Nebraska Lincoln EXTENSION

EC830

Costs of Cattle Fencing for Grazing Areas

By Roger K. Wilson, Research Analyst; and Richard T. Clark, Extension Agricultural Economist

This publication is an update to ***Livestock Fencing Costs and Information*** *published in 1996.[1] Costs for fencing have increased since that time even though the fencing technology is similar.*

Fence contractors across Nebraska were surveyed in early 2002. The names of those surveyed were obtained from public lists of approved contractors maintained by USDA's Natural Resources Conservation Service (NRCS) county offices in Nebraska. Fourteen contractors provided usable information. In addition, five farm suppliers were contacted to obtain prices for fencing materials.

The survey requested prices for materials and labor needed to construct three- and four-strand barbed wire fences and two- and four-strand high-tensile electric (HTE) fences. Both of the four-strand fences are considered exterior fencing while the three-strand barbed wire and two-strand HTE fences are internal or cross-fencing alternatives.

Costs for the same type of fence varied substantially among the contractors. Some of these differences are due to the use of different materials such as hedge versus creosote treated pine posts. However, even when similar materials were used, the reported costs still varied widely. It is possible that these variations are a reflection of different local conditions throughout the state as topography and soil types and conditions impact labor and material costs. It is more difficult to fence rougher terrain. Hills, depressions, and obstructions that require changing directions increase the number of posts, braces, and special anchors needed, as well as the labor required for construction. It is more difficult to set posts in dry, rocky, or clay soils and more difficult to construct sound braces in sandy soils where posts have a tendency to move.

This publication addresses only the cost of building fences. There are other considerations that may impact the final cost of a fencing project. Site preparation, for example, is an important consideration when contemplating building new fences or replacing old ones. Removing an old fence or the remnants of a former fence may be expensive. If a new boundary fence is planned, it may be advisable to have a survey done in order to avoid having to make costly changes after the fence is installed.

Nebraska statutes provide that a person may collect a portion of the cost of building a property line fence from the adjoining neighbor if stipulated procedures are followed and the fence is built according to statute specifications. Nebraska Cooperative Extension has published the complete text of the statute in a NebFact (NF98-390) titled *Nebraska Fence Viewer Statutes*.

The University of Georgia Circular 774, *Fences for the Farm*, by John W. Worley, provides descriptions and illustrations of fence construction.[2]

Four-Strand Barbed Wire

Table I summarizes the estimated costs for a permanent, four-strand barbed wire fence. The type, size, and spacing of posts determine post costs. Most of the respondents used creosote treated pine posts. Post diameter varied from 3 to 4 inches. The most common size was 3.5 inches. The most common spacing was 16.5 feet or 1 rod. Nebraska statutes have set the 1-rod

[1]Norton, Nancy A., Richard T. Clark, Maurice E. Baker and Linda A. Mahn, *Livestock Fencing Costs and Information,* University of Nebraska Cooperative Extension EC96-820, Lincoln, NE, 1996.
[2]Worley, John W., *Fences for the Farm,* Circular 774, University of Georgia, Athens, Georgia, 2000.

Table I. Cost estimates for one-quarter mile of barbed wire fence (four strands) with two H-braces.

Fence Item	*No. of Units per 1/4 Mile*	*Range of Costs Price/Unit ($)*	*Average Cost Price/Unit ($)*	*Total for 1/4 Mile ($)*
Materials:				
Wire, 12.5 gauge (4-strand)	5,280 ft.	$ .025-.029/ft	$ 0.027	$ 143
Line posts (3.5″ spaced 16′)	80	$2.25-5.17/post	$ 4.15	$ 332
Miscellaneous costs		$ 9.60-26.40	$ 10.00	$ 10
Subtotal of Materials (without H-braces)				$ 485 ($0.37/ft)
H-brace materials	2	$ 17.00-56.50	$ 30.00	$ 60
Total Materials				$ 545 ($0.41/ft)
Labor Charges:				
Labor for fence line	1,320 ft.	$ 0.28-0.75	$ 0.45	$ 594
H-brace labor	2	$ 18-100	$ 42.50	$ 85
Total Labor				$ 679 ($0.51/ft)
Total Material and Labor				$ 1,224 ($0.93/ft)

spacing as a maximum for a legal fence.[3] Irregularities common to fence building often result in the average spacing being closer than that targeted. The example shown in *Table I* uses 3.5-inch diameter creosote posts set every 16.5 feet. The price used for these posts is $4.15 each, resulting in a total cost for posts of $332.

