eShepherd

Gunnison Colorado, USA

Trial Description

February 2021

AGERSENS

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Document Change History

Version	Author	Date	Change Description
A1	Victor Quittner	10-Feb-2021	First revision

Agersens eShepherd Overview

Agersens and eShepherd Product Vision

Agersens Pty Ltd is a privately owned Australian company that has developed an agricultural technology product named ‘eShepherd’ incorporating Internet of Things (IoT) technology.

eShepherd is the world’s first virtual shepherd for precision livestock management. Using patented CSIRO Virtual Fencing IP and breakthrough IoT and wearable technologies, the product empowers farmers through automation of livestock grazing and management. Farmers are able to fence, move and monitor their livestock using only their laptop or tablet.

This will enable them to vastly improve farm profitability, productivity and sustainability while also improving the health and well-being of their livestock, preventing pollution of rivers and waterways and avoiding land degradation through overgrazing. eShepherd will enable Agersens to revolutionize livestock farming on a global scale.

eShepherd Development Program

The eShepherd development program has now reached the Minimum Viable Product (MVP) stage, We aim to launch commercially in Australia in early 2021, for which we have all the necessary regulatory approvals.

Agersens has conducted several trials within Australia with government and private organisations to refine the system, and form the MVP user requirements and technical specification.

Our product roadmap includes development activities to support new markets in other regions around the globe scheduled to start in Q3 2021. These activities will include modifications for regulatory compliance in those regions.

We are in discussions with several potential customers outside Australia, and have developed procedures to offer trials tailored to customers’ particular locations, user needs and regulatory requirements.

This document details the proposed trial with the Gunnison Conservation District in Colorado.

Gunnison, Colorado USA Trial

Gunnison Conservation District

The Gunnison District of Colorado USA encompasses most of Gunnison County, the North-Western 1/3 of Saguache County, and the Northern 1/3 of Hinsdale County, comprising approx. 2,127,000 acres of private, state and federal lands.

The Gunnison Conservation District (GCD) is a local grassroots organization created to address conservation concerns of landowners in the District. They encourage the protection and enhancement of natural resources and work extensively with partners with common objectives.

The GCD is the local unit of government through which the Natural Resource Conservation Service (NRCS) administers technical assistance and facilitates cost-share programs to local ranchers and landowners. The GCD exists for the sole purpose of promoting and facilitating soil, water, and wildlife conservation, management, and improvement practices on private land in the Gunnison Basin area.

The GCD is located at 216 North Colorado Street, Gunnison, Colorado 81230.
Contact person is Aleshia Rummel.

Proposed Trial

The Gunnison Conservation District (GCD) has requested Agersens prepare a Proposal for undertaking a controlled grazing trial using the Agersens eShepherd Virtual Fencing (VF) system.

The aim of the trial is to demonstrate the effectiveness of using a virtual shepherd system to enhance and conserve rangeland, including:

- improving cattle grazing efficiency by implementing High Density Short Duration Grazing (HDSD) on large landscapes in the Gunnison Basin, and
- improve habitat for big game, cattle, sage grouse and other wildlife.

To determine improvements the GCD will seek to measure:

- The effectiveness of the system to exclude or limit grazing in riparian areas and critical or sensitive areas for sage grouse, big game and other wildlife habitat.
- Impact of HDSD grazing on soil health, and
- Reduction in labor and equipment costs to the producer

