Using virtual fencing with cover crop grazing to enhance corn and soybean profitability and soil health

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University of Missouri

How to achieve profit?

There is Good Profit in Grazing Cover Crops

Jim Isermann farm, Illinois – Photo credit: Progressive Forage

USDA-SARE analysis showed net profit of $49.23/acre (2019 prices)

MO CRCL Project

$25 million 5-year Farmer Conservation Effort through MU Center for Regenerative Agriculture

- Cereal rye befoe soybeans $30/acre
- Cover crop mix before corn $40/acre
- Late termination (≥May 1) $15/acre
- Cover crop grazing $20/acre

Cover Crop Grazing

MU Center for Regenerative Agriculture
Virtual Fencing Project

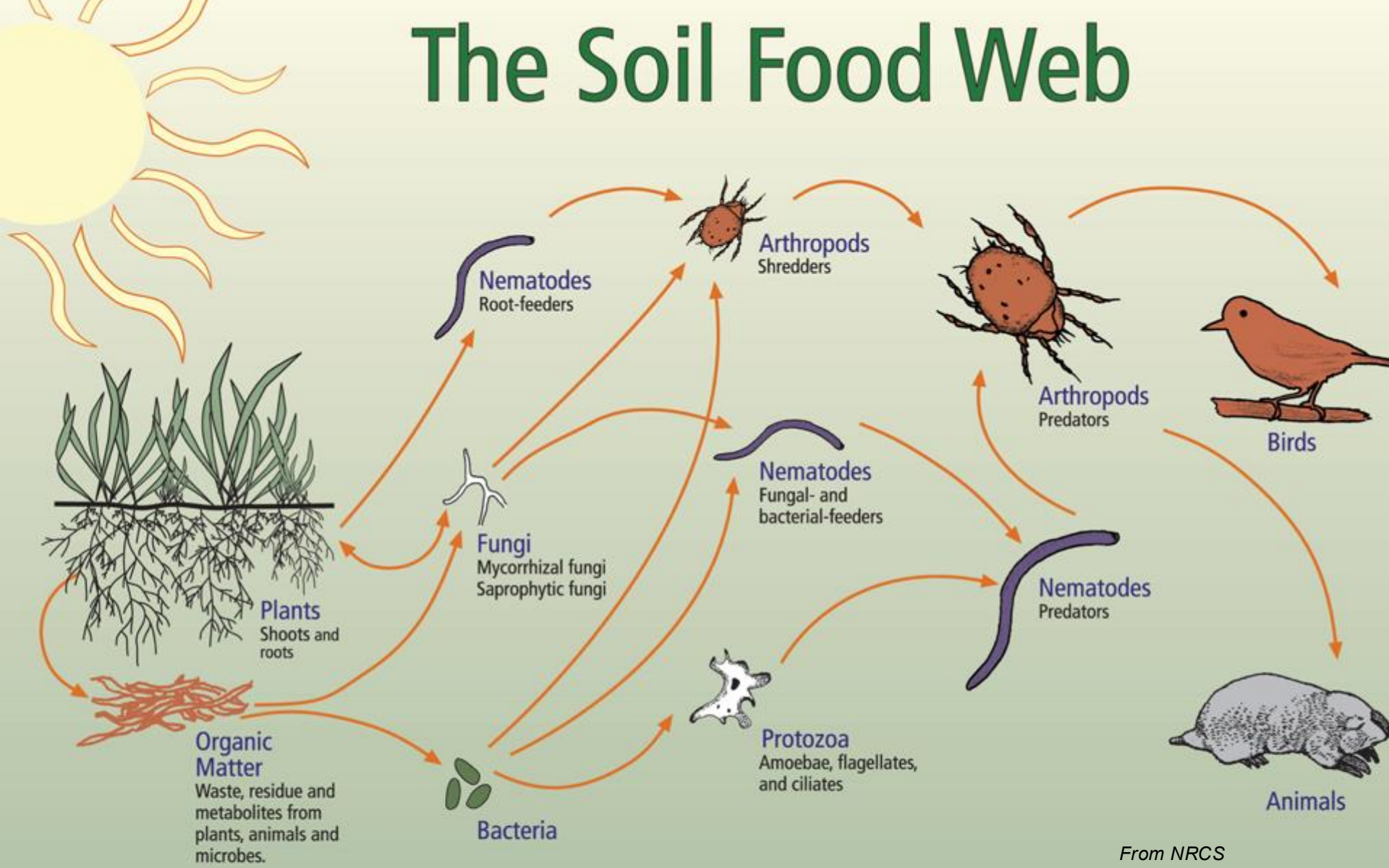
Photo credit: Business Norway article on Nofence technology.

Photo credit: Nofence.

Cover crops are a key soil health practice

Feeding the Soil Biology with Living Roots

The Soil Food Web



From NRCS

Soils evolved with herbivores

Missouri Ruralist

Grass options: cool-season covers

- Cereal rye - Reliable, hardy, can be planted late fall
- Winter wheat - Keeps palatability later in spring
- Triticale - intermediate between cereal rye and winter wheat
- Barley - Low lignin content
- Oats - Best fall growth, but does not overwinter in most of MO


Edwin Remsberg- SARE

Annual ryegrass

- Rapid fall growth
- Stockpiles well
- Use caution – potential weed

Winter Annual Grass Cover Crops

The most commonly grazed covers are grasses

	Average daily gain	Total Gain
Small grain	lb/day	lb/acre
Wheat	1.8	180
Cereal Rye	1.6	336
Annual ryegrass	1.8	511

