Grain Hauling Cost Calculator Instructions

UT Extension

Introduction:

The Grain Hauling Cost Calculator was developed as a decision aid to assist Tennessee producers estimate the cost of transporting corn, wheat, and soybeans from their farm to alternative locations. Costs (total, dollars per bushel, or custom rate equivalent in dollars per mile) can be compared between marketing locations based on user-entered parameters. Users enter the following parameters: distance, total bushels to be hauled, bushels per load, loading and unloading time, average fuel use, average speed, diesel price, wage rate, interest rate, and truck and/or trailer information (purchase price, useful life, annual use, repair factor, salvage value, and number of axles). The user can enter parameter values, select from a drop down list, or choose to accept the default values. Spreadsheet cells highlighted in dark orange reveal drop down menus that users can select from a list of alternatives. Spreadsheet cells highlighted in light orange can be modified by the user to estimate different hauling scenarios. Cells not highlighted in orange cannot be changed as they contain formulas. Red triangles in the corner of a cell indicate additional information about the contents or values that should be entered in that cell. The grey shaded area on the right hand side of the spreadsheet shows the estimated costs of the scenario entered. The "Print" button located in the bottom right hand corner of the spreadsheet allows the user to print a one page summary using their default printer.

Commodity:

Users can select from three commodities: corn, soybeans, and wheat. The commodity selected is used to estimate the weight per load. Default weights for each commodity from the Chicago Mercantile Exchange (CME) are: corn – 56 lbs/bu; soybeans – 60 lbs/bu; and wheat – 60 lbs/bu. Total bushels per load may not exceed 1,200. Additionally, if the estimated weight per axle for the truck and/or trailer exceeds the Tennessee Department of Transportation's limits, an error message will appear. ***This restriction is not a guarantee that a truck will not be over weight limits if an error message does not appear, as moisture content and thus weight will vary in addition to individual truck and trailer weights.***

Tennessee Department of Transportation limits the total load weight to a maximum of 80,000 lbs (73,280 lbs on interstate highways) and further limits weight per axle to 20,000 lbs (18,000 lbs on inter-state highways) for single axles and 34,000 lbs (32,000 lbs on inter-state highways) for tandem axles. Weight restrictions are important to consider for individual routes as restrictions may vary depending on county, road, and time of year.

Haul Details:

This section allows the user to enter specific details about their haul. **Distance** is the number of miles travelled one way from the loading point to the unloading point. **Total Number of Bushels** is the total amount of the commodity that will be transported from one location to another, not the number of bushels per load. **Bushels per Load** are the total number of bushels that can be loaded on the truck or

truck and trailer (specified by the user under Truck/Trailer Information). **Number of Loads** is the total number of trips it will take to haul the total number of bushels given the bushels per load. Number of loads is calculated as total number of bushels divided by bushels per load, the number is rounded up as it is assumed that all bushels will be delivered. For example, if total bushels are 2,900 and the bushels that can be hauled per load are 1,000 then the number of loads is 3. **Loading Time** is the number of hours required to load the truck and trailer. Loading time is used when estimating the total labor cost. **Unloading Time** is the estimated number of hours it will take to unload the truck and trailer. Wait times should be included in unloading time as this will affect labor costs. **Average Fuel Use** is the fuel efficiency of the truck and trailer described below in the Truck/Trailer Information section. The number entered should reflect an average of both loaded and unloaded miles. For example, if the loaded fuel efficiency is 4 miles per gallon and unloaded is 8 miles per gallon then the user should enter 6 ($\frac{4+8}{2}$). **Average Speed** is the average speed in miles per hour the truck will be travelling during the haul. It is important to consider stops, starts, road conditions, topography, differences in loaded versus unloaded miles, and speed limits when estimating average speed.

Inputs:

        Diesel Fuel is the dollars per gallon that the tucker pays for fuel. **Wage Rate** is the dollars per hour being paid to the truck driver. A wage rate for producers hauling their own production should still be entered (your time is a cost). **Interest Rate** is the current percentage at which money can be borrowed. **Share of Annual Truck Use** is an estimate of the fraction of the truck's total annual use used to haul the total number of bushels entered above. This is used to assign fixed costs to the haul. For example, if total fixed costs for the truck are $10,000 for the year and the share of annual truck use is 10% then the total fixed cost attributed to the haul is $1,000.

Truck (Tractor) and Trailer Information:

        Truck (Tractor) and trailer information allows the user to describe the truck and trailer used in the haul. **Purchase Price** is the purchase price in dollars of the truck and trailer. If the truck and/or trailer was/were obtained via trade then the estimated or appraised value should be entered. **Useful Life** in hours is the total amount of time the truck or trailer will be utilized on the operation. For example, if the truck is used an average of 240 hours per year and the truck is anticipated to be used for 10 years then the total useful life in hours is 2,400 hours. It is important to note, this decision aid was designed for farm grain trucks not highway tractor trailers and, as such estimates should reflect this. **Annual Use** is the number of hours the truck or trailer is used per year. Annual use should include all sources of use not just the hours used on the estimated haul or hauling grain in general. **Repair Factor** is used to estimate the annual costs of repair and maintenance (see formulas below for additional details). Typically repair factors for a truck will range from 0.2 to 0.35 and a trailer will range from 0.1 to 0.2. **Salvage Value** is the estimated value of the truck or trailer at the end of its useful life. **Number of Single Axles** is the total number of single axles on the truck or trailer. **Number of Tandem Axles** is the total number of tandem axels for the truck and trailer. The total number and type of axles is used to estimate if the truck and trailer exceed the weight limit as determined by the Tennessee Department of

Transportation above. Again, this is an estimate not a guarantee the truck/trailer complies with weight restrictions.

