USDA
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Agricultural Marketing Service

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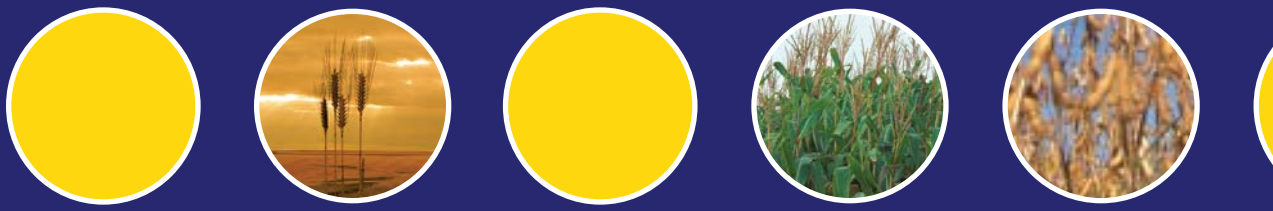
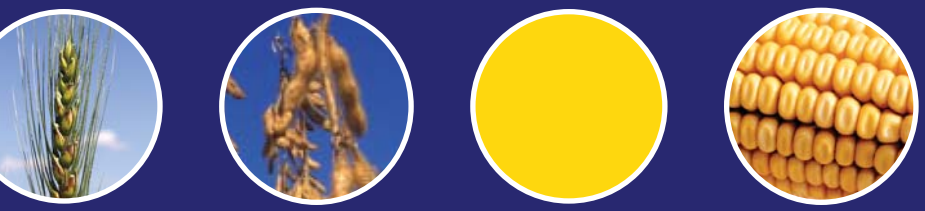


# Transportation of U.S. Grains

## A Modal Share Analysis 1978-2010 Update



# Transportation of U.S. Grains

## A Modal Share Analysis 1978-2010 Update

Nick Marathon, *Economist*
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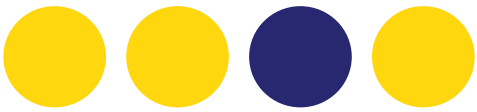
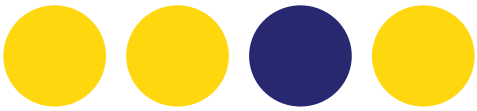
Transportation Services Division
USDA Agricultural Marketing Service



# Contents



# Introduction

The purpose of this analysis is to examine trends in the type of transportation used to move grains grown for the food and feed industry.[1] Grains produced in the United States move to domestic and foreign markets through a well-developed transportation system. Barge, rail, and truck transportation facilitate a highly competitive market that bridges the gap between U.S. grain producers and domestic and foreign consumers.

Barges, railroads, and trucks often compete head-to-head to supply transportation for grains. Despite a high degree of competition in some markets, these modes also complement each other. Before a bushel of grain reaches its final destination, it has often been transported by two or more modes. This balance between competition and integration provides grain shippers with a highly efficient, low-cost system of transportation. The competitiveness of U.S. grains in the world market and the financial well-being of U.S. grain producers depends upon this competitive balance. A highly competitive and efficient transportation system results in lower shipping costs, smaller marketing margins for middlemen, and more competitive export prices. Such efficiencies also result in lower food costs for U.S. consumers and higher market prices for U.S. producers.

This analysis of the transportation of the final movement of grain, by mode, provides information about changes in market share among the modes. Over several years, such work helps identify critical trends affecting the transportation of grain. It also provides a framework to assess public policies that influence the development and success of the Nation's transportation infrastructure. Public policies that promote an efficient grain transportation system also promote strong U.S. agricultural and rural economies.

*Note to reader regarding past versions of this report: This update presents new data for 2008, 2009, and 2010. Some of the pre-2008 data has also been updated to reflect data revisions, so this report is more accurate than the previous versions.*

1 For this analysis, it is assumed that corn, wheat, soybeans, sorghum, and barley represent all grain movements.

# Methodology

## Estimating modal tonnages and shares

Any effort to measure tonnages of grain moved by mode of transport is limited by the absence of information on the total volume of truck movements. Accurate data exist for barge and rail freight tonnages and commodities, but not for trucks. Other analyses of grain movements have relied extensively on survey data to overcome this obstacle. This analysis uses the Waterborne Commerce Statistics of the U.S. Army Corps of Engineers to calculate tonnages of barged grain and uses the Carload Waybill Sample from the Surface Transportation Board to estimate the amount of railed grain. Trucking data are derived from known grain production data, as compared to the estimates of the railed and barged volumes of grain. Estimating these modal grain volumes and modal shares on an annual basis provides a data series that tracks changes in grain transportation over time.

In this analysis, the term "modal share" describes that portion of the total tonnages of grain moved by each mode of transport—barge, rail, or truck. These shares, expressed as percentages, were determined by mode for particular types of grains and movements. Grains identified for this analysis were corn, wheat, soybeans, sorghum, and barley. The 1992 and 1998 versions of this study also included rye and oats. Rye and oats were taken out of the calculations for this report because of unreliability due to small volumes, which total less than 1 percent of all grain movements. Transport modes are categorized according to the final movement going to domestic markets or ports for export.

The estimates of modal tonnages and shares are based on the amount of grain moved to commercial markets. Truck tonnages are estimated by subtracting barge and rail tonnages from total tonnages transported. Figure 1 shows how modal shares are estimated. For each crop, total movements are determined first, and then exports are subtracted from the total to get domestic movements. Total rail and barge volumes are subtracted from total movements to get truck movements. A more detailed description of the methodology is covered in Appendix A.

