

Virtual Fencing

Using e-Collars vs. Physical Fencing Cost Comparison on New Mexico Cattle Ranches

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PART 2 OF 2 ON VIRTUAL FENCES USING E-COLLARS ON NEW MEXICO CATTLE RANCHES

Introduction

In the first publication of this series,⁴ we explained the operation and features of Virtual fence. The purpose of this factsheet is to guide New Mexico livestock producers when deciding whether virtual fence makes economic sense for their ranching operation. This focuses on a typical large-size ranch in Southeast New Mexico, since a majority of New Mexico's beef cattle production (74%) occurs on ranches with at least 2,000 acres of pasture.⁶ Smaller ranches, with a herd size of less than 200 head, require different virtual fencing technology addressed in a companion factsheet.

Soaring costs of traditional metal fencing force ranchers to find alternatives when replacement becomes necessary. For example, building a 4-wire metal fence has increased by at least 50% over the past few years, costing upwards of \$15,000 per mile.² Virtual fencing can be a cost-effective option, especially on larger ranches where fencing needs can become overwhelming. Beyond providing a lower-cost fencing option, virtual fencing provides ranchers with additional benefits that in many cases could justify its use even if fence replacement is not an immediate priority. These benefits include: (1) reducing cattle gathering time, (2) keeping cattle off environmentally sensitive areas, and (3) improved forage productivity by installing interior fences.³

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Physical versus Virtual Fence Cost Comparisons

Based on the NM livestock enterprise budget,⁵ we assumed a ranch with 360 head of cattle operating with 6,000 acres of private land and 75 miles of physical fence. Access to public grazing land is available, which carries 280 Animal Unit Yearlong (AUY), approximately the size of 17,920 acres assuming a stocking rate of 64 acres per cow. Its total operating ranch size is taken to be 23,920 acres.

1.1 Physical Fence Costs for a Large Size Ranch

Physical fence construction costs are taken as \$15,000 per mile for the representative New Mexico ranch. This cost is based on custom-built fence costs,² since fence costs vary with terrain, geography, boundary shape, etc. For example, in mountainous areas with uneven or rocky terrain, labor costs can increase, which in turn raises the overall fencing cost. In contrast, a perfectly square acre requires less fencing than an irregularly shaped one, decreasing the fencing cost for the square acre. A cost calculator is available that can be used to adjust costs to specific ranch conditions. The total cost of constructing the physical fence would be \$1,125,000 (\$15,000 x 75 miles). Annual repair and maintenance costs are assumed 2% of the initial fence construction cost,¹ which is expected to average \$22,500 per year, for a total repair and maintenance cost of \$562,500 (\$22,500 x 25 years).

The useful life of the physical fence is typically 25 years. Depreciating the fence's construction and annual maintenance costs over its 25-year service life, and assuming zero salvage at the end of its service life, results in an annual charge of \$45,000 (Table 1). Placed in more relative terms, physical fence costs an average \$188 per cow annually.

Item	Cost	Annual Depreciation Costs	Annual Costs	Annual Costs (per cow)
Construction	\$1,125,000	\$45,000	\$45,000	\$125
Repair & Maintenance	\$562,500	-	\$22,500	\$63
Total	\$1,687,500	\$45,000	\$67,500	\$188

Note: Based on the representative ranch with 75 miles of fence with a herd size of 360 and a 25-year service life.

Table 2. Virtual Fence total and straight-line depreciated annual costs.

Item	Unit Cost	Qty	Total Cost	Annual Cost	Annual Cost (\$ per head)
LoRaWan Tower	\$10,000	4	\$40,000	\$4,000	\$11.11
Collars	\$200	720	\$144,000	\$14,400	\$40.00
Collar loss (1%)	\$200	7.2	\$1,440	\$144	\$0.40
Batteries	\$20	3,600	\$72,000	\$7,200	\$20.00
Battery loss (1%)	\$20	36	\$720	\$72	\$0.20
Labor: Tower maintenance	\$12	1,800	\$21,600	\$2,160	\$6.00
Labor: Herd gathering	\$1,200	20	\$24,000	\$2,400	\$6.67
Labor: E-collar-batt. Maint.	\$3,000	10	\$30,000	\$3,000	\$8.33
Total	-	-	\$333,760	\$33,376	\$92.71

Notes: 1) Based on over a 10-year service life for the representative ranch with 360 cows. 2) Collar and battery loss requires the purchase of an additional 1% of collar and battery quantities at the same purchase price as new ones.

