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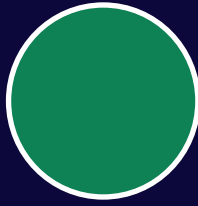
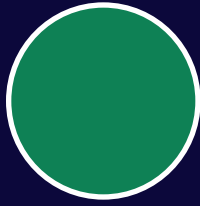
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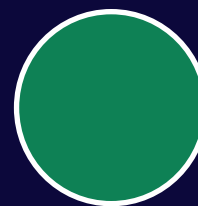
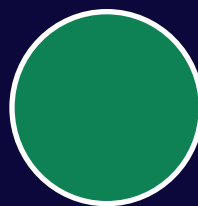
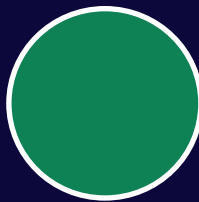
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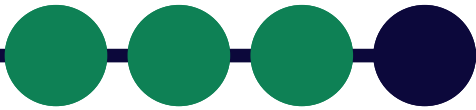
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# Transportation of U.S. Grains

## A Modal Share Analysis 1978-2016 Update





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# Transportation of U.S. Grains

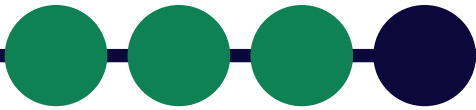
## A Modal Share Analysis 1978-2016 Update

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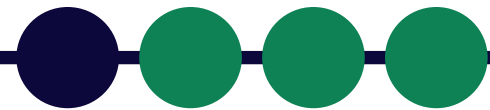
Transportation Services Division  
USDA Agricultural Marketing Service





# Abstract ●●●●

This report provides a breakout by mode of corn, wheat, soybeans, sorghum, and barley movements to either domestic markets or U.S. ports for export between 1978 and 2016. It is the eleventh update of an initial modal share study completed in 1992. The purpose of this series of reports is to provide the latest information about changes and trends in the relative competitiveness and efficiency among the different transportation modes in moving grain. Estimates of the tonnages (and shares) of grain railed, barged, and trucked are developed from a variety of secondary sources. This data can be used to identify trends and implications on transportation from factors, such as changes in production volumes and commodity mix, as well as changes in the relative demand for U.S. grain for domestic purposes versus export.



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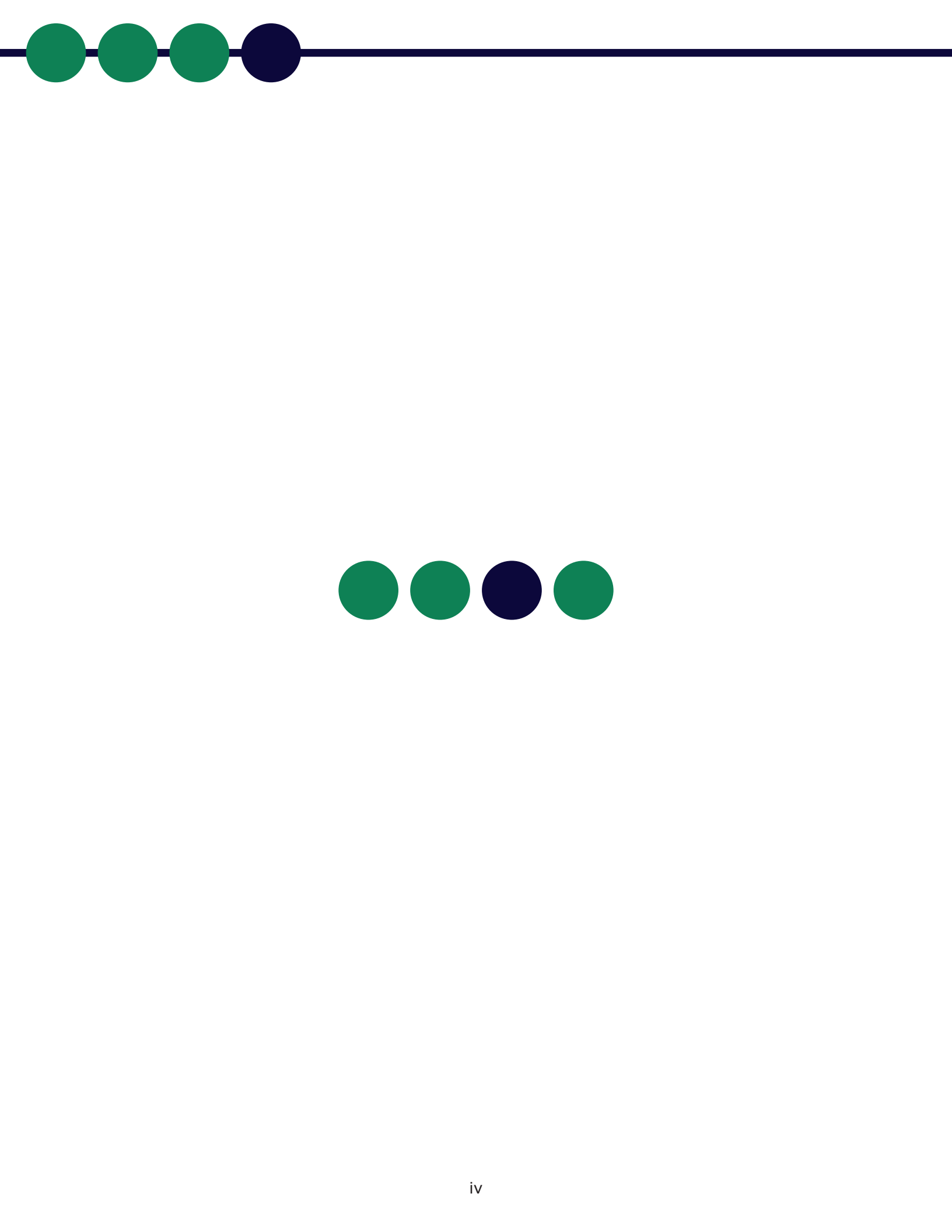
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# Introduction

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.<sup>1</sup> 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 readers regarding past versions of this report: This update presents new data for 2015 and 2016 as well as minor revisions to previous years.*

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



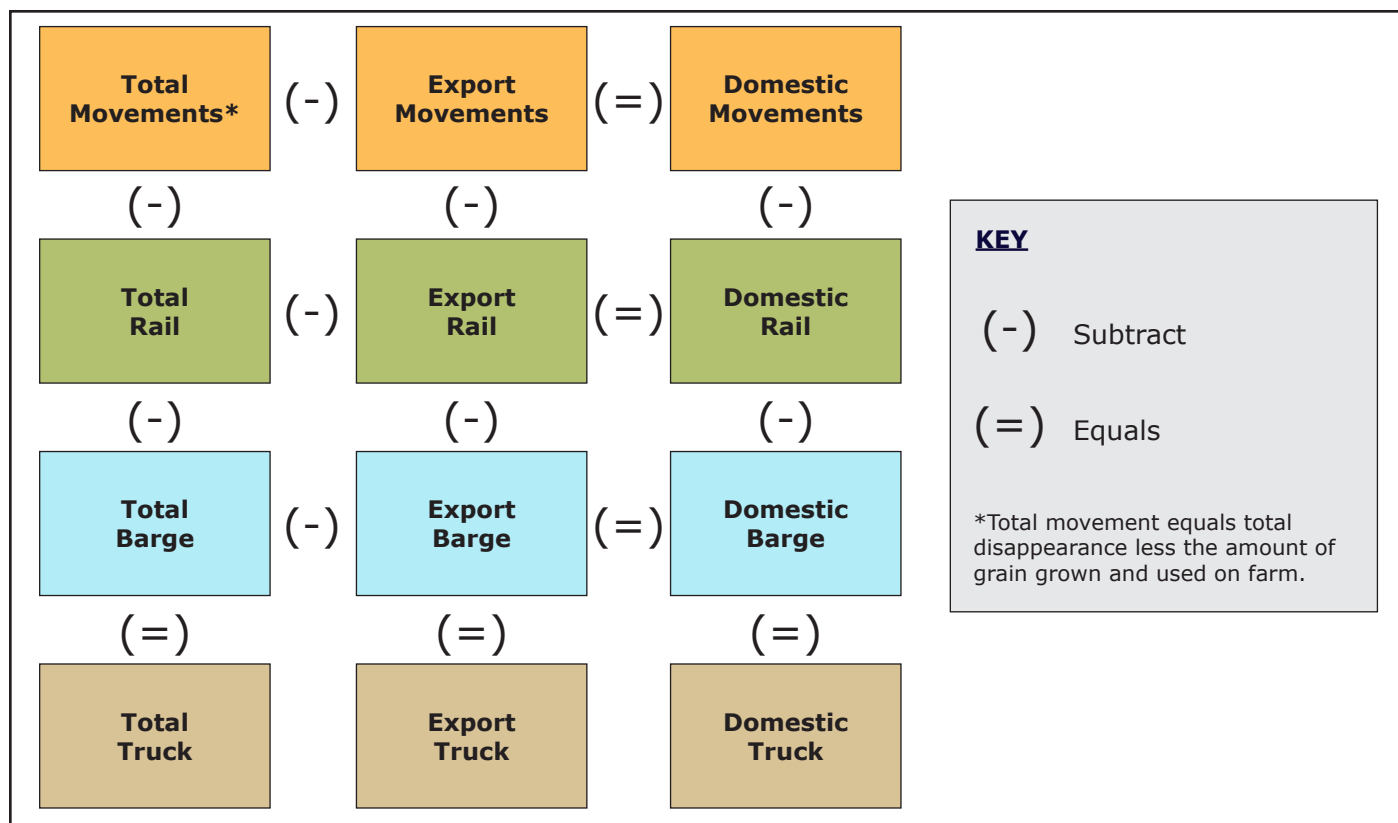
# Methodology

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.