**Figure 1: Estimating modal tonnages and share**

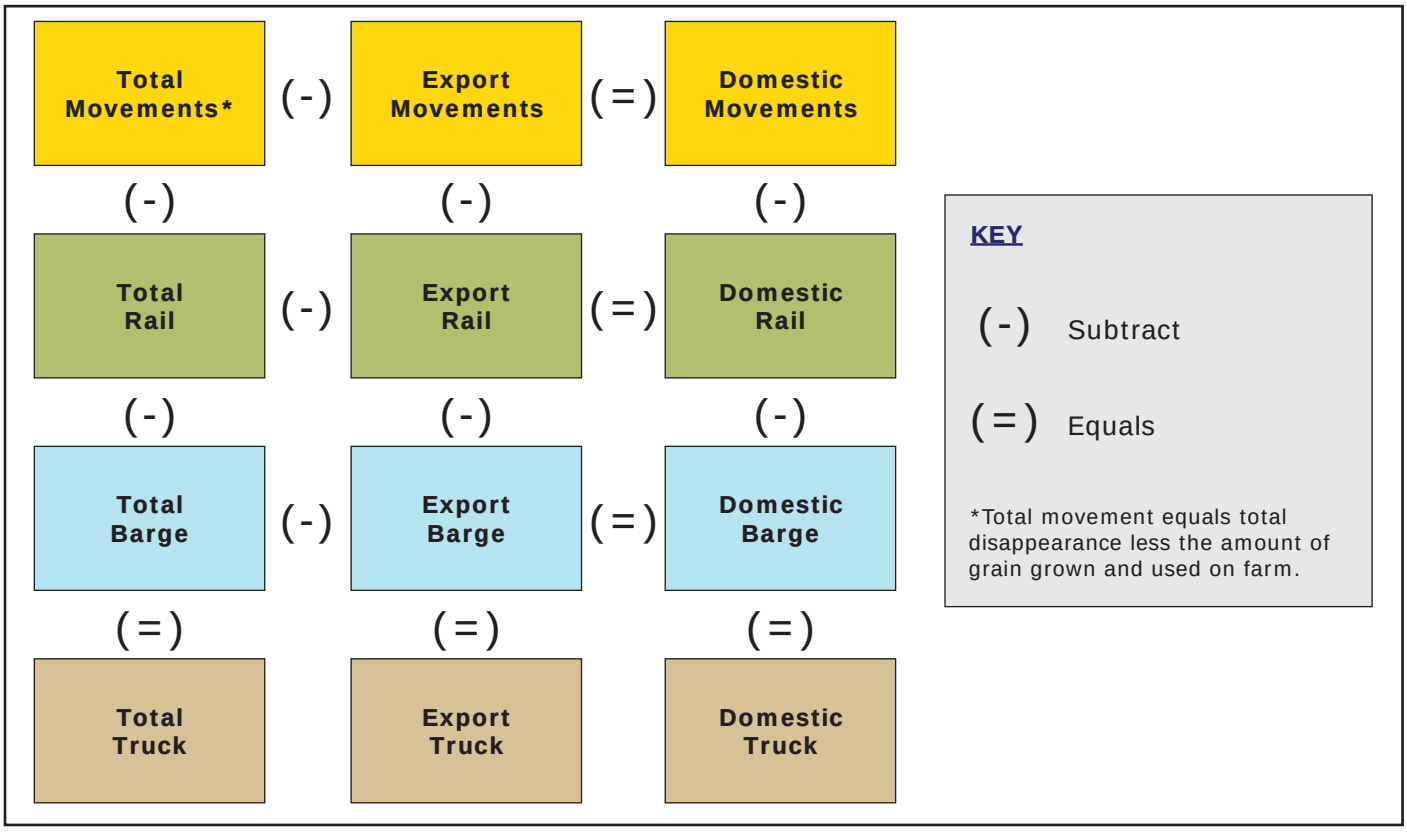


**Figure 2: Total grain movements to domestic and export markets, 1978-2010**

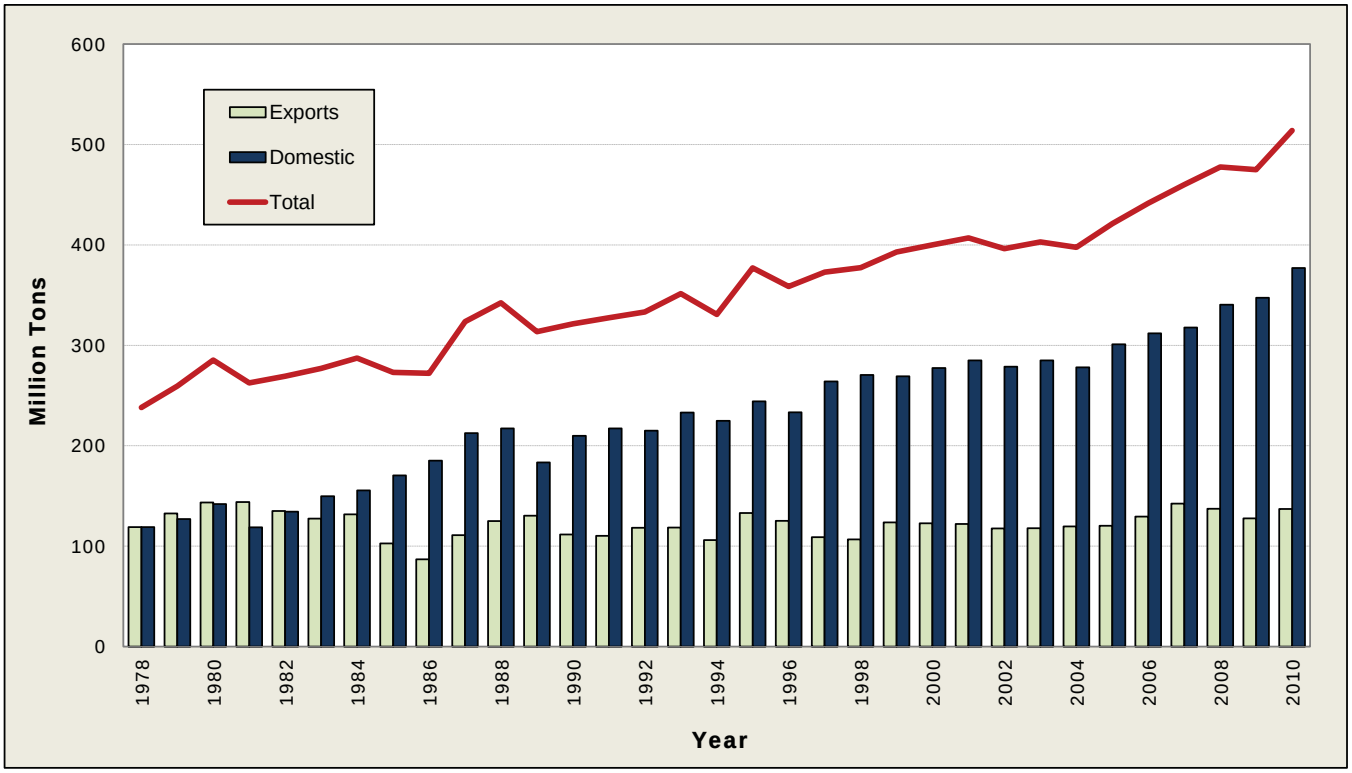



**Figure 3: U.S. grain shipments by commodity, 1978-2010**

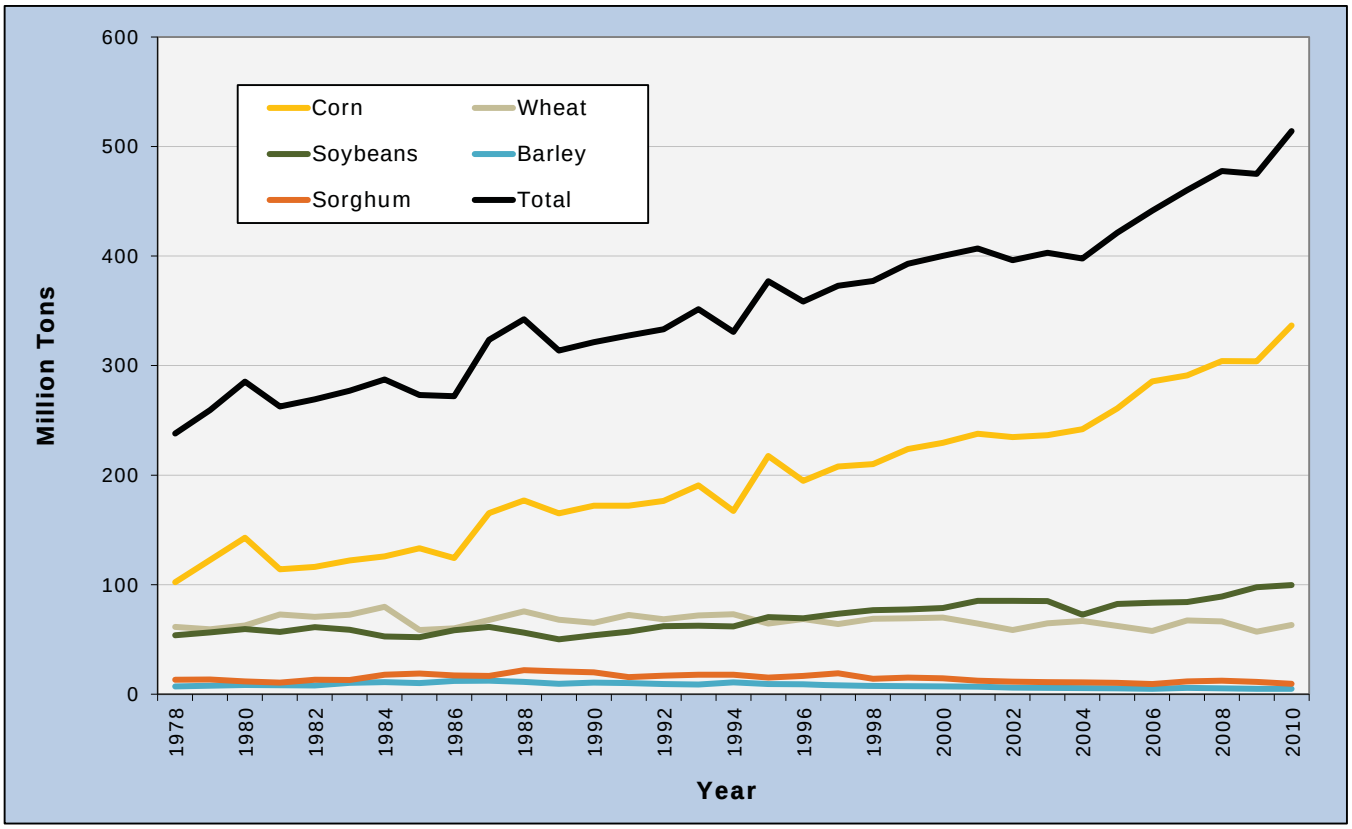
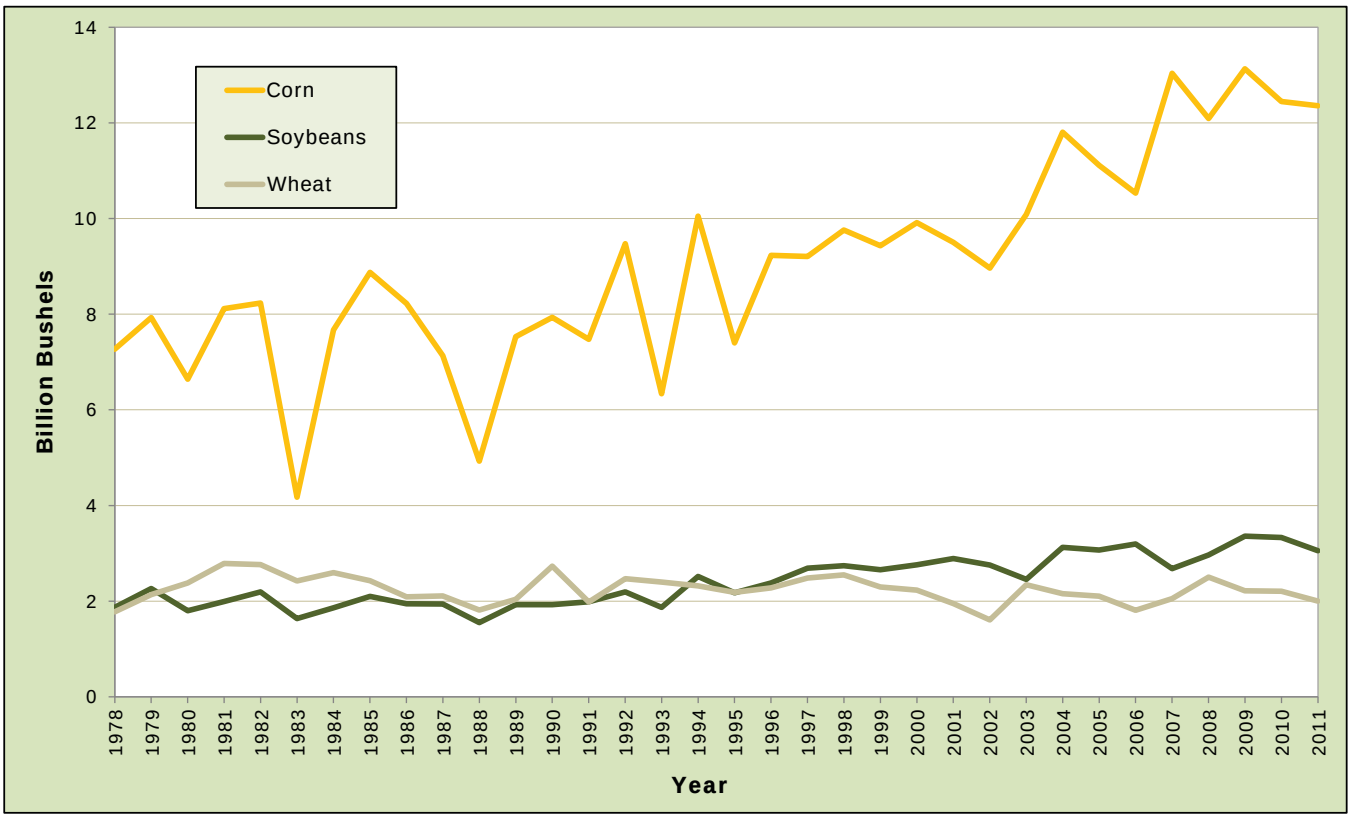