Some respondents used hedge posts or a combination of wood and steel posts because they are generally less expensive. The post price data from the survey are summarized in *Table II*. There is disagreement whether or not staples can be used for hedge posts. Because the posts are so hard it is difficult to drive staples into them. If used, staples need to be shorter than those used for other wood posts. Baling or other soft wire is commonly used for attaching the fence wire to hedge, as well as to steel posts.

Comparing prices for fiberglass posts is complicated by the fact that there are differences in length, diameter and features from one supplier to another. *Table II* groups these posts into two diameter ranges but does not account for the other differences, resulting in substantial differences between the maximum and minimum prices.

Corner braces are required on each end of a fence line as well as where fences change direction. The most commonly used corner brace is an H-brace, although angle and dead-man braces can be used in some situations.[4] One contractor indicated that he used a double span H-brace consisting of three posts

[3] *Revised Statutes Of Nebraska 1943,* Section 34-115, Lawful fences, defined.

Table II. Post price analysis.

Post		*Price*		
Material	*Description*	*Ave*	*Min*	*Max*
Creosote Treated Wood	6′ X 3″ Diameter	3.35	3.20	3.45
Creosote Treated Wood	6′ X 3.5″ Diameter	4.15	3.75	4.50
Creosote Treated Wood	6′ X 4″ Diameter	4.70	4.20	5.15
CCA Treated Wood	6′ X 3″ Diameter	2.85	2.75	2.95
CCA Treated Wood	6′ X 3.5″ Diameter	3.90	3.75	4.00
CCA Treated Wood	6′ X 4″ Diameter	4.75	4.25	5.25
Steel	6′ T	2.20	2.00	2.35
Hedge		2.50	2.25	2.70
Corner Hedge		11.25	6.50	16.00
Fiberglass	4-6′ X 7/8-1″ Diameter	4.90	4.00	5.95
Fiberglass	4′ X 3/8″ Diameter	1.78	1.35	2.49

connected with cross braces and guide wires. This may indicate that he does most of his fencing in sandy soils where it is more difficult to set a solid post.

The cost of materials for H-braces varied from $17 to $56.50. The cost used in *Table I* is $30 per brace for materials and $42.50 for labor or $145 for a brace at each end of the fence.

Braces are needed for each change of direction. A simple dead-man brace properly placed may be adequate in some situations. If H-braces are used, double H-braces are required.

One or two additional braces may be needed for each gate depending on where it is located in the fence line. A gate located in a corner needs only one additional H-brace. Other gate locations require two. These additional braces are not included in *Table I* since they may not be required. Most of those surveyed charge extra for gates. These charges range from $20 to $50 with an average charge of $28.

Wire costs varied little across all those surveyed. *Table I* uses $0.027 per foot for barbed wire, resulting in the total wire cost of $143 for one-quarter mile of fence.

Miscellaneous costs include staples and wire used for guide wires. Some contractors did not include any miscellaneous costs, but one listed 50 to 75 "tie downs" per one mile of fence at one dollar each. *Table I* includes $10 for miscellaneous costs.

Labor costs for fence line construction varied from $350 to $990 per quarter mile with an average of $549. When labor for braces is included, total labor for one-quarter mile of fence varied from $390 to $1,120 with an average of $628. While most of the surveys came from fence contractors with addresses in the Sandhills, the contractor with the highest labor cost had an address in southeast Nebraska. This demonstrates the effect that local conditions can have on labor costs and points out the need for localizing the results of this survey. *Table I* uses a labor cost of $0.45 per foot and $42.50 for each brace making the total labor cost $679. One contractor indicated that a rule of thumb for calculating labor is to charge the price of the materials. This has the advantage of increasing labor costs when conditions call for using more materials, such as posts. But as was mentioned before, local conditions also have a major impact on labor costs. *Table I* shows that labor costs exceed material costs by 20 percent.