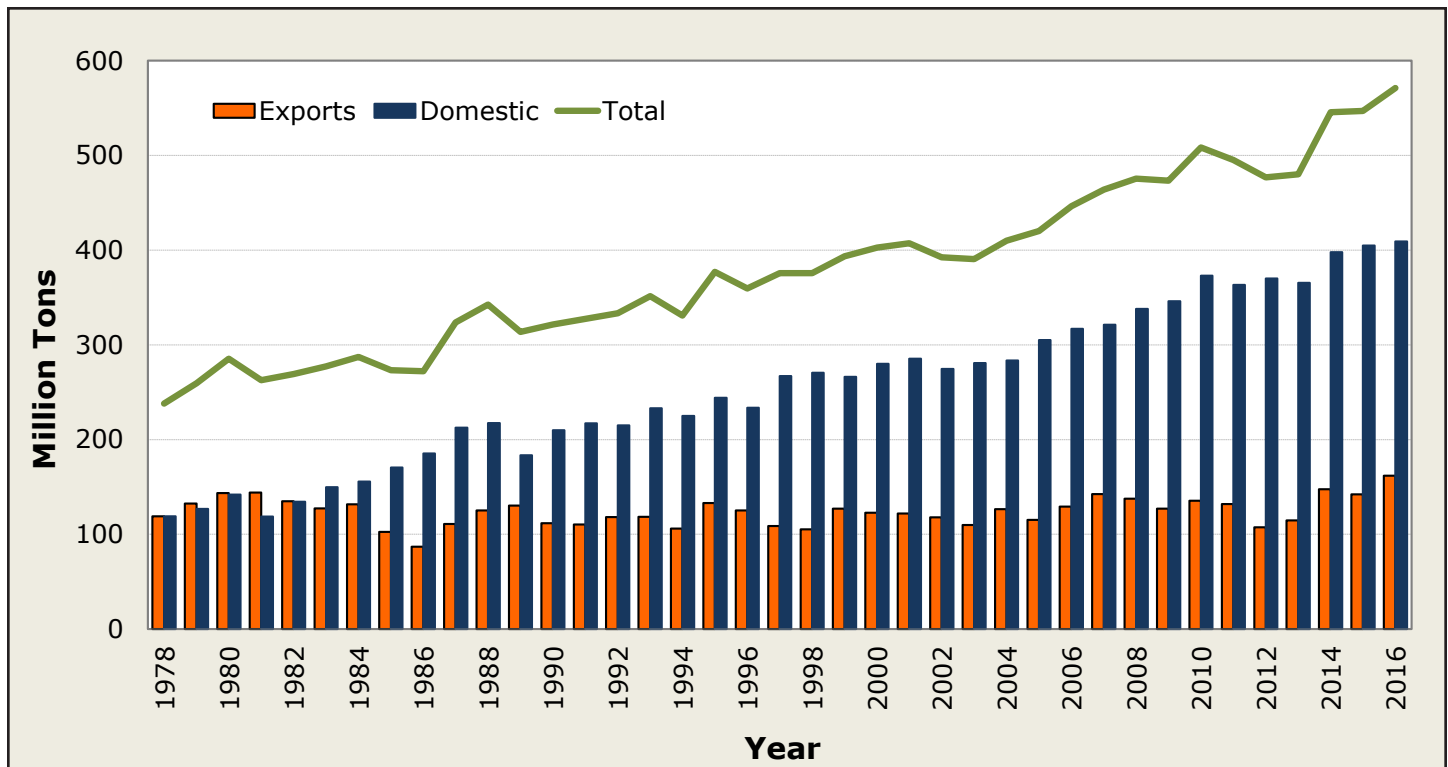
In this analysis, the term “modal share” describes that portion of the total tonnages of grain moved by each mode of transport—barge, rail, or truck. These shares, expressed as percentages, were determined by mode for particular types of grains and movements. Grains identified for this analysis were 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.

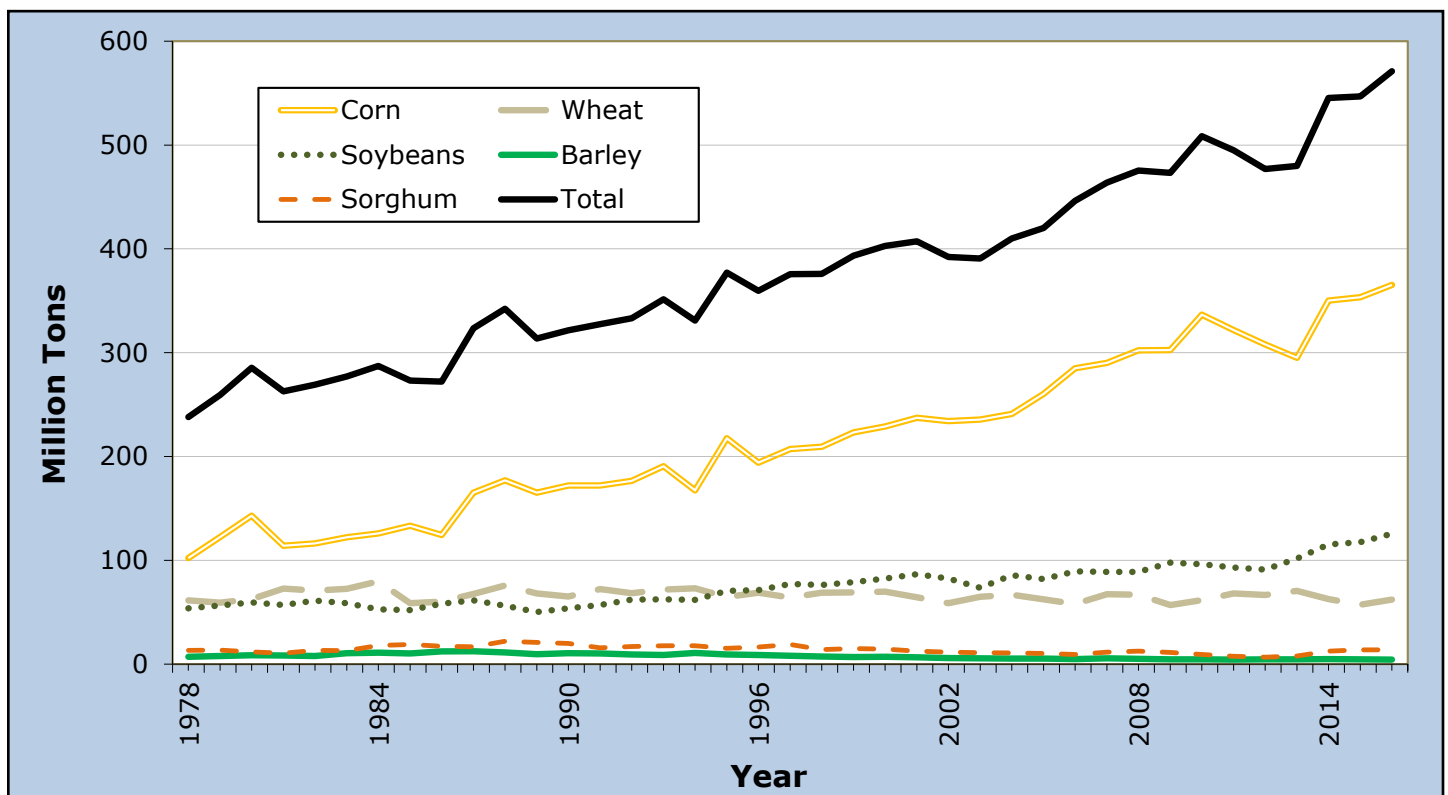
**Figure 1: Estimating modal tonnages and shares**



**Figure 2: Total grain movements to domestic and export markets, 1978-2016**



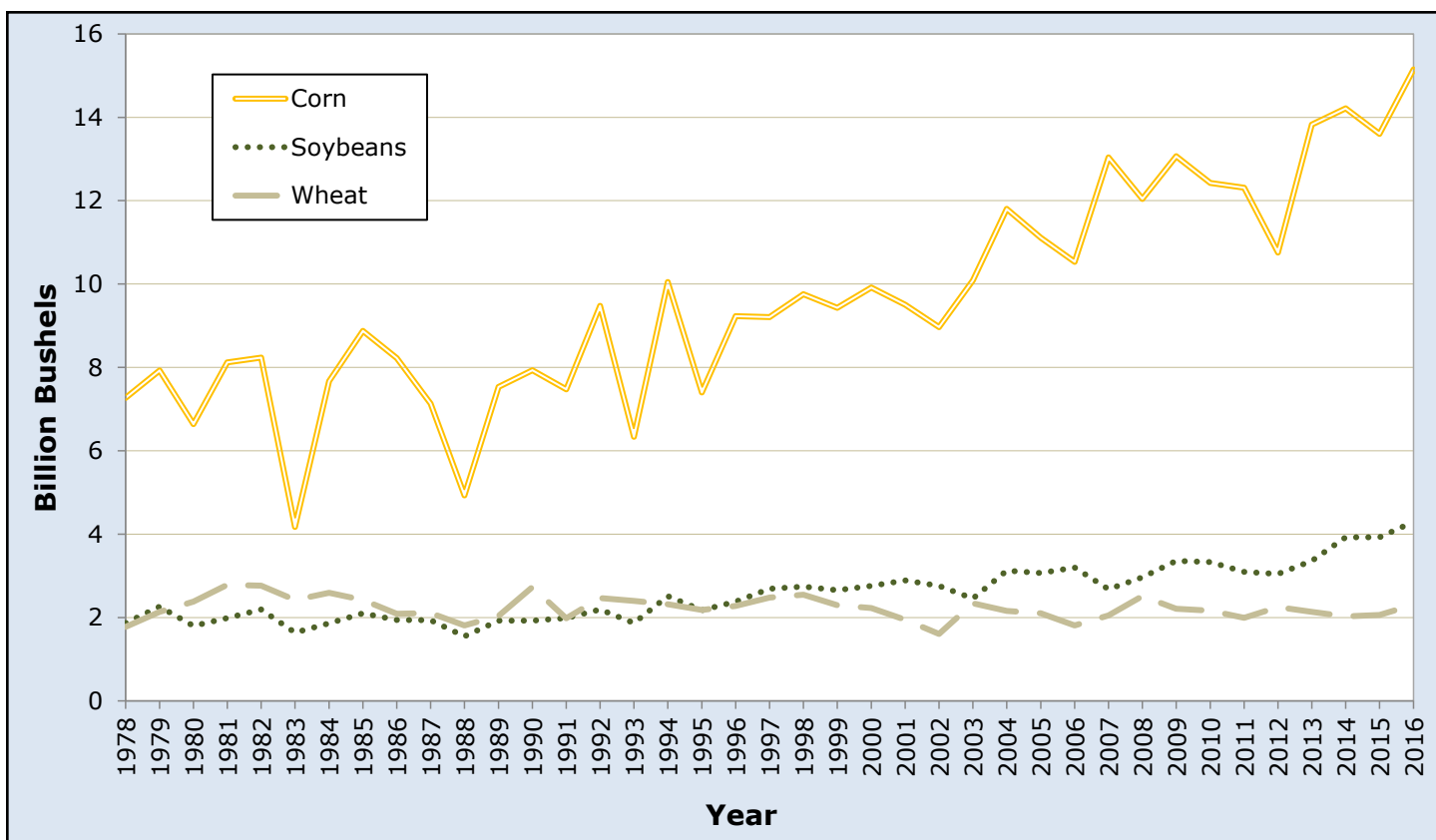
**Figure 3: U.S. grain shipments by commodity, 1978-2016**



