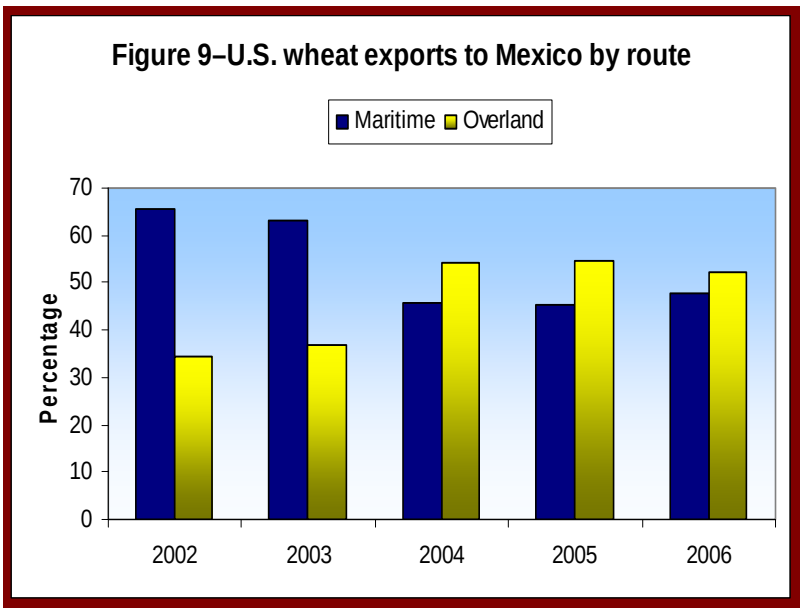



**Table 8–U.S. wheat exports to Mexico by route, 2002-2006 (MT)**

| Route | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| **Maritime:** | | | | | | |
| U.S. Gulf | East Gulf | 7,817 | 20,930 | 0 | 0 | 0 |
| | Mississippi River | 699,598 | 880,148 | 715,444 | 685,050 | 668,082 |
| | North Texas | 730,216 | 692,617 | 558,550 | 468,753 | 347,245 |
| | South Texas | 15,990 | 32,915 | 0 | | 0 |
| | Subtotal | 1,453,621 | 1,626,610 | 1,273,994 | 1,153,803 | 1,015,327 |
| | | | | | | |
| Lakes | Toledo | 0 | 17,889 | 0 | 0 | 0 |
| | Duluth-Sup | 0 | 0 | 0 | 0 | 18,890 |
| | Subtotal | 0 | 17,889 | 0 | 0 | 18,890 |
| | | | | | | |
| Atlantic | North Atlantic | 0 | 0 | 14,803 | 16,501 | 24,358 |
| | South Atlantic | 69,514 | 0 | 0 | 53,401 | 0 |
| | Subtotal | 69,514 | 0 | 14,803 | 69,902 | 24,358 |
| Total | | 1,523,135 | 1,644,499 | 1,288,797 | 1,223,705 | 1,058,575 |
| Maritime as % of total exports | | 65 | 63 | 46 | 45 | 48 |
| | | | | | | |
| **Overland** | | 802,511 | 955,337 | 1,528,823 | 1,482,234 | 1,160,791 |
| Overland as % of total exports | | 35 | 37 | 54 | 55 | 52 |
| **Total U.S. Exports** | | **2,325,646** | **2,599,836** | **2,817,620** | **2,705,939** | **2,219,366** |

Source: Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics and USDA/GIPSA

## Soybean Exports to Mexico

Mexico is the world's fourth largest soybean importer, after China, the EU-27, and Japan. Mexican domestic production has virtually been displaced by U.S. imports because of reform in Mexico's domestic crop support program and the elimination of soybean tariffs due to NAFTA, and because of improvements in rail transportation links at the border (Ash, Livezey, and Dohlman 2006). In addition, strong income growth among Mexican consumers has boosted consumption of meat and vegetable oils and increased demand for soybeans as a feed ingredient. U.S. soybean exports to Mexico increased 9 percent from 2005 to 2006, to 7.7 mmt (FAS 2007a).

