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Firewood Economics

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"How much money can I pay for wood and still save on my utility bills?"

"If I gather wood myself from a national forest here in Idaho, how far can I drive and save money?"

This publication shows you how to answer both questions. You can determine if the wood you are burning in your "traditional, open-faced fireplace" is costing you money. You can also determine if a draft-controlled wood stove will save you money.

By following the steps outlined, you can calculate your existing costs. You will need a small calculator, your highest utility bill from the past heating season and a pencil.

STEP 1 — Determine the cost of heat from your present system:

Take your utility bill and divide the total amount paid by the amount used. This should include any fixed monthly charges. These costs/unit are normally expressed as:

$/gal for heating oil
$/therm for natural gas
$/KWH for electricity
$/gal for propane
$/ton for coal

My cost/unit is _____

For example, an electric home uses 1,780 KWH for a cost of $53.40. Thus $\frac{\$53.40}{1{,}780\ \text{KWH}} = \$0.03$ a KWH

STEP 2 — Convert Step 1 costs to costs per 1,000 BTU (British Thermal Unit). These costs are expressed in dollars:

Select on alternative below. If you heat with:

oil _____ ÷ 103.875 = $ _____
(cost/unit from Step 1)

natural gas _____ ÷ 80.0 = $ _____
(cost/unit from Step 1)

electricity _____ ÷ 3.413 = $ _____
(cost/unit from Step 1)

propane _____ ÷ 73.20 = $ _____
(cost/unit from Step 1)

coal _____ ÷ 15,000 = $ _____
(cost/unit from Step 1)

For example, electricity 0.03 ÷ 3.413 = $0.0088/1,000 BTU (rounded to 4 digits)

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STEP 3 — Find the heat yield of the wood you burn:

The heat yield is simply the amount of heat that you can actually capture in your home. It is expressed as 1,000 BTU/cord. Select the species of wood that you most commonly burn and the type of wood burning unit you use. Multiply the **gross heat** times the **efficiency**.

	Gross heat	
Black locust	29,260.2	high
Western larch (tamarack)	25,833.6	↓
Elm	23,200.0	
Douglas-fir (red fir)	22,732.4	
Paper Birch	20,884.1	
Lodgepole, ponderosa or white pine	19,276.5	
Grand fir (white fir)	17,400.0	
Alder	17,400.0	
Willow/poplar	16,800.0	
Spruce	15,272.8	low

Efficiency (stove examples)

high	0.65 multi-chambered, airtight stove
↓	0.40 single stage, airtight
	0.30 Franklin type
	0.15 to 0.25 improved fireplace (i.e., heatalator, glass doors, blowers, etc.)
low	0.10 open fireplace

Heat yield = _____ (gross heat) × _____ (efficiency) = _____

For example, if Douglas-fir is burned in a single chamber, airtight stove, the heat yield is:
22,732.4 × 0.40 = 9,092.96 M BTU/cord

STEP 4 — Determine the break-even value (BEV) of the wood:

Multiply the heat yield value (Step 3) times the cost value determined in Step 2. The BEV is expressed in dollars per cord of wood.

BEV _____ (heat yield (Step 3)) × _____ (cost (Step 2)) = _____

For example,
BEV = 9,092.96 × 0.0088 = $80.02

The BEV is defined as the amount of money you could spend for a cord of wood to break even on your utility bills. If you spend less, the difference is how much you will save per cord of wood burned.

If you are spending more for wood than the BEV, you are subsidizing your bill and would be better off economically to heat with other traditional fuels.

In order to compare the BEV with the price paid for wood (if purchased), you must consider the cost of the wood stove. In an analysis of this type, you should consider the costs on a per cord burned basis.

STEP 5 — Determine the cost of purchasing and maintaining a wood stove:

Cost of wood burning unit _____

Maintenance costs + _____

Total _____ (5a)

Expected lifetime of wood stove (Expressed as the total number of cords burned) _____ (5b)

Cost per cord = _____ (5a) - _____ (5b) = _____

For example, assume 12-year life and 5 cords/year

$ 700	fireplace insert
300	chimney cleaning (6 times at $50 each)
$1,000	

$1,000 ÷ 60 = $16.67/cord or
$ 700 ÷ 60 = $11.67/cord (you do maintenance yourself)

STEP 6 — Determine chain saw costs on a cost/cord basis:

Assume life expectancy at 12 years and 5 cords of wood cut per year.