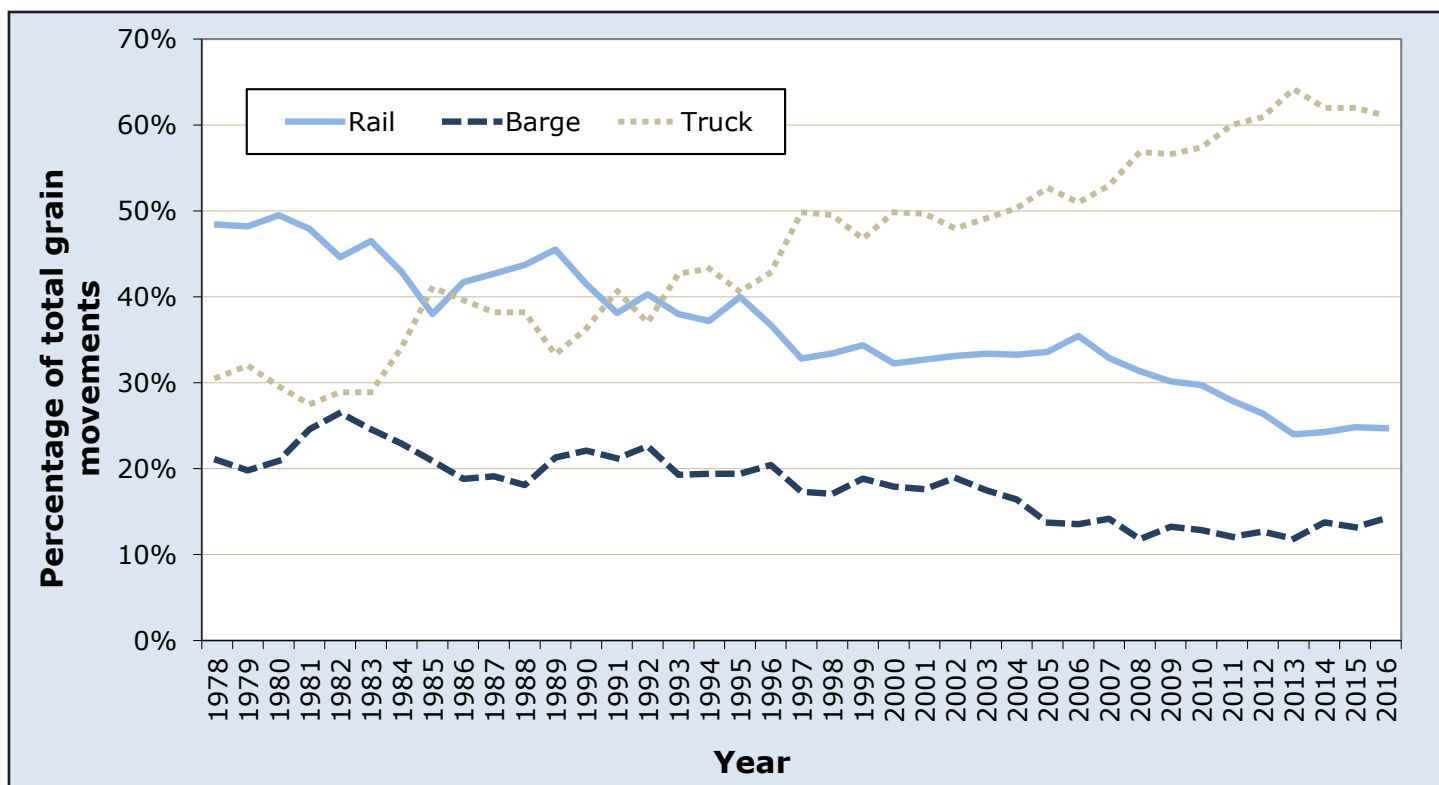
**Table 1: Tonnages of U.S. grains transported, by type of crop and type of movement, 2000-2016**

Year	Corn	Wheat	Soybeans	Sorghum	Barley	All grains
	1,000 tons					
Total						
2000	228,886	69,751	82,406	14,492	7,172	402,706
2001	237,224	64,508	86,566	12,420	6,608	407,326
2002	233,986	58,665	82,311	11,485	5,846	392,292
2003	235,694	64,768	73,625	10,985	5,535	390,607
2004	241,129	66,878	85,645	10,885	5,386	409,923
2005	260,160	62,372	81,925	10,293	5,334	420,085
2006	284,980	57,895	89,274	9,284	4,887	446,318
2007	290,163	67,470	88,782	11,602	5,689	463,705
2008	302,243	66,847	88,832	12,419	5,174	475,516
2009	302,403	56,895	97,860	11,319	4,685	473,163
2010	336,597	61,780	96,186	9,220	4,651	508,434
2011	321,787	68,045	93,110	7,592	4,456	494,991
2012	308,008	66,591	91,043	6,698	4,538	476,878
2013	295,065	70,691	101,668	7,800	4,648	479,871
2014	350,176	62,616	115,262	12,553	4,784	545,390
2015	353,472	57,188	117,606	13,847	4,649	546,763
2016	365,260	62,090	125,618	13,732	4,366	571,066
Export						
2000	52,957	31,780	29,876	7,037	1,128	122,779
2001	53,032	29,410	31,910	6,720	944	122,016
2002	52,329	27,580	31,331	6,085	542	117,867
2003	47,607	29,406	26,597	5,546	686	109,841
2004	53,373	34,728	32,915	5,089	370	126,475
2005	50,629	30,413	28,196	5,062	839	115,140
2006	63,429	26,778	33,495	5,205	439	129,347
2007	63,438	37,058	34,765	6,326	832	142,419
2008	58,874	33,812	38,379	5,813	601	137,478
2009	52,749	25,153	44,971	4,164	132	127,169
2010	54,819	31,174	45,149	4,143	189	135,474
2011	50,371	36,540	40,958	3,728	218	131,815
2012	35,265	30,197	39,826	1,991	213	107,492
2013	26,200	36,626	49,157	2,492	217	114,692
2014	55,305	28,676	55,273	7,870	369	147,493
2015	48,923	23,933	58,268	10,595	336	142,056
2016	61,918	27,176	65,210	7,566	109	161,979
Domestic						
2000	175,929	37,971	52,529	7,455	6,044	279,928
2001	184,192	35,098	54,657	5,700	5,664	285,311
2002	181,657	31,085	50,979	5,399	5,304	274,425
2003	188,087	35,362	47,028	5,439	4,850	280,766
2004	187,756	32,150	52,731	5,796	5,015	283,449
2005	209,532	31,959	53,729	5,231	4,495	304,945
2006	221,551	31,117	55,779	4,078	4,447	316,971
2007	226,725	30,412	54,017	5,276	4,856	321,287
2008	243,369	33,035	50,453	6,606	4,574	338,038
2009	249,654	31,743	52,889	7,155	4,553	345,994
2010	281,777	30,607	51,036	5,077	4,462	372,960
2011	271,416	31,505	52,153	3,864	4,238	363,176
2012	272,743	37,015	51,217	4,707	4,324	370,006
2013	268,865	34,260	52,511	5,308	4,431	365,374
2014	294,872	33,940	59,989	4,682	4,414	397,897
2015	304,550	33,255	59,338	3,252	4,313	404,707
2016	303,342	34,914	60,409	6,165	4,258	409,087

**Figure 4: U.S. corn, soybeans, and wheat production, 1978-2016**



**Figure 5: U.S. grain modal shares, 1978-2016**



**Table 2: Tonnages and modal shares for all U.S. grains, 2000–2016**

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	129,824	32	72,197	18	200,686	50
2001	133,233	33	71,808	18	202,286	50
2002	129,915	33	74,267	19	188,110	48
2003	130,356	33	68,396	18	191,855	49
2004	136,317	33	67,274	16	206,333	50
2005	141,130	34	57,668	14	221,287	53
2006	158,287	35	60,484	14	227,547	51
2007	152,423	33	65,750	14	245,533	53
2008	149,061	31	56,118	12	270,337	57
2009	142,663	30	62,689	13	267,812	57
2010	151,251	30	65,428	13	291,754	57
2011	138,159	28	59,789	12	297,042	60
2012	125,993	26	60,426	13	290,459	61
2013	115,107	24	56,764	12	308,000	64
2014	132,234	24	74,966	14	338,190	62
2015	135,734	25	72,063	13	338,966	62
2016	141,140	25	81,235	14	348,691	61
<b>Export</b>						
2000	46,067	38	67,556	55	9,156	7
2001	46,951	38	67,189	55	7,875	6
2002	43,565	37	68,506	58	5,796	5
2003	41,784	38	62,776	57	5,282	5
2004	48,015	38	61,729	49	16,730	13
2005	53,797	47	52,981	46	8,361	7
2006	59,673	46	56,617	44	13,057	10
2007	61,366	43	61,613	43	19,440	14
2008	67,300	49	51,765	38	18,413	13
2009	59,077	46	59,095	46	8,997	7
2010	67,409	50	61,371	45	6,694	5
2011	53,092	40	55,877	42	22,845	17
2012	41,471	39	55,603	52	9,798	9
2013	39,984	35	51,854	45	22,660	20
2014	52,500	36	71,045	48	23,948	16
2015	49,182	35	68,157	48	24,717	17
2016	63,014	39	77,253	48	21,712	13
<b>Domestic</b>						
2000	83,757	30	4,641	2	191,530	68
2001	86,282	30	4,619	2	194,410	68
2002	86,350	31	5,761	2	182,314	66
2003	88,572	32	5,620	2	186,574	66
2004	88,302	31	5,544	2	189,602	67
2005	87,332	29	4,686	2	212,926	70
2006	98,614	31	3,867	1	214,490	68
2007	91,057	28	4,137	1	226,093	70
2008	81,761	24	4,353	1	251,924	75
2009	83,586	24	3,594	1	258,814	75
2010	83,843	22	4,057	1	285,060	76
2011	85,067	23	3,912	1	274,197	75
2012	84,523	23	4,823	1	280,660	76
2013	75,123	21	4,910	1	285,340	78
2014	79,734	20	3,921	1	314,243	79
2015	86,552	21	3,907	1	314,249	78
2016	78,126	19	3,982	1	326,979	80