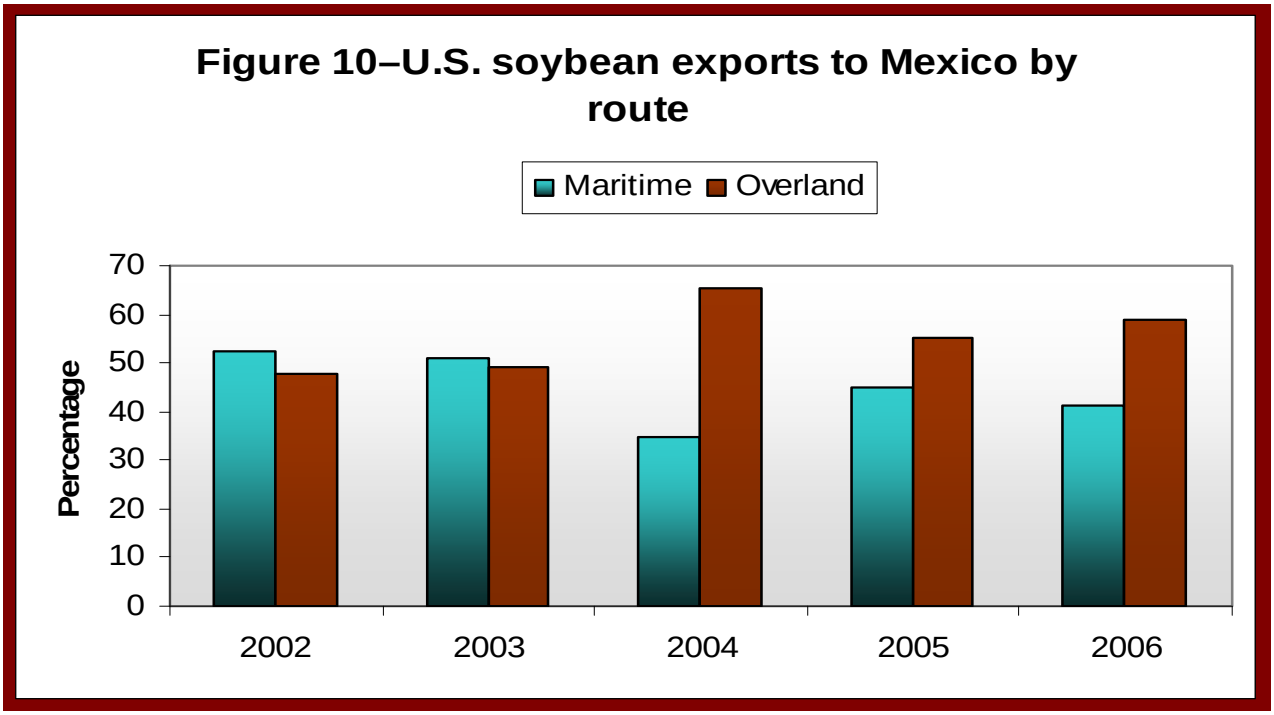
Soybeans are crushed into meal and oil in Mexico. Major soybean crushing facilities are located in Merida, Yucatan, Monterrey, Nuevo Leon, Guadalajara, Jalisco, northern Mexico City, Guanajuato, and near the ports of Veracruz and Coatzacoalcos (Adcock, Rosson, and Varela 2007). Soybean meal is an important protein feed for livestock, dairy, poultry, and aquaculture. Small portions are used as a baking ingredient and meat substitutes (Ash, Livezey, and Dohlman 2006, and American Soybean Association 2000).

## Soybean Modal Share

Ocean vessels are the predominant transport mode for shipping soybeans to Mexico (tables 9 and 10, and figure 10). From 2002 to 2006, ocean vessels moved 45 percent of U.S. soybean exports to Mexico, rail hauled 32 percent, and truck carried 23 percent. The ports of Altamira and Veracruz were the major ocean points of entry of soybeans into Mexico (figure 3 and table 4). Almost all soybean exports originated in the Gulf, mostly from the Mississippi River (table 9). Texas (Brownsville, Eagle Pass, El Paso, and Laredo) was the major entry point for rail shipments (figure 2). Major rail destinations were Guanajuato, Nuevo Leon, Hidalgo, Tamaulipas, Jalisco, and San Luis Potosi (Adcock, Rosson, and Varela 2007). In the last 3 years, there has been a shift from maritime to overland shipments of soybeans to Mexico; trucks have gained market share at the expense of ocean and rail carriers. Figure 11 shows that U.S. soybean exports are spread throughout the year, reaching peaks in April and October.

**Table 9–Tonnages (MT) and modal share for U.S. soybean exports to Mexico**

| Year/type of movement | Mode of transport | | | | | | Total U.S. exports to Mexico |
|---|---|---|---|---|---|---|---|
| | Ocean (U.S. Gulf) | | Rail | | Truck | | |
| | Quantity | Percentage | Quantity | Percentage | Quantity | Percentage | |
| 2002 | 2,047,166 | 52 | 1,872,810 | 48 | 0 | 0 | 3,919,976 |
| 2003 | 1,985,002 | 51 | 994,517 | 26 | 908,285 | 23 | 3,887,804 |
| 2004 | 998,748 | 35 | 859,880 | 30 | 1,012,228 | 35 | 2,870,856 |
| 2005 | 1,549,847 | 45 | 987,614 | 29 | 903,054 | 26 | 3,440,515 |
| 2006 | 1,545,366 | 41 | 1,050,397 | 28 | 1,146,953 | 31 | 3,742,716 |
| **Average 02–06** | **1,625,226** | **45** | **1,153,044** | **32** | **794,104** | **23** | **3,572,373** |



