UI Extension Forestry Information Series II
Wood as a Fuel No. 19

The Economics of Heating With Wood - Is It for You?

Yvonne C. Barkley

The blue skies and crisp nights of fall in Idaho sees many traditions – football, leaf raking, and for many, getting in your firewood. Throughout history, wood has been an important renewable resource for heating homes and outbuildings. When burned in a wood stove or fireplace, wood provides radiant energy that can bring quick comfort to a cold room. In the spring and fall, a fire will dispel an early morning or evening chill more economically than a large heating system. And should a storm interrupt services, your wood stove or fireplace will always be available to keep you and yours warm and as well as provide you with a way to serve up a hot meal.

Is it cheaper for me to heat with wood versus another energy source?

To figure out the costs of heating with wood, whether in an open fireplace or in an EPA approved, energy-efficient wood stove, you'll need to do some math.

1). Determine the cost of heating 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. This cost/unit is normally expressed as: $/gallon for heating oil; $/therm for natural gas; $/KWH for electricity; $/gallon for propane; $/ton for coal.

Example for a home with an electric source of heat uses 1,780 KWH for a cost of $53.40/month:

$ 53.40 ÷ 1,780 KWH = $0.03/KWH

My cost/unit is _____.

2). Convert Step 1 costs to costs per 1,000 BTU (British Thermal Unit). These costs are expressed in dollars. Select an alternative below. Take the cost/unit from step 1 and for:

- Oil ÷ 103.875 = $/1,000 BTU
- Natural gas ÷ 80.0 = $/1,000 BTU
- Electricity ÷ 3.413 = $/1,000 BTU
- Propane ÷ 73.20 = $/1,000 BTU
- Coal ÷ 15,000 = $/1,000 BTU

Example (for electricity):

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

My cost/BTU is _____.

3). Find the heat yield of the wood you burn. The heat yield is the amount of heat you can 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

yield of selected species (Table 1., pg. 2) times the efficiency of your type of stove or fireplace (Table 2., pg. 2).

Example for Douglas-fir burned in a single chamber, airtight stove:

22,732.4 (from Table 1) x 0.40 (from Table 2) = 9,092.96 M BTU/cord heat yield

My heat yield is _____.

Table 1. Gross heat yield of selected tree species	
black locust	29,260.2
western larch	25,833.6
elm	23,200.0
douglas-fir	22,732.4
paper birch	20,884.1
pine	19,276.5
grand fir	17,400.0
alder	17,400.0
willow/poplar	16,800.0
spruce	15,272,8

Table 2. Selected stove efficiency rates.	
Multi-chambered, airtight stove	0.65
Single stage, airtight stove	0.40
Franklin-type stove	0.30
Improved fireplace (glass doors, heat exchanger, blowers, etc)	0.15 to 0.25
Open fireplace	0.10

4). Determine the break-even value (BEV) of the wood. This is the amount you could spend for a cord of wood to break even on your utility bills.

Heat yield value (step 3) x cost value (step 2) = break-even value/cord of wood

Example of break-even value:

9,092.96 (heat yield value) x 0.0088 (cost value) = $80.02

My break-even value is: _____.

Is it more cost-effective to buy wood or go to the forest and get it myself?

To compare the break-even value of your wood with the price you would pay to buy wood you must consider the cost of the wood stove in order to consider the costs on a per cord burned basis. Use the information below to determine the economics of buying wood versus cutting your own.

5). Determine the cost of purchasing and maintaining a wood stove.

- Cost of wood burning unit + maintenance costs = (5a)
- Expected lifetime of wood stove (expressed as the total number of cords burned) = (5b)
- (5a) ÷ (5b) = costs per cord.

Example of the cost of purchasing and maintaining a wood stove, assuming a 12-year life and 5 cords/year:

- $ 700 fireplace insert + $ 300 chimney cleaning (6 times at $50 each) = $1,000
- $1,000 (5a) ÷ 60 (5b) = $16.67/cord

OR

- $ 700 ÷ 60 = $11.67/cord (if you do maintenance yourself)

My cost per cord is _____.