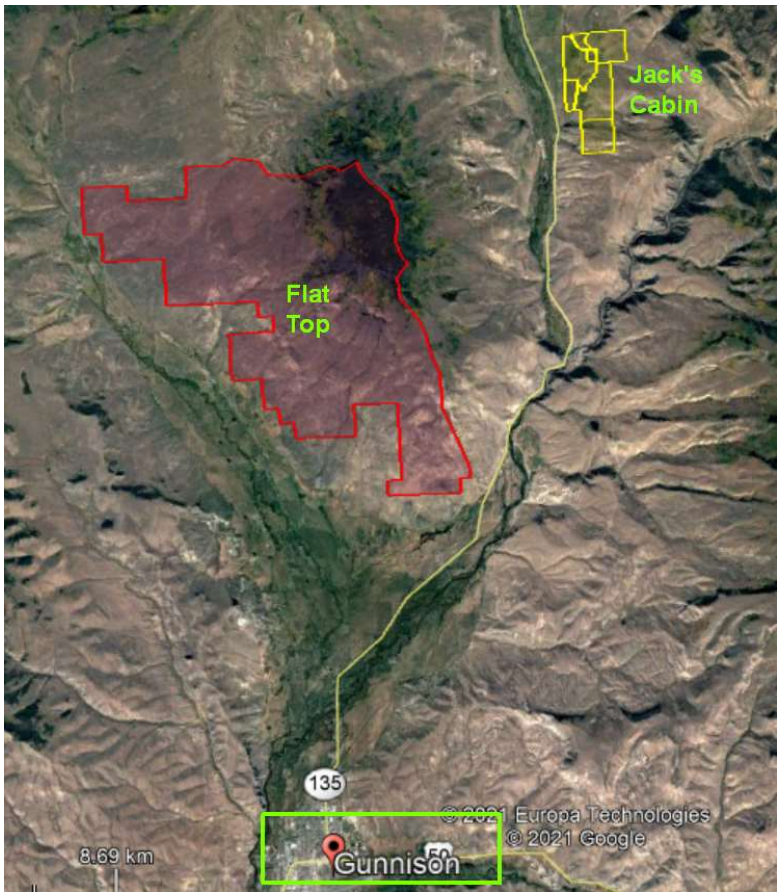
Trial Location

GCD will be acquiring the eShepherd system and undertaking the trial in conjunction with local cattle rancher Allen Ranches (Curtis Allen proprietor).

The trial is proposed to start in early May 2021, which is important from a seasonal timing perspective.

Allen Ranches has a number of land parcels in the Gunnison area. One group of paddocks is centred at approximately 38°43’40” N , 106°50’11” W and is referred to collectively as “Jack’s Cabin”.
Combined area is approximately 3.85km^2 and elevation is approximately 2530m for most pasture and up to 2700m for a small hill within the area.
This area is proposed for installation, initial animal training and test of the system over an extended period.

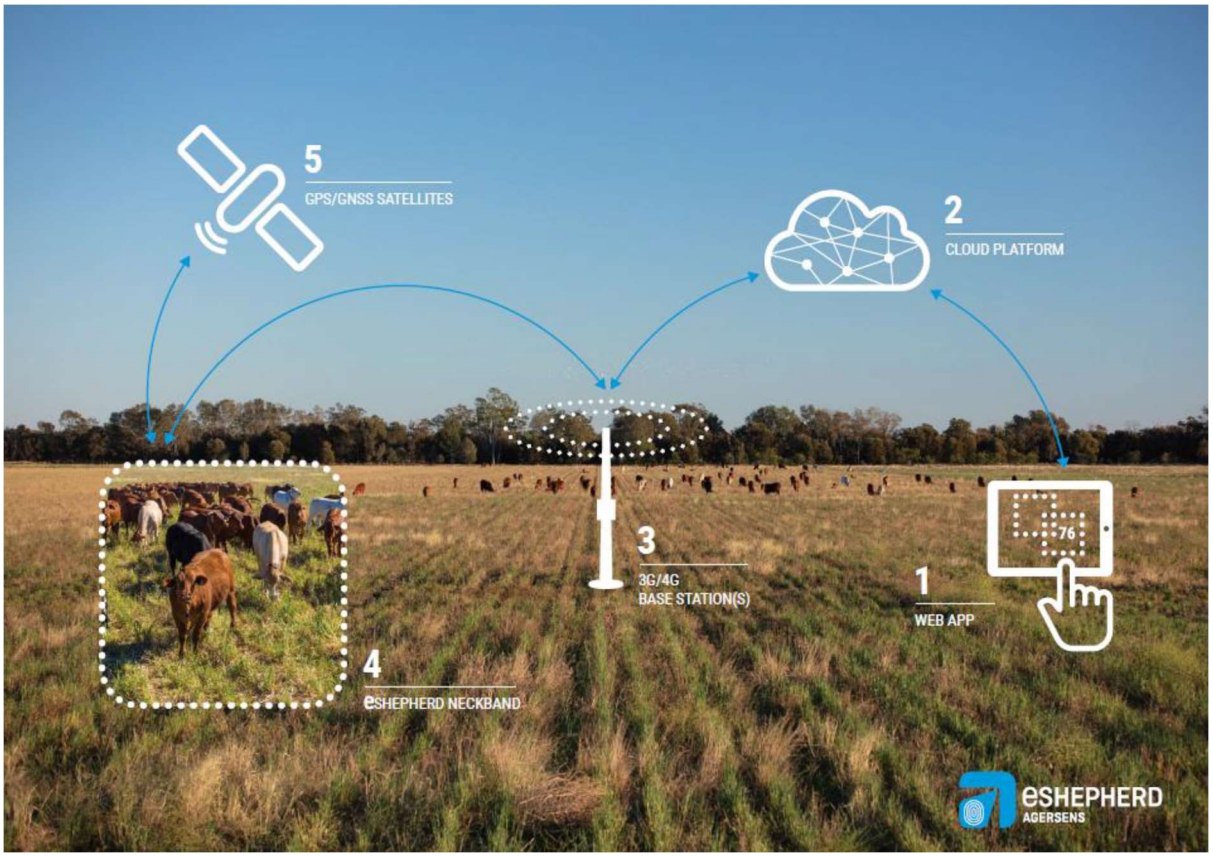
[The system *may* be re-located later in the trial to another group of paddocks centred at approximately 38°40’30” N , 106°55’15” W referred to collectively as “Flat Top”. Combined area is approximately 42.9 km^2 and elevation is approximately 2390m to 2560m.]