**Table 1: Tonnages of U.S. grains transported, by type of crop and type of movement, 1998–2010**

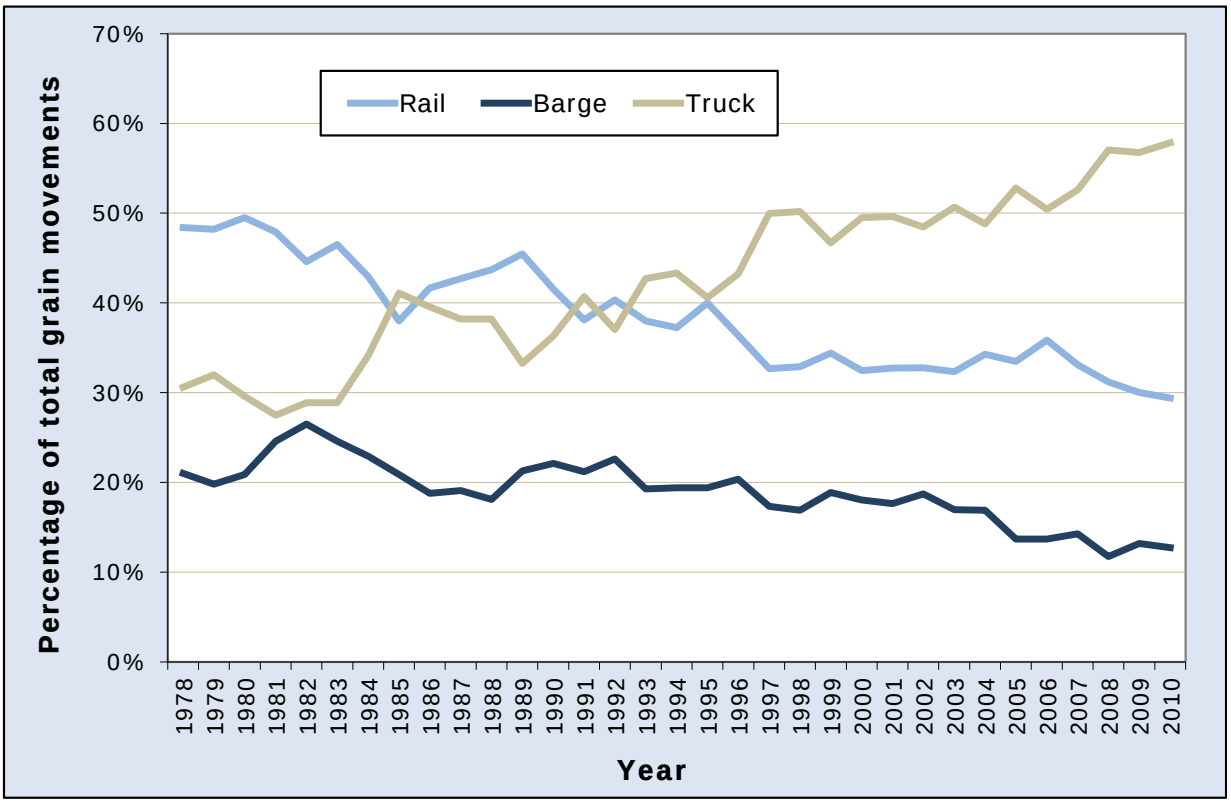
| Year | Corn | Wheat | Soybeans | Sorghum | Barley | All grains |
|---|---|---|---|---|---|---|
| | 1,000 tons | | | | | |
| **Total** | | | | | | |
| 1998 | 209,977 | 68,859 | 76,848 | 14,114 | 7,477 | 377,275 |
| 1999 | 223,877 | 69,227 | 77,501 | 15,107 | 7,136 | 392,847 |
| 2000 | 229,534 | 69,904 | 78,662 | 14,524 | 7,400 | 400,023 |
| 2001 | 237,853 | 64,481 | 85,347 | 12,455 | 6,805 | 406,942 |
| 2002 | 234,647 | 58,668 | 85,354 | 11,518 | 6,044 | 396,231 |
| 2003 | 236,406 | 64,790 | 84,950 | 11,018 | 5,742 | 402,905 |
| 2004 | 241,854 | 66,834 | 72,531 | 10,912 | 5,539 | 397,670 |
| 2005 | 260,869 | 62,289 | 82,351 | 10,318 | 5,483 | 421,310 |
| 2006 | 285,643 | 57,825 | 83,604 | 9,306 | 5,030 | 441,408 |
| 2007 | 290,994 | 67,424 | 84,193 | 11,630 | 5,869 | 460,110 |
| 2008 | 304,155 | 66,501 | 89,156 | 12,355 | 5,389 | 477,556 |
| 2009 | 303,803 | 57,138 | 97,728 | 11,379 | 4,850 | 474,898 |
| 2010 | 336,633 | 63,285 | 99,692 | 9,532 | 4,884 | 514,026 |
| **Export** | | | | | | |
| 1998 | 44,865 | 30,070 | 25,450 | 5,507 | 811 | 106,703 |
| 1999 | 57,820 | 33,130 | 25,509 | 6,309 | 915 | 123,683 |
| 2000 | 52,957 | 31,780 | 29,698 | 7,037 | 1,256 | 122,729 |
| 2001 | 53,032 | 29,410 | 31,663 | 6,720 | 1,189 | 122,014 |
| 2002 | 52,329 | 27,580 | 30,506 | 6,085 | 1,008 | 117,508 |
| 2003 | 47,607 | 29,390 | 34,147 | 5,546 | 1,167 | 117,857 |
| 2004 | 53,374 | 32,809 | 27,485 | 5,089 | 838 | 119,595 |
| 2005 | 50,615 | 31,907 | 31,663 | 5,062 | 1,093 | 120,339 |
| 2006 | 63,420 | 29,370 | 30,506 | 5,205 | 888 | 129,390 |
| 2007 | 63,420 | 37,040 | 34,147 | 6,326 | 1,463 | 142,396 |
| 2008 | 58,875 | 33,830 | 37,338 | 5,813 | 1,340 | 137,195 |
| 2009 | 52,752 | 25,150 | 44,616 | 4,164 | 908 | 127,590 |
| 2010 | 54,936 | 31,220 | 46,243 | 4,189 | 512 | 137,100 |
| **Domestic** | | | | | | |
| 1998 | 165,111 | 38,789 | 51,398 | 8,607 | 6,666 | 270,572 |
| 1999 | 166,057 | 36,097 | 51,992 | 8,798 | 6,221 | 269,164 |
| 2000 | 176,576 | 38,124 | 48,964 | 7,486 | 6,143 | 277,294 |
| 2001 | 184,821 | 35,071 | 53,685 | 5,735 | 5,616 | 284,928 |
| 2002 | 182,318 | 31,088 | 54,848 | 5,433 | 5,037 | 278,724 |
| 2003 | 188,799 | 35,400 | 50,802 | 5,472 | 4,575 | 285,048 |
| 2004 | 188,480 | 34,025 | 45,046 | 5,823 | 4,701 | 278,075 |
| 2005 | 210,254 | 30,382 | 50,688 | 5,256 | 4,390 | 300,971 |
| 2006 | 222,223 | 28,455 | 53,098 | 4,101 | 4,141 | 312,018 |
| 2007 | 227,574 | 30,384 | 50,046 | 5,304 | 4,406 | 317,714 |
| 2008 | 245,281 | 32,671 | 51,818 | 6,542 | 4,049 | 340,361 |
| 2009 | 251,051 | 31,988 | 53,112 | 7,215 | 3,942 | 347,308 |
| 2010 | 281,697 | 32,065 | 53,449 | 5,343 | 4,372 | 376,926 |

**Figure 4: U.S. corn, soybeans, and wheat production, 1978-2011**




Source: National Agricultural Statistics Service, USDA

**Figure 5: U.S. grain modal shares, 1978-2010**



## Table 2: Tonnages and modal shares for all U.S. grains, 1998–2010

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 125,021 | 33 | 64,199 | 17 | 190,727 | 50 |
| 1999 | 135,232 | 34 | 74,174 | 19 | 183,441 | 47 |
| 2000 | 129,824 | 32 | 72,197 | 18 | 198,002 | 49 |
| 2001 | 133,233 | 33 | 71,808 | 18 | 201,901 | 50 |
| 2002 | 129,915 | 33 | 74,267 | 19 | 192,049 | 48 |
| 2003 | 130,356 | 32 | 68,396 | 17 | 204,153 | 51 |
| 2004 | 136,317 | 34 | 67,274 | 17 | 194,079 | 49 |
| 2005 | 141,130 | 33 | 57,668 | 14 | 222,512 | 53 |
| 2006 | 158,287 | 36 | 60,484 | 14 | 222,637 | 50 |
| 2007 | 152,423 | 33 | 65,750 | 14 | 241,938 | 53 |
| 2008 | 149,061 | 31 | 56,118 | 12 | 272,377 | 57 |
| 2009 | 142,663 | 30 | 62,689 | 13 | 269,546 | 57 |
| 2010 | 151,251 | 29 | 65,428 | 13 | 297,346 | 58 |
| **Export** | | | | | | |
| 1998 | 41,700 | 39 | 57,509 | 54 | 7,369 | 7 |
| 1999 | 50,876 | 41 | 67,949 | 55 | 4,647 | 4 |
| 2000 | 46,196 | 38 | 67,556 | 55 | 8,849 | 7 |
| 2001 | 47,196 | 39 | 67,189 | 55 | 7,383 | 6 |
| 2002 | 44,030 | 38 | 68,506 | 59 | 4,505 | 4 |
| 2003 | 45,571 | 39 | 62,776 | 53 | 9,029 | 8 |
| 2004 | 48,482 | 41 | 61,729 | 52 | 8,405 | 7 |
| 2005 | 55,544 | 47 | 52,981 | 45 | 10,060 | 8 |
| 2006 | 62,715 | 50 | 56,617 | 45 | 7,034 | 6 |
| 2007 | 62,055 | 44 | 61,613 | 43 | 18,113 | 13 |
| 2008 | 68,050 | 50 | 51,765 | 38 | 16,633 | 12 |
| 2009 | 59,853 | 47 | 59,095 | 47 | 7,870 | 6 |
| 2010 | 67,732 | 50 | 61,371 | 45 | 7,677 | 6 |
| **Domestic** | | | | | | |
| 1998 | 83,322 | 30 | 6,690 | 2 | 183,357 | 67 |
| 1999 | 84,356 | 31 | 6,225 | 2 | 178,794 | 66 |
| 2000 | 83,628 | 30 | 4,641 | 2 | 189,154 | 68 |
| 2001 | 86,037 | 30 | 4,619 | 2 | 194,518 | 68 |
| 2002 | 85,884 | 31 | 5,761 | 2 | 187,545 | 67 |
| 2003 | 84,786 | 30 | 5,620 | 2 | 195,123 | 68 |
| 2004 | 87,835 | 31 | 5,544 | 2 | 185,674 | 67 |
| 2005 | 85,586 | 28 | 4,686 | 2 | 212,452 | 70 |
| 2006 | 95,572 | 30 | 3,867 | 1 | 215,603 | 68 |
| 2007 | 90,368 | 28 | 4,137 | 1 | 223,824 | 70 |
| 2008 | 81,011 | 24 | 4,353 | 1 | 255,745 | 75 |
| 2009 | 82,810 | 24 | 3,594 | 1 | 261,676 | 75 |
| 2010 | 83,519 | 22 | 4,057 | 1 | 289,670 | 77 |

## Table 3: Modal Share Summary: 2010 and 5-year average, percent

| Mode / Year | Corn | | | Wheat | | | Soybeans | | | All grains | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exports | Domestic | All corn | Exports | Domestic | All wheat | Exports | Domestic | All soybeans | Exports | Domestic | All grains |
| **Rail** | | | | | | | | | | | | |
| 2010 | 40 | 19 | 22 | 72 | 68 | 70 | 44 | 12 | 27 | 50 | 22 | 29 |
| 5-yr avg | 38 | 23 | 26 | 70 | 74 | 72 | 42 | 12 | 25 | 48 | 26 | 32 |
| **Barge** | | | | | | | | | | | | |
| 2010 | 57 | 1 | 10 | 26 | 1 | 13 | 47 | 3 | 24 | 45 | 1 | 13 |
| 5-yr avg | 53 | 1 | 11 | 28 | 1 | 14 | 46 | 2 | 20 | 44 | 1 | 13 |
| **Truck** | | | | | | | | | | | | |
| 2010 | 3 | 81 | 68 | 3 | 31 | 17 | 8 | 85 | 50 | 6 | 77 | 58 |
| 5-yr avg | 9 | 76 | 63 | 2 | 25 | 14 | 13 | 85 | 55 | 9 | 73 | 55 |