**Table 3: Modal Share Summary: 2016 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
<b>Rail</b>												
2016	35	16	19	62	51	56	30	16	23	39	19	25
5-yr avg	29	19	20	55	56	56	31	14	22	37	22	25
<b>Barge</b>												
2016	55	1	10	29	2	14	54	3	29	48	1	14
5-yr avg	58	1	8	33	2	17	50	3	25	47	1	13
<b>Truck</b>												
2016	10	84	71	9	48	31	16	81	47	13	80	61
5-yr avg	12	81	72	12	42	28	20	83	53	16	77	62

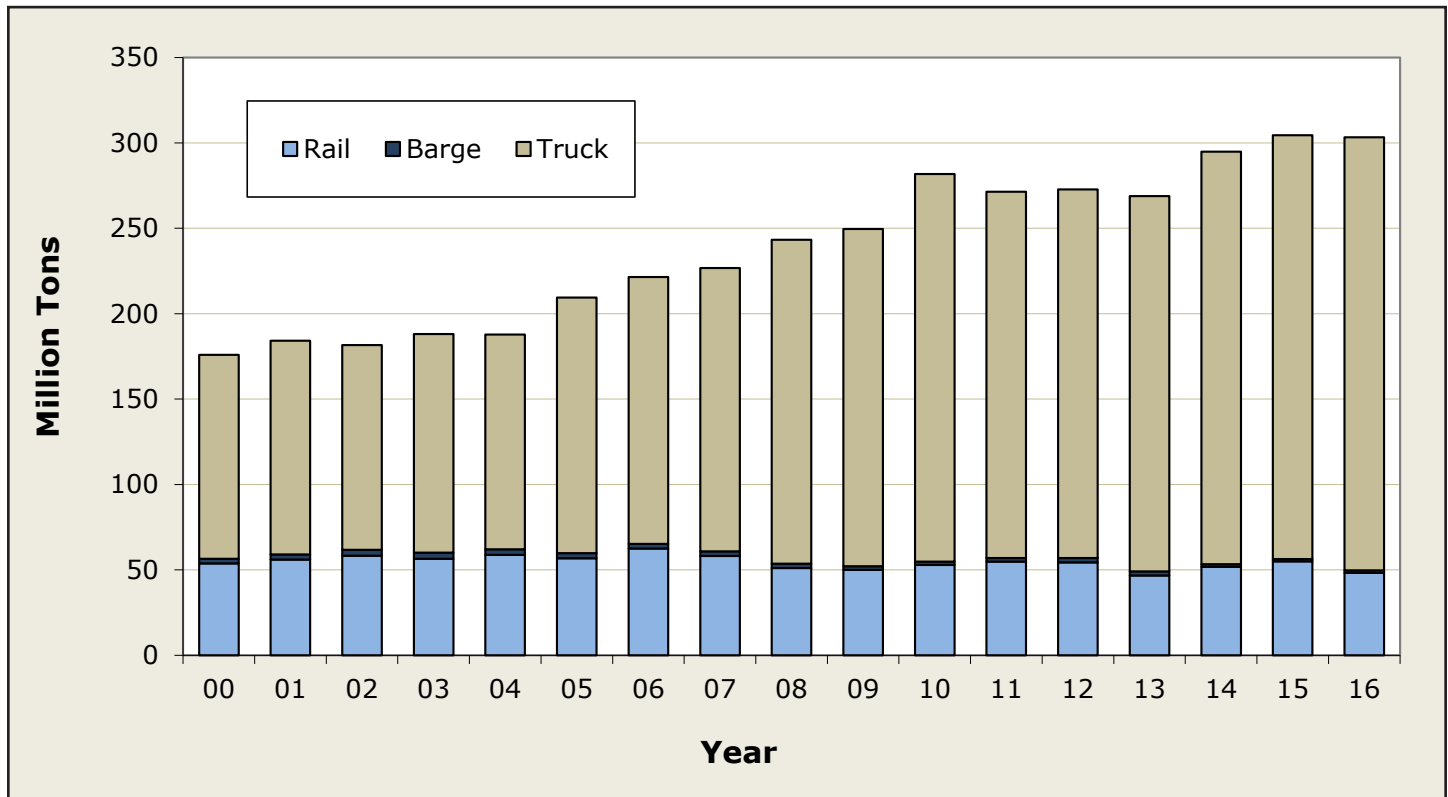
\*Percentages may not total 100 due to rounding.

# Corn Modal Shares

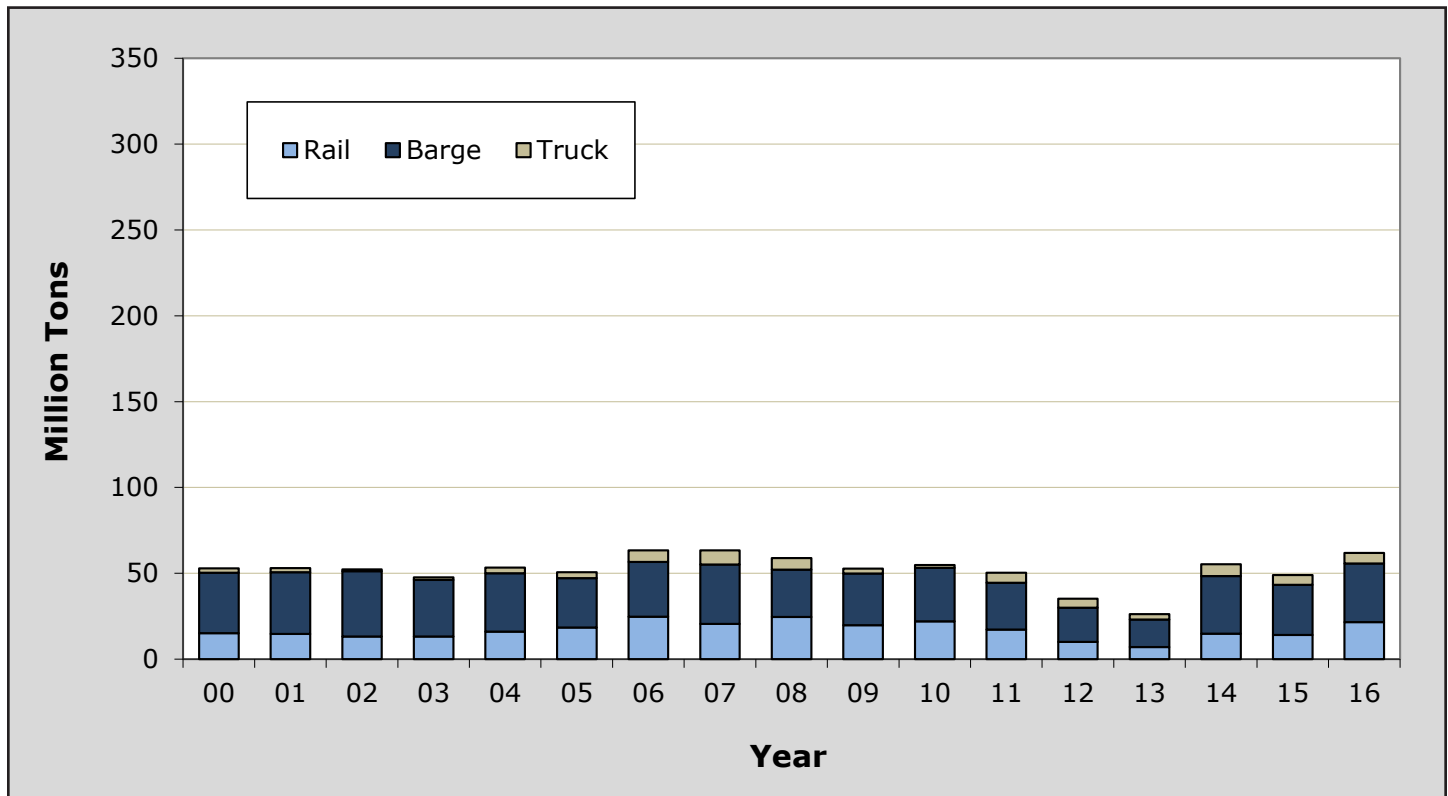
Table 4: Tonnages and modal shares for U.S. corn, 2000–2016

Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	68,984	30	37,831	17	122,071	53
2001	70,773	30	38,864	16	127,588	54
2002	71,488	31	41,598	18	120,900	52
2003	69,775	30	36,488	15	129,431	55
2004	74,766	31	37,302	15	129,062	54
2005	75,261	29	31,739	12	153,161	59
2006	87,314	31	34,587	12	163,079	57
2007	78,650	27	37,407	13	174,106	60
2008	75,652	25	30,088	10	196,503	65
2009	69,803	23	32,147	11	200,453	66
2010	74,909	22	33,134	10	228,553	68
2011	72,059	22	29,434	9	220,294	68
2012	64,514	21	22,331	7	221,162	72
2013	53,808	18	18,421	6	222,836	76
2014	66,701	19	35,072	10	248,403	71
2015	69,153	20	30,572	9	253,747	72
2016	69,839	19	35,729	10	259,692	71
<b>Export</b>						
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	3,344	6
2005	18,380	36	28,778	57	3,472	7
2006	24,735	39	31,941	50	6,753	11
2007	20,478	32	34,689	55	8,270	13
2008	24,615	42	27,457	47	6,802	12
2009	19,801	38	30,013	57	2,936	6
2010	22,070	40	31,174	57	1,575	3
2011	17,237	34	27,331	54	5,802	12
2012	10,108	29	19,825	56	5,332	15
2013	7,034	27	16,019	61	3,147	12
2014	14,822	27	33,624	61	6,859	12
2015	14,116	29	29,256	60	5,551	11
2016	21,582	35	34,187	55	6,150	10
<b>Domestic</b>						
2000	53,771	31	2,681	2	119,476	68
2001	56,097	30	2,960	2	125,136	68
2002	58,331	32	3,473	2	119,852	66
2003	56,568	30	3,616	2	127,903	68
2004	58,711	31	3,328	2	125,717	67
2005	56,881	27	2,961	1	149,689	71
2006	62,579	28	2,646	1	156,326	71
2007	58,171	26	2,718	1	165,836	73
2008	51,037	21	2,631	1	189,701	78
2009	50,002	20	2,135	1	197,517	79
2010	52,839	19	1,960	1	226,978	81
2011	54,822	20	2,102	1	214,492	79
2012	54,406	20	2,506	1	215,830	79
2013	46,774	17	2,402	1	219,689	82
2014	51,879	18	1,448	0	241,544	82
2015	55,037	18	1,317	0	248,196	81
2016	48,258	16	1,542	1	253,542	84