1.2 Virtual Fence (VF) Costs for a Large Ranch

There are two main components to a virtual fencing system: one is the communications, and the other is the e-collar worn by the cattle. The heart of the communications is a locally installed Long Range Wide Network (LoRaWAN) station, or tower, that facilitates communication between the rancher and the cattle's e-collar. The range of the LoRaWAN tower is highly site-specific: hilly terrain prevents signals from reaching the e-collars in valleys, especially where there is dense forest. A typical ranch in this area of New Mexico will need four towers to completely cover its 6,000 acres of private land, allowing 24/7 communication with their cattle. While using public land, the rancher may or may not have access to complete 24/7 LoRaWAN tower coverage but is expected to maintain daily contact with the herd.

LoRaWAN towers are expected to last 10 years and cost \$10,000 each. Annual straight-line depreciation is \$1,000. For this ranch, four towers will be provided to cover their 6,000 acres of private land, so the total annual tower cost would be \$4,000. Virtual fencing also requires e-collars that need to be replaced every few years or so (Table 2). E-collar costs vary by brand, with some companies leasing e-collars on an annual basis while others require ranchers to purchase collars. Assuming an e-collar unit price of \$200 and a five-year service life, the total e-collar cost (360 heads x \$40/collar x 2 collars for 10 years) is \$28,800. The straight-line depreciated cost is \$2,880 per year. A pair of batteries are required to power the e-collars and are purchased separately. They typically last a year but expected life depends on use. The required pair of batteries cost \$20 each, so the example ranch will pay \$7,200 per year to equip their 360-cow herd. E-collar and battery loss are assumed to be 1% each, with annual costs of \$144 and \$80.

Labor is required throughout the year to maintain the LoRaWAN towers, e-collars, and batteries. The labor cost to set up and maintain the tower is \$21,600 (= \$12/hour x 180 hours for 10 years) with an annual cost of \$2,160. Twice a year labor is required to change out batteries and maintain e-collar performance. Labor costs for gathering the herd are expected to be \$1,200 and \$3,000 for the e-collar and battery maintenance. All told the total virtual fence cost is \$333,760, the straight-line depreciated annual cost is \$33,376, and the annual cost per cow is \$92.71 (Table 2).

1.3 Cost comparison between physical fence and virtual fence

From Table 1 and Table 2, the cost of virtual fencing is 24% of physical fencing. In terms of cost, virtual fencing has an advantage over physical fencing. However, cost alone cannot explain all New Mexico ranchers' choices (Figure 1).