# Corn Modal Shares

**Table 4: Tonnages and modal shares for U.S. corn, 1998–2010**

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 63,470 | 30 | 33,995 | 16 | 112,511 | 54 |
| 1999 | 71,807 | 32 | 40,620 | 18 | 111,449 | 50 |
| 2000 | 68,984 | 30 | 37,831 | 16 | 122,718 | 53 |
| 2001 | 70,773 | 30 | 38,864 | 16 | 128,217 | 54 |
| 2002 | 71,488 | 30 | 41,598 | 18 | 121,561 | 52 |
| 2003 | 69,775 | 30 | 36,488 | 15 | 130,143 | 55 |
| 2004 | 74,766 | 31 | 37,302 | 15 | 129,787 | 54 |
| 2005 | 75,261 | 29 | 31,739 | 12 | 153,869 | 59 |
| 2006 | 87,314 | 31 | 34,587 | 12 | 163,742 | 57 |
| 2007 | 78,650 | 27 | 37,407 | 13 | 174,937 | 60 |
| 2008 | 75,652 | 25 | 30,088 | 10 | 198,415 | 65 |
| 2009 | 69,803 | 23 | 32,147 | 11 | 201,853 | 66 |
| 2010 | 74,909 | 22 | 33,134 | 10 | 228,589 | 68 |
| **Export** | | | | | | |
| 1998 | 12,240 | 27 | 30,592 | 68 | 2,033 | 5 |
| 1999 | 18,307 | 32 | 37,533 | 65 | 1,980 | 3 |
| 2000 | 15,213 | 29 | 35,150 | 66 | 2,594 | 5 |
| 2001 | 14,676 | 28 | 35,904 | 68 | 2,452 | 5 |
| 2002 | 13,157 | 25 | 38,125 | 73 | 1,048 | 2 |
| 2003 | 13,207 | 28 | 32,872 | 69 | 1,528 | 3 |
| 2004 | 16,055 | 30 | 33,974 | 64 | 3,345 | 6 |
| 2005 | 18,380 | 36 | 28,778 | 57 | 3,457 | 7 |
| 2006 | 24,735 | 39 | 31,941 | 50 | 6,744 | 11 |
| 2007 | 20,478 | 32 | 34,689 | 55 | 8,252 | 13 |
| 2008 | 24,615 | 42 | 27,457 | 47 | 6,803 | 12 |
| 2009 | 19,801 | 38 | 30,013 | 57 | 2,938 | 6 |
| 2010 | 22,070 | 40 | 31,174 | 57 | 1,692 | 3 |
| **Domestic** | | | | | | |
| 1998 | 51,230 | 31 | 3,403 | 2 | 110,478 | 67 |
| 1999 | 53,501 | 32 | 3,087 | 2 | 109,469 | 66 |
| 2000 | 53,771 | 30 | 2,681 | 2 | 120,124 | 68 |
| 2001 | 56,097 | 30 | 2,960 | 2 | 125,765 | 68 |
| 2002 | 58,331 | 32 | 3,473 | 2 | 120,513 | 66 |
| 2003 | 56,568 | 30 | 3,616 | 2 | 128,615 | 68 |
| 2004 | 58,711 | 31 | 3,328 | 2 | 126,441 | 67 |
| 2005 | 56,881 | 27 | 2,961 | 1 | 150,412 | 72 |
| 2006 | 62,579 | 28 | 2,646 | 1 | 156,998 | 71 |
| 2007 | 58,171 | 26 | 2,718 | 1 | 166,684 | 73 |
| 2008 | 51,037 | 21 | 2,631 | 1 | 191,612 | 78 |
| 2009 | 50,002 | 20 | 2,135 | 1 | 198,915 | 79 |
| 2010 | 52,839 | 19 | 1,960 | 1 | 226,898 | 81 |

**Figure 6: U.S. corn domestic shipments by mode, 1995–2010**

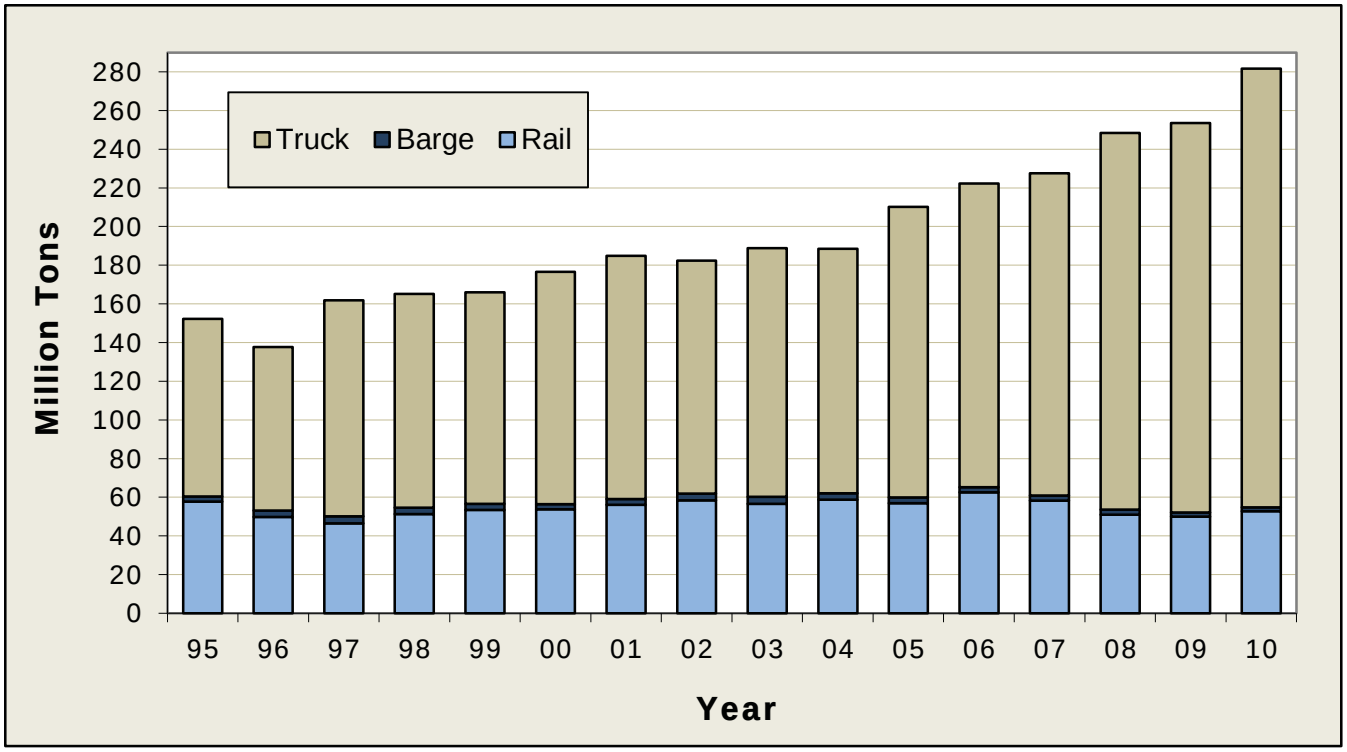
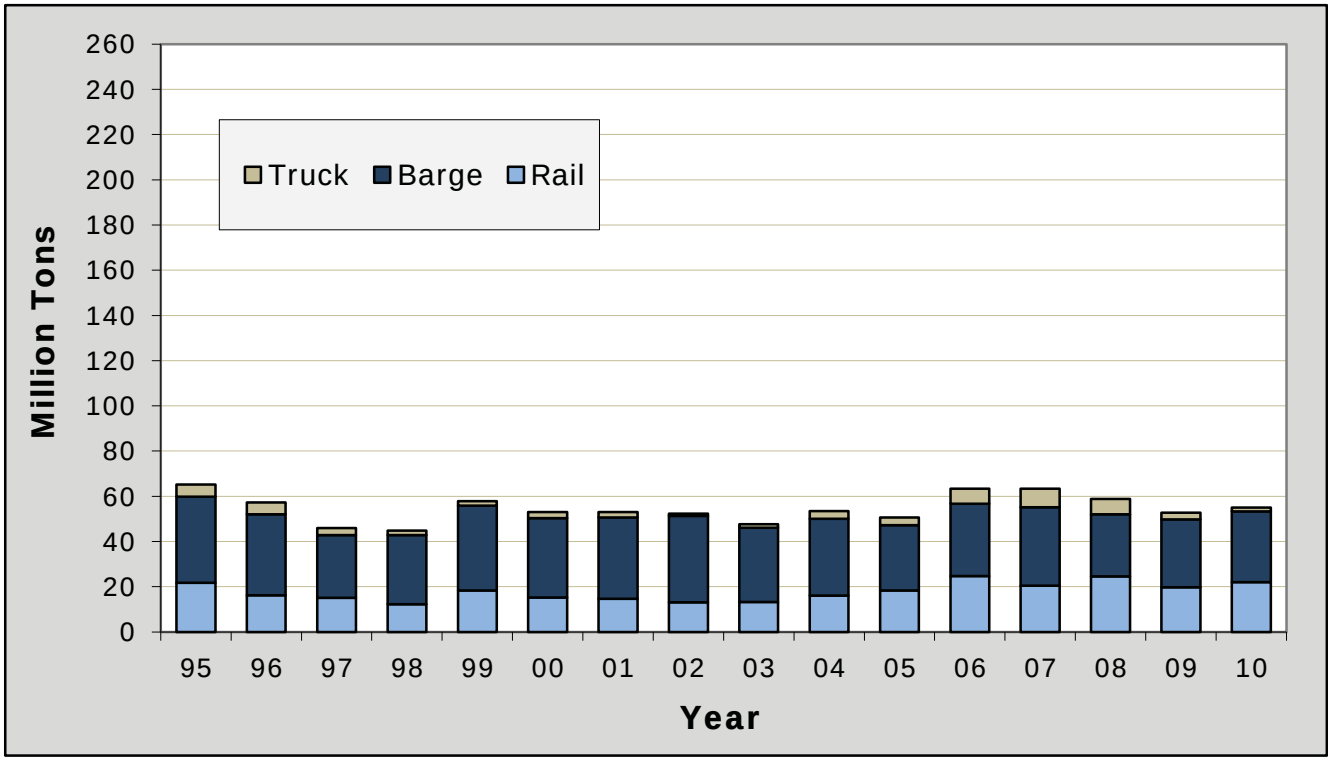



**Figure 7: U.S. corn export shipments by mode, 1995–2010**



# Wheat Modal Shares

**Table 5: Tonnages and modal shares for U.S. wheat, 1998-2010**

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 37,119 | 54 | 10,756 | 16 | 20,984 | 30 |
| 1999 | 37,599 | 54 | 12,038 | 17 | 19,590 | 28 |
| 2000 | 35,380 | 51 | 12,391 | 18 | 22,132 | 32 |
| 2001 | 35,809 | 56 | 11,534 | 18 | 17,138 | 27 |
| 2002 | 34,523 | 59 | 9,876 | 17 | 14,270 | 24 |
| 2003 | 36,900 | 57 | 10,180 | 16 | 17,710 | 27 |
| 2004 | 40,924 | 61 | 11,937 | 18 | 13,973 | 21 |
| 2005 | 44,180 | 71 | 8,668 | 14 | 9,441 | 15 |
| 2006 | 44,735 | 77 | 8,767 | 15 | 4,324 | 7 |
| 2007 | 47,777 | 71 | 10,515 | 16 | 9,132 | 14 |
| 2008 | 45,670 | 69 | 8,872 | 13 | 11,959 | 18 |
| 2009 | 41,094 | 72 | 8,462 | 15 | 7,582 | 13 |
| 2010 | 44,017 | 70 | 8,471 | 13 | 10,798 | 17 |
| **Export** | | | | | | |
| 1998 | 18,824 | 63 | 10,083 | 34 | 1,162 | 4 |
| 1999 | 19,556 | 59 | 11,558 | 35 | 2,016 | 6 |
| 2000 | 17,934 | 56 | 11,975 | 38 | 1,871 | 6 |
| 2001 | 16,657 | 57 | 11,099 | 38 | 1,654 | 6 |
| 2002 | 16,966 | 62 | 9,367 | 34 | 1,247 | 5 |
| 2003 | 18,348 | 62 | 9,726 | 33 | 1,316 | 4 |
| 2004 | 21,439 | 65 | 11,370 | 35 | 0 | 0 |
| 2005 | 23,613 | 74 | 8,294 | 26 | 0 | 0 |
| 2006 | 20,804 | 71 | 8,566 | 29 | 0 | 0 |
| 2007 | 24,806 | 67 | 10,229 | 28 | 2,004 | 5 |
| 2008 | 24,519 | 72 | 8,428 | 25 | 883 | 3 |
| 2009 | 17,117 | 68 | 7,970 | 32 | 63 | 0 |
| 2010 | 22,369 | 72 | 8,013 | 26 | 838 | 3 |
| **Domestic** | | | | | | |
| 1998 | 18,295 | 47 | 672 | 2 | 19,822 | 51 |
| 1999 | 18,043 | 50 | 480 | 1 | 17,573 | 49 |
| 2000 | 17,446 | 46 | 416 | 1 | 20,262 | 53 |
| 2001 | 19,152 | 55 | 435 | 1 | 15,484 | 44 |
| 2002 | 17,556 | 56 | 509 | 2 | 13,023 | 42 |
| 2003 | 18,552 | 52 | 454 | 1 | 16,394 | 46 |
| 2004 | 19,485 | 57 | 566 | 2 | 13,973 | 41 |
| 2005 | 20,567 | 68 | 375 | 1 | 9,441 | 31 |
| 2006 | 23,931 | 84 | 200 | 1 | 4,324 | 15 |
| 2007 | 22,971 | 76 | 286 | 1 | 7,127 | 23 |
| 2008 | 21,151 | 65 | 444 | 1 | 11,076 | 34 |
| 2009 | 23,977 | 75 | 493 | 2 | 7,519 | 24 |
| 2010 | 21,647 | 68 | 458 | 1 | 9,960 | 31 |