**Figure 6: U.S. corn domestic shipments by mode, 2000–2016**



**Figure 7: U.S. corn export shipments by mode, 2000–2016**

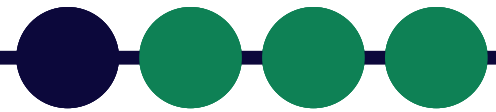




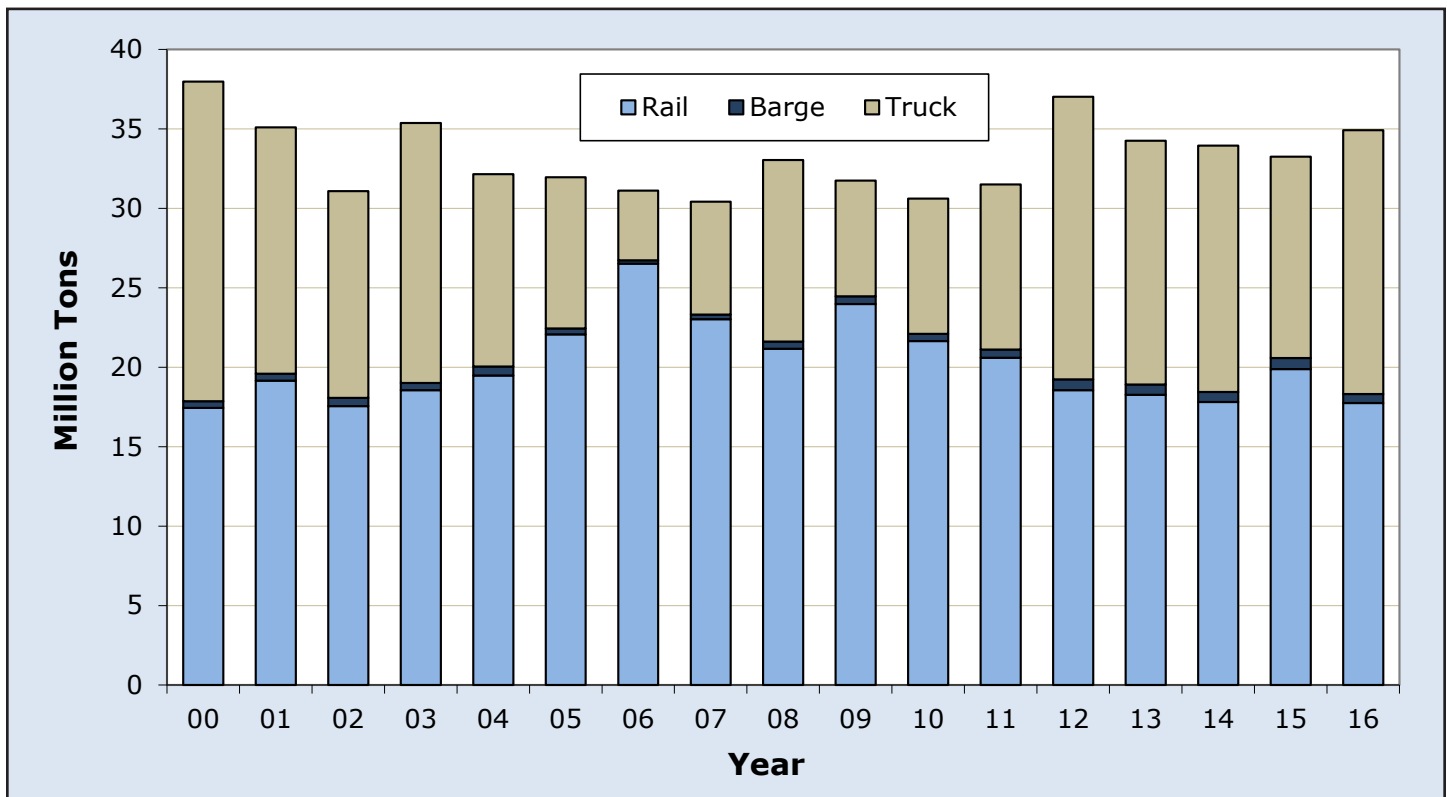
# Wheat Modal Shares

Table 5: Tonnages and modal shares for U.S. wheat, 2000-2016

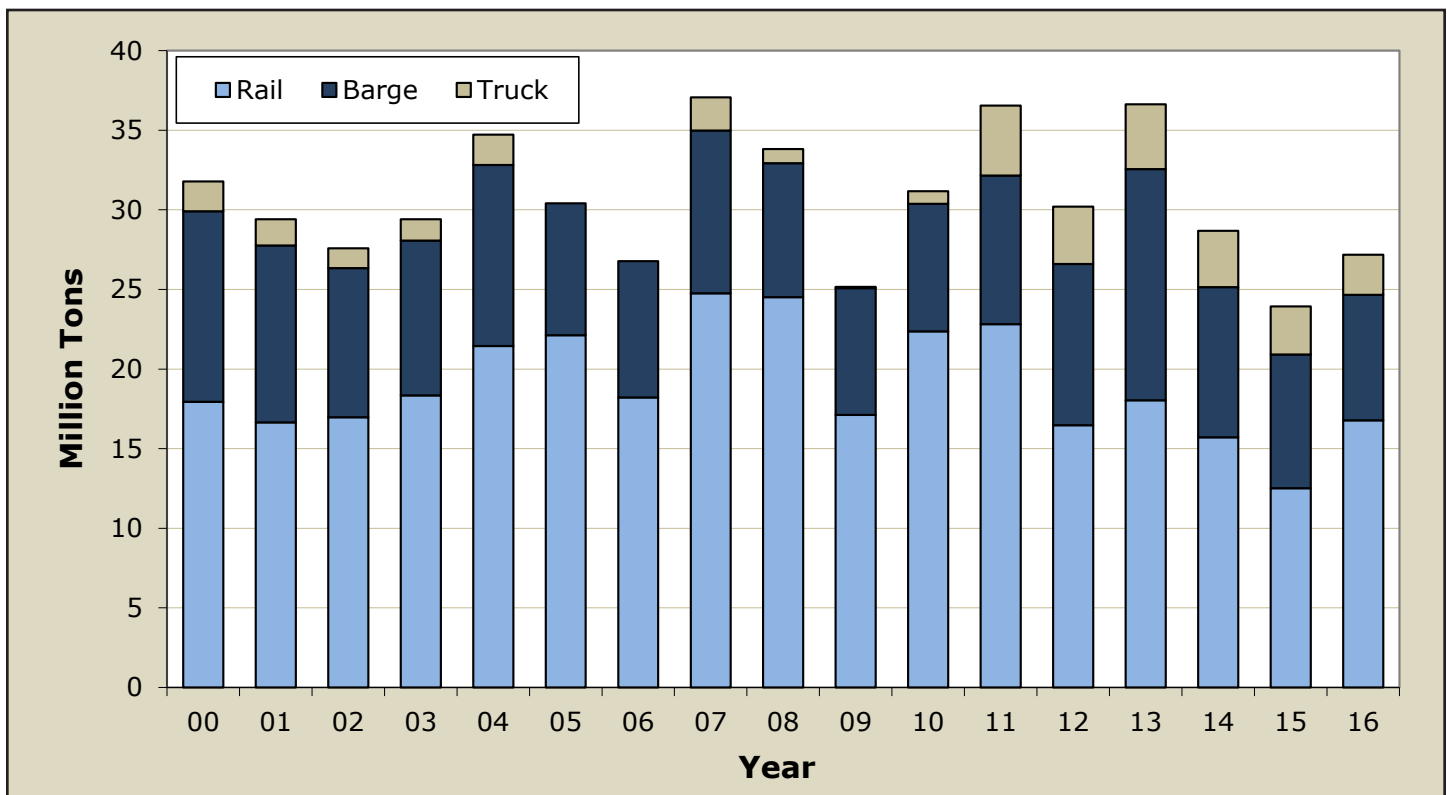
Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	35,380	51	12,391	18	21,980	32
2001	35,809	56	11,534	18	17,165	27
2002	34,523	59	9,876	17	14,267	24
2003	36,900	57	10,180	16	17,688	27
2004	40,924	61	11,937	18	14,017	21
2005	44,180	71	8,668	14	9,524	15
2006	44,735	77	8,767	15	4,393	8
2007	47,777	71	10,515	16	9,178	14
2008	45,670	68	8,872	13	12,305	18
2009	41,094	72	8,462	15	7,339	13
2010	44,017	71	8,471	14	9,293	15
2011	43,417	64	9,844	14	14,784	22
2012	35,025	53	10,814	16	20,753	31
2013	36,290	51	15,170	21	19,232	27
2014	33,527	54	10,055	16	19,034	30
2015	32,388	57	9,112	16	15,688	27
2016	34,522	56	8,445	14	19,123	31
<b>Export</b>						
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	1,332	5
2004	21,439	62	11,370	33	1,919	6
2005	22,120	73	8,294	27	0	0
2006	18,212	68	8,566	32	0	0
2007	24,749	67	10,229	28	2,080	6
2008	24,509	72	8,428	25	875	3
2009	17,117	68	7,970	32	66	0
2010	22,369	72	8,013	26	792	3
2011	22,820	62	9,333	26	4,387	12
2012	16,474	55	10,126	34	3,597	12
2013	18,034	49	14,519	40	4,073	11
2014	15,710	55	9,437	33	3,529	12
2015	12,508	52	8,411	35	3,015	13
2016	16,728	62	7,887	29	2,562	9
<b>Domestic</b>						
2000	17,446	46	416	1	20,109	53
2001	19,152	55	435	1	15,511	44
2002	17,556	56	509	2	13,020	42
2003	18,552	52	454	1	16,356	46
2004	19,485	61	566	2	12,099	38
2005	22,060	69	375	1	9,524	30
2006	26,524	85	200	1	4,393	14
2007	23,028	76	286	1	7,098	23
2008	21,161	64	444	1	11,430	35
2009	23,977	76	493	2	7,273	23
2010	21,647	71	458	1	8,501	28
2011	20,596	65	511	2	10,397	33
2012	18,551	50	688	2	17,776	48
2013	18,255	53	651	2	15,354	45
2014	17,818	52	617	2	15,505	46
2015	19,881	60	701	2	12,673	38
2016	17,794	51	558	2	16,561	47



