

For the example values given:

$$\begin{aligned}
 \text{Capital recovery} &= (\text{capital recovery factor} \\
 &\quad \times \text{total depreciation}) \\
 &\quad + (\text{salvage value} \times \text{interest rate}) \\
 &= (.130 \times \$25,000) + (\$20,000 \times .05) \\
 &= \$3,250 + \$1,000 \\
 &= \$4,250 \text{ per year}
 \end{aligned}$$

For a semi-trailer truck the cost for the trailer can be estimated separately or combined with the truck. In the example, the trailer is assumed to have a purchase price of \$25,000, an ownership life of 20 years, and a salvage value of \$5,000. The capital recovery factor for five percent and 20 years is 0.08, so the annual capital recovery cost is:

$$\begin{aligned}
 \text{Capital recovery} &= .08 \times (\$25,000 - 5,000) \\
 &\quad + (\$5,000 \times .05) \\
 &= \$1,600 + \$250 \\
 &= \$1,850
 \end{aligned}$$

Insurance and License

Costs for insuring and licensing a grain truck are usually much smaller than depreciation and interest, but they need to be considered, nevertheless. Insurance and license fees can be verified by farm records. In our example, they are estimated to be \$350 and \$500 per year, respectively, but they can vary widely.

Total Ownership Cost

The estimated costs of depreciation, interest, insurance, and license are added together to find the total ownership cost. For our example truck, this adds up to \$6,950 per year.

Capital recovery, truck	= \$4,250
Capital recovery, trailer	= \$1,850
Insurance	= \$ 350
License	= \$ 500
Total ownership cost	= \$6,950 per year

Operating Costs

Also called variable costs, include repairs, replacement of tires, fuel, lubrication, and operator labor.

Repairs and Maintenance

Repair costs occur because of routine maintenance, wear and tear, and accidents. The best data for estimating repair costs are the owner's own records of past repair expenses. *Ag Decision Maker File A3-16, Grain Harvesting Equipment and Labor in Iowa* (www.extension.iastate.edu/agdm/crops/html/a3-16.html), shows reported repair and maintenance costs for grain trucks from a recent Iowa survey. In our example, the owner estimates annual repair costs to be about \$3,000 for the truck and \$500 for the trailer.

Tires

Replacement of tires is a significant maintenance cost. The average number of tires purchased each year depends on the life of each tire, the number of miles driven, and the number of tires on each truck or trailer.

In our example, the semi-truck tractor has 10 tires with an expected life of 40,000 miles and a replacement cost of \$400 each. If the truck is driven 8,000 miles per year, an average of two tires must be replaced each year, at a total cost of \$800.

$$\begin{aligned}
 \text{Tires replaced} &= (8,000 \text{ miles} / 40,000 \text{ miles} \\
 &\quad \text{per tire}) \times 10 \text{ tires} = 2 \text{ tires} \\
 \text{Cost of tires} &= 2 \text{ tires} \times \$400 \text{ per tire} \\
 &= \$800 \text{ per year}
 \end{aligned}$$

Similarly, if the trailer has eight tires with an average life of 50,000 miles and a replacement cost of \$250, the annual costs for trailer tires is:

$$\begin{aligned}
 \text{Tires replaced} &= (8,000 \text{ miles} / 50,000 \text{ miles} \\
 &\quad \text{per tire}) \times 8 \text{ tires} = 1.6 \text{ tires} \\
 \text{Cost of tires} &= 1.6 \text{ tires} \times \$250 \text{ per tire} \\
 &= \$320 \text{ per year}
 \end{aligned}$$

Fuel

Fuel costs can be estimated by dividing the total miles the truck is driven each year by the average fuel efficiency (in miles per gallon) to find the total gallons of fuel used, then multiplying by the average cost of fuel per gallon.

In the example, the truck is driven 8,000 miles per year and the average miles per gallon achieved is assumed to be 5.0, so 1,600 gallons of fuel are used annually. If the price of fuel is \$2.65 per gallon, the annual expenditure is:

$$\begin{aligned} \text{Fuel use} &= 8,000 \text{ miles} / 5 \text{ miles per gallon} \\ &= 1,600 \text{ gallons} \\ \text{Fuel cost} &= 1,600 \text{ gallons} \times \$2.65 \text{ per gallon} \\ &= \$4,240 \text{ per year} \end{aligned}$$

Another 10 percent is added to the fuel cost for the cost of lubricants.

$$\text{Lubricants cost} = \$4,240 \times .10 = \$424$$

Labor

The cost of labor can be the wages paid to the driver of the truck or the value of the operator's own labor. Hours of road time can be estimated by dividing the total miles the truck is driven each year by the average speed at which it is driven. Additional hours spent loading and unloading (including hours waiting in line) can be added. The total hours are multiplied by the assumed wage rate to estimate the total labor cost.