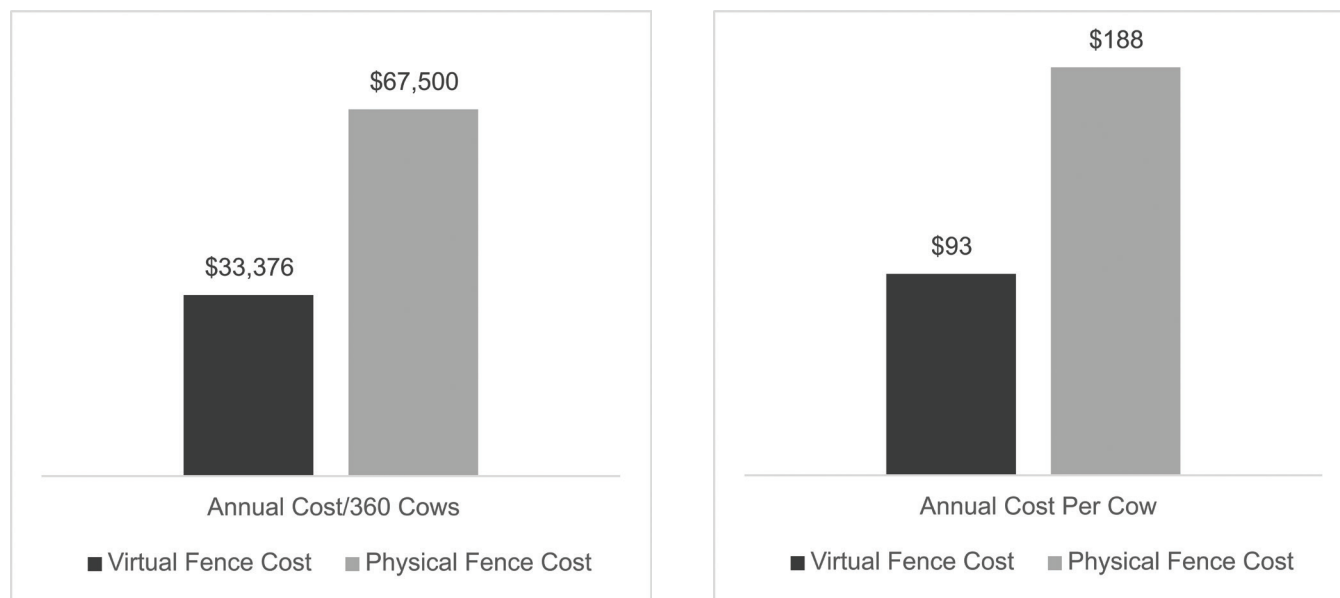


Figure 1. Annual Costs between Virtual Fence and Physical Fence on an annual (left) and per-cow (right) basis

1.4 Cost comparison between different fence lengths

We now compare the costs of physical fences and virtual fences with 30 miles, 75 miles, 100 miles, and 125 miles fences for a 360-cow herd and 25-year physical fence life. Figure 2 below shows that the longer the fence, the greater the cost advantage virtual fencing has over physical fencing. Only the smallest ranch considered would not benefit from the lower cost of virtual fencing.

2. Virtual Fencing Industry Resources

The following are contact information of Virtual Fencing industries for New Mexico ranches interested in Virtual Fencing.

- Gallager:** Sarah.Adams@Gallagher.com
- Gallager:** Sharl.Liebergreen@Gallagher.com
- Nofence:** sales.us@nofence.no
- Halter:** theo.beaumont@halter.co.nz
- Vence:** ContactVence@merck.co