Rob Kallenbach, University of Missouri

Brassica Cover Crops

- Some species can produce 3 or more tons/acre
- Grow for awhile past first frost (down to low 20s F.)
- Some can overwinter (canola/rapeseed)
- Tubers can be grazed
- High in protein, best if combined with a grass cover crop

Cool-season legume covers

- Crimson clover - relative fast-establishing, generally overwinters but doesn't like poorly drained situations
- Red clover - slower initial growth but very winter hardy
- White clover - can tolerate heavy grazing but less productivity
- Berseem clover - as good quality as alfalfa, but not winter-hardy
- Balansa clover - slower growing at first, fast growth in late spring

Crimson Clover

Balansa Clover

MS State Extension

Warm season cover crop mixes

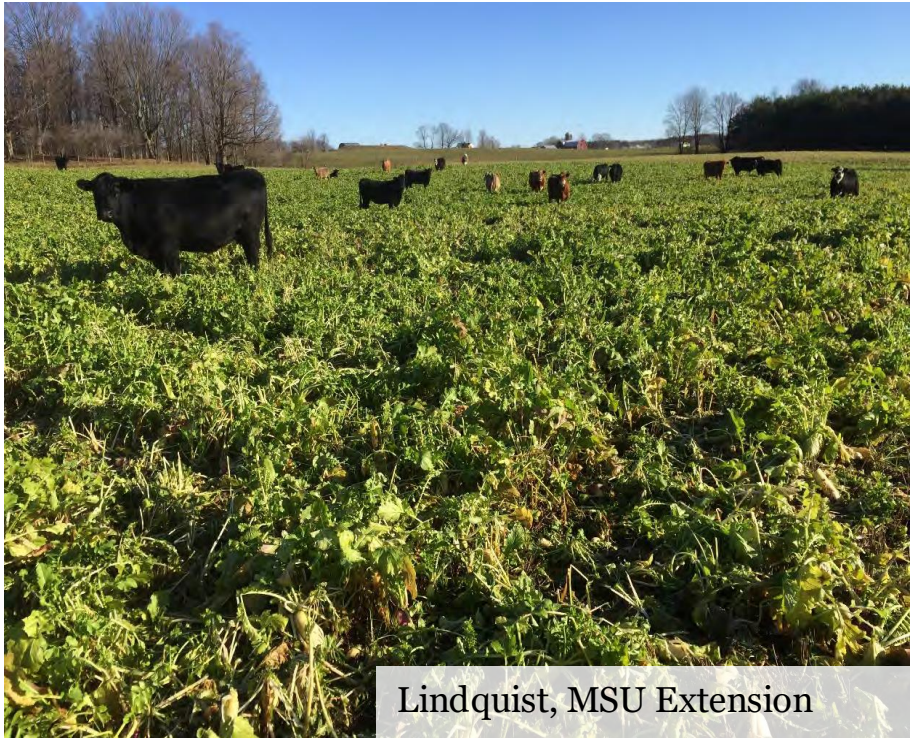
- Grasses
  - Sorghum-sudan
  - Forage sorghum
  - Pearl millet
  - Other millets (Japanese, foxtail)
- Legumes
  - Cowpeas
  - Sunn hemp
  - Mung beans
- Other broadleaf species
  - Sunflowers
  - Buckwheat

Cover Crop Cocktails ->

- Add cool season covers for extended fall and spring grazing
  - Cereal rye, triticale, or wheat
  - Oats
  - Crimson clover
  - Radishes &/or turnips

Maximizing grazing potential

1. Manage cover crops for grazing
   - Increase seeding rates
   - Lengthen the growing period
2. Use mixes when appropriate
3. Move the cattle regularly (management intensive grazing)
4. Graze at appropriate times
5. Consider incorporating wheat to allow longer grazing season with high biomass summer mix



Lindquist, MSU Extension

Getting more grazing profit out of the crop rotation

Add wheat back to the rotation

- After wheat harvest, drill in high biomass summer cover crop mix
- Graze in early fall
- Graze in late fall
- Graze in spring
- Plant corn
- After corn, drill cereal rye, graze the rye fall &/or spring
- Plant soybeans
- After soybeans drill wheat and potentially fall graze the wheat

Sorghum-sudan grass and sunnhemp

Rob Myers

Summary Comments on Cover Crop Grazing

- Creates significant profit opportunity both for crop-livestock operators and for crop farmers who can collaborate with a neighbor that has livestock
- Cover crop grazing is one of the fastest ways to stimulate soil biology and improve soil health
- Getting more biodiversity into the rotation improves resilience of the system to weather and pests and can help lower inputs while boosting profit
- Virtual fencing can help!



What is virtual fencing and how can we utilize it for grazing cover crops?

