Firewood: How to Obtain, Measure, Season, and Burn

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The chill of an Oklahoma winter is easier to accept if your home is cozy and warm. Due to the variability of fossil fuel costs, many southern homeowners are relying on the steady supply of inexpensive firewood as a heating source. Not only can firewood be less expensive, it is also a renewable resource that landowners can manage and grow. This is not so with the fossil fuels of oil, natural gas, and coal. Fossil fuels are non-renewable. Once used, these fuels can never be effectively replaced. As an alternative to fossil fuels, firewood has a long history as an economical, environmentally sound fuel to burn in the home.

Questions exist, however, concerning the acquisition of firewood and the characteristics of different woods. What are the best types of firewood available in Oklahoma? What is a cord? What is a rick? What is the best method to split and stack firewood? How should firewood be stored and for how long? Is firewood a safe fuel to collect and burn? What are some precautions that firewood users should know about properly burning wood in the home? These questions need answers.

Buying Firewood

Best Types of Oklahoma Firewood

What characteristics do firewood burners look for in firewood? Different types of wood burn differently. If firewood is to be gathered by the user, the fuel must be relatively close by and accessible by a road system. Good firewood should be inexpensive to collect, split, and season. Different types of woods split easier than others. Some, like elm, are stringy, tough, and difficult to split while others, like cottonwood, split easily. Different woods burn differently. Those considering firewood as a home heating fuel should consider the pros and cons of the variety of woods that are available. Table 1 (page 6) summarizes the characteristics of commonly used woods available in Oklahoma.

Heating values. Different types of wood will yield varying amounts of heat when burned. Wood goes through different stages when it is burned. Heating efficiency of firewood depends on how that wood progresses through three stages. Energy is expended in each of the three stages. In the first stage, wood is heated to a point where the moisture within the wood cells can evaporate. After the wood has dried, it then undergoes a chemical breakdown to charcoal, volatile gases and volatile liquids. The second stage is indicated by the obvious visual sign of actual flames. What burns in this second stage are the volatile gases and volatile liquids. Finally, the third stage occurs when the charcoal burns and can be seen when the embers glow. During this third stage, heat is radiated from the burning charcoal. Different species of wood burn and expend energy differently throughout these three stages. Good firewood: (1) is dry, (2) burns through the second stage evenly, without sparks, and with a minimum of smoke production, and (3) spends a long time burning in the third phase (i.e. has good "coaling qualities").

The heating value of wood depends upon the density of that wood. In general, the heavier or denser woods contain higher heating values, in BTU's per unit volume, than lighter woods. A BTU (British thermal unit) is a standard measure of heat that can be used for comparative purposes (one BTU is equal to the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit). Air dried wood will produce about 7000 BTU's per pound regardless of the species. The variation in density between different species, however, can be quite large. For example, one cubic foot of black locust will produce almost as much heat (in BTU's) as two cubic feet of cottonwood. Lighter woods, such as cottonwood and willow, produce roughly the same heat value per pound as heavier woods, such as oak, but are less dense, and therefore produce less heat per unit volume. This means that a greater volume of cottonwood is needed than oak to produce the same amount of heat.

Some species of wood start easier than others and, when burned, give off more smoke or more sparks than others. Finally, different woods will last longer and have better coaling qualities than others. It is important to consider these factors when selecting firewood.

Softwoods vs. Hardwoods. Sometimes confusing, the term "softwood" applies to conifers (or evergreens) and the term "hardwood" applies to deciduous trees (or leafshedding). The term "softwood" implies that the wood of these trees is soft. This, however, is not always the case. For example, Southern Yellow Pine native to southeastern Oklahoma is classified as a "softwood," but its wood is considerably harder than cottonwood, which is classified as a "hardwood." Some generalizations can be made, however, in regard to the burn-

ing characteristics of "softwoods." In general, softwoods are easier to ignite because they are resinous. Softwoods tend to burn rapidly with a high, hot flame and burn out quickly, requiring frequent attention. Also, softwoods such as redcedars and some of the pines contain moisture pockets which can be hazardous. Trapped gases in these pockets can explode when heated causing "pops," which throw sparks. These "pops" can present a significant fire danger, especially in open fireplaces with improper screens.