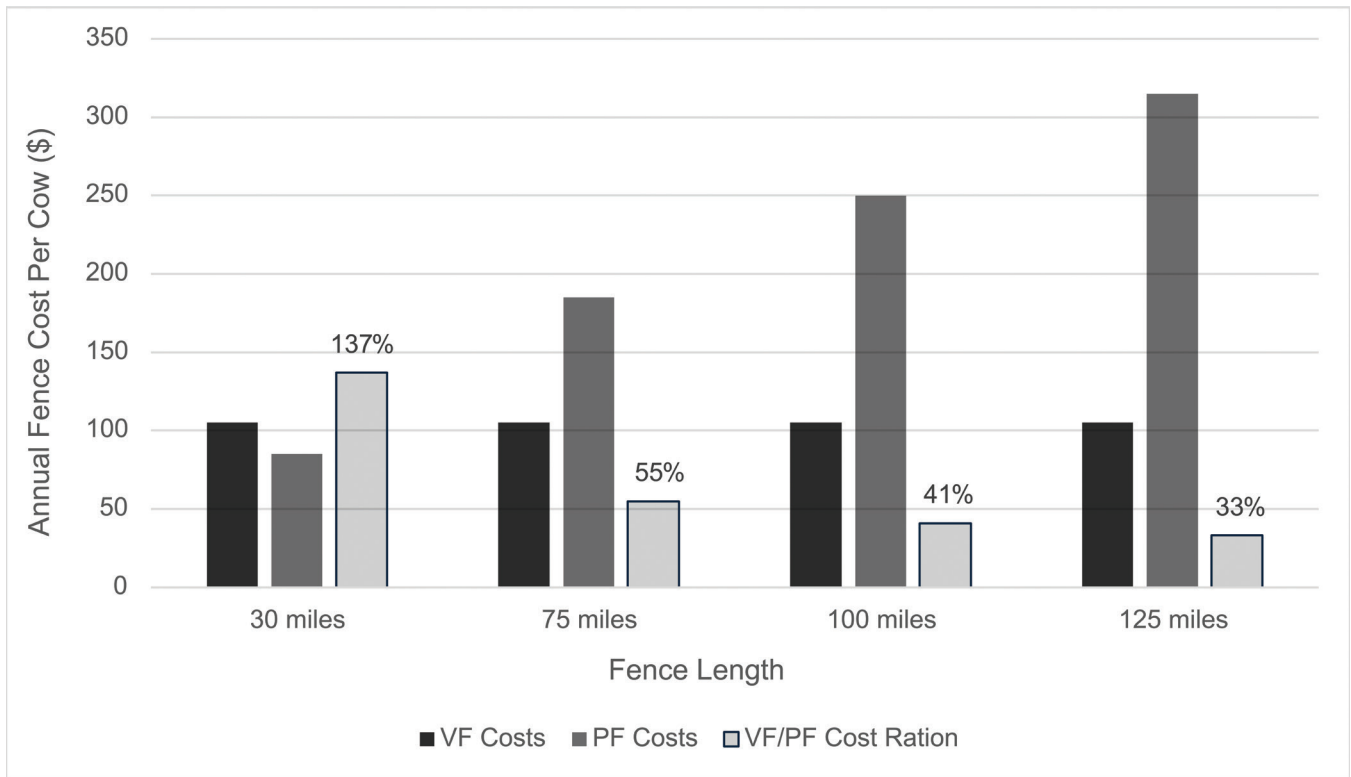


Figure 2. Annual cost comparison of Physical Fences versus Virtual Fences by fence length

3. Opportunities to cost sharing for installing Virtual Fencing with USDA grants

The following seven government programs share the cost of installing Virtual Fencing.

3.1 Agricultural conservation easement program

<https://www.nrcs.usda.gov/programs-initiatives/acep-agricultural-conservation-easement-program>

3.2 Conservation Innovation Grants

<https://www.nrcs.usda.gov/programs-initiatives/cig-conservation-innovation-grants>

3.3 Conservation Reserve Program

<https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/>

3.4 Conservation Reserve Enhance Program

www.fsa.usda.gov/Assets/USDA-FSA-Public/usdfiles/Conservation/PDF/fsa_crep_factsheet_22.pdf

3.5 Conservation Stewardship Program

<https://www.nrcs.usda.gov/programs-initiatives/csp-conservation-stewardship-program>

3.6 Environmental Quality Incentives Program

<https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives>

3.7 Regional Conservation Partnership Program

<https://www.nrcs.usda.gov/programs-initiatives/rcpp-regional-conservation-partnership-program>

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2. Beiermann, J., Tranel, J.E., & Young, R.B. (May 2024). *2023 Land Rental & Custom Rates for Colorado Farms & Ranches*. Colorado State University Extension. <https://abm.extension.colostate.edu/wp-content/uploads/sites/61/2024/06/2023-CustomRates-Final-1.pdf>
3. Blum, B., & Audoin, F. (2024, August 15). *Exploring The Boundaries of Virtual Fence*. The Rangelands Gateway. <https://rangelandsgateway.org/virtual-fence/webinar-1>
4. Gifford, C., Utsumi, S., Ward, M., Vitale, P., Cox, A., Vitale, J., & Marta, S. (October 2024). *Virtual Fencing Using E-Collars on New Mexico Cattle Ranches: Part 1 of 2* (Guide B-132). New Mexico State University Cooperative Extension Program. https://pubs.nmsu.edu/_b/B132/index.html
5. New Mexico State University. (2019). *Livestock Budgets. Cost and Returns Estimates for Farms and Ranches 2013-2019*. <https://costsandreturns.nmsu.edu/>
6. USDA National Agricultural Statistics Service. (n.d.). *New Mexico Field Office (Part of the Mountain Regional Field Office)*. https://www.nass.usda.gov/Statistics_by_State/New_Mexico/Contact_Us/index.php



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