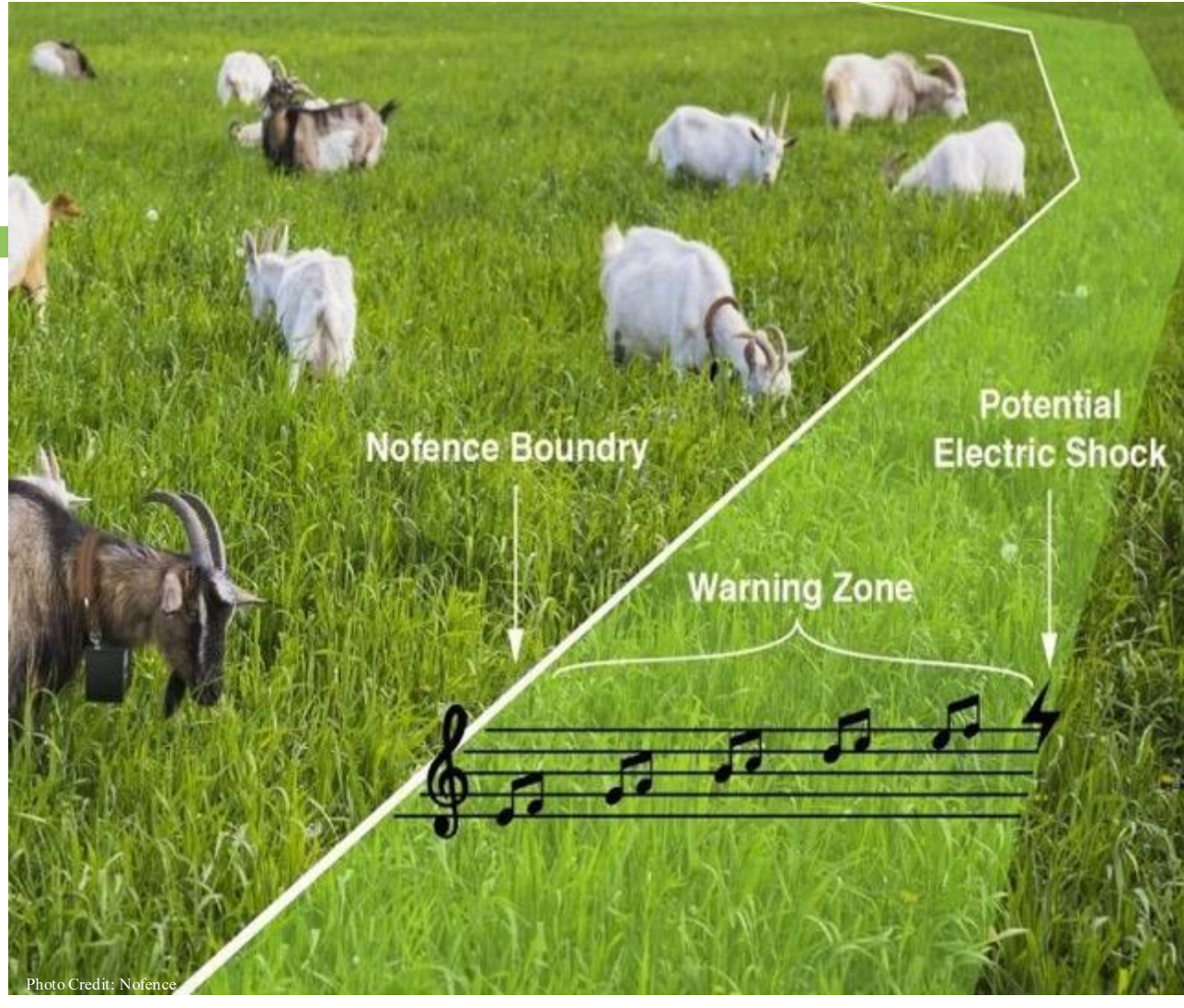
What is virtual fence?

- New precision livestock technology that allows producers to track and manage livestock location without the need of physical fencing.

  (physical fencing along roadways is always recommended)

- The system utilize GPS coordinates to establish invisible virtual fence boundaries and livestock location

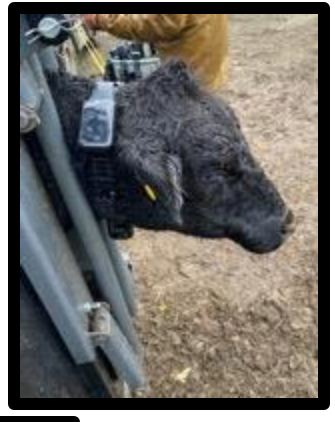
- Each animal is equipped with a virtual fence collar that keeps the livestock in or out of an area by administering sensory cues such as vibrations, sound and electrical stimuli.



History of Virtual Fence

First virtual fence prototypes early 2000's
(Anderson 2007)