**Figure 8: U.S. wheat domestic shipments by mode, 2000–2016**



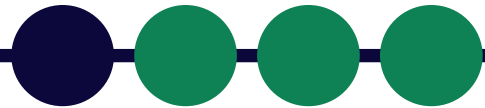
**Figure 9: U.S. wheat export shipments by mode, 2000–2016**



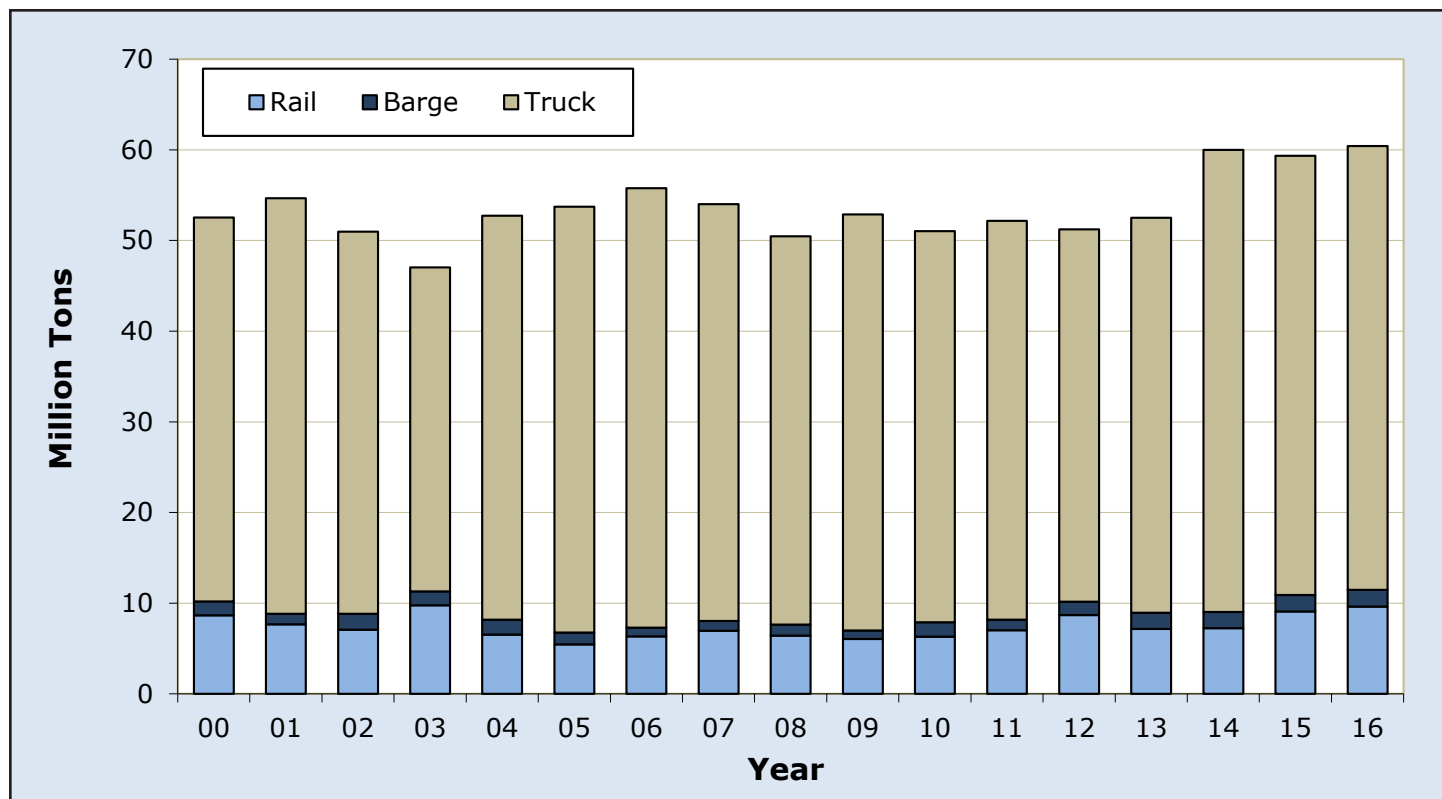
# Soybean Modal Shares

Table 6: Tonnages and modal shares for U.S. soybeans, 2000-2016

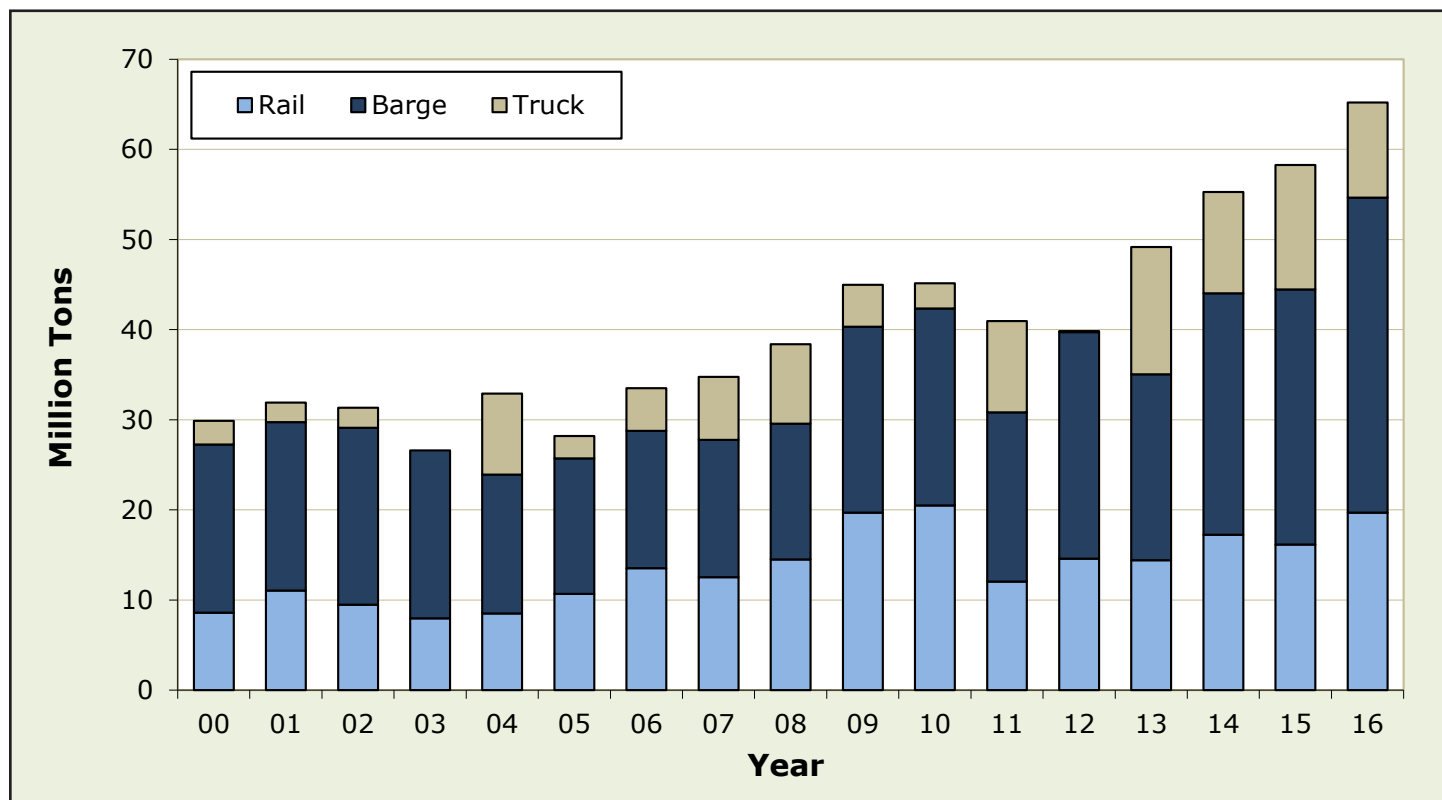
Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	17,257	21	20,174	24	44,974	55
2001	18,699	22	19,872	23	47,996	55
2002	16,550	20	21,399	26	44,362	54
2003	17,735	24	20,167	27	35,723	49
2004	15,029	18	17,053	20	53,564	63
2005	16,141	20	16,332	20	49,452	60
2006	19,862	22	16,221	18	53,191	60
2007	19,478	22	16,327	18	52,976	60
2008	20,899	24	16,326	18	51,607	58
2009	25,745	26	21,569	22	50,546	52
2010	26,778	28	23,472	24	45,935	48
2011	19,055	20	19,962	21	54,093	58
2012	23,281	26	26,604	29	41,158	45
2013	21,591	21	22,399	22	57,677	57
2014	24,472	21	28,590	25	62,200	54
2015	25,239	21	30,131	26	62,237	53
2016	29,315	23	36,825	29	59,479	47
<b>Export</b>						
2000	8,591	29	18,665	62	2,620	9
2001	11,047	35	18,689	59	2,173	7
2002	9,477	30	19,642	63	2,212	7
2003	7,964	30	18,632	70	0	0
2004	8,496	26	15,412	47	9,007	27
2005	10,676	38	15,030	53	2,490	9
2006	13,541	40	15,240	45	4,714	14
2007	12,524	36	15,242	44	6,999	20
2008	14,492	38	15,089	39	8,798	23
2009	19,694	44	20,634	46	4,644	10
2010	20,484	45	21,864	48	2,801	6
2011	12,041	29	18,793	46	10,124	25
2012	14,598	37	25,124	63	104	0
2013	14,426	29	20,611	42	14,119	29
2014	17,231	31	26,791	48	11,251	20
2015	16,168	28	28,296	49	13,803	24
2016	19,693	30	34,968	54	10,549	16
<b>Domestic</b>						
2000	8,666	16	1,510	3	42,354	81
2001	7,651	14	1,183	2	45,823	84
2002	7,072	14	1,758	3	42,150	83
2003	9,771	21	1,535	3	35,723	76
2004	6,533	12	1,641	3	44,556	84
2005	5,465	10	1,302	2	46,962	87
2006	6,321	11	982	2	48,476	87
2007	6,953	13	1,086	2	45,978	85
2008	6,407	13	1,237	2	42,809	85
2009	6,051	11	936	2	45,902	87
2010	6,294	12	1,608	3	43,134	85
2011	7,015	13	1,169	2	43,969	84
2012	8,683	17	1,480	3	41,054	80
2013	7,165	14	1,788	3	43,558	83
2014	7,241	12	1,799	3	50,949	85
2015	9,070	15	1,834	3	48,434	82
2016	9,622	16	1,857	3	48,930	81



