Estimating Regional Per-Mile Costs of Transporting Grains and Soybeans by Truck in the United States (*Technical Report CNAS-TR2015-1)*

Flynn Adcock, Center for North American Studies, Texas A&M AgriLife Research

Mark Welch, Texas A&M AgriLife Research

David Ellis, Texas A&M Transportation Institute

Author Contact: Flynn Adcock; 979-845-8694; fjadcock@tamu.edu

USDA Contact: Delmy L. Salin, Ph.D.; 202-720-0833; delmy.salin@ams.usda.gov

Recommended Citation: Adcock, Flynn J., Mark Welch, and David Ellis. *Estimating Regional Per-Mile Costs of Transporting Grains and Soybeans by Truck in the United States.* Center North American Studies Technical Report CNAS-TR2015-1. Research Report for Cooperative Agreement between Agricultural Marketing Service, USDA and Texas A&M AgriLife Research, December 2015. Posted at http://cnas.tamu.edu.

Acknowledgements: This work was supported by Cooperative Agreement Number 12-25-A-5728 with the Agricultural Marketing Service of the U.S. Department of Agriculture.

Technical Report CNAS-TR2015-1:
Estimating Regional Per-Mile Costs of Transporting Grains and Soybeans by Truck in the United States

December 2015

The Transportation Services Division of the Agricultural Marketing Service (AMS), USDA, currently provides regional truck transportation costs for grain and soybeans on a quarterly basis as shown in the quarterly *Grain Truck and Ocean Rate Advisory (GTOR)*. These estimates are derived from a series of surveys and selected secondary data sources. Another method of accomplishing the same task is to develop a model for estimating regional U.S. grain and soybean transportation costs using only publicly available data. This approach provides both transparency and ease of use as the model could be updateable on an ongoing basis.

Under a cooperative agreement with AMS, researchers at Texas A&M AgriLife Research and Texas A&M AgriLife Extension Service, with expertise in grain markets, and Texas A&M Transportation Institute, with expertise in transportation cost estimation, collaborated to develop the model for estimating transportation costs for the North Central region of the United States for selected grains and soybeans. The model was then expanded to estimate grain transportation costs for other production regions: West, Rocky Mountain, and South Central. These estimates were developed for various distances from farmgate to central storage and processing facilities. The resulting MS Excel spreadsheet model estimates the per mile costs to transport grains and soybeans by truck in each of these four regions of the United States for 25-mile, 100-mile, and 200-mile trips. The initial version of the model was developed, tested, and presented to staff at the Transportation and Marketing Program of the Agricultural Marketing Service, USDA in February 2015.

In the following months, the two-spreadsheet model was fine-tuned so as to eliminate several small inconsistencies. The connected spreadsheets are the model with the file name of *AMS Tool* and the data entry spreadsheet with a file name of *Master Data Entry Sheet*. The models are linked in such a way that the only actions the user is required to perform are to enter the appropriate data in the *Master Data Entry Sheet* and then review the results in the same spreadsheet. Figure 1 displays the instructions for using the model and can be found in the "READ THIS FIRST" tab of the *Master Data Entry Sheet*.

As a result, the user of the model need only regional diesel fuel prices from the U.S. Energy Information Agency (EIA), annual truck driver wage rates by state from the U.S. Bureau of Labor Statistics (BLS), and annual production of selected grain and oilseed crops by state from the USDA National Agricultural Statistical Service (NASS). All of these data are publicly available at no cost and, when combined with the quarter of the year and the region of the country, are used to calculate per-mile estimates of transportation charges for the three distances specified. Basically, all of the costs are summed and divided by the distances. In *AMS Tool*, the fuel usage takes into account both miles per hour (found in "Speed Data" tab) and miles per gallon as well as time spent on a particular trip at slower and higher speeds.

Figure 1. Instructions for Using the Regional Transportation Cost Estimates Model

NOTE: In this model, only enter data in cells that are WHITE in color.