Today's virtual fencing collars 2025



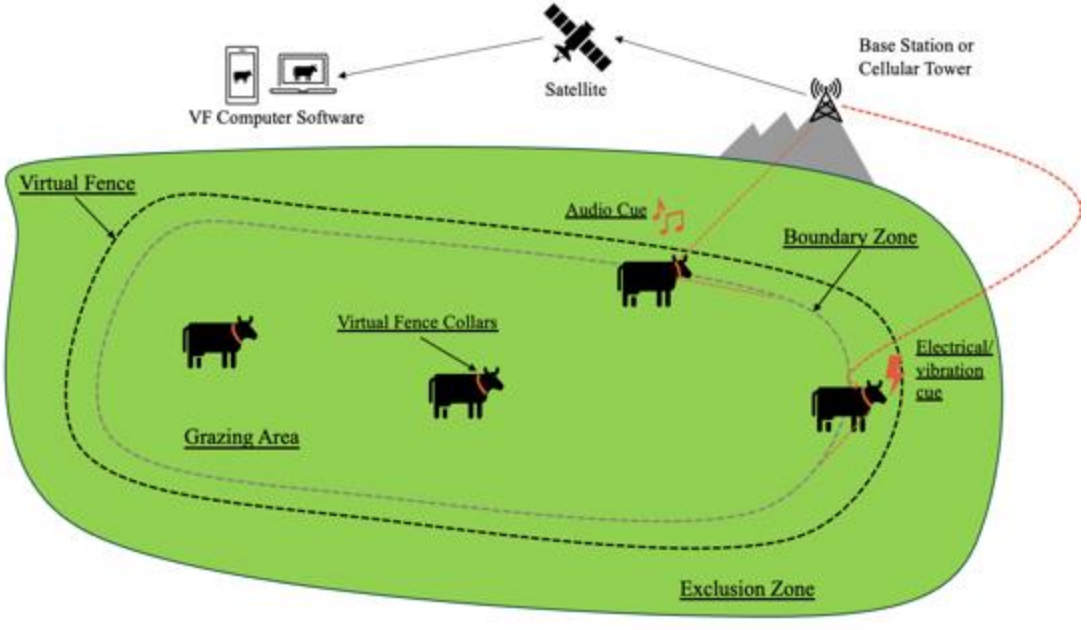
Virtual Fence: How it works

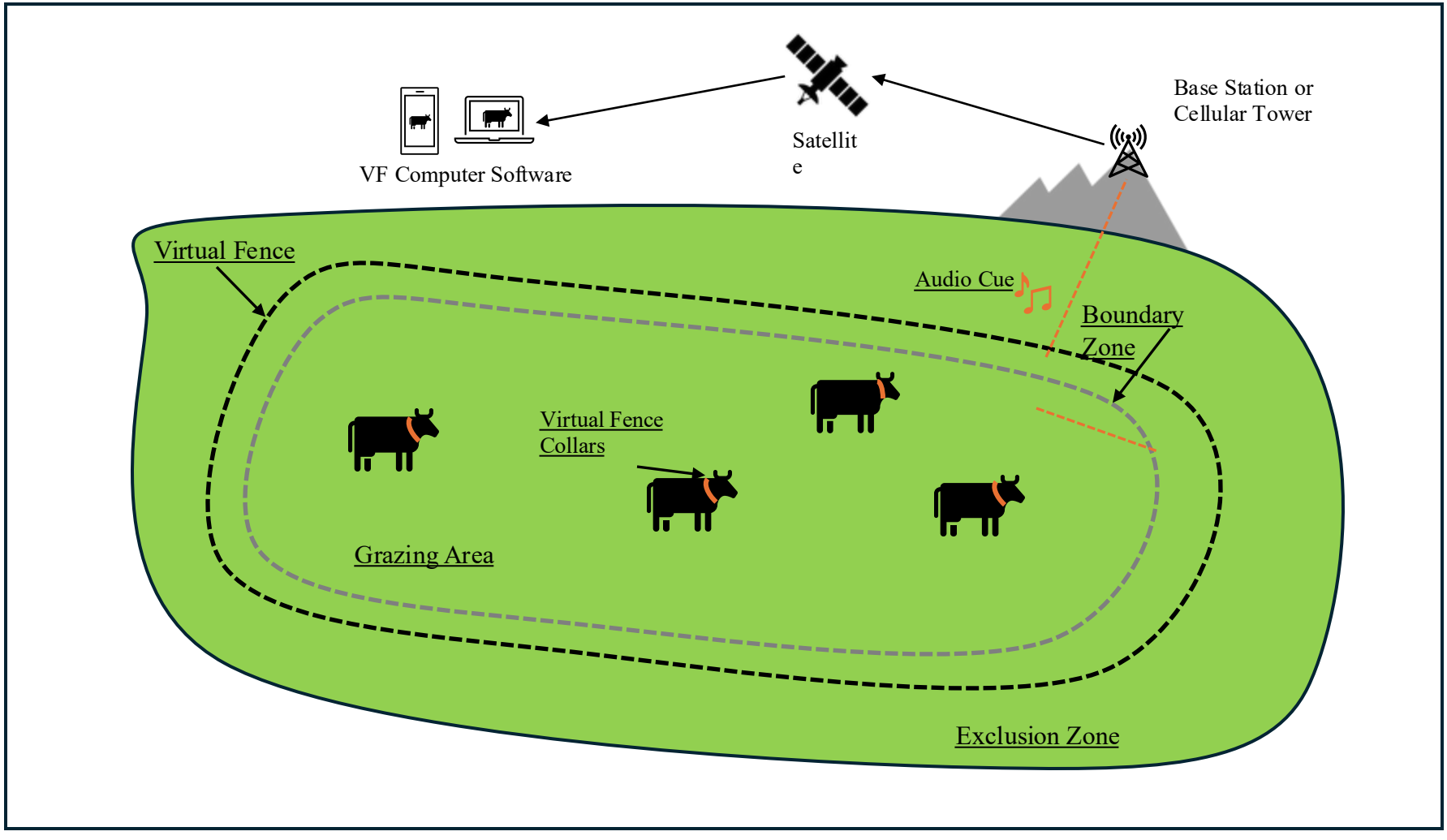
Each animal is equipped with a virtual fence collar

Producers draws virtual fence boundaries on phone app, computer or t

GPS coordinates are sent to virtual fencing collars via on the ground base station or cellular tower

The virtual fence is established, and the livestock are met with stimuli if they try to exit the grazing area