Fixed costs

Chain saw cost = _____

Maintenance, repairs and personal protective clothing + _____

Salvage value - _____

Subtotal = (F) _____

Divide total fixed costs by number of cords cut.

For example,

Chain saw cost	=	$250
Maintenance, etc.	+	150
Salvage value	-	50
		$350

then $350 ÷ 60 = $5.83/cord

Variable costs

gasoline (¾ gal/cord) = _____

fuel mix (3 oz/cord) + _____

bar oil (6 oz/cord) + _____

Subtotal = (V) _____

For example,

gasoline	=	$1.00
fuel mix	+	.60
bar oil	+	.40
		$2.00/cord

Total chain saw costs

Fixed costs/cord (subtotal F) = _____

Variable costs/cord (subtotal V) + _____

Total = _____

For example,

Fixed costs	=	$5.83
Variable costs	+	2.00
		$7.83

STEP 7 — Determine the total cost/cord:

Wood stove = _____ (Step 5)

Chain saw + _____ (Step 6)

Wood cutting permit cost/cord (if any) + _____

For example,

Wood stove	=	$16.67/cord
Chain saw	+	7.83/cord
Wood cutters permit	+	.50/cord
Total		$25.00/cord

As you can see, obtaining your own wood from a "free" source will actually cost you more than $20/cord **plus** transportation expenses.

STEP 8 — Determine your transportation costs:

Transportation costs are those costs associated with hauling a cord of wood from the forest to your home. The amount will be figured on a cost per mile per cord hauled. You will need to know your total cost/mile to operate your truck (including depreciation, maintenance and fuel) and its capacity. Assume the following:

Truck type	Capacity in cords
Import size	4/10
½ T (1-foot side racks)	½ to ¾
¾ T (2-foot side racks)	¾ to 1
1 T	1 to 1¼
2 T	2 to 2¼

A cord is a stack of wood that has a volume of 128 cubic feet (4 × 4 × 8 feet) and weighs approximately 2,500 pounds.

(A) Total cost/mile _____ ($/mile)

(B) Truck capacity _____ (cords)

Thus, the total cost/mile/cord is found by dividing the cost/mile by the capacity (A ÷ B).

Transportation costs = _____ (A) ÷ _____ (B) = _____

For example,

Total cost/mile (A)	=	$.30/mile
Capacity (B)	=	¾ cord

Total cost/mile/cord = $.30 ÷ ¾ = $.40/mile/cord

STEP 9 — Determine your maximum round trip mileage (MRTM):

The maximum round trip mileage that you can drive to gather your own wood can be calculated by subtracting your total costs from the break-even value of the wood. If you then divide this difference, called maximum allowable transportation cost (MATC), by your cost per mile, the quotient is your maximum mileage.

MATC = _____ (BEV (Step 4)) - _____ (Total cost (Step 7)) = _____

MRTM = _____ (MATC (Step 9)) ÷ _____ (Transportation cost (Step 8)) = _____

For example,

BEV	=	$80.02
Total costs	-	25.00
MATC	=	$55.02

MRTM = 55.02 ÷ 0.40 = 137.5 miles

Reducing Transportation Costs

The only significant way to reduce the costs of gathering your own firewood is to minimize your transportation costs. Consider doing this:

1. Use a large truck to haul your wood. The cost/cord/mile is lower on a large truck **provided** it is filled to capacity. You might want to scout out potential wood in a small truck before cutting.
2. Keep spare parts for your chain saw. You can easily waste $15 to $20 for gas to drive to the woods and back if your starter rope breaks on the first pull.
3. Tow a trailer behind a two wheel drive ¾ ton (or larger) truck. You will be able to almost double your wood hauling capacity at a fraction of the cost.
4. Do not overload your vehicle. Haul at capacity, but do not abuse your vehicle. Vehicle breakdowns are a sure way to very expensive firewood.
5. Work and drive safely.
6. Enjoy getting out into the forest for recreation and exercise. Remember, you are not paying yourself a wage for this work!

For information on how to use your chain saw safely and efficiently, get a copy of PNW 228, **Safe Chain Saw Operation**, *from the University of Idaho Cooperative Extension agent in your county. Other useful publications on wood are in a series entitled "Wood As a Fuel," also available from your Extension county office.*

You may want to run a computer program on firewood economics. If you do, get a copy of MCUG 12 from Ag Computer Group, University of Idaho, Ag Sci 308A, Moscow, Idaho 83843.

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