Step 1:	On the "FUEL PRICE" tab, enter the year and quarter in cell B2 in the following format: YYYY.Q
Step 2:	On the "FUEL PRICE" tab, go the link provided for each region and enter the latest price for "Ultra Low Sulfur Diesel" for each of the four regions.
Step 3:	In cell B5 of the "WAGE RATE" tab, enter the quarter for which the analysis is being conducted.
Step 4:	In cell B3 of the "WAGE RATE" tab, enter the last year of crop production shown on the "PRODUCTION" tabs.
Step 5:	There are four "PRODUCTION" tabs, one for each of the regions included in the analysis. Update the grain production in each of the regions with the latest annual numbers.
Step 6:	Click on the "RESULTS" tab to view the calculations.

The labor costs estimates take into account driving time, waiting time to unload during peak harvest periods, and normal weigh-in, off-load, and weigh-out times ("Waiting and Process (Qtr Adjus)" tab). The main drivers for waiting times are differences based on harvest versus non-harvest quarters. For instance, in the North Central region, quarters 1 and 2 are non-harvest, resulting in 15 minutes of wait time, while initial harvest begins in quarter 3, resulting in 30 minutes of wait time, and full harvest is in quarter 4, resulting in 60 minutes of wait time. In the other three regions, the third quarter is the full harvest quarter – 60 minutes of wait time – while all other quarters are non-harvest – 15 minutes of wait time. Once a load arrives at the front of the off-loading line, it is assumed that it takes 15 minutes to off-load. It is assumed that all of this employee time must be paid; therefore, these wages are allocated on a per-mile basis. Further, if the user has more recent wage data, they can be input in place of the BLS data.

A five-year average of grain and soybean production is used to assign the relative importance of each state within a region. This time period was used to provide a bit of consistency from year to year and to take into account farm-held stocks; however, a four-year, three-year, or two-year average could be used if the user prefers. It is not recommended to use only the most recent year's production data as there are often wide swings from year to year and on-farm stocks would be ignored.

The model is designed to be usable through the 2018 crop year. After that time, it is felt that many of the underlying cost assumptions may become obsolete. These underlying cost assumptions can be found in the *AMS Tool* spreadsheet in the "Costs" tab and include truck and trailer purchase prices; salvage value; repair and maintenance; permits, licenses and insurance; and tires. After 2018, or earlier if preferred, the user can introduce more contemporary costs.

Once the data are entered, the linked spreadsheets calculate the per-mile estimates from different length trips. The results can be found in the "Results" tab of the *Master Data Entry Sheet* and the "Public View" tab of the *AMS Tool*.

One of the motivating factors for this project was to supplement and/or replace the per-mile truck transportation rates found in the *GTOR* quarterly reports. As such, the model was developed in such a way as to mimic the rates generated by the survey and reported in the *GOTR* in terms of both value and changes from quarter to quarter. In some quarters, the results are fairly close for each method while in other months the differences were greater. Further, in some quarters, results for some regions and/or trip-lengths were similar while they were dissimilar for other regions and/or trip-lengths. Table 1 shows the results comparisons of the model for the first and second quarters of 2015, the latest quarters for which the survey results are known. These results illustrate the differences in results between the *AMS Model* and the survey method results, with first quarter of 2015 being fairly similar while the second quarter resulted in greater differences.

Table 1: Comparison of Model Results to Survey Results

2015, 1st Quarter

U.S. Grain Truck Market

	MODEL RATES			SURVEY RATES			PERCENT DIFFERENCE		
	Rate per mile, per truckload			Rate per mile, per truckload			Model Rates ÷ Survey Rates		
	25 miles	**100 miles**	**200 miles**	**25 miles**	**100 miles**	**200 miles**	**25 miles**	**100 miles**	**200 miles**
North Central	$4.65	$3.32	$2.57	$3.90	$3.00	$2.72	19.2%	10.6%	-5.4%
Rocky Mountain	$4.61	$3.30	$2.56	$4.56	$3.29	$2.81	1.1%	0.3%	-8.9%
South Central	$4.48	$3.23	$2.51	$3.89	$3.01	$2.68	15.2%	7.3%	-6.2%
West	$4.67	$3.34	$2.59	$4.16	$3.44	$2.76	12.3%	-3.0%	-6.2%