Hardwoods, as discussed above, do not necessarily indicate the hardness of their woods. Like softwoods, however, generalizations can be made regarding the burning characteristics of a hardwood. In general, hardwoods burn longer and less vigorously when compared to softwoods. Hardwoods make good fuel because they tend to produce more coals that last longer when compared to softwoods. Well seasoned oak, for example, is an excellent fuel because it produces a uniformly short flame and culminates in steady, glowing coals. Hardwoods, however, do tend to be more difficult to ignite compared to softwoods.

Splitability. If firewood is collected by the user or if the user purchases unsplit wood, some wood will need to be split. Splitting enables the wood to dry out faster and reduces the size of the sticks. Various woods have different splitting characteristics which are important to consider. Some woods split with little effort while others can be tough, stringy, and difficult to split. Short lengths of straight grained cottonwood or pine that are knot free will split easily. In contrast, woods with interlocking grain, like American elm or sycamore, can be extremely stringy and are difficult to split even with a hydraulic log splitter. In general, green wood will split more easily than dry wood. Also, softwoods will generally split more easily than hardwoods.

Aroma. Firewood connoisseurs will assess a firewood's aroma. Some people attach tradition to various smells that different woods have when burned. According to some, aroma is best achieved through burning the fruit woods. Meat smokers have utilized the fruit woods through history as a major component in the taste of their meats. Apple, cherry, hickory, and pecan are Oklahoma woods that have an aroma that resembles their fruit. Firewood taken from fruit and nut trees often commands a higher market price than woods with higher heating values.

Composite "logs." Artificial "logs" are used in fireplaces for their convenience and ease of starting. These "logs" burn differently and have different heating values than solid wood. Often advertised as having various colored flames when burned, these artificial "logs" are composites of sawdust, wood chips, wax, chemicals, and starch binders. Their combustion characteristics and gaseous outputs are considerably different from wood logs. Most artificial "logs" are designed to be burned in an open fireplace, not in a closed wood stove. Before using these artificial "logs," read and follow all manufacturer's label instructions.

Measuring Firewood

A confusing array of units exist that are unique to stacks of wood. It is quite important to have a clear understanding of the unit of measure used when purchasing wood from a seller.

The Cord. A standard cord is a compact stack eight feet long, four feet high, and four feet wide (Figure 1). This equates to a volume of 128 cubic feet. This volume, however, includes the air space between the sticks of wood. The amount of solid wood is quite variable and depends on the skill of the stacker, the straightness and size of the sticks, and the way the sticks were split. Research has shown that a standard cord of wood contains between 60 and 110 cubic feet of solid wood. A commonly used rule-of-thumb to convert gross volume to solid wood content is 80 cubic feet per standard cord. Larger diameters of round wood, neatly stacked, usually yield more solid wood per cord.

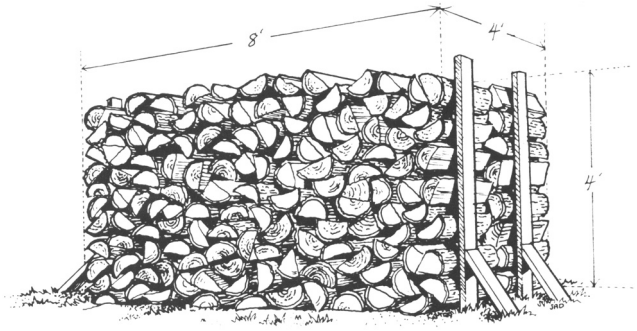

Figure 1. A cord is a standard measure - 4' x 4' x 8'.

State Regulations. The State of Oklahoma has developed regulations for the sale of fireplace and stove wood. The regulations state that "wood ... for use as fuel shall be advertised, offered for sale, and sold only by measure, using the term "cord" and fractional parts of a cord, or the cubic meter." The exception to this rule is wood sold by the package. Packaged wood must be sold by the cubic foot or fraction of cubic foot. The terms "face cord," "rack," "pile," "truckload," or terms of similar import shall not be used when advertising, offering for sale, or selling wood for use as fuel.

The regulations further state that a delivery ticket or sales invoice shall be presented by the seller to the purchaser whenever any nonpackaged fireplace or stove wood is sold. The minimum information required on this ticket includes: a) the name and address of the vendor, b) the name and address of the purchaser, c) the date delivered, d) the quantity upon which the price is based, e) the quantity delivered, f) the price of the amount delivered, and g) the identity of wood sold.