**Figure 10: U.S. soybean domestic shipments by mode, 2000-2016**



**Figure 11: U.S. soybean export shipments by mode, 2000-2016**



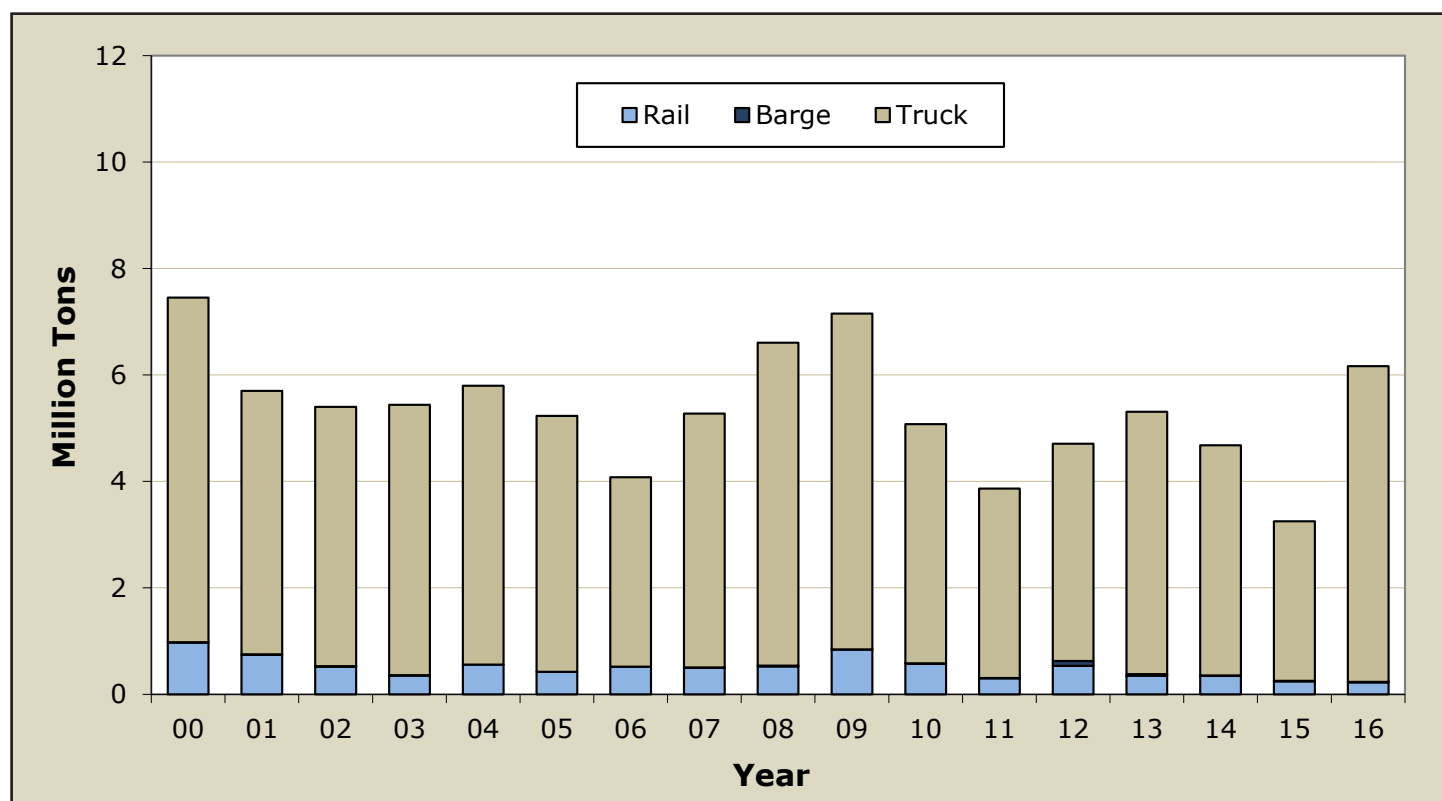
# Sorghum Modal Shares

**Table 7: Tonnages and modal shares for U.S. sorghum, 2000-2016**

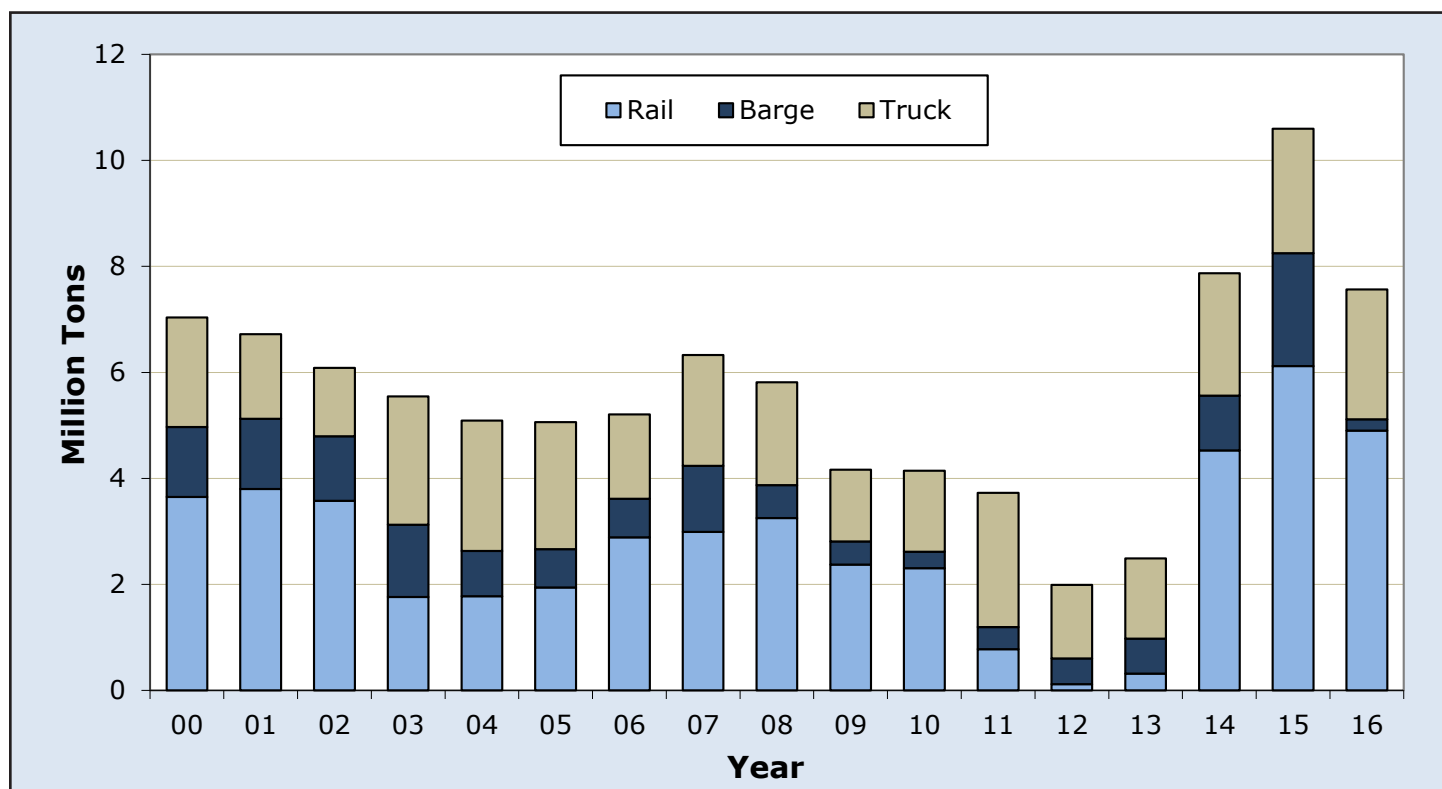
Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	4,626	32	1,322	9	8,545	59
2001	4,541	37	1,335	11	6,544	53
2002	4,100	36	1,225	11	6,160	54
2003	2,121	19	1,365	12	7,500	68
2004	2,334	21	852	8	7,698	71
2005	2,366	23	721	7	7,206	70
2006	3,407	37	730	8	5,147	55
2007	3,490	30	1,252	11	6,859	59
2008	3,779	30	634	5	8,006	64
2009	3,218	28	442	4	7,660	68
2010	2,886	31	315	3	6,019	65
2011	1,078	14	427	6	6,087	80
2012	653	10	577	9	5,468	82
2013	667	9	691	9	6,441	83
2014	4,873	39	1,046	8	6,633	53
2015	6,361	46	2,139	15	5,347	39
2016	5,127	37	225	2	8,379	61
<b>Export</b>						
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	56	309	7	1,526	37
2011	776	21	420	11	2,532	68
2012	120	6	485	24	1,386	70
2013	316	13	660	26	1,515	61
2014	4,528	58	1,033	13	2,309	29
2015	6,117	58	2,130	20	2,349	22
2016	4,903	65	212	3	2,451	32
<b>Domestic</b>						
2000	976	13	5	0	6,474	87
2001	743	13	8	0	4,949	87
2002	522	10	6	0	4,871	90
2003	358	7	3	0	5,078	93
2004	558	10	0	0	5,238	90
2005	425	8	0	0	4,806	92
2006	521	13	0	0	3,557	87
2007	502	10	6	0	4,769	90
2008	527	8	11	0	6,068	92
2009	846	12	2	0	6,307	88
2010	579	11	5	0	4,493	88
2011	302	8	7	0	3,555	92
2012	534	11	92	2	4,082	87
2013	351	7	31	1	4,926	93
2014	345	7	13	0	4,324	92
2015	244	8	9	0	2,999	92
2016	224	4	13	0	5,928	96