Table I shows the total estimated cost of fencing at $1,224 per quarter mile. The average cost for those surveyed was $1,286 with a range of $913 to $1,712. Producers may reduce fencing costs by using alternative materials such as hedge posts and combinations of wood and steel posts. Extras such as direction changes, hills, canyons, and gates will add to the cost. Rough or uneven terrain and direction changes will increase both the material and labor costs.

HTE Fences

HTE fences combine the advantages of lower-cost wire and the need for fewer posts. The wire also can be handled more easily because it is single strand and does not have barbs. HTE fences have the disadvantage of requiring an energizer that adds to the initial cost and requires monitoring and a power source, increasing operating costs.

Fewer contractors installed HTE fences compared to barbed wire fences. In addition, those that installed both HTE and barbed wire fences were among those that charged the higher labor rates for installing barbed wire fences.

Respondents to the 1995 survey indicated spacing for HTE exterior fences ranged from 33 to 50 feet.[5] The 1995 calculations used a post spacing of 45 feet. Responses on the 2002 survey had post spacing ranging from 20 to 45 feet for four-strand exterior fences with an average spacing of 25.4 feet. There are two possible reasons why the results of this survey show decreased post spacing for HTE fencing. The first is that this change resulted from sampling error. The second is that contractors have reduced the post spacing on HTE fences.

One contractor from the Sandhills noted a potential problem for widely spaced fiberglass posts: The pressure from the weight and tension of the wire sometimes pushes posts farther into the soil. That contractor alternated wood and fiberglass posts to overcome the problem. Other contractors who use mostly fiberglass posts commonly put wood posts on hilltops to avoid this problem. The contractor that used the
45-feet spacing was from southeast Nebraska where the soils are much heavier, making the pressure needed to push posts into the soil greater.

Fiberglass posts were generally higher priced than wood posts, which reduces the cost advantage due to wider post spacing for HTE fences. Some producers used fiberglass sucker rods from the pumps of oil fields, which can reduce post cost considerably if they can be found and purchased right.

Table III summarizes the estimated costs for four-strand HTE fences using 4-inch diameter creosote treated posts. The post spacing of 25 feet, along with a cost of $4.70 per post resulted in a total post cost of $249, $83.50 less than the post cost for the barbed wire fence.

[4]Worley, 2000.

[5]Norton, et al., 1996.

Table III. Cost estimates for one-quarter mile of high-tensile wire fence (four strands) with two H-braces.

Fence Item	*No. of Units per 1/4 Mile*	*Range of Costs Price/Unit ($)*	*Average Cost Price/Unit ($)*	*Total for 1/4 Mile ($)*
Materials:				
Wire, 12.5 gauge (4-strand)	5,280 ft.	$0.0098-0.0225/ft	$ 0.0147	$ 78
Line posts (4″ spaced 25′)	53	$ 4.25-5.25/post	$ 4.70	$ 249
Miscellaneous costs	4		$ 1.50	$ 6
Subtotal of Materials (without H-braces)				$ 333 ($ 0.26/ft)
H-brace materials	2	$ 22.25-45	$ 30.00	$ 60
Total Materials				$ 393 ($0.30/ft)
Labor Charges:				
Labor for fence line	1,320 ft.	$ 0.23-0.75	$ 0.47	$ 620
H-brace labor	2	$ 40-50	$ 45.00	$ 90
Total Labor				$ 710 ($0.54/ft)
Total Material and Labor for Fence Construction				$ 1,103 ($0.84/ft)
Energizer:				
Energizer Cost	1	$ 90-175	$ 135.00	$ 135
Energizer Installation	1	$ 50-100	$ 50.00	$ 50
Total Energizer				$ 185
Total for Fence and Energizer				$ 1,288 ($0.98/ft)

Wire costs for HTE fences varied from $0.0098 to $0.0225 per foot with an average cost of $.0147 per foot, which is used in *Table III*. The total cost of wire for the HTE fence is $78 per quarter mile, resulting in a $65.50 savings when compared to the barbed wire fence.