**Figure 8: U.S. wheat domestic shipments by mode, 1995–2010**

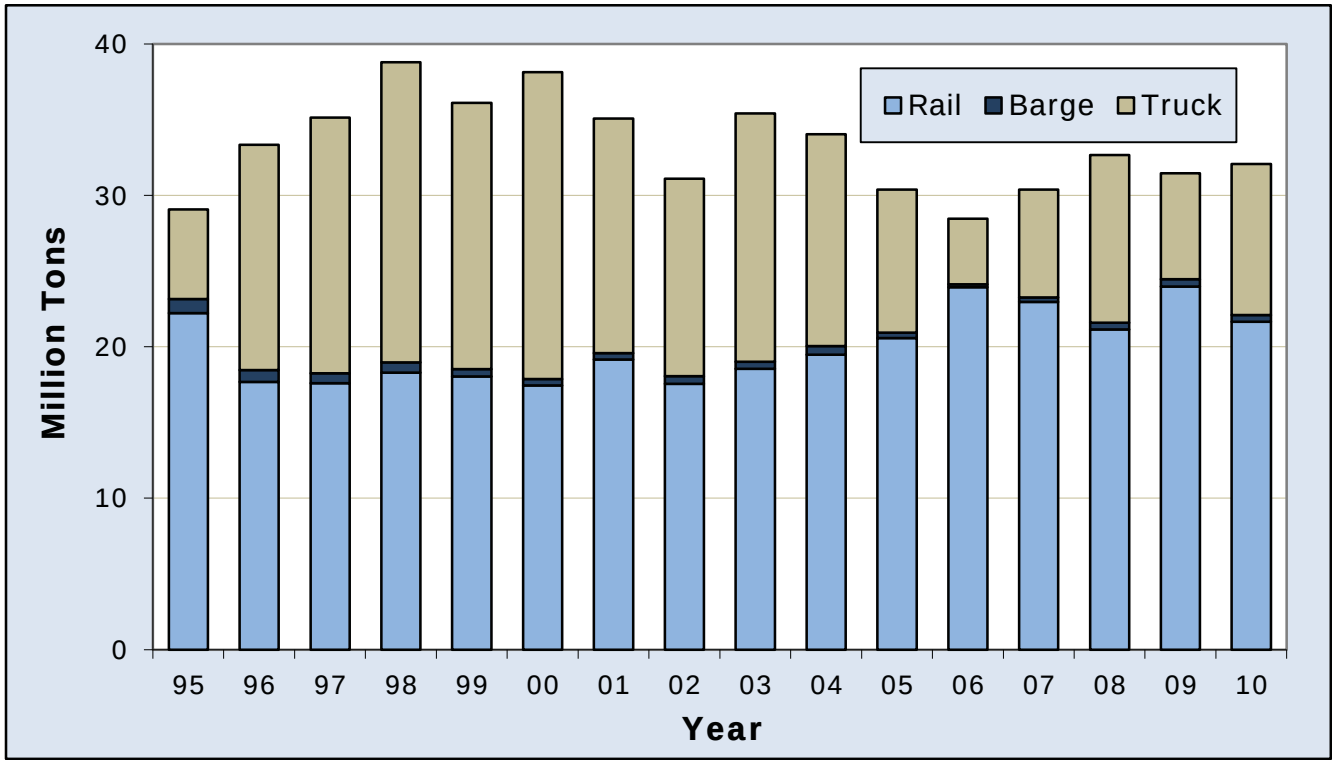
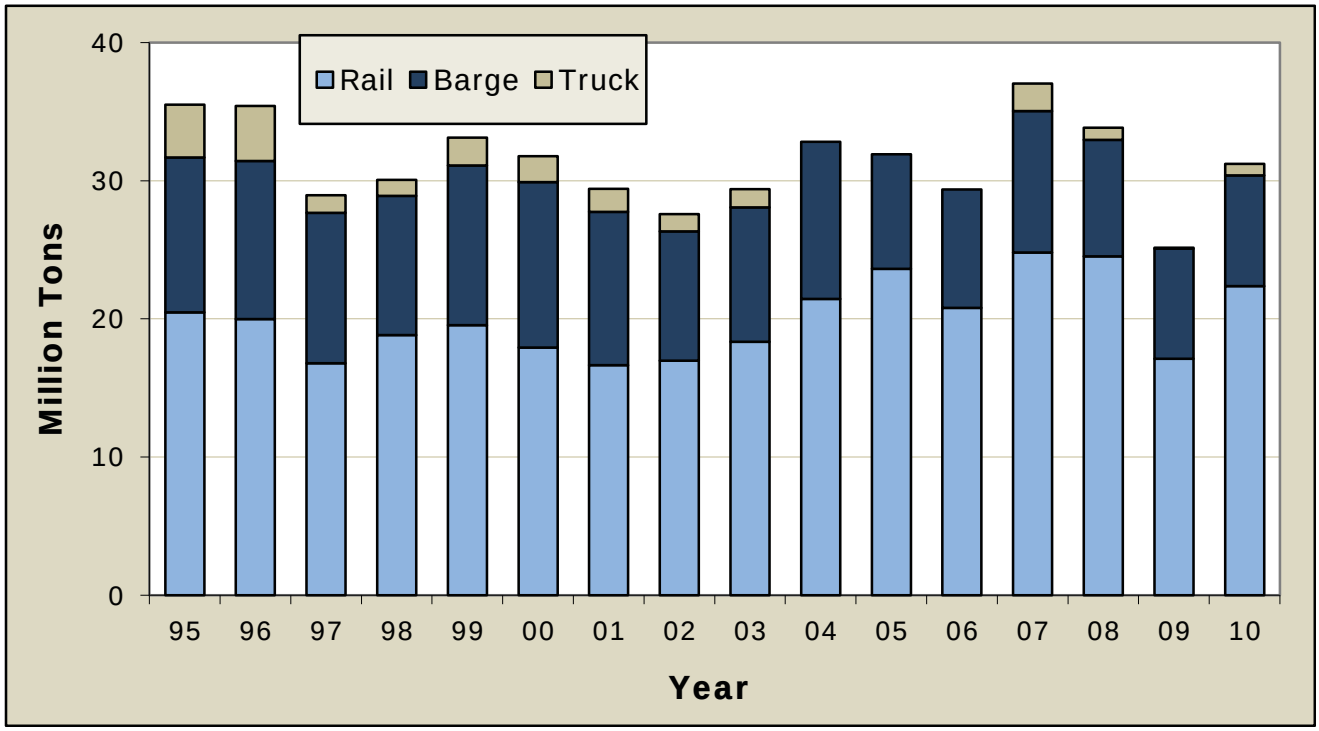



**Figure 9: U.S. wheat export shipments by mode, 1995-2010**



# Soybean Modal Shares

**Table 6: Tonnages and modal shares for U.S. soybeans, 1998-2010**

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 16,476 | 21 | 18,000 | 23 | 42,372 | 55 |
| 1999 | 16,685 | 22 | 19,875 | 26 | 40,941 | 53 |
| 2000 | 17,257 | 22 | 20,174 | 26 | 41,231 | 52 |
| 2001 | 18,699 | 22 | 19,872 | 23 | 46,777 | 55 |
| 2002 | 16,550 | 19 | 21,399 | 25 | 47,405 | 56 |
| 2003 | 17,735 | 21 | 20,167 | 24 | 47,047 | 55 |
| 2004 | 15,029 | 21 | 17,053 | 24 | 40,449 | 56 |
| 2005 | 16,141 | 20 | 16,332 | 20 | 49,878 | 61 |
| 2006 | 19,862 | 24 | 16,221 | 19 | 47,521 | 57 |
| 2007 | 19,478 | 23 | 16,327 | 19 | 48,388 | 57 |
| 2008 | 20,899 | 23 | 16,326 | 18 | 51,931 | 58 |
| 2009 | 25,745 | 26 | 21,569 | 22 | 50,413 | 52 |
| 2010 | 26,778 | 27 | 23,472 | 24 | 49,441 | 50 |
| **Export** | | | | | | |
| 1998 | 7,299 | 29 | 15,410 | 61 | 2,741 | 11 |
| 1999 | 8,189 | 32 | 17,240 | 68 | 80 | 0 |
| 2000 | 8,591 | 29 | 18,665 | 63 | 2,442 | 8 |
| 2001 | 11,047 | 35 | 18,689 | 59 | 1,926 | 6 |
| 2002 | 9,477 | 31 | 19,642 | 64 | 1,387 | 5 |
| 2003 | 11,270 | 33 | 18,632 | 55 | 4,245 | 12 |
| 2004 | 8,496 | 31 | 15,412 | 56 | 3,578 | 13 |
| 2005 | 10,676 | 34 | 15,030 | 47 | 5,956 | 19 |
| 2006 | 13,541 | 44 | 15,240 | 50 | 1,725 | 6 |
| 2007 | 12,524 | 37 | 15,242 | 45 | 6,381 | 19 |
| 2008 | 14,492 | 39 | 15,089 | 40 | 7,757 | 21 |
| 2009 | 19,694 | 44 | 20,634 | 46 | 4,288 | 10 |
| 2010 | 20,484 | 44 | 21,864 | 47 | 3,895 | 8 |
| **Domestic** | | | | | | |
| 1998 | 9,177 | 18 | 2,590 | 5 | 39,631 | 77 |
| 1999 | 8,496 | 16 | 2,636 | 5 | 40,861 | 79 |
| 2000 | 8,666 | 18 | 1,510 | 3 | 38,789 | 79 |
| 2001 | 7,651 | 14 | 1,183 | 2 | 44,851 | 84 |
| 2002 | 7,072 | 13 | 1,758 | 3 | 46,018 | 84 |
| 2003 | 6,465 | 13 | 1,535 | 3 | 42,802 | 84 |
| 2004 | 6,533 | 15 | 1,641 | 4 | 36,872 | 82 |
| 2005 | 5,465 | 11 | 1,302 | 3 | 43,922 | 87 |
| 2006 | 6,321 | 12 | 982 | 2 | 45,795 | 86 |
| 2007 | 6,953 | 14 | 1,086 | 2 | 42,007 | 84 |
| 2008 | 6,407 | 12 | 1,237 | 2 | 44,174 | 85 |
| 2009 | 6,051 | 11 | 936 | 2 | 46,125 | 87 |
| 2010 | 6,294 | 12 | 1,608 | 3 | 45,546 | 85 |