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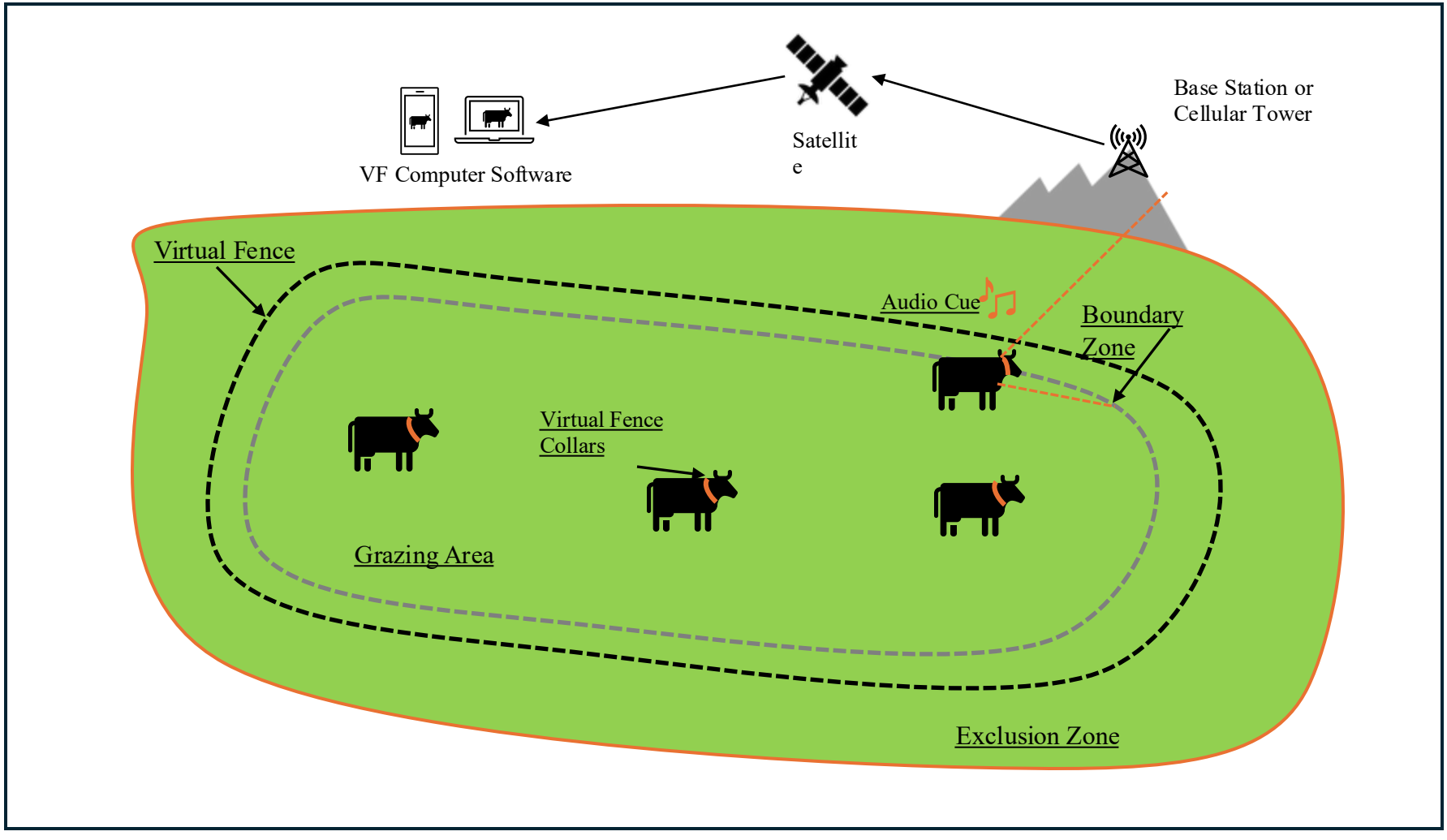
Base Station or
Cellular Tower
Virtual Fence
Audio Cue
Boundary
Zone
Virtual Fence
Collars
Grazing Area
Exclusion Zone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