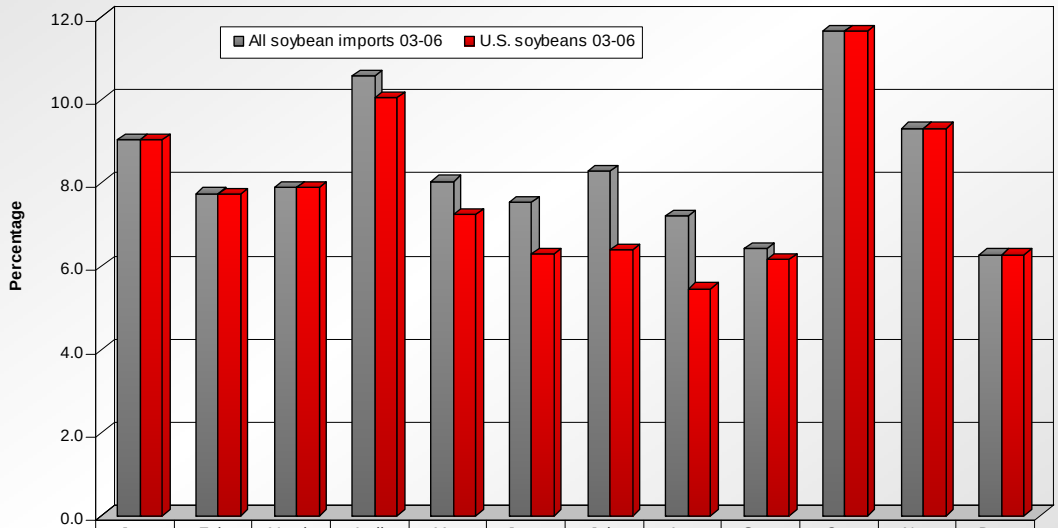

Source: USDA/GIPSA, STB Carload Waybill Sample, and Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics

**Table 10–U.S. soybean exports to Mexico by route, 2002-2006 (MT)**

| Route | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| **Maritime:** | | | | | | |
| U.S. Gulf | East Gulf | 145,716 | 46,088 | 0 | 54,407 | 12,560 |
| | Mississippi River | 1,682,448 | 1,871,502 | 980,338 | 1,446,421 | 1,460,557 |
| | North Texas | 195,154 | 48,480 | 18,410 | 17,407 | 72,249 |
| | South Texas | 18,384 | 18,932 | 0 | 0 | 0 |
| | Subtotal | 2,041,702 | 1,985,002 | 998,748 | 1,518,235 | 1,545,366 |
| Atlantic | North Atlantic | 0 | 0 | 0 | 0 | 0 |
| | South Atlantic | 5,464 | 0 | 0 | 31,612 | 0 |
| | Subtotal | 5,464 | 0 | 0 | 31,612 | 0 |
| Total | | 2,047,166 | 1,985,002 | 998,748 | 1,549,847 | 1,545,366 |
| Maritime as % of total exports | | 52 | 51 | 35 | 45 | 41 |
| **Overland** | | 1,872,810 | 1,902,802 | 1,872,108 | 1,890,668 | 2,197,350 |
| Overland as % of total exports | | 48 | 49 | 65 | 55 | 59 |
| **Total U.S. Exports** | | **3,919,976** | **3,887,804** | **2,870,856** | **3,440,515** | **3,742,716** |

Source: Dept. of Commerce/U.S. Census Bureau/Foreign Trade Statistics and USDA/GIPSA

**Figure 11–Mexico's average monthly soybean imports**




| | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All soybean imports 03-06 | 9.0 | 7.7 | 7.9 | 10.6 | 8.0 | 7.5 | 8.3 | 7.2 | 6.4 | 11.7 | 9.3 | 6.3 |
| U.S. soybeans 03-06 | 9.0 | 7.7 | 7.9 | 10.0 | 7.2 | 6.3 | 6.4 | 5.5 | 6.2 | 11.7 | 9.3 | 6.3 |

Source: SIAP/SAGARPA

## Conclusions and Further Research

Exports of U.S. corn, sorghum, wheat, and soybeans to Mexico have shifted from maritime to overland modes during the last five years. Rail is the primary overland mode for wheat and soybeans. Trucks carry most overland transport for sorghum because the major production areas are along the border in the Rio Grande Valley.

Grain shippers in both countries along the border have the advantage of proximity to Mexico. However, this close proximity results in less transportation service being available, translating the physical advantage into an economic disadvantage, if there are no short-line or regional railroad services available. Captive shippers in these areas are forced to use trucks as the only available means of transportation.

Shippers located in Corpus Christi, TX, and Monterrey, Nuevo Leon, Mexico, are captive shippers. Corpus Christi and Monterrey are each about 141 miles from the border town of Laredo. The lack of rail service in the border region could lead to some degree of concentration in regional transportation. Shippers might cooperate to make joint shipments and gain bargaining power with the Class I railroads, for which short-haul service is less profitable. Railroads consider shipments in the border region to be short hauls. This United States–Mexico grain transportation structure should be further investigated by looking at the impact of railroad consolidation in the border area.

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