**Figure 10: U.S. soybean domestic shipments by mode, 1995-2010**

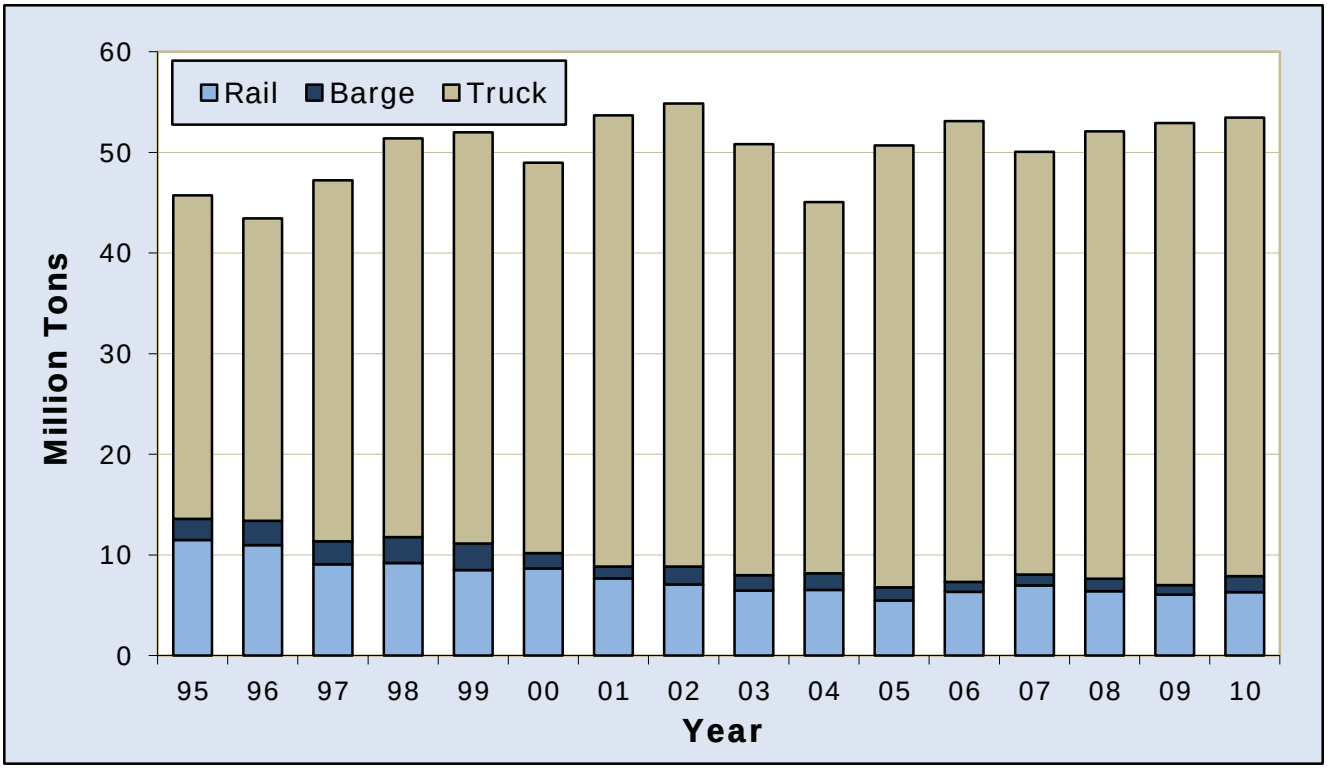
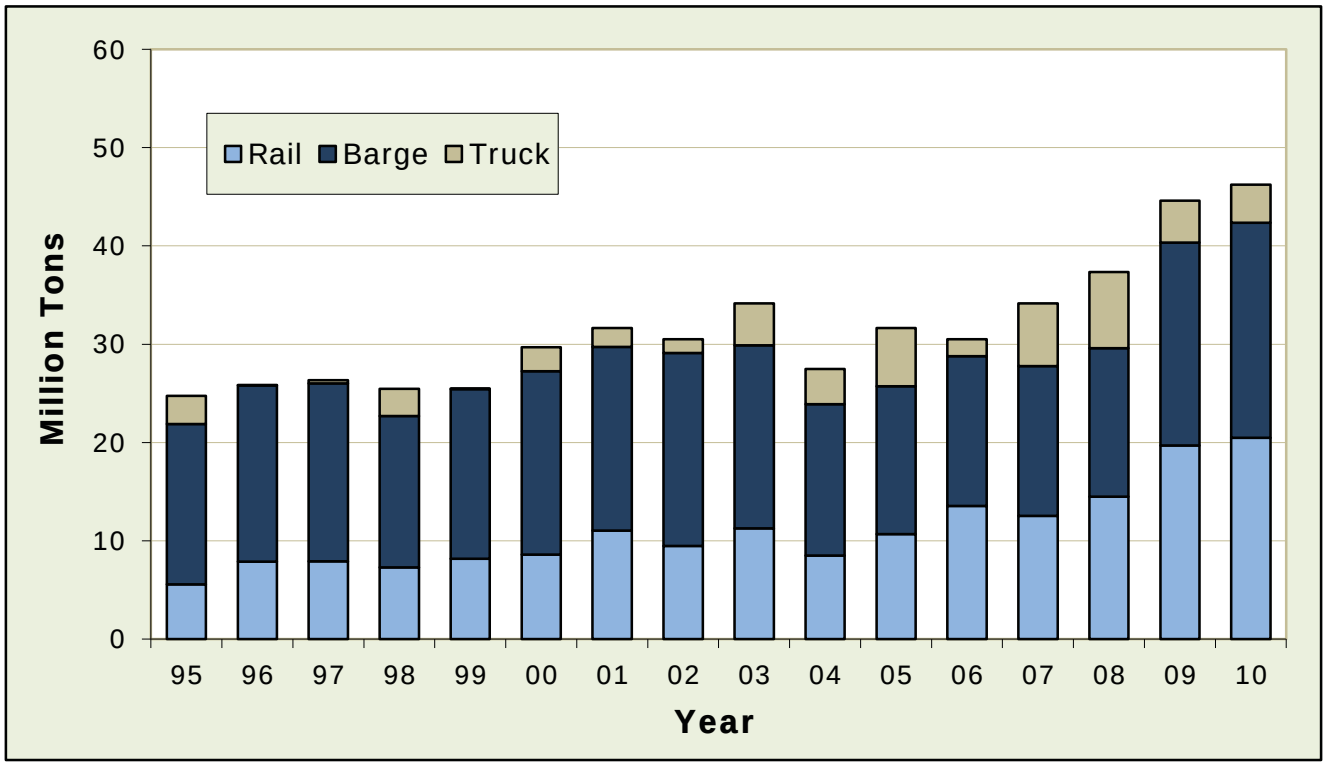



**Figure 11: U.S. soybean export shipments by mode, 1995-2010**



# Sorghum Modal Shares

**Table 7: Tonnages and modal shares for U.S. sorghum, 1998-2010**

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 4,710 | 33 | 1,168 | 8 | 8,236 | 58 |
| 1999 | 5,222 | 35 | 1,333 | 9 | 8,552 | 57 |
| 2000 | 4,626 | 32 | 1,322 | 9 | 8,576 | 59 |
| 2001 | 4,541 | 36 | 1,335 | 11 | 6,580 | 53 |
| 2002 | 4,100 | 36 | 1,225 | 11 | 6,194 | 54 |
| 2003 | 2,121 | 19 | 1,365 | 12 | 7,533 | 68 |
| 2004 | 2,334 | 21 | 852 | 8 | 7,725 | 71 |
| 2005 | 2,366 | 23 | 721 | 7 | 7,231 | 70 |
| 2006 | 3,407 | 37 | 730 | 8 | 5,169 | 56 |
| 2007 | 3,490 | 30 | 1,252 | 11 | 6,887 | 59 |
| 2008 | 3,779 | 31 | 634 | 5 | 7,942 | 64 |
| 2009 | 3,218 | 28 | 442 | 4 | 7,719 | 68 |
| 2010 | 2,886 | 30 | 315 | 3 | 6,332 | 66 |
| **Export** | | | | | | |
| 1998 | 3,065 | 56 | 1,165 | 21 | 1,277 | 23 |
| 1999 | 4,197 | 67 | 1,331 | 21 | 782 | 12 |
| 2000 | 3,650 | 52 | 1,317 | 19 | 2,070 | 29 |
| 2001 | 3,798 | 57 | 1,326 | 20 | 1,596 | 24 |
| 2002 | 3,578 | 59 | 1,218 | 20 | 1,289 | 21 |
| 2003 | 1,763 | 32 | 1,362 | 25 | 2,421 | 44 |
| 2004 | 1,776 | 35 | 852 | 17 | 2,460 | 48 |
| 2005 | 1,941 | 38 | 721 | 14 | 2,399 | 47 |
| 2006 | 2,886 | 55 | 730 | 14 | 1,590 | 31 |
| 2007 | 2,989 | 47 | 1,246 | 20 | 2,091 | 33 |
| 2008 | 3,253 | 56 | 622 | 11 | 1,938 | 33 |
| 2009 | 2,372 | 57 | 440 | 11 | 1,352 | 32 |
| 2010 | 2,307 | 55 | 309 | 7 | 1,573 | 38 |
| **Domestic** | | | | | | |
| 1998 | 1,645 | 19 | 3 | 0 | 6,959 | 81 |
| 1999 | 1,025 | 12 | 2 | 0 | 7,771 | 88 |
| 2000 | 976 | 13 | 5 | 0 | 6,506 | 87 |
| 2001 | 743 | 13 | 8 | 0 | 4,984 | 87 |
| 2002 | 522 | 10 | 6 | 0 | 4,904 | 90 |
| 2003 | 358 | 7 | 3 | 0 | 5,112 | 93 |
| 2004 | 558 | 10 | 0 | 0 | 5,265 | 90 |
| 2005 | 425 | 8 | 0 | 0 | 4,832 | 92 |
| 2006 | 521 | 13 | 0 | 0 | 3,580 | 87 |
| 2007 | 502 | 9 | 6 | 0 | 4,797 | 90 |
| 2008 | 527 | 8 | 11 | 0 | 6,004 | 92 |
| 2009 | 846 | 12 | 2 | 0 | 6,367 | 88 |
| 2010 | 579 | 11 | 5 | 0 | 4,759 | 89 |