eShepherd System Description

System Summary

The key elements of the eShepherd Platform are outlined below:



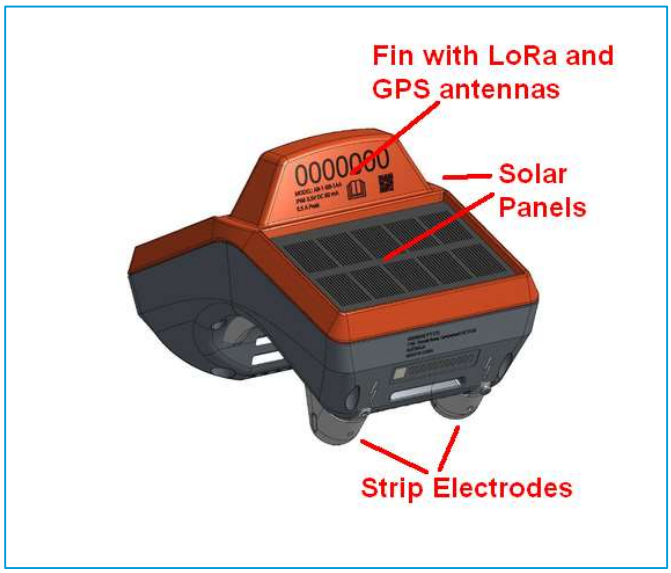
1. The farmer creates a Virtual Paddock using the eShepherd web application on a computer, laptop or tablet (1)
2. The co-ordinates of the created paddock are sent via the cloud platform (2) to the Base Station (3)
3. The Base Station then communicates with each animal's eShepherd Neckband (4) sending the co-ordinates of the Virtual Paddock.
4. The eShepherd Neckband tracks the position of each animal relative to the Virtual Paddock boundary using a combination of GPS data (5) and data from internal motion sensors.
5. The system uses this information in conjunction with audio cues and a pulse stimulus to train each animal to remain within the boundary of the Virtual Paddock.
6. The Neckband then continuously monitors both the animal's GPS location and behaviour.

Neckband

The eShepherd Neckband is fitted to each animal and, once programmed with virtual paddock coordinates, acts autonomously to keep the animal within the designated Inclusion Zones and out of designated Exclusion Zones.

The solar powered Neckband tracks the position and behaviour of each animal by using a combination of data from the internal motion sensors and GPS location data. The solar panels also charge an internal LiFePO4 battery to maintain operation at night and during poor sunlight conditions.

An internal speaker delivers an audio cue, to which trained animals respond by changing direction to avoid crossing the virtual fence. If the animal does not respond after several audio cues (such as during initial training), strip electrodes with a custom pulse circuit deliver an aversive but harmless pulse stimulus.