6). Determine chain saw costs on a cost/cord basis, assuming a life expectancy of 12 years and 5 cord of wood cut per year.

- **Fixed costs (F)**
  1. Chain saw cost + maintenance, repairs, protective clothing - salvage value = (F).
  2. Divide total fixed costs by number of cords cut to get a cost per cord.
- **Variable costs (V)**
  Gasoline (gal/cord) + fuel mix (oz/cord) + bar oil (oz/cord) = (V).
- **Total chain saw costs**
  Fixed costs/cord (F) + variable costs/cord (V) = Total cost.

Example of chain saw costs on a cost/cord basis.

- **Fixed Costs (F)**
  $250 (Chain saw cost) + $150 (maintenance) - $50 (salvage value) = $350.
  $350 ÷ 60 (cords cut) = $5.83/cord.
- **Variable Costs (V)**
  $1.00 (gasoline) + .60 (fuel mix) + .40 (bar oil) = $2.00/cord
- **Total Chainsaw Costs**
  $5.83 (Fixed costs) + $2.00 (Variable costs) = $7.83/cord.

My chain saw cost per cord is: _____.

7). Determine the total cost/cord (your labor not included).

Wood Stove (Step 5) + Chain saw (Step 6) + Wood cutting permit cost/cord (if any) = Total cost/cord.

Example of the total cost/cord (you cut):

$16.67/cord (step 5 - wood stove) + 7.83/cord (step 6 – chain saw) + $5.00/cord (permit) = $29.50/cord.

My total cost per cord of wood is _____.

As you can see, getting your wood from a "free" source actually costs you $29.50 per cord. And this does not include transportation and labor costs.

8). Transportation costs. These are 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 and its capacity.

A cord is a stack of wood that has a volume of 128 cubic feet (4x4x8 feet) and weighs approximately 2,500 pounds. Table 3 lists approximate amounts of wood you can haul by truck type.

Total cost/mile ($/mile) ÷ truck capacity (cords) = transportation costs.

Example of Transportation costs:

Total cost/mile/cord = $.60/mile ÷ 1 cord wood = $.60/mile/cord.

My transportation cost is _____.

Table 3. Truck type/capacity (in cords).	
1/2 T (1-foot side racks)	1/2 to 3/4
3/4 T (2-foot side racks)	3/4 to 1
1 T	1 to 1 1/4
2 T	2 to 2 1/4

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.

- BEV (Step 4) – Total cost (Step 7) = MATC
- MATC (Step 9) ÷ Transport cost (Step 8) = MRTM

Example of maximum round trip mileage:

$80.02 (Step 4) - $29.50 (Step 7) = $50.52 (MATC)

$50.52 (MATC) ÷ 0.60 (Step 8) = 84.20 miles (MRTM)

My round-trip mileage is _____.

In summary, the above example shows that it will cost you $29.50 for a cord of "free" Douglas-fir firewood from the forest plus an additional $50.52 for a round trip of 84.20 miles, bringing the total to $80.02/cord of firewood. **This does not include your labor.** The current value of a cord of Douglas-fir firewood is approximately $180.00/cord, so in the example above this person is saving approximately $100.00/cord by cutting their own wood (excluding labor).

Some suggestions to decrease transportation costs include:

- 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 to find a source closest to home.
- 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.
- 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.
- Do not overload your vehicle. Haul at capacity, but do not abuse your vehicle. Vehicle breakdowns are a sure way to very expensive firewood.
- Work and drive safely.

Some love to gather and cut wood – it is a tradition and a way to spend time with family and friends out in the forest. To these, the costs of heating and transportation are not that important. To others, getting in the year's firewood is a chore to avoid. Now that you have done the math you can decide – is heating with wood for you?

This article was excerpted from "Firewood Economics" by Dr. Don Hanley, WSU Emeritus Extension Forester and Professor. Special thanks to Carl Morrow for reviewing this article.

About the Author: *Yvonne C. Barkley* is an Associate Extension Forester at the University of Idaho.