**Figure 12: U.S. sorghum domestic shipments by mode, 2000–2016**



**Figure 13: U.S. sorghum export shipments by mode, 2000–2016**



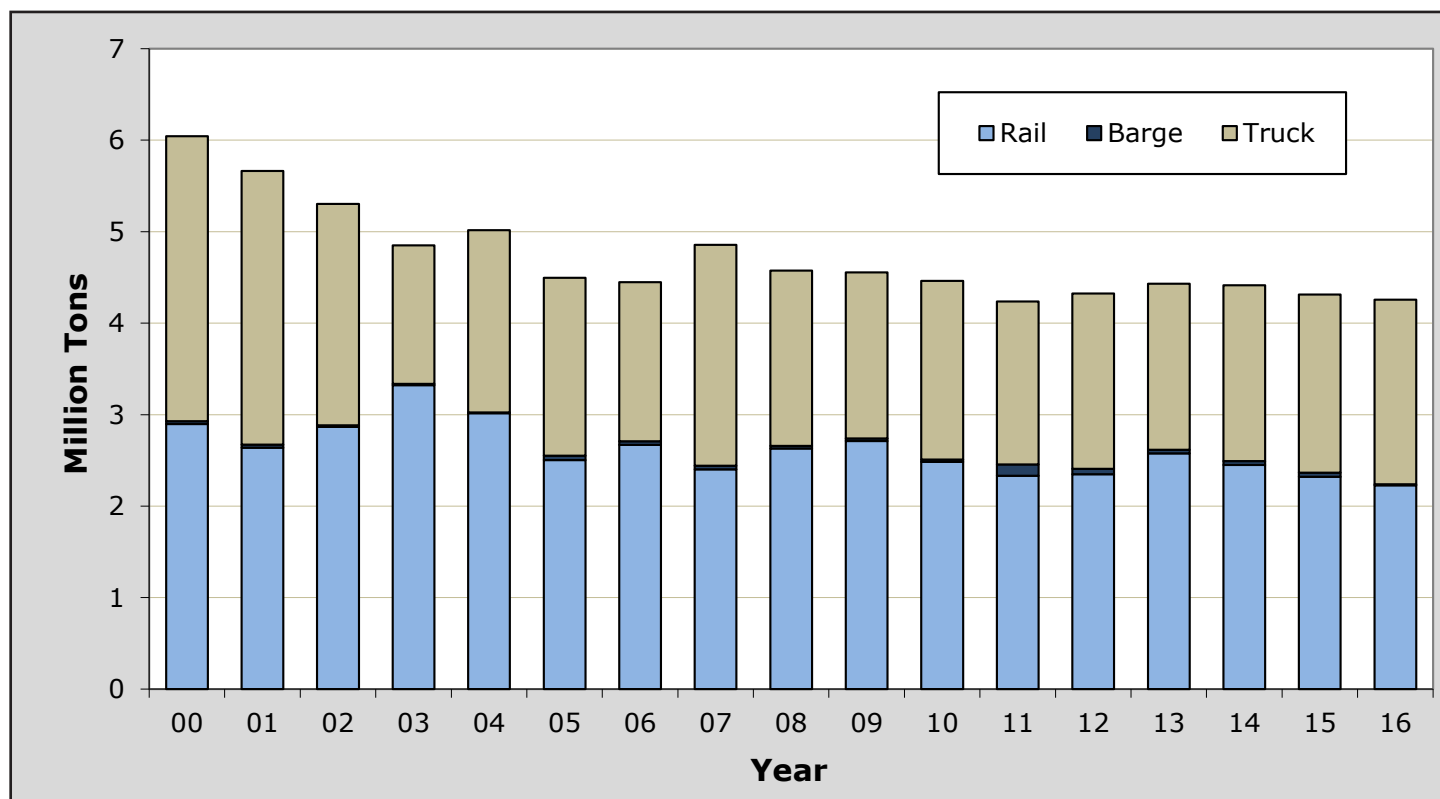
# Barley Modal Shares

**Table 8: Tonnages and modal shares for U.S. barley, 2000-2016**

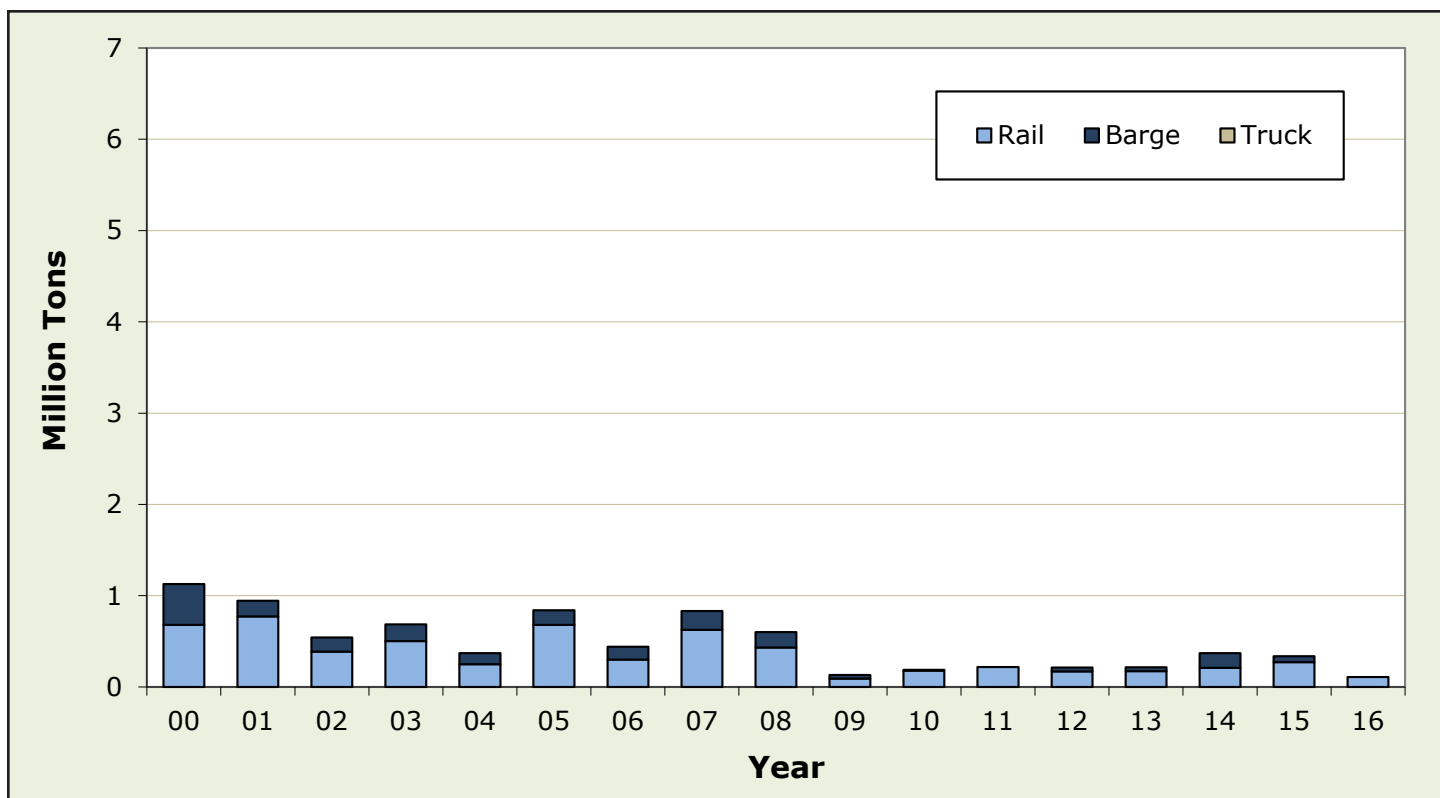
Year & type of movement	Mode of transport					
	Rail		Barge		Truck	
	1,000 tons	Percent	1,000 tons	Percent	1,000 tons	Percent
<b>Total</b>						
2000	3,577	50	478	7	3,117	43
2001	3,412	52	204	3	2,992	45
2002	3,254	56	170	3	2,421	41
2003	3,826	69	196	4	1,513	27
2004	3,264	61	130	2	1,991	37
2005	3,182	60	207	4	1,944	36
2006	2,969	61	179	4	1,738	36
2007	3,028	53	247	4	2,413	42
2008	3,061	59	198	4	1,916	37
2009	2,803	60	68	1	1,814	39
2010	2,661	57	36	1	1,954	42
2011	2,550	57	123	3	1,784	40
2012	2,520	56	100	2	1,918	42
2013	2,751	59	83	2	1,814	39
2014	2,660	56	203	4	1,921	40
2015	2,593	56	109	2	1,947	42
2016	2,337	54	12	0	2,018	46
<b>Export</b>						
2000	679	60	449	40	0	0
2001	773	82	171	18	0	0
2002	386	71	155	29	0	0
2003	502	73	183	27	0	0
2004	249	67	121	33	0	0
2005	680	81	159	19	0	0
2006	299	68	140	32	0	0
2007	626	75	206	25	0	0
2008	432	72	168	28	0	0
2009	93	70	39	30	0	0
2010	178	94	11	6	0	0
2011	218	100	0	0	0	0
2012	171	80	42	20	0	0
2013	173	80	44	20	0	0
2014	210	57	160	43	0	0
2015	272	81	64	19	0	0
2016	109	100	0	0	0	0
<b>Domestic</b>						
2000	2,898	48	29	0	3,117	52
2001	2,639	47	33	1	2,992	53
2002	2,868	54	15	0	2,421	46
2003	3,323	69	13	0	1,513	31
2004	3,015	60	9	0	1,991	40
2005	2,502	56	48	1	1,944	43
2006	2,670	60	39	1	1,738	39
2007	2,402	49	41	1	2,413	50
2008	2,629	57	29	1	1,916	42
2009	2,711	60	29	1	1,814	40
2010	2,483	56	26	1	1,954	44
2011	2,332	55	123	3	1,784	42
2012	2,349	54	58	1	1,918	44
2013	2,578	58	39	1	1,814	41
2014	2,450	56	43	1	1,921	44
2015	2,320	54	45	1	1,947	45
2016	2,229	52	12	0	2,018	47



**Figure 14: U.S. barley domestic shipments by mode, 2000–2016**



**Figure 15: U.S. barley export shipments by mode, 2000–2016**







## 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 by calendar year, 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.

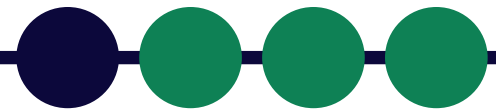
**Total Domestic.** Total domestic tonnages are estimated by subtracting total export tonnages from total disappearance.

**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.** Annual rail movements come 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.** Annual barge movement data, 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

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