**Figure 12: U.S. sorghum domestic shipments by mode, 1995–2010**

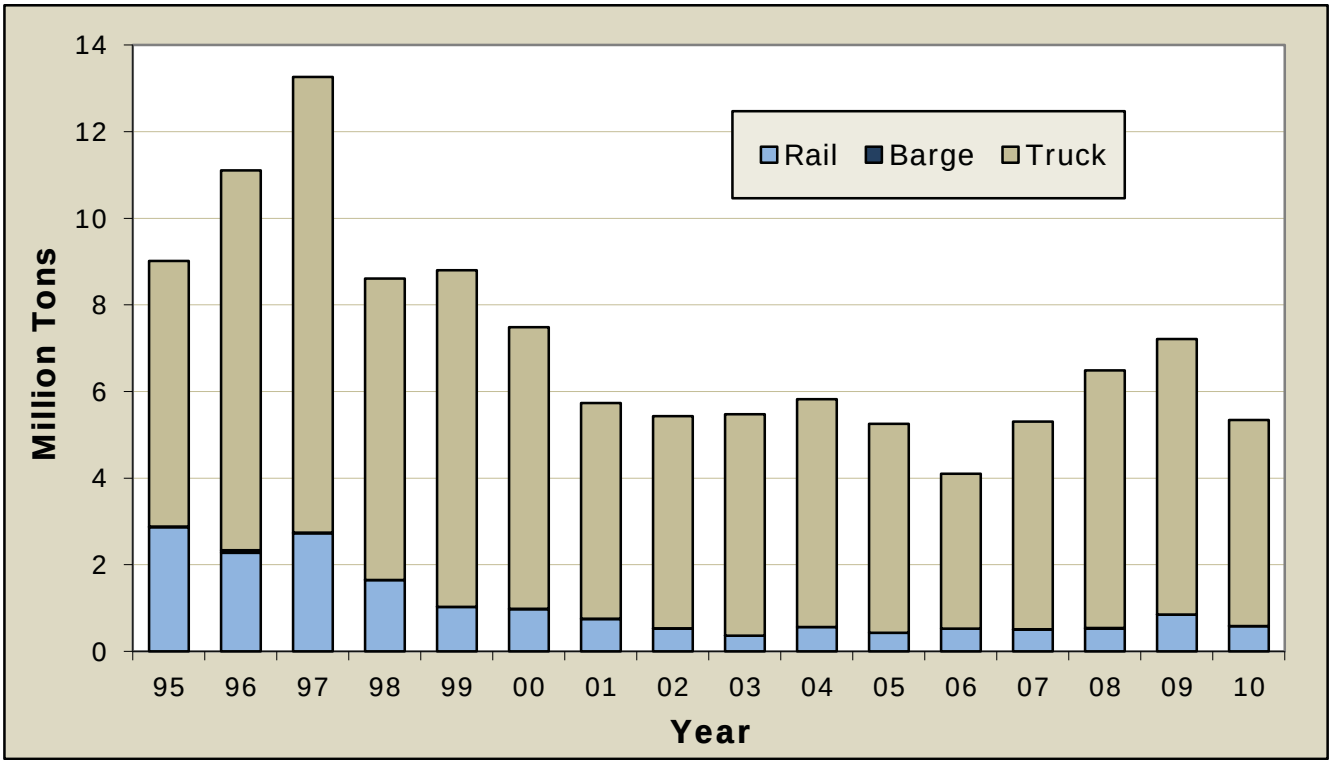
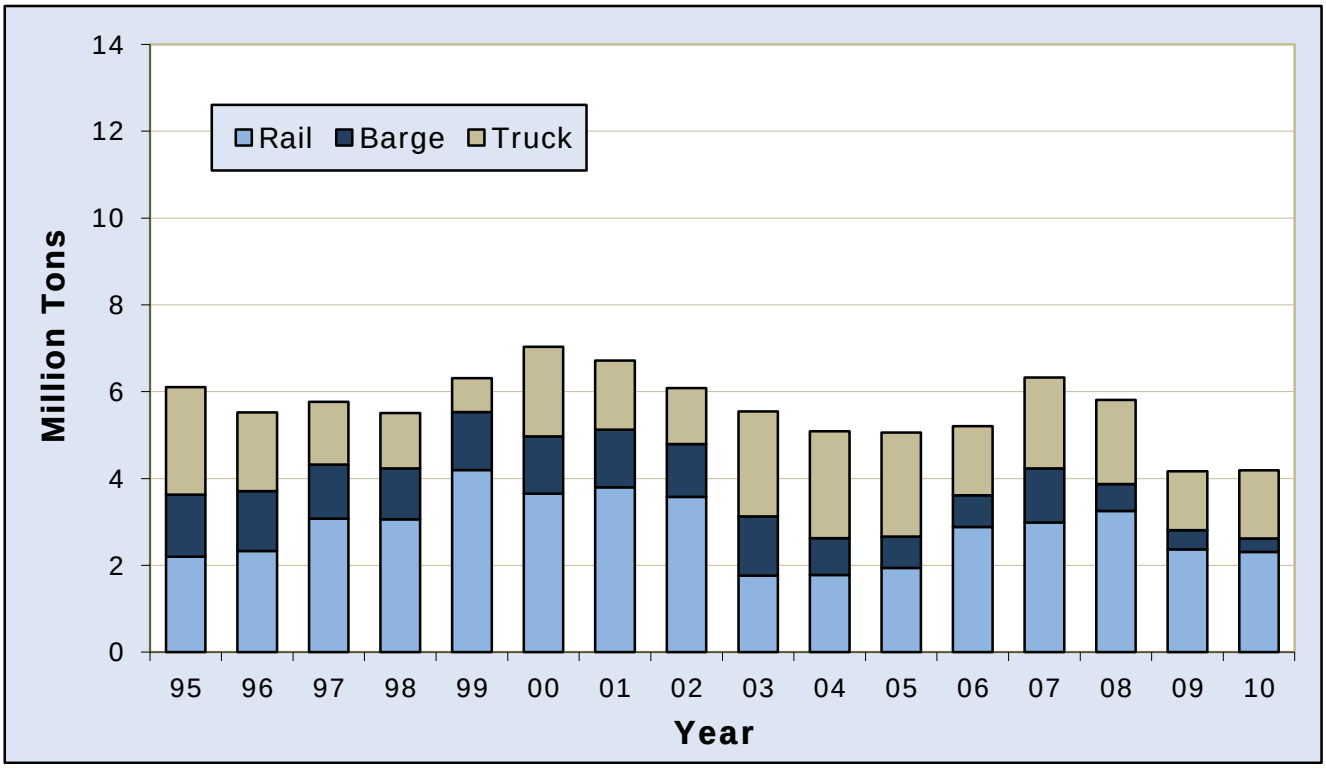



**Figure 13: U.S. sorghum export shipments by mode, 1995–2010**



# Barley Modal Shares

**Table 8: Tonnages and modal shares for U.S. barley, 1998-2010**

| Year & type of movement | Mode of transport | | | | | |
|---|---|---|---|---|---|---|
| | Rail | | Barge | | Truck | |
| | 1,000 tons | Percent | 1,000 tons | Percent | 1,000 tons | Percent |
| **Total** | | | | | | |
| 1998 | 3,246 | 44 | 280 | 4 | 3,819 | 52 |
| 1999 | 3,919 | 55 | 307 | 4 | 2,909 | 41 |
| 2000 | 3,577 | 48 | 478 | 6 | 3,345 | 45 |
| 2001 | 3,412 | 50 | 204 | 3 | 3,189 | 47 |
| 2002 | 3,254 | 54 | 170 | 3 | 2,620 | 43 |
| 2003 | 3,826 | 67 | 196 | 3 | 1,720 | 30 |
| 2004 | 3,264 | 59 | 130 | 2 | 2,144 | 39 |
| 2005 | 3,182 | 58 | 207 | 4 | 2,093 | 38 |
| 2006 | 2,969 | 59 | 179 | 4 | 1,881 | 37 |
| 2007 | 3,028 | 52 | 247 | 4 | 2,594 | 44 |
| 2008 | 3,061 | 57 | 198 | 4 | 2,130 | 40 |
| 2009 | 2,803 | 58 | 68 | 1 | 1,978 | 41 |
| 2010 | 2,661 | 54 | 36 | 1 | 2,186 | 45 |
| **Export** | | | | | | |
| 1998 | 271 | 41 | 259 | 39 | 126 | 19 |
| 1999 | 628 | 69 | 287 | 31 | 0 | 0 |
| 2000 | 807 | 64 | 449 | 36 | 0 | 0 |
| 2001 | 1,018 | 86 | 171 | 14 | 0 | 0 |
| 2002 | 852 | 85 | 155 | 15 | 0 | 0 |
| 2003 | 983 | 84 | 183 | 16 | 0 | 0 |
| 2004 | 716 | 86 | 121 | 14 | 0 | 0 |
| 2005 | 934 | 85 | 159 | 15 | 0 | 0 |
| 2006 | 748 | 84 | 140 | 16 | 0 | 0 |
| 2007 | 1,257 | 86 | 206 | 14 | 0 | 0 |
| 2008 | 1,172 | 87 | 168 | 13 | 0 | 0 |
| 2009 | 869 | 96 | 39 | 4 | 0 | 0 |
| 2010 | 501 | 98 | 11 | 2 | 0 | 0 |
| **Domestic** | | | | | | |
| 1998 | 2,975 | 44 | 21 | 0 | 3,693 | 55 |
| 1999 | 3,291 | 53 | 20 | 0 | 2,909 | 47 |
| 2000 | 2,769 | 45 | 29 | 0 | 3,345 | 54 |
| 2001 | 2,393 | 43 | 33 | 1 | 3,189 | 57 |
| 2002 | 2,402 | 48 | 15 | 0 | 2,620 | 52 |
| 2003 | 2,842 | 62 | 13 | 0 | 1,720 | 38 |
| 2004 | 2,548 | 54 | 9 | 0 | 2,144 | 46 |
| 2005 | 2,249 | 51 | 48 | 1 | 2,093 | 48 |
| 2006 | 2,221 | 54 | 39 | 1 | 1,881 | 45 |
| 2007 | 1,771 | 40 | 41 | 1 | 2,594 | 59 |
| 2008 | 1,889 | 47 | 29 | 1 | 2,130 | 53 |
| 2009 | 1,934 | 49 | 29 | 1 | 1,978 | 50 |
| 2010 | 2,160 | 49 | 26 | 1 | 2,186 | 50 |