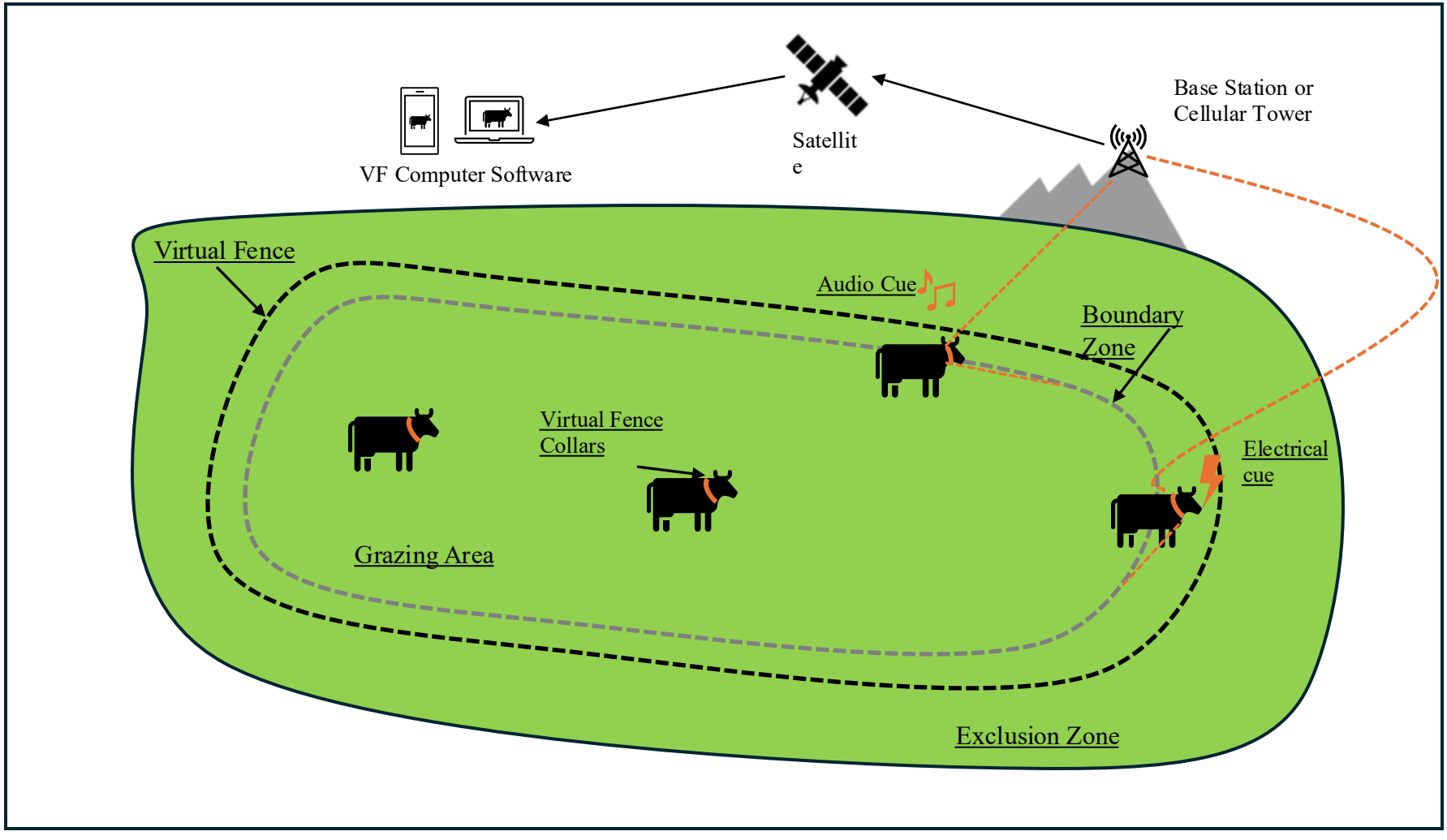
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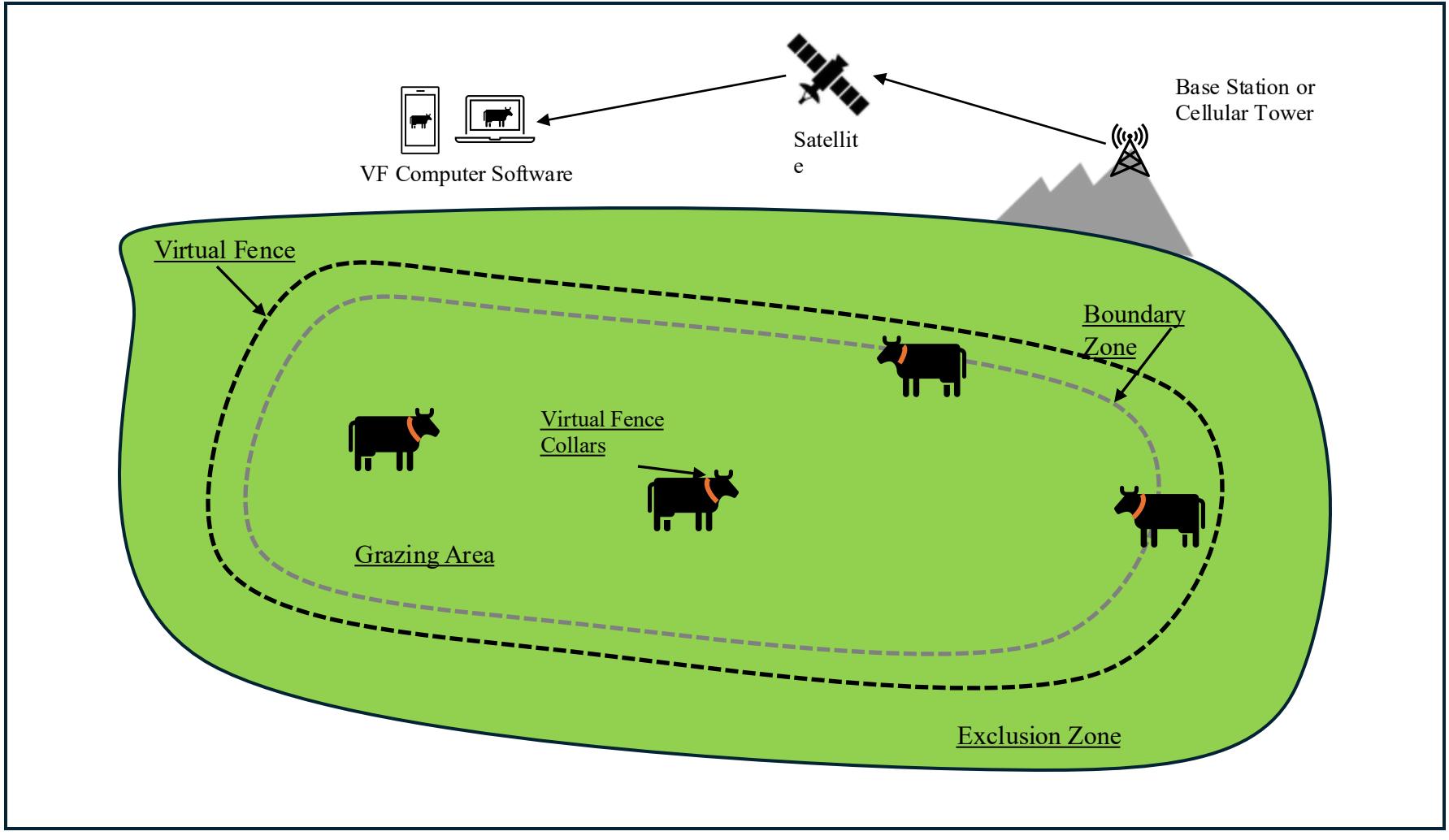
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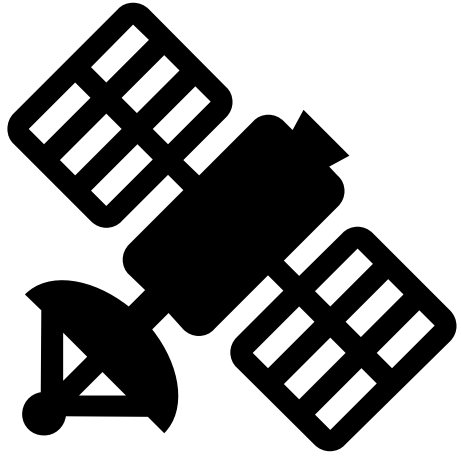
Cellular vs Tower-based Systems