For our example, the truck is driven 8,000 miles per year at an average speed of 50 miles per hour.

$$\begin{aligned} \text{Road time} &= 8,000 \text{ miles} / 50 \text{ miles/hour} \\ &= 160 \text{ hours} \\ \text{Loads hauled} &= 50,000 \text{ bushels hauled} / \\ &= 1,000 \text{ bu. per load} \\ &= 50 \text{ loads per year} \\ \text{Loading time} &= 50 \text{ loads} \times .5 \text{ hour/load} \\ &= 25 \text{ hours} \\ \text{Unloading time} &= 50 \text{ loads} \times 1.0 \text{ hour /load} \\ &= 50 \text{ hours} \\ \text{Total labor time} &= 160 + 25 + 50 = 235 \text{ hours} \\ \text{Total labor cost} &= 235 \text{ hours} \times \$15/\text{hour} \\ &= \$3,525 \end{aligned}$$

Total Operating Cost

Repairs, fuel, lubricants and labor costs are added to calculate total operating cost. For the truck example, the total operating cost is:

$$\begin{aligned} \text{Total operating cost} &= \$3,000 + \$500 + \$800 \\ &+ \$320 + \$4,240 + \$424 \\ &+ \$3,525 \\ &= \$12,809 \end{aligned}$$

Total Cost

After all costs have been estimated, the total ownership cost per year can be added to the operating cost to calculate the total cost to own and operate the truck. Total cost for our example is:

$$\begin{aligned} \text{Total ownership cost} &= \$ 6,950 \\ \text{Total operating cost} &= \underline{\$12,809} \\ \text{Total cost} &= \$19,759 \end{aligned}$$

Cost per Bushel or per Mile

Sometimes it is useful to calculate the total cost per mile driven or bushel hauled. In the example it was assumed that the truck was driven 8,000 miles per year, so the average total cost per mile would be:

$$\begin{aligned} \text{Cost per mile} &= \$19,759 / 8,000 \text{ miles} \\ &= \$2.47 \text{ per mile} \end{aligned}$$

Remember, for hauling one load the round-trip miles should be used to calculate the total cost of the trip.

If 50,000 bushels of grain are hauled each year, the average cost per bushel hauled would be:

$$\begin{aligned} \text{Cost per bushel} &= \$19,759 / 50,000 \text{ bushels} \\ &= \$0.395 \text{ per bushel} \end{aligned}$$

When comparing the cost of hauling to alternative sites, only the operating costs need to be taken into account. The ownership costs will not change if more or fewer miles are driven. In the example, the operating cost per mile would be:

$$\begin{aligned} \text{Operating cost} &= \$12,809 / 8,000 \text{ miles} \\ \text{per mile} &= \$1.60 \text{ per mile} \end{aligned}$$

If one potential grain selling location is 10 miles from the farm and another buyer is 75 miles away, the total operating costs for hauling to each one would be:

First location = \$1.60/mile x 10 miles x 2 = \$32
 Second location = \$1.60/mile x 75 miles x 2 = \$240

The difference is equal to \$208 per trip. If 1,000 bushels are hauled each trip, the price at the second location would have to be (\$208 / 1,000 miles) = \$.208 per bushel higher to make up for the greater hauling cost.

The worksheet at the end of this publication can be used to calculate the cost of transporting grain for your own situation. *Ag Decision Maker Decision Tool A3-29, Grain Truck or Wagon Transportation Calculator*, (www.extension.iastate.edu/agdm/crops/xls/a3-29graintransportation.xls) contains an electronic spreadsheet for estimating grain transportation costs using either a truck or a tractor and wagon combination. *Ag Decision Maker Decision Tool A2-32-A3-41, Grain Bid Comparison Tool*, (www.extension.iastate.edu/agdm/crops/xls/a2-32-a3-41grainbidpricecomparison.xls) allows you to easily compare grain bids at different locations, taking into account hauling costs as well as moisture discounts and drying charges.

Table 1. Capital recovery factors

Interest rate	2%	3%	4%	5%	6%	7%	8%	9%	10%
Years									
1	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	0.515	0.523	0.530	0.538	0.545	0.553	0.561	0.568	0.576
3	0.347	0.354	0.360	0.367	0.374	0.381	0.388	0.395	0.402
4	0.263	0.269	0.275	0.282	0.289	0.295	0.302	0.309	0.315
5	0.212	0.218	0.225	0.231	0.237	0.244	0.250	0.257	0.264
6	0.179	0.185	0.191	0.197	0.203	0.210	0.216	0.223	0.230
7	0.155	0.161	0.167	0.173	0.179	0.186	0.192	0.199	0.205
8	0.137	0.142	0.149	0.155	0.161	0.167	0.174	0.181	0.187
9	0.123	0.128	0.134	0.141	0.147	0.153	0.160	0.167	0.174
10	0.111	0.117	0.123	0.130	0.136	0.142	0.149	0.156	0.163
11	0.102	0.108	0.114	0.120	0.127	0.133	0.140	0.147	0.154
12	0.095	0.100	0.107	0.113	0.119	0.126	0.133	0.140	0.147
13	0.088	0.094	0.100	0.106	0.113	0.120	0.127	0.134	0.141
14	0.083	0.089	0.095	0.101	0.108	0.114	0.121	0.128	0.136
15	0.078	0.084	0.090	0.096	0.103	0.110	0.117	0.124	0.131
16	0.074	0.080	0.086	0.092	0.099	0.106	0.113	0.120	0.128
17	0.070	0.076	0.082	0.089	0.095	0.102	0.110	0.117	0.125
18	0.067	0.073	0.079	0.086	0.092	0.099	0.107	0.114	0.122
19	0.064	0.070	0.076	0.083	0.090	0.097	0.104	0.112	0.120
20	0.061	0.067	0.074	0.080	0.087	0.094	0.102	0.110	0.117