Other Firewood Measures. Even though State regulations specify how fireplace and stove wood shall be sold, other firewood measures are important to note, simply because of their familiarity to Oklahomans. A very common measure of firewood in Oklahoma is the rick (or face cord). A rick is a nonstandardized unit of measure. It refers to a stack of wood eight feet long, four feet high and the width of a single stick-length of firewood. Since the length of a single stick of firewood is variable, the volume of a rick is also variable. Some people cut firewood to 16 inch lengths. Some people cut firewood to 24 inch lengths. Stick length varies because different stoves and fireplaces can accept different sized firewood sticks. Depending upon stick length, a rick will equal between one-third to one-half of a standard cord.

Often firewood users will purchase wood by the truck load. Obviously, trucks vary in size and corresponding volume capacities. A "truck-load" is a vague term and depends upon the dealer's truck. Was the dealer's truck a standard sized long bed, a standard sized short bed, a small truck or a dump truck? The amount of wood in a "truck-load" also depends on how that the wood was packed. Was the wood stacked or randomly loaded into the truck? Another variable specification that will affect the volume capacity of a "truck-load" is the height to which that wood is stacked within the pickup bed. A logical conclusion to this discussion is that the consumer should be alert to the variation in actual volumes of a "truck load." A pickup truck-load, on the average, will equal between one-fifth to one-half of a standard cord. A dump-truck may hold up to four cords. Large pulpwood trucks with a wood rack may hold up to nine cords.

Firewood is also available by the bundle at local supermarkets or convenience stores. Targeting the recreational user, these bundles may contain three to six or more sticks. The amount of wood contained in a bundle, of course, will depend upon the size and quantity of sticks. A common sized bundle one foot by one foot by two feet will contain two cubic feet or roughly 1/64th of a standard cord (about 1 1/4 cubic feet of solid wood).

The Firewood Market

Firewood dealers can be found in most communities and are usually listed in the "want-ads" section of local newspapers. Many dealers operate on a part-time basis only. Price will vary according to the available local supply, the type and quantity of wood, and whether it is split, delivered, or seasoned. More economical firewood purchases can be made by ordering well in advance, by purchasing in the "off" season when demand is low, or buying green wood and letting it season. In areas of eastern Oklahoma, industrial wood scraps (slabs, trim, and edging) can often be purchased directly from a sawmill or other wood based industry. These pieces are usually small enough for fireplaces and stoves and are easily splittable for kindling.

The collection of wood is often an enjoyable, healthy way to spend time outdoors in the fall. This activity, however, should more appropriately be viewed as "timber harvesting." Beware; timber harvesting is one of the most dangerous professions in the United States. Safe chain saw operation and proper tree felling techniques are learned through years of experience. Learning these skills from a book or film is not an alternative to many hours of supervised practice. Understanding fundamentals, however, is a good place to start. For more information on safe chain saw operation, request OSU Extension Fact Sheet NREM-9430, "Safe Chain Saw Operation" from your county Extension office. It is important to remember that the same machine that was designed for cutting through wood, can just as easily cut through a leg or an arm.

For those interested in harvesting and collecting their own wood, supplies exist throughout the state. Available local supplies vary, however. The eastern portions of Oklahoma contain greater volumes of firewood and easier access than the western portions. The central and eastern portions of the state contain good firewood species, such as post oak or blackjack oak, which may not be suitable for manufacturing into more valuable wood products. Firewood volumes in the western portions of the state are generally located in drainages and scattered stands.

Collecting Firewood on Your Own

Forest Management

For forest landowners, the cutting of firewood fits in quite well with proper forest management. Cutting firewood out of a stand will improve the quality and the rate of growth of the remaining trees. A typical woodlot in Oklahoma has a sustainable yield of about one-third of a standard cord per acre per year. A 10 acre woodlot can easily supply the continuous fuel needs of an average Oklahoma household.

Proper thinning of woodlots for firewood production should be done with the idea of providing growing space for the higher quality trees. Select the poorly formed, low quality trees for firewood harvest. Landowners should not cut straight well-pruned trees simply because they split easier. Such cutting quickly reduces the overall value of the woodlot. Although crooked, limby, diseased, dead, or otherwise damaged trees require more time and energy per volume of wood produced, their removal improves the value of the woodlot. Allowing high quality, vigorous trees to develop a timber product of higher value is good for the total timber resource.