Collars use cellular networks to communicate directly with the collars and the virtual fence app or web interface.

The base station acts as a relay passing information between the collars and the virtual fencing app or web platform by connecting to nearby cellular towers or another internet source.

The Companies

VENCE

- Battery: Lithium Battery (Life expectancy 6 months -1 year)
- Livestock: Cattle
- System requires tower
- First U.S. available system
- More used in the West
- Company based in the U.S.

Vence collars

Photo Credit: Vence

Nofence

- Battery: Solar Rechargeable Battery
  (Need swapped out periodically)
- Livestock: Cattle, Sheep, and Goats
- Cellular based system
- Company based in Norway

Esheperd collars

Photo Credit: Nofence

Halter

- Battery: solar charged
- Livestock: cattle
- System requires tower
- Company based in New Zealand

Halter collar

Photo Credit: Halter

GALLAGHER eSheperd

- Battery: solar charged
- Livestock: cattle
- Choice between tower or cellular based system
- Company based in New Zealand

eSheperd collar

Photo Credit: eSheperd

Virtual Fence Company Cost Examples

This document isn't meant to be shared or posted on social media or public websites

CRA Virtual Fence Program Information

VIRTUAL FENCE COMPANY	LIVESTOCK	COST PER COLLAR	SUBSCRIPTION FEE *PER COLLAR*	ADDITIONAL INFRASTRUCTURE	BATTERY
HALTER	Cattle	No up-front fee	*(collars purchased)* (50- 99) $96 Annually (100+) $72 Annually	Tower $4,500 Monthly Internet fee $50	Solar Charged
ESHEPHERD	Cattle	*(collars purchased)* (<20) - $350 (20-59) - $300 (>60) -$250	Tower $1.50/Month or Cellular $2.00/Month	Tower $6000 Additional Towers $5,000 Cellular $0.00	Solar Charged
NOFENCE	Cattle, Sheep, & Goats	*(collars purchased)* Cattle: (5-49) $345 (50+) $331 Sheep & Goats: (5-49) $255 (50+) $241	After the first 12 months... (5-49) $45 Annually (50+) $32 Annually	Battery Chargers 1 charger per 10 collars. Cattle $49 Sheep/Goat $39	Solar Charged/ Rechargeable
VENCE	Cattle	No up-front fee	$40 Annually	Tower $10,000 Set up Fee $2,500	Replaceable $10 per battery

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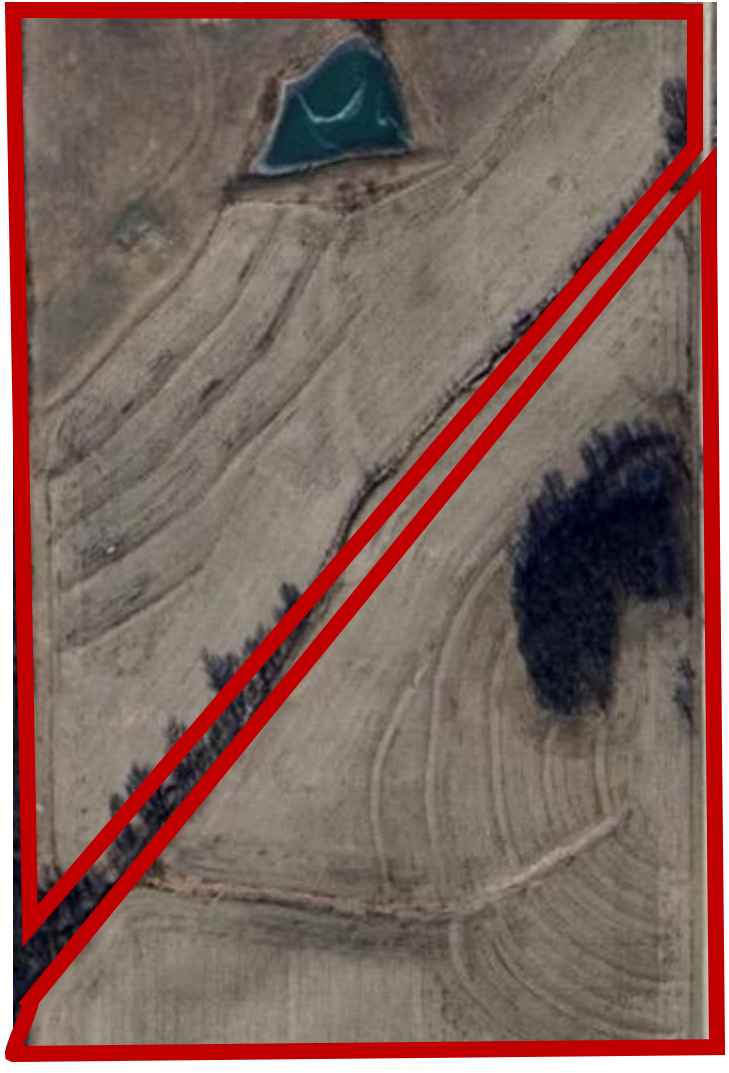
Information as of August 2025 for the most up to date company information and pricing please see company website

What Sets Virtual Fence Apart?