Labor for constructing HTE fences varied from $300 to $990 per quarter mile. The average labor was $620, $26 higher than the average labor for a barbed wire fence. Since all but one contractor that built both kinds of fences indicated they charged less for building a HTE fence than a barbed wire fence, the higher labor cost for the HTE fence may be because the contractors that charge more for labor are the same ones that build HTE fences. This also may reflect regional differences in labor costs due to soils and topography where HTE fences are more commonly installed.

The cost of labor for building braces is similar for both HTE and barbed wire fences. The range in costs for labor to build a brace for an HTE fence is $40 to $50, with an average cost of $45. This is comparable to $42.50 average labor cost for building a brace for a barbed wire fence. The cost for brace materials used for both types of fences is $30.

The total estimated cost for a quarter mile of a HTE fence (*Table III*) is $1,103 before the cost of an energizer is considered. This compares to the estimated cost of $1,224 for a barbed wire fence, for a savings of $121.

Determining an appropriate cost for an energizer for the above example presented a number of problems. The next section on energizers shows that there are many choices encompassing a wide range of prices. Also, our example is for one-quarter mile of fence and spreading the cost of an energizer over a longer length of fence makes it more cost efficient. On the other hand, most energizers will be replaced over the life of the fence being built, thus increasing the cost over time. The above example uses $135, a cost near the midpoint for small AC energizers, as the cost for the energizer, and $50 for installation. This increases the cost of the HTE fence to $1,288, $64 more than a barbed wire fence.

Most contractors that build HTE fences feel that they are an excellent choice. The advantages of HTE fences are greater when terrain and soil conditions allow fewer posts. The contractors indicated that it is extremely important to correctly install HTE fences. The effectiveness of HTE fences rely on available electric current. A fence that "leaks" current, shorts out, or for some other reason loses power is less effective. Also, special care must be taken in installation

to protect the energizer against lightning or it will be ruined when a strike hits the fence or causes a spike in the power supply. A recommended policy when considering this alternative is to spend the time necessary to learn about HTE fences or rely on someone for installation who is knowledgeable.

Energizers

Energizers come in many sizes and qualities. The cost of energizers depends on their make, size, and power source. Costs generally vary within each group. The power sources for energizers include AC, battery, and solar. The cost is generally less for comparable sizes of AC. Battery powered energizers not only cost more than those powered by AC, but also require the purchase of a battery that must be replaced periodically. Solar powered energizers generally are the most expensive. Solar units also require the purchase of a battery but the replacement period is longer. Energizer size may be quoted in joules, watts, or miles of fence supposedly energized. *Table IV* contains price information obtained from contractors and retail sales outlets.

Other essential costs of a power system include grounding rods and lightning arrestors. The number of recommended grounding rods ranged from one to seven. Higher power energizers require more contact with the soil. Additionally, dry soil is a poorer conductor of electricity so it may increase the number of rods required. Most contractors recommend spending a few extra dollars to ensure a proper grounding system since improper grounding is a major cause of energizer failure. Likewise, lightning arrestors or diverters are recommended for the fence, as well as surge suppressors when the system is powered by an AC source.

To decide on the size and power source of the energizer it is advisable to talk to a contractor(s) and/or experienced neighbors. Vegetative load — the number and kind of plants that come in contact with the electrified wire — is the most important factor determining how large the energizer must be. That is why rating energizers by miles of fence is misleading. Longer fences provide more opportunity for plants to come in contact with the electrified wire so they need more power. However, fences in areas where there is more plant growth and potentially more plant contact with the electrified wire will also increase the power requirements. Electrified wires placed lower on a fence will come into contact with plants more often than those located higher so they will need more power.

If long-term plans include fence expansion then a larger energizer may be justified at the start. Spreading the cost of an energizer over more fence is one way of lowering its cost. The consequences of animal escapes is another consideration when determining energizer size. Ensuring adequate power for fences next to a highway or for division fences between bulls and heifers may be desirable.

Since using an AC power source reduces the cost of the energizer and maintenance requirements, this alternative should be explored. If AC power is desired but the power source is not close to the fence, a single-strand lead-out wire from the energizer to the fence may be the answer if it does not interfere with other parts of the operation.