The art of culling a woodlot requires good judgement and proper planning. Before cutting, landowners should determine what condition they would like their woodlot to be in the future. The development of a forest management plan is integral to firewood harvest. Landowners unfamiliar with woodlot improvement techniques or management planning may obtain technical advise and service through consulting foresters, local representatives of the Oklahoma State Department of Agriculture, Forestry Division, or local OSU Extension offices. For more information on managing your woodlot for firewood, request OSU Extension Fact Sheet NREM-9439, "Growing Firewood" or NREM-5015, "Farm Woodland Improvement" from your county Extension office.

Sources

The vast majority of Oklahoma woodlands are privately owned. For those interested in collecting firewood, securing permission from the landowner prior to cutting is obviously the first step. Some wood may be available from public sources, especially in eastern Oklahoma. Public lands, sanitary landfills, and city tree managers are all potential sources of firewood. Other sources include harvesting slash (the tops of trees left following timber harvest), limbs from pruning, ice or storm damaged trees, or dead or dying trees in windbreaks and shelterbelts. Pecan plantations are potential sources for high quality firewood. Many of the existing groves are in need of thinning to reduce competition. It is important to shop around and arrange for a reliable wood supply. In securing firewood supplies, look for as many sources as possible for your needs. Start early; the fall is not the best-time to build a firewood supply for the forthcoming winter. Try to cut your wood one year ahead.

Seasoning Firewood

The primary function of processing and seasoning your firewood is to remove the moisture contained in freshly cut trees. Reducing the amount of moisture in firewood greatly increases the recoverable heat because water absorbs heat in the process of being changed to steam. Also, reducing the amount of moisture in wood reduces firewood ignition problems, creosote build-up in the chimney, and potential insect pest nuisances. The moisture within the wood of living trees will vary depending on species and site conditions. Trees taken from drier sites will tend to have lower wood moisture contents. Moisture content of wood within a tree will also vary. Often, there is a significant difference between the moisture content of the inner heartwood compared to the outer layers of sapwood. Regardless, air drying split wood for one season prior to burning will sufficiently reduce the moisture content of firewood so that it will ignite easily and burn well. Also, air dried, split, firewood is lighter and easier to work with during the heating season.

Splitting Firewood

The greater the surface area without bark that is exposed to air, the more rapid the drying. Round pieces of firewood, even if small, should be split for proper drying. Also, shorter pieces of firewood will dry more rapidly than longer pieces because moisture moves most freely along the grain. Split firewood is also easier to handle and will fit in fireboxes better as compared to unsplit roundwood.

Tools required for splitting by hand include axes mauls and wedges. Many different types of axes are available. A heavy, single-bit axe with a wide poll (broad surfaced head) will split wood easily. Wedges are available in different weights. The four and five pound varieties work well for splitting most woods. A splitting maul is an extra heavy combination of an axe and a wedge usually weighing six to eight pounds or more. A maul is useful because its extra weight and thickness keeps it from getting stuck in the wood (see Figure 2).

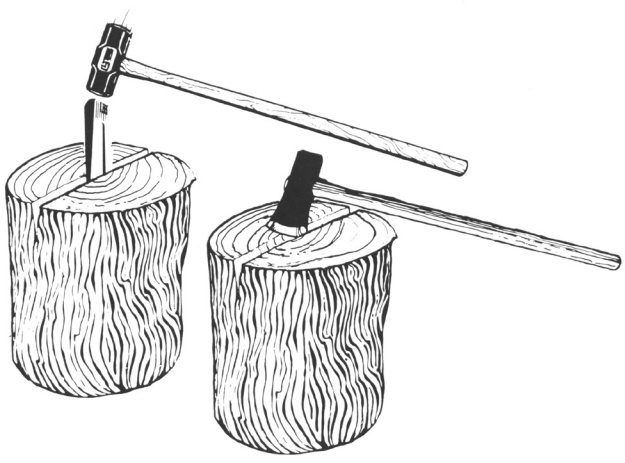

Figure 2. Use of proper tools will make the splitting job easier and safer.