Base Station

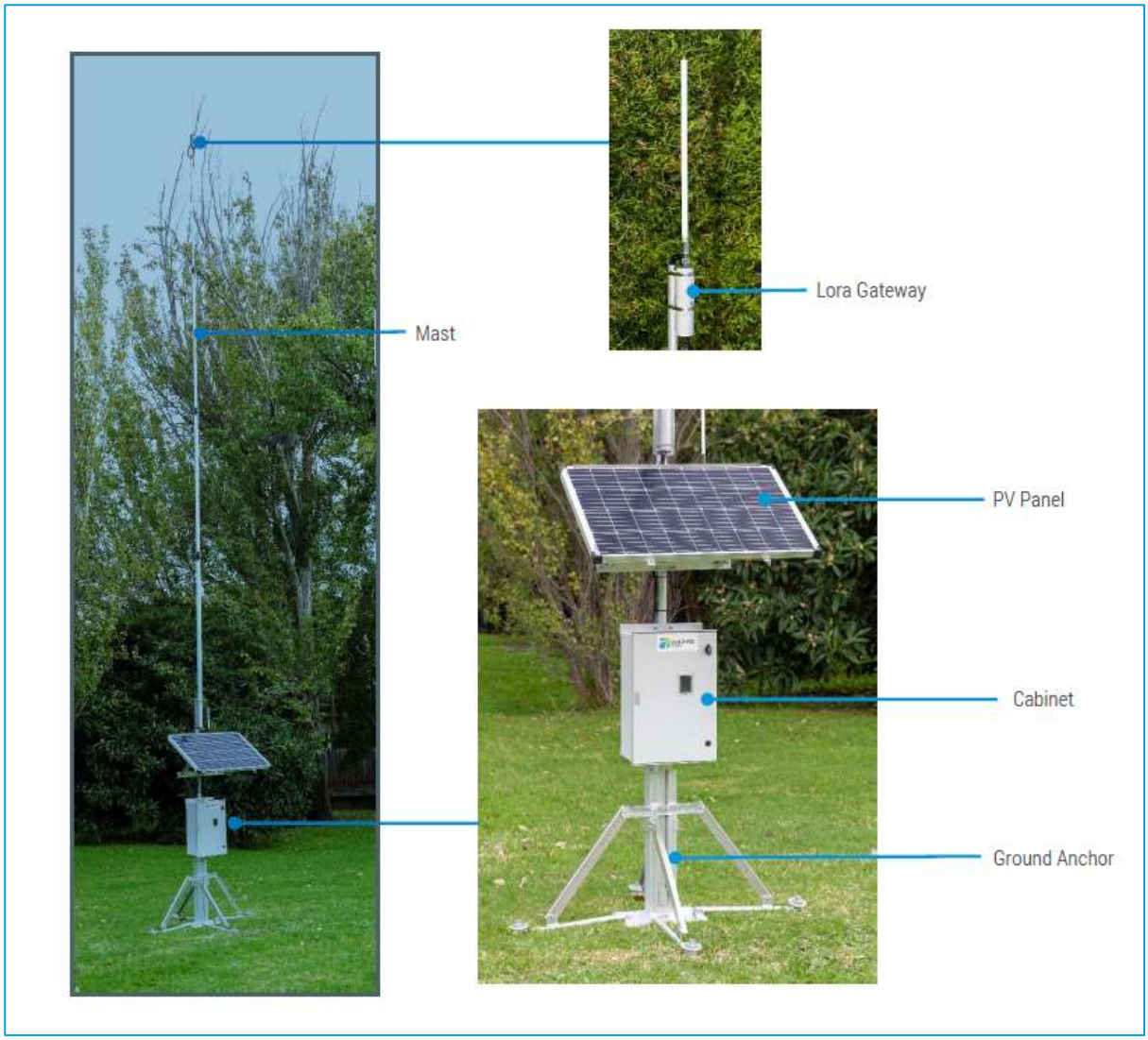
The Base Station provides the two-way links between the Neckband fitted to each animal, and the Cloud Platform on the Internet that provides management and control.

The control cabinet contains a rechargeable battery, solar panel battery charger/regulator, power distribution, and an Ethernet to 3G/4G router/gateway.

The solar panel charges a battery inside the control cabinet to enable autonomous operation. Attached to the solar panel frame is the antenna for the 3G/4G link to a telecommunications carrier for data communications to the Cloud Platform.

The LoRa Gateway at the top of the mast communicates with up to several hundred Neckbands to set their virtual paddock parameters and receive regular status updates. It utilizes frequencies in the 902MHz to 928MHz unlicensed ISM band and is classified as a Low Power, Short Range Device. Connection to the control cabinet is by an Ethernet/Power cable located inside the mast.

The total height of the Base Station assembly including LoRa Gateway and antenna is less than 10 metres from ground level. (Refer to separate dimensioned mechanical drawing.)



Communications Technical Description

A detailed description of the LoRa radio communications technology and settings used between Base Station and Neckbands is described in a separate document.

In brief, LoRa is a low-power, long-range radio communications technology for low to medium data rates and small data packets. It uses a proprietary spread-spectrum digital modulation scheme developed by Semtech Corporation, and is used in a wide range of IoT products and applications.

Digital modulation parameters can be adjusted over a wide range to trade-off data-rate, distance, RF-power, and power consumption to suit particular use-cases.

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