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Precision Ranching Technologies

Tools for Ranch Management

What is “Precision Ranching Technology”

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- Precision ranching involves the use of sensors and technology to increase production, reduce labor time, and streamline operational efficiency.
  - Sensors are capable of collecting:
    - Individual GPS location data
    - Boundary monitoring (the basis of “Virtual Fence”)
    - Precipitation data
    - In-tank water levels
  - There are multiple options for collecting data from sensors:
    - Cellular (4G/5G)
    - LoRaWAN (long-range wide area network)
    - Satellite
    - Wi-Fi
  - Ensure that the sensor you’re considering is compatible with the connectivity option that’s best for you.

Connectivity Options

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- Cellular (4G/5G):
  - The cellular 4G/5G network is a nationwide system already put in place by cellular companies (e.g., Verizon, T-Mobile, AT&T, Sprint, etc.) that allows people to connect their devices to the internet and transfer information from one place to another.
  - It's the same system your cell phone or tablet uses every time you make a call, send a message, or go online.
- LoRaWAN:
  - Long-range wide area networks (LoRaWAN) are systems that use long-range radio frequencies to transmit information across distance.
- Satellite:
  - There are companies with networks of satellites (e.g., Starlink, Kuiper, OneWeb, etc.) that work together to create virtually uninterrupted internet coverage across most parts of the world.
- Wi-Fi:
  - Wi-Fi uses routers connected to a central wired internet source from a cable company (e.g., Century Link, Xfinity, etc.) to spread wireless internet coverage across distance.
  - Most public buildings and many homes utilize Wi-Fi routers to provide a wireless internet network that's easily accessible by phones, tablets, computers, and other devices.

Individual GPS Tracking Collars

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- Tracking collars placed on livestock allow the manager to:
  - Locate the herd or individual cattle from a computer or mobile device
  - Identify and locate injured, escaped, or immobile animals
  - Increase operational efficiency by reducing time spent looking for cattle
- Current Cost: (August 2022)
  - GPS collar: $77 each
  - Solar-powered portable signal receiver station: $2,600-$5,000 each
  - Data storage and processing subscription: one payment of $2,300 for up to 7 receiver stations and 200 sensors, plus an annual fee of $290 per receiver station

Virtual Fence Collars

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- Virtual Fence collars divide large grazing areas into “digital” paddocks
  - GPS enabled-technology allows the user to define a grazing area from a computer or mobile device
  - When livestock near the “boundary,” the collar emits a noise, then a small electric pulse to discourage livestock from crossing the boundary
  - After training with the collars, cattle learn to respond to the collar’s noise and rarely need an electric pulse to remain in the boundary.
  - Virtual fencing of livestock could be implemented to help protect creeks, streams, and fragile riparian zones, manage fire fuels, or rest and restore rangelands impacted by fires, floods and droughts.
- Current Cost: (December 2022)
  - Virtual Fence collar: $285 each
  - Subscription service: $60 per year

Real-Time Data Tipping Bucket Rain Gauge

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- Real-time data tipping bucket rain gauges can be deployed over ranges to track precipitation
  - Real-time data rain gauges provide information using LoRaWAN about precipitation events, that can vary pasture by pasture, in a dashboard interface a rancher can access from a computer or smartphone.
  - This information could eliminate, or reduce, the need to drive to traditional rain gauges spread across a large area, potentially saving time and fuel and reducing wear and tear on vehicles.
- Current Cost: (August 2022)
  - Rain gauge: $1,143 per gauge
  - Solar-powered portable receiver station: $2,600-$5,000 each
  - Data storage and processing subscription: one payment of $2,300 for up to 7 receiver stations and 200 sensors, plus an annual fee of $290 per receiver station

Ultrasonic Distance Water Level Sensor

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- Ultrasonic distance water level sensors monitor water levels in livestock drink tanks
  - In-tank sensors reduce the need for frequent travel to check water sources
  - Data is collected at set intervals, and level alerts can be set by the user
  - Water level sensors aid ranchers in making rapid decisions to monitor and address water supply issues in remote locations
- Current Cost: (August 2022)
  - Ultrasonic water level sensor: $670 each
  - Solar-powered portable receiver station: $2,600-$5,000 each
  - Data storage and processing subscription: one payment of $2,300 for up to 7 receiver stations and 200 sensors, plus an annual fee of $290 per receiver station

Body Condition Scoring Camera

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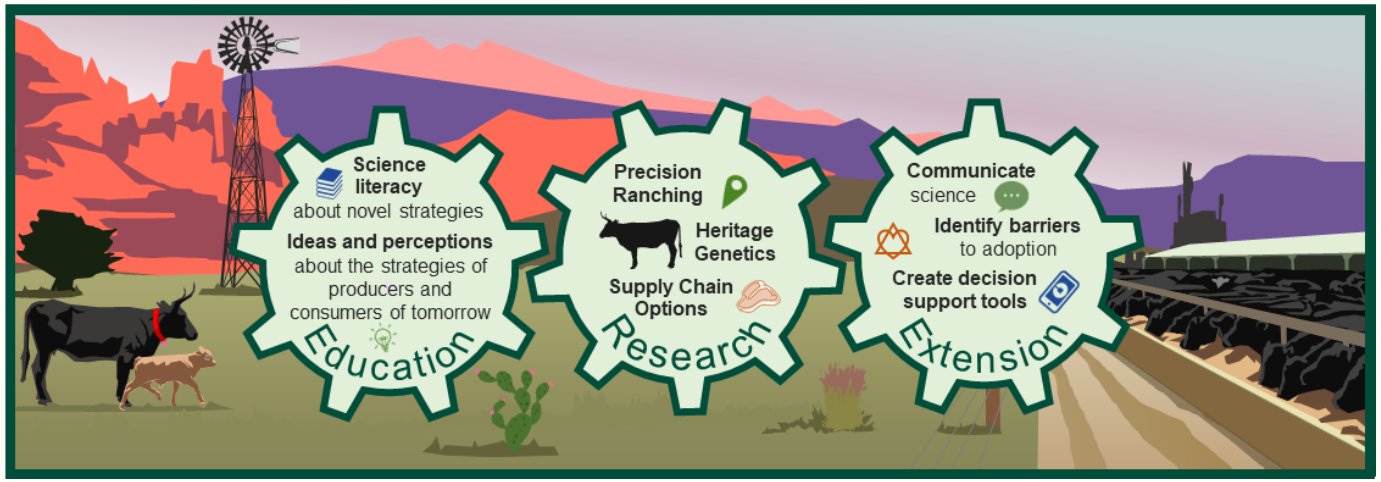
- The Body Condition Scoring Camera will include:
  - A camera mounted in an enclosed/high traffic area, i.e. near feed, processing alley, etc.
  - Images taken as cattle pass under the camera
  - Images processed by software, body condition score sent to user interface
  - Useful for evaluating cattle condition

- Current Cost: (October 2022)
  - 3D camera: $330 each
  - Raspberry Pi computer: $75
  - RFID scanner: $280
  - Time of Flight sensor: $55
  - Other supporting hardware: $125
- Currently in research phase only!



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