Motorized power splitters are common and can take some of the back-breaking labor out of woodsplitting. The cost of these wood-splitters, however, should be weighed against the amount of firewood to be split. Hydraulic units apply force along the grain to split wood with one thrust. Screw type splitters bore into wood and rupture the wood along grain lines.

For more information on cutting and splitting firewood, request a copy of OSU Extension Fact Sheet NREM-9431, "Cutting Firewood Safely" from your county Extension office.

Storing Fuelwood

Air drying firewood takes time. Firewood burners need to allocate yard space for firewood stacks to season. Planning and organizing a firewood supply will save you time and headaches during the burning season. A firewood stack located too far from the house will draw angered comments inversely proportional to the outside temperature. A firewood stack located too close to the house will cut down on circulation and increase mess and insect problems. Firewood stacked close to a house will also present a fire hazard, especially in rural areas where wildfire is a threat.

Stacked firewood should be raised off the ground slightly to increase air circulation. Stacking wood under a shelter will reduce drying time by keeping outside moisture off the stack. Shelters made of plastic sheeting located in sunny places can be used to speed up the drying process by increasing the temperature within the shelter. Plastic sheeting shelters however need to have proper ventilation so that moisture can escape. Locate plastic sheeting shelters to maximize free solar heat intake. Plans for solar dryers are available through your local county Extension office.

A simple method to determine if your firewood is dry is to strike two pieces of wood together. A sharp cracking sound usually indicates that the wood is fairly dry. A dull thud, however, means that the moisture content is still quite high. You can also get an indication of drying by observing the cracks in the ends of the larger firewood pieces; in general, larger cracks indicate drier wood.

The harvesting, hauling, and preparation of firewood generally takes 4 to 10 hours of work per standard cord for the fire. Allowing your firewood to air dry for an appropriate amount of time prior to burning will reduce the total volume of firewood you will need; hence, the total amount of time you will spend collecting, hauling, and preparing will also be reduced.

Burning Firewood Saving Money

The amount of money saved by burning firewood will vary depending upon the prices and characteristics of the wood burned compared to the price of conventional heating fuels. The comparison between fossil fuels such as natural gas, LP gas, fuel oil, or coal (used in generating electricity) and firewood will vary with time. For more information about comparing fuel costs, request OSU Extension Fact Sheet BAE-9441, "Heating Your Home with Wood" from your county Extension office.

Another important factor in the economic feasibility of burning firewood compared to electricity or natural gas is the efficiency of the system used in burning wood. An open

fireplace, for example, often removes more heat from a house than it puts back because a fire will create an open draft which will suck the heat out of an area. An efficient air-tight wood stove, on the other hand, can achieve an efficiency of up to 70 percent fuel input to actual heat output. The efficiency of a stove is affected by the design and location of the system, as well as by indoor and outdoor temperatures and individual use patterns. Burning wood in an air-tight stove allows the operator to control the rate at which the wood will burn. Often, one stoking of an efficient stove will last all night and continue to provide warmth the next morning. The more efficient the stove used in burning the wood, the more money the firewood burner will save over conventional fuels. For more information on stove efficiency and safety, request OSU Extension Fact Sheet BAE-9432, "Selecting a Wood-Burning Stove for Safety and Efficiency" from your county Extension office.

Burning Firewood Safely

Burning wood as a heating source can be quite satisfying. Its use, however, can also be quite dangerous. The obvious problems with operating hot stoves aside, burning wood causes creosote to form in stovepipes and exhaust systems. Creosote fires can be extremely dangerous and usually lead to major house fires. Precautions can be taken to reduce your risk to creosote fires. Have your stovepipe and stove exhaust system inspected regularly. Checking for creosote buildup and regular cleaning will reduce your risk of catastrophe. For detailed information on burning firewood safely, request OSU Extension Fact Sheet BAE-9434, "Safe Operation of Wood Burning Stoves" from your county Extension office.

Table 1. Fuel Woods and Their Characteristics

The following are approximate weights, potential heat contents, and characteristics of various woods used for fuel. Values given are based on 80 cubic feet of solid wood per cord, air-dried weight of 20 percent moisture content, and heat content of 7000 BTU's per pound.