Worksheet for estimating grain transportation costs

Input Data	Semi Tractor	Trailer	Units
a. Purchase price	\$ _____	\$ _____	
b. Years truck will be owned	_____	_____	years
c. Expected salvage value at end of ownership	\$ _____	\$ _____	
d. Annual cost of repairs and maintenance	\$ _____	\$ _____	per year
e. Number of tires	_____	_____	tires
f. Replacement cost per tire	\$ _____	_____	per tire
g. Lifetime per tire	_____	_____	miles/tire
h. Miles truck driven per year	_____	_____	miles/year
i. Average hauling speed	_____	_____	miles/hour
j. Average miles driven per round trip	_____	_____	miles/trip
k. Bushels hauled per year with this truck	_____	_____	bushels/year
l. Bushels hauled per load	_____	_____	bushels/load
m. Loading time per load	_____	_____	hours
n. Unloading time per load	_____	_____	hours
o. Driver labor rate	\$ _____		\$/hour
p. Interest rate on investment	_____ %		
q. Price of fuel	\$ _____		\$/gallon
r. Fuel efficiency	_____		miles/gallon
s. Annual cost of truck license	\$ _____		
t. Annual cost of truck insurance	\$ _____		

Ownership Costs	Truck, \$/year	Trailer, \$/year	Combined
Capital recovery: capital recovery factor (from Table 1) [_____ × (a - c) + (c × p)]	_____	_____	_____
Insurance and license: [s + t]	_____	_____	_____
Total ownership cost	_____	_____	_____
Operating Costs			
Repair and maintenance cost: [d]	_____	_____	_____
Tires cost: [(h / g) × e × f]	_____	_____	_____
Fuel and lubrication cost: [(h / r) × q × 1.1]	_____	_____	_____
Labor cost: {(h / i) + [(m + n) × (k / l)]} × o	_____	_____	_____
Total operating cost	_____	_____	_____
Total Ownership plus Operating Costs	_____	_____	_____

Worksheet for estimating grain transportation costs - example

Input Data	Semi Tractor	Trailer	Units
a. Purchase price	\$45,000	\$25,000	
b. Years truck will be owned	10	20	years
c. Expected salvage value at end of ownership	\$20,000	\$5,000	
d. Annual cost of repairs and maintenance	\$3,000	\$500	per year
e. Number of tires	10	8	tires
f. Replacement cost per tire	\$400	\$250	per tire
g. Lifetime per tire	40,000	50,000	miles/tire
h. Miles truck driven per year	8,000		miles/year
i. Average hauling speed	50		miles/hour
j. Average miles driven per round trip	60		miles/trip
k. Bushels hauled per year with this truck	50,000		bushels/year
l. Bushels hauled per load	1,000		bushels/load
m. Loading time per load	0.50		hours
n. Unloading time per load	1.00		hours
o. Driver labor rate	\$15.00		\$/hour
p. Interest rate on investment	5%		
q. Price of fuel	\$2.65		\$/gallon
r. Fuel efficiency	5.0		miles/gallon
s. Annual cost of truck license	\$350		
t. Annual cost of truck insurance	\$500		
Ownership Costs	Truck, \$/year	Trailer, \$/year	Combined
Capital recovery: capital recovery factor (from Table 1) [$\text{_____} \times (a - c) + (c \times p)$]	\$4,250	\$1,850	\$6,100
Insurance and license: s + t	850		850
Total ownership cost	\$5,100	\$1,850	\$6,950
Operating Costs			
Repair and maintenance cost: [d]	\$3,000	\$500	\$3,500
Tires cost: $[(h / g) \times e \times f]$	800	320	1,120
Fuel and lubrication cost: $[(h / r) \times q \times 1.1]$	4,664		4,664
Labor cost: $\{(h / i) + [(m + n) \times (k / l)]\} \times o$	3,525		3,525
Total operating cost	\$11,989	\$820	\$12,809
Total Ownership plus Operating Costs	\$17,089	\$2,670	\$19,759

... and justice for all

Iowa State University Extension and Outreach does not discriminate on the basis of age, disability, ethnicity, gender identity, genetic information, marital status, national origin, pregnancy, race, religion, sex, sexual orientation, socioeconomic status, or status as a U.S. veteran. (Not all prohibited bases apply to all programs.) Inquiries regarding non-discrimination policies may be directed to Ross Wilburn, Diversity Officer, 2150 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, 515-294-1482, wilburn@iastate.edu.