- It can improve land use efficiency by providing livestock the exact amount of feed without the paddock **size and shape** constraint
- It makes unrealistic paddock designs become realistic

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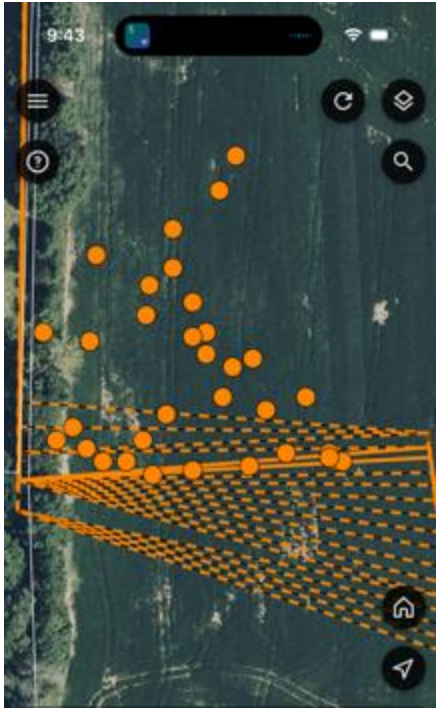
What can virtual fence do for your operation?

Real time livestock location tracking

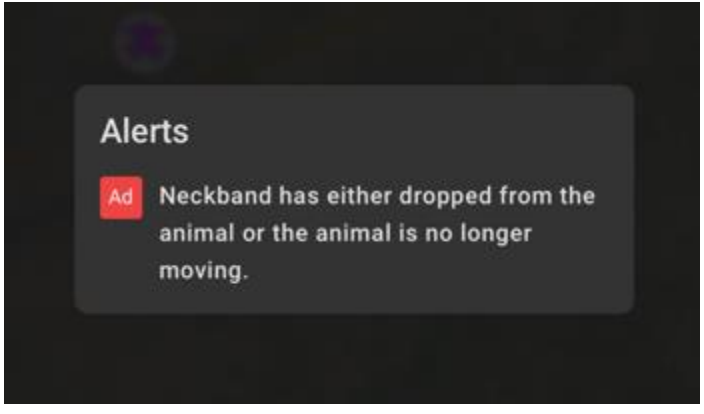
Automated grazing boundaries



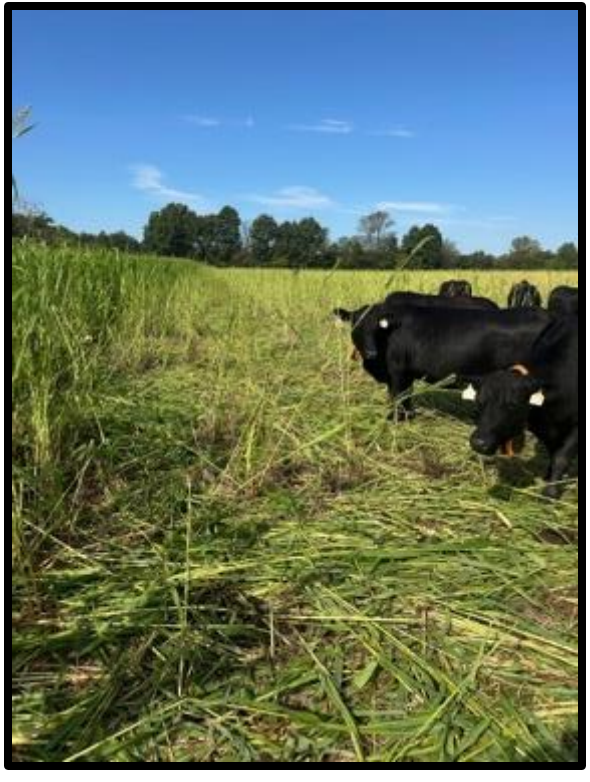
What can virtual fence do for your operation?

Protect sensitive areas

Cattle behavior alerts



Program producer Christopher Hudson



Key Virtual Fence Take Aways

- Enables producers to strategically manage livestock grazing more easily than physically moving cross fences.
- Virtual fencing is designed to function more like a cross-fencing system rather than a perimeter fence. A physical boundary fence is always recommended!
- Properly training livestock on virtual fence is important for livestock welfare.
- Virtual fencing is not suitable for every operation. It is important to analyze whether the technology is cost-effective and how it could benefit your operation.
- Virtual fencing should not replace physically checking cattle or monitoring cover crops, but it can be a valuable tool to make these tasks more time- and energy-efficient.

"It gives us more time to focus on family life, improve animal welfare, and plan herd management. Instead of constantly putting up fence posts and racing against the clock, we can dedicate our time to more productive tasks."

— James Waight, livestock farmer (UK), on using virtual fencing

Questions?

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