Permanent Internal Fences

Fences that provide barriers for rotation grazing or separation within larger pastures may not require the same level of protection against animal escapes. There is a potential for conserving resources by constructing fences using less materials with the associated labor savings.

Past publications have included a three-strand barbed wire fence as one alternative. Most contractors surveyed did not respond to the three-strand barbed

Table IV. Costs of alternative power sources for fences.

AC Energizer		*Battery Energizer*		*Solar Powered*	
Description	*Cost*	*Description*	*Cost*	*Description*	*Cost*
Light, 110 v; .8-1.2 joules	$ 90-175	Light, 12 v; .7-1.0 joules	$ 75-235	5 watt panel	$120-340
Medium, 110 v; 2.1-3.7 joules	$110-280	Medium, 12 v; 1.35-2.5 joules	$110-370	10-11 watt panel	$325-350
High, 110 v; 5.2-8.0 joules	$145-400	High, 12 v; 5.0-8.0 joules	$165-350	20-22 watt panel	$550
Super, 110 v; 9.0-14.0 joules	$150-995	Super, 12 v; 9.0-11.0 joules	$200-550	40 watt panel	$500-850

wire section. One commented "Why have a three wire when a four wire works so much better?" Another crossed out "three" and penciled in "five" and provided cost information for that alternative. The problem with the three-strand option is it provides enough space so animals can put their head between the wires to graze on the other side of the fence. This puts extra pressure on the fence as the wire is stretched and staples loosened, increasing maintenance requirements. The three-strand barbed wire fence is not included in this analysis. If you wish to estimate the cost for a three-strand barbed wire fence simply subtract the cost of one wire from the four-strand example shown in *Table I*. In addition, subtract about $66 per quarter mile for labor.

There is a potential cost savings for two-strand HTE fence if the conditions allow post spacing to be increased substantially. This may significantly reduce both labor and materials. The estimated costs provided by the contractors ranged from $500 to $1,040 per quarter mile, with an average of $725 without end braces. In some cases, end braces may not be required but if they are needed their cost should be about the same as a four-strand HTE fence. One wire also works well and requires less end bracing.

Table V shows estimates for the cost of a two-strand HTE fence using 40 feet post spacing at $767 plus the cost of the energizer. Much of the literature suggests only one of these wires needs to be electrified and the other serve as the ground. If the fence is designed for calves as well as mature cows, both wires may need to be electrified, and if a ground wire is desired, a third wire should be added.

Table V. Cost estimates for one-quarter mile of HTE interior (permanent) fencing.

HTE (2-strand)		
Wire (2,640 ft. @ $0.0147/ft)	$ 39	
3/8" steel posts, 40 ft spacing (33 @ 4.50/post)	$ 149	
Miscellaneous	$ 20	
Subtotal (without corners)	$ 207 ($0.16/ft)	
H-brace (2 @ $30.00)	$ 60	
Total Materials	$ 267 ($0.20/ft)	
Labor for fence line	$ 415	
H-brace labor (2 @ $42.50)	$ 85	
Total Labor	$ 500	
Total Materials and Labor Costs	$ 767 ($ 0.58/ft)	Plus Energizer

Semi-permanent and Movable Fences

Single wire electric fences are inexpensive alternatives for interior fencing when the consequences of animal escapes are not serious and when fences need to be moved or removed during the course of a year. Post spacing and the type of posts and wire used determine the cost. Some common types are 14-gauge wire, polywire, and polytape.

These types of fences are rarely installed by fencing contractors so the following estimates use price information obtained from farm supply sources and do not include labor estimates.

The least expensive of these fences is a 14-gauge electric wire using 3/8 inch steel posts. This fence is commonly used to fence corn stalks. Material costs are estimated at $72 per quarter mile, using 40 feet post spacing (*Table VI*). Cost estimates for fencing materials using 30 and 60 feet post spacing are also provided.

Table VI. Cost examples for one-quarter mile of single wire electric (materials only).