2015, 2nd Quarter

U.S. Grain Truck Market

	MODEL RATES			SURVEY RATES			PERCENT DIFFERENCE		
	Rate per mile, per truckload			Rate per mile, per truckload			Model Rates ÷ Survey Rates		
	25 miles	**100 miles**	**200 miles**	**25 miles**	**100 miles**	**200 miles**	**25 miles**	**100 miles**	**200 miles**
North Central	$4.62	$3.30	$2.56	$3.66	$2.29	$1.98	26.3%	44.2%	29.2%
Rocky Mountain	$4.60	$3.29	$2.55	$3.04	$2.59	$1.96	51.3%	27.1%	30.2%
South Central	$4.47	$3.22	$2.50	$2.74	$2.56	$2.52	63.1%	25.7%	-0.7%
West	$4.68	$3.34	$2.59	$3.88	$2.76	$2.64	20.5%	21.1%	-1.8%

Comparisons for first-quarter 2013 to second quarter 2015 can be found in the "COMPARISON" tab of the *Master Data Entry Sheet* of the model. In general, the longer distance trips are closer to the surveyed rates than the shorter distance trips. Over the entire time period, the model per-mile rates average 14.6 percent higher than the surveyed rates for 25-mile trips; 9.5 percent higher for 100-mile trips; and 2.7 percent lower for 200-mile trips.

While the two-spreadsheet model is consistent in estimating per-mile truck transportation rates for various distances and by region, it should be understood that the results are both generalized and backward looking. It would be inappropriate to apply any results to a particular grain transportation situation as any individual instance would likely yield different results than the results for a large region. Further, caution should be taken when using the model to estimate future grain transportation rates as future fuel rates, wage rates and production volumes cannot be known. Nevertheless, the model yields useful results which could be considered by AMS as they prepare the quarterly *GTOR* reports.

References

Ag Decision Maker, Iowa State University Extension and Outreach. *Grain Truck Transportation Cost Calculator*. http://www.extension.iastate.edu/agdm/. Last accessed October 2015.

Agricultural Marketing Service, USDA. *Grain Truck and Ocean Rate Advisory*. Various Issues, Quarter 1 2013 – Quarter 1 2015. http://www.ams.usda.gov/services/transportation-analysis/gtor

Bureau of Labor Statistics, U.S. Department of Labor. Occupational Employment Statistics: May 2014 State Occupational Employment and Wage Estimates. http://www.bls.gov/oes/current/oessrcst.htm. Last Accessed May 2015.

Fender, Katherine J. and David A. Pierce. *An Analysis of the Operational Costs of Trucking: A 2013 Update*. American Transportation Research Institute. Arlington, VA. September 2013.

National Agricultural Statistical Service, USDA. QuickStats 2.0. http://quickstats.nass.usda.gov/. Last Accessed October 2015.

U.S. Energy Administration, U.S. Department of Energy. Weekly Retail Gasoline and Diesel Prices (Using Regional and Monthly Options) http://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm. Last Accessed October 2015.

Prepared under AMS/USDA cooperative agreement Award Number: 12-25-A-5728, 9/30/13-8/31/15, by Flynn Adcock, International Program Coordinator and Assistant Director, Center for North American Studies, Department of Agricultural Economics, Texas A&M AgriLife Research; Mark Welch, Associate Professor and Extension Economist–Grain Marketing, Department of Agricultural Economics, Texas A&M AgriLife Extension Service; and David Ellis, Research Scientist and Program Manager, Infrastructure Investment Analysis, Texas A&M Transportation Institute. For further information, please contact Flynn Adcock, fjadcock@tamu.edu or call 979-845-8694. Special acknowledgement to Luis Ribera and Parr Rosson, Department of Agricultural Economics, Texas A&M University.