**Figure 14: U.S. barley domestic shipments by mode, 1995–2010**

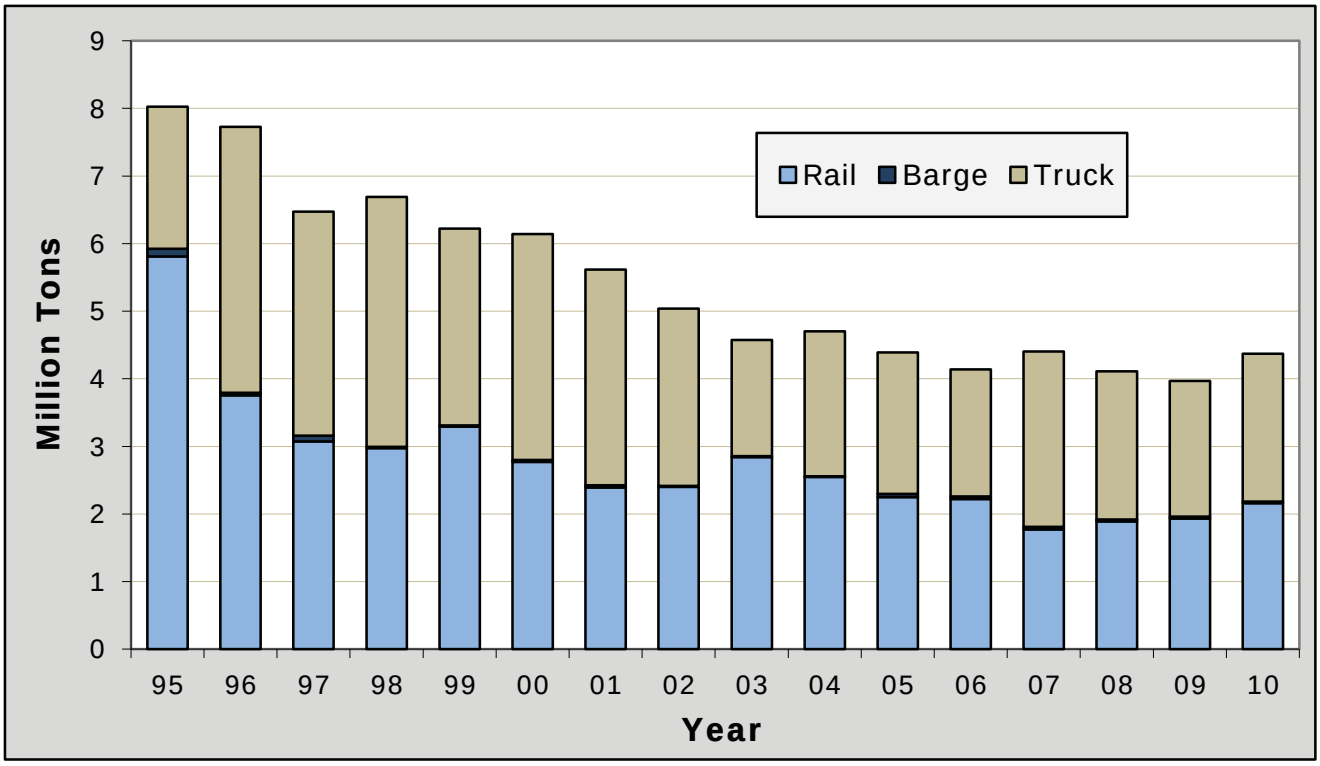
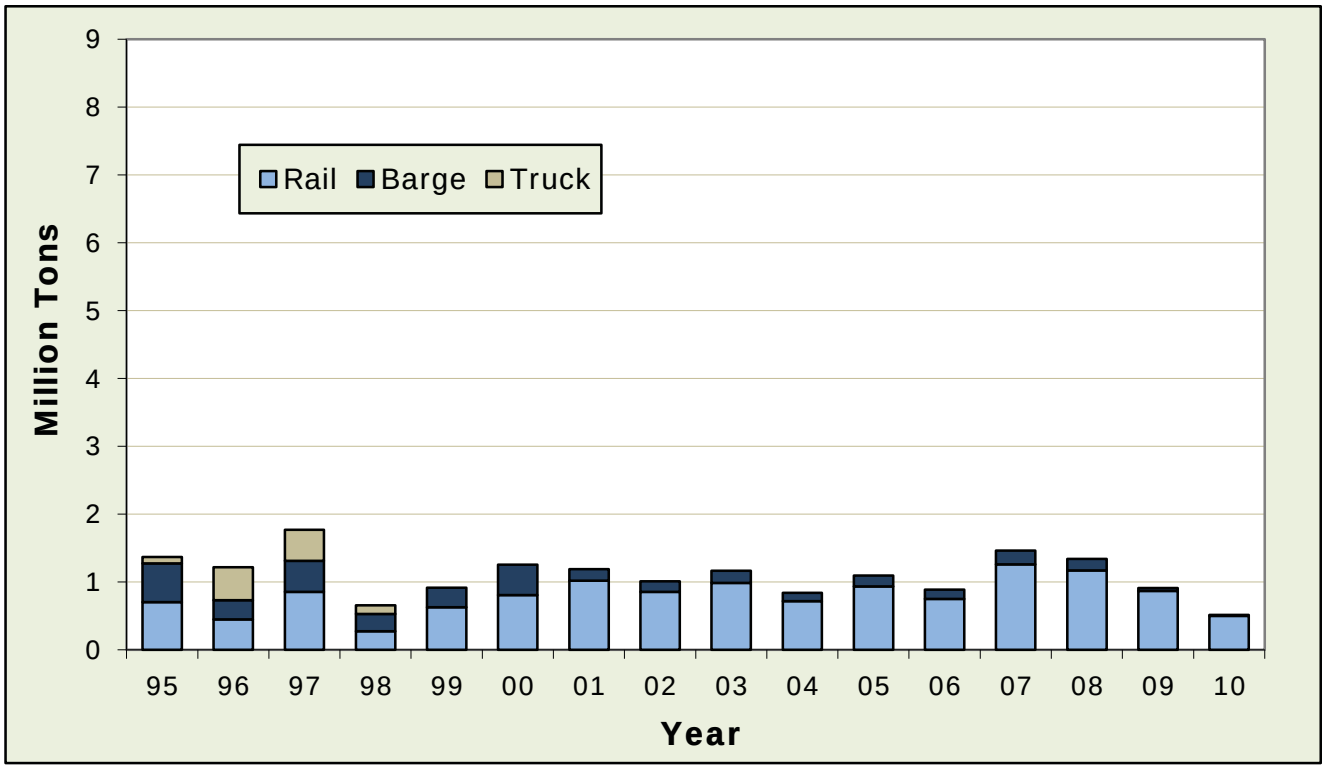



**Figure 15: U.S. barley export shipments by mode, 1995–2010**



# Appendix A: Modal Share Methodology

Modal shares are calculated for all grains and each grain type, based on the estimated modal tonnages. These modal shares are determined for total, export, and domestic movements.

**Total Tonnages.** The approach used to estimate modal tonnages and shares requires that total tonnages of grain transported to market be determined. It is also necessary to determine the portions of total tonnages transported to domestic and export markets. Total tonnages are defined as total disappearance minus grain that was grown and used on-farm. Total disappearance for this study is calculated using the ERS *Wheat Outlook, Feed Outlook,* and *Oil Crop Outlook* reports. These reports include marketing year supply and disappearance tables that list domestic use and exports. The *Oil Crop Outlook* lists these numbers by marketing year. The other two reports break the numbers down on a quarterly basis. To get disappearance numbers for calendar years 1995 through 2010, monthly totals are calculated from the marketing year data and added together into respective calendar year totals.

**Total Export.** Total exports are calculated using export numbers reported in the ERS *Outlook* reports.

**Total Domestic.** Total domestic tonnages are estimated by subtracting total export tonnages from total disappearance.

**Grown and Used-on-Farm Totals.** Grown and used-on-farm data are provided by ERS. These data are reported in percentages by year and commodity. Production numbers for each commodity are multiplied by the grown and used-on-farm percentages. Those numbers are then subtracted from total disappearance to get total transported grain tonnages. Grain grown and used on-farm must be deducted from total disappearance because it generates no commercial transportation demand.

**Rail Total.** Rail movements for 1996 to 2010 came from the STB Master Carload Waybill Sample. STB's Waybill Sample is a stratified 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 calculated using the billed weight in tons from the Waybill Sample and multiplying it by an expansion factor to estimate the tonnages for all grain movements by all railroads. Movements that originated and terminated in the same five-digit, Federal Information Processing Standards (FIPS) region are assumed to be short hauls, which would be double-counted and, thus, were deleted.

Some grain is moved by a combination of rail and barge. Since this represents a relatively small amount of grain, these movements are not included in the rail calculations. Instead, they are counted in the barge movements—the final mode used to transport the grain. There are other instances in which grain shipments are rebilled from one railroad to another at terminal markets. Such a movement would be considered a double-count of grain movements. An attempt is made to minimize the rebilled movements. Again, as with the rail-to-barge movements, these types of shipments represent a small portion of total rail shipments.

**Rail Export.** Export regions are defined by five-digit FIPS codes and are listed in Appendix B. The regions chosen are based on methodology from the 1998 modal share report as those regions with ports in the Pacific Northwest, Atlantic Coast, and Gulf of Mexico. Rail exports to the Great Lakes are determined from grain delivery information at Duluth-Superior, MN, and Toledo, OH. Total tonnages exported are then calculated using the designated export regions. Movements that originated and terminated in the same five-digit FIPS region are assumed to be short hauls, which would be double-counted and, thus, were deleted.

**Rail Domestic.** Domestic rail tonnages are estimated by subtracting export grain tonnages moved by rail from total grain tonnages moved by rail.

**Barge Total.** Barge movement data for 1996–2010, which are collected and compiled by the U.S. Army Corps of Engineers, are obtained from *Waterborne Commerce of the United States.* The categories used to calculate modal shares for barge are river shipping range (origin) and river receiving range (destination). Total movements are determined by summing the total of all receiving ranges. As explained in the Rail Total section above, when barge and rail are used in combination to ship grain, with barge being the final mode in the transportation route, only the barge movement is included.

**Barge Export.** The following river receiving ranges are used to find barge export movements: Atlantic, Pacific, Central Gulf, East Gulf, and West Gulf. Any movement that is received into a port in the defined regions is determined to be an export movement. The receiving ranges are based on the 1998 report's methodology. For that report, export barge modal shares were calculated using barge export tonnages based on internal grain and oilseed receipts reported on the inland waterways. Movements were defined as those to: 1) Kalama and Vancouver, WA, and Portland, OR, on the Columbia-Snake River system; 2) Baton Rouge through New Orleans, LA, to the mouth of the passes on the Mississippi River system; 3) Lake Charles, LA, on the Calcasieu River; 4) Mobile, AL, on the Tennessee-Tombigbee River system; 5) Pascagoula, MS, on the Gulf Intracoastal Waterway; 6) Beaumont and Port Arthur, TX; 7) Galveston Bay (including Houston), TX; 8) Corpus Christi, TX, and the Gulf Intracoastal Waterway ports between Corpus Christi and the Mexican border; and 9) Hampton Roads and Norfolk, VA, on the Chesapeake Bay.

**Barge Domestic.** Domestic barge movements are calculated by subtracting export barge movements from total barge movements.

**Truck Total.** Total truck tonnages are estimated by subtracting total rail and total barge from total disappearance. The method for estimating truck grain tonnages and modal shares assumes that all barge and rail tonnages represent "long-haul" movements. "Short-haul" movements (farm-to-elevator) that originate on the farm are almost exclusively done by truck. Such farm-to-elevator movements are considered gathering movements. Unlike barge or rail movements that typically end at the point of domestic consumption or export, these truck movements represent only the first and shortest segment of the entire shipping route for grain.

**Truck Export.** Truck export tonnages are estimated by subtracting rail export and barge export tonnages from total export tonnages.

**Truck Domestic.** Domestic truck tonnages are estimated by subtracting domestic rail and domestic barge tonnages from total domestic tonnages.

# Appendix B: FIPS Regions Included in Rail Export Tonnages[2]

| State / country | FIPS code | County |
|---|---|---|
| Canada & Mexico | 0 | All areas |
| Alabama | 1003 | Baldwin |
| Alabama | 1097 | Mobile |
| Arizona | 4023 | Santa Cruz |
| California | 6025 | Imperial |
| California | 6073 | San Diego |
| Georgia | 13051 | Chatham |
| Georgia | 13127 | Glynn |
| Louisiana | 22019 | Calcasieu |
| Louisiana | 22023 | Cameron |
| Louisiana | 22033 | East Baton Rouge |
| Louisiana | 22051 | Jefferson |
| Louisiana | 22063 | Livingston |
| Louisiana | 22071 | Orleans |
| Louisiana | 22075 | Plaquemines |
| Louisiana | 22089 | St. Charles |
| Louisiana | 22093 | St. James |
| Louisiana | 22095 | St. John the Baptist |
| Louisiana | 22121 | West Baton Rouge |
| Minnesota | 27137 | St. Louis |
| Mississippi | 28045 | Hancock |
| Mississippi | 28047 | Harrison |
| Mississippi | 28059 | Jackson |
| Ohio | 39043 | Erie |
| Ohio | 39095 | Lucas |
| Oregon | 41009 | Columbia |
| Oregon | 41051 | Multnomah |
| South Carolina | 45019 | Charleston |
| South Carolina | 45053 | Jasper |
| Texas | 48061 | Cameron |
| Texas | 48141 | El Paso |
| Texas | 48167 | Galveston |
| Texas | 48201 | Harris |
| Texas | 48245 | Jefferson |
| Texas | 48323 | Maverick |
| Texas | 48355 | Nueces |
| Texas | 48361 | Orange |
| Texas | 48377 | Presidio |
| Texas | 48409 | San Patricio |
| Texas | 48479 | Webb |
| Virginia | 51710 | Norfolk |
| Washington | 53011 | Clark |
| Washington | 53015 | Cowlitz |
| Washington | 53033 | King |
| Washington | 53053 | Pierce |
| Wisconsin | 55031 | Douglas |
| Wisconsin | 55079 | Milwaukee |

2 Bureau of Transportation Statistics, 2002. United States Department of Transportation, *Atlas Databases 2002*, CD-ROM: BTS.

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