Single Wire Electric (Corn Stalk Fencing)	
Wire, 14 ga. (1,320 ft. @ $0.0114/ft)	$ 15
3/8" steel posts, 40' spacing (33 @ $0.90/post)	$ 30
Post clips ($4.00/25)	$ 5
Subtotal (without corners)	$ 50
End posts (2 @ $10.00)	$ 20
Insulators (2 @ $1.00)	$ 2
Total Materials Cost	$ 72 ($0.05/ft.)
Total cost with 30 ft. post spacing (44 posts)	$ 82 ($0.06/ft.)
Total cost with 60 ft. post spacing (22 posts)	$ 62 ($0.05/ft)

The polywire and polytape fences are usually the easiest to move. Their increased visibility make them a more effective alternative than 14-gauge wire for a fence that is being moved often. Polytape is more visible than polywire but is more affected by wind. Step-in posts make moving the fence much easier. A wire reel and jumper clips can be added to further facilitate movability.

Table VII shows the estimated materials costs for electrical fences using polywire and polytape. Both use more expensive materials than the steel wire fences. The estimated cost per quarter mile is $109 for a polywire fence using fiberglass posts, and $165 for a polytape fence using step-in polyposts. The cost for both is figured using 40 feet spacing for posts.

Table VII. Cost examples for one-quarter mile of polywire and polytape interior fencing (materials only).

Polywire (1-strand) Fence Costs		*Polytape (1-strand) Fence Costs*	
Polywire (1320 ft. @ $0.024/ft)	$ 32	Polytape (1,320 ft. @ $0.046/ft)	$ 61
3/8" fiberglass posts, 40' spacing (33 @ $1.50/post)	$ 50	Step-in polyposts with built-in clips, 40' spacing (33 @ $2.50/post)	$ 83
Post clips (33 @ $0.15/post)	$ 5		
Subtotal (without corners)	$ 87	**Subtotal (without corners)**	$ 143
End Posts (2 @ $10.00)	$ 20	End Posts (2 @ $10.00)	$ 20
Insulators (2 @ $1.00)	$ 2	Insulators (2 @ $1.00)	$ 2
Total Materials Cost	$ 109 ($0.083/ft)	**Total Materials Cost**	$ 165 ($0.125/ft)

Cost estimates for fences in *Tables VI* and *VII* do not include the cost of the required energizer.

Not all materials or combinations of materials have been considered in this analysis. Aluminum wire is one example. Also, polywire can be used with the steel posts and insulators, which are usually used with the corn stalk fence. The choice of materials depends on material costs, the type of livestock being contained, topography and soil types, potential costs of livestock escapes, labor availability, and future plans for the land.

Cost Sharing

Cost sharing is sometimes available for permanent fencing through various programs offered by USDA's Natural Resources Conservation Service (NRCS) or the Natural Resource Districts (NRD). Access to these programs varies from one location to the next and they are subject to the availability of funds. Different programs may have different requirements that may change over time. Producers should contact their local NRCS and NRD offices for reliable information. They will only approve applications submitted before fence building begins.

Your Worksheet

Fill in the worksheet with the estimates from the tables to get an estimate of the cost (excluding power) of the fence system(s) you are considering. Labor cost estimates are only available for the permanent interior and perimeter fences (*Tables I, III,* and *V*). Keep in mind that local conditions such as topography and soil type and conditions have major impacts on costs for specific projects. The estimates contained in this bulletin reflect straight fences on relatively level land. Rougher terrain, rocky soils, streams, etc., can add substantially to material and labor costs.

Type of fence _____ (See *Table* _____) (1)

Cost of line fence materials (excluding brace materials)

Post: Number of feet of fence (_____) ÷ Post spacing (_____) X Post cost (_____) = _____ (2)

Wire: Number of feet of fence (_____) X Wire cost per foot (_____) = _____ (3)

Cost of brace materials (_____)/brace X Number of braces (_____) = _____ (4)

Total materials cost of your fence (add lines 2, 3 and 4) = _____ (5)

Estimated labor cost (permanent fencing only):

Cost/ft of labor for fence line (_____) X Number of feet of fence (_____) = _____ (6)

Cost of labor/brace (_____) X Number of braces (_____) = _____ (7)

Total labor cost of your fence (add lines 6 and 7) = _____ (8)

Type of gate _____; Cost/gate (_____) X Number (_____) = _____ (9)

Total cost (add lines 5, 8, and 9) = _____