EXCELLENT

BLACK LOCUST
Heating Value: 1 cord = 29.3 million BTU's
Density: 1 cord = 4,192 pounds
Comments: Moderate to split, few sparks, slight fragrance, difficult to start, light smoke, excellent coaling qualities

HICKORY (Also Pecan)
Heating Value: 1 cord = 28.5 million BTU's
Density: 1 cord = 4,072 pounds
Comments: Moderate to split, moderate sparks, excellent fragrance, difficult to start, light smoke, excellent coaling qualities

VERY GOOD

WHITE OAK (Burr Oak, Post Oak, etc.)
Heating Value: 1 cord = 26.4 million BTU's
Density: 1 cord = 3,776 pounds
Comments: Easy to split, few sparks, slight fragrance, moderate to start, light smoke, excellent coaling qualities

HONEY LOCUST
Heating Value: 1 cord = 25.8 million BTU's
Density: 1 cord = 3,680 pounds
Comments: Moderate to split, moderate to start

RED OAK (Blackjack Oak, Black Oak, etc.)
Heating Value: 1 cord = 24.8 million BTU's
Density: 1 cord = 3,536 pounds
Comments: Easy to split, few sparks, slight fragrance, moderate to start, light smoke, good coaling qualities

WHITE ASH
Heating Value: 1 cord = 24.3 million BTU's
Density: 1 cord = 3,472 pounds
Comments: Easy to split, few sparks, slight fragrance, moderate to start, light smoke, good coaling qualities

GOOD

HARD MAPLE (Sugar Maple)
Heating Value: 1 cord = 23.9 million BTU's
Density: 1 cord = 3,408 pounds
Comments: Easy to split, few sparks, good fragrance, moderate to start, heavy smoke, very good coaling qualities

OSAGE ORANGE (Bois d'Arc, Hedge, etc.)
Heating Value: 1 cord = 30.1 million BTU's
Density: 1 cord = 4,300 pounds (estimate)
Comments: Excellent heating value, difficult to split, difficult to start, heavy smoke, very good coaling qualities

MEDIUM

SYCAMORE
Heating Value: 1 cord = 24.1 million BTU's
Density: 1 cord = 2,872 pounds
Comments: Difficult to split, few sparks, slight fragrance, fair to start, medium smoke, good coaling qualities

AMERICAN ELM
Heating Value: 1 cord = 20.1 million BTU's
Density: 1 cord = 2,872 pounds
Comments: Very difficult to split, few sparks, fair fragrance, fair to start, medium smoke, good coaling qualities

HACKBERRY
Heating Value: 1 cord = 20.5 million BTU's
Density: 1 cord = 2,928 pounds
Comments: Easy to split, good coaling qualities

SOFT MAPLE (Silver Maple, Red Maple)
Heating Value: 1 cord = 19.3 million BTU's
Density: 1 cord = 2,752 pounds
Comments: Moderate to split, moderate to start, light smoke, excellent coaling qualities

SOUTHERN PINE (Shortleaf, Loblolly)
Heating Value: 1 cord = 22.0 million BTU's*
Density: 1 cord = 2,936 pounds
Comments: Easy to split, few sparks, heavy smoke, easy to burn, poor coaling qualities

EASTERN REDCEDAR
Heating Value: 1 cord = 19.7 million BTU's
Density: 1 cord = 2,812 pounds
Comments: Easy to split, moderate smoke, many sparks, poor coaling qualities

MESQUITE
Heating Value: 1 cord = 28.0 million BTU's
Density: 1 cord = 4,000 pounds
Comments: Heavy fragrance used for smoking meats

POOR

COTTONWOOD
Heating Value: 1 cord = 15.9 million BTU's
Density: 1 cord = 2,272 pounds
Comments: Easy to split, moderate sparks, slight fragrance, easy to start, light smoke, makes good kindling

WILLOW
Heating Value: 1 cord = 15.7 million BTU's
Density: 1 cord = 2,248 pounds
Comments: Easy to split, moderate sparks, slight fragrance, fair to start, medium smoke

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* Based on 7500 BTU's per pound because of resin content.

Data compiled from:

Wood Handbook. USDA FS Agricultural Handbook No. 72
Forestry Handbook. Society of American Foresters
Firewood for your Fireplace. USDA FS Leaflet No. 559
Burning Wood and Coal. NE Regional Ag. Engineering Service

The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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