Estimated Costs:

Estimated costs are segmented into two categories variable and fixed. **Variable Costs** are those estimated per trip. **Fixed Costs** are costs that occur as a result of ownership of capital assets adjusted for share of annual use. Two variable costs are estimated: fuel and labor (see formulas appendix for further information). Fixed costs estimated are repair and maintenance, capital recovery, and taxes, insurance and housing. Costs are displayed in **Total Cost ($)**, **Cost per Bushel ($/bu)**, and **Custom Rate Equivalent ($/mile)**. Total costs may be useful in budgeting or cash flow analysis for the farm operation. Cost per bushel is estimated as the total costs divided by the total number of bushels. Cost per bushel is useful when producers are comparing marketing alternatives. For example: Location A is offering $13.80/bu for 5,000 bu of soybeans and hauling costs are estimated at $0.20/bu. Location B is offering $14.00/bu for 5,000 bu of soybeans and hauling costs are estimated at $0.50/bu. Location A results in a net price to the producer of $13.60/bu ($68,000 total) versus Location B $13.50/bu ($67,500 total). The custom rate equivalent allows producers to compare the cost of hauling commodities with their own resources versus contracting with a custom grain hauling company.

Disclaimer: The information provided within represents estimates that are a result of a set of calculations that are described in more detail in the instructions. Changes in parameter values and corresponding costs are estimates and the user should use their own reasonable judgment to reflect whether the estimates are appropriate before acting on the results. The user is advised to test the calculator thoroughly before relying on its results. The University of Tennessee will not be liable for any claim or damage brought against the user by any third party, nor will the University of Tennessee be liable for any consequential, indirect or special damages suffered by the user as a result of using the calculator.

Questions and comments can be directed to Dr. Aaron Smith, Assistant Professor, University of Tennessee. Phone: (865) 974-7476 or Email: aaron.smith@utk.edu.

Formulas Appendix

1)   **Share of Annual Use** is estimated as:

SA = ((D/AS*2 + LT + UT) * NL) / AU

where,
SA   is share of annual use
D   is the one way distance of the haul in miles
AS   is the average speed in miles per hour
LT   is the loading time in hours
UT   is the unloading time in hours
NL   is the estimated number of loads
AU   is annual use in hours

2)   **Fuel Cost** is estimated as:

$FC = D \cdot 2 / AFU \cdot P_f$

where,
FC   is the estimated fuel cost in dollars per load
D   is the one way distance of the haul in miles
AFU   is the average fuel use in miles per gallon
P_f is the price of diesel fuel in dollars per gallon

3)   **Labor Cost** is estimated as:

$LC = (D \cdot 2 / AS + LT + UT) \cdot P_l$

where,
LC   is the estimated labor cost in dollars per load
D   is the one way distance of the haul in miles
AS   is the average speed in miles per hour
LT   is the loading time in hours
UT   is the unloading time in hours
P_l is the wage rate in dollars per hour

4)   **Repair and Maintenance** is estimated as:

$RM = RF \cdot PP / (UL / AU) \cdot SA$

where,
RM   is the estimated repair and maintenance cost in dollars
RF   is the repair factor

PP   is the purchase price in dollars
UL   is useful life in hours
AU   is annual use in hours
SA   is share of annual use

5)   **Capital Recovery** is estimated as:

$$CR = ((PP - SV) \cdot (r / 1 - (1 + r)^{(UL/AU)})) + SV \cdot r) \cdot SA$$

where,

CR   is the estimated capital recovery cost in dollars
PP   is the purchase price in dollars
SV   is the salvage value in dollars
r   is the interest rate in percent
UL   is useful life in hours
AU   is annual use in hours
SA   is share of annual use

6)   **Taxes, Insurance, and Housing** are estimated as:

$$TIH = PP \cdot 0.02 \cdot SA$$

where,

TIH   is the estimated taxes, insurance, and housing cost in dollars
PP   is the purchase price in dollars
SA   is share of annual use

7)   **Total Costs** are estimated as:

$$TC = (LC + FC) \cdot NL + RM + CR + TIH$$
where,

TC   is the total cost of the haul in dollars
LC   is the estimated labor cost in dollars per load
FC   is the estimated fuel cost in dollars per load
NL   is the number of loads per haul
RM   is the estimated repair and maintenance cost in dollars
CR   is the estimated capital recovery cost in dollars
TIH   is the estimated taxes, insurance, and housing cost in dollars

8)   **Custom Rate Equivalent** is estimated as:

$$CRE = CB \cdot BL / (D \cdot 2)$$

where,
CRE   is the custom rate equivalent in $ per mile

CB is the cost in $ per bushel
BL is the number of bushels per load
D   is the one way distance of the haul in miles