Dairy Australia

Australian Government
Department of Agriculture, Water and the Environment

VIRTUAL HERDING RESEARCH UPDATE

TECHNOTE 5: USE OF VIRTUAL HERDING TECHNOLOGY TO HERD ANIMALS

Background

Livestock are shifted from one paddock to another and are regularly brought into a central area for milking, mustering, shearing, etc. This may represent an appreciable cost including labour, quad bikes, dogs or horses, depending upon the livestock industry. For example, the results of a case study in this Project found a 50 per cent reduction in labour required to fetch cows for milking time twice a day would save nearly $13,000 per year for an average sized dairy farm. In addition to the costs of labour involved, moving livestock can potentially be stressful for the animals and increase animal health costs. Implementation of virtual herding (VH) technology offers the advantage of being able to 'herd' livestock remotely where a back fence regularly shifts closer to the target area, thereby 'herding the animals'.

Potential application of VH technology to herd animals

There are many applications of VH technology to herd animals in the livestock industries but most are yet to be proven.

- Bringing in cows to the dairy for each milking, including:
  - Staggered herding to ensure cows spend minimal time on concrete,
  - Fetching the last 10-15 per cent of cows in a robotic milking system.

  In addition, by herding cattle with a virtual backing fence, the animals are likely to go at their own speed, potentially minimising stress and/or injury.
- Bringing in sheep to the shearing shed for shearing, crutching, etc. during the year,
- Mustering cattle in extensive beef production systems,
- Bringing livestock into yards for transport, either out of the farm or movement to a new grazing area.

This project is supported by funding from the Australian Government as part of its Rural R&D for Profit program.

CASE STUDY

Herding cattle

A 5-week trial was conducted on site at CSIRO in Armidale in 2018 to determine if VH technology could move groups of 12 pregnant beef cows from one end of a paddock to another (approximately six ha paddock and 300 m in length). A total of five different groups (12 cattle per group) were tested through applying two different combinations of fences.

1 A single shifting fence behind the group of animals to prevent them turning back.

2 A fence both behind and in front of the group to keep the group together more tightly as they moved down the paddock. The average distance between the front fence and the back fence for this group of 12 animals was between 75 and 150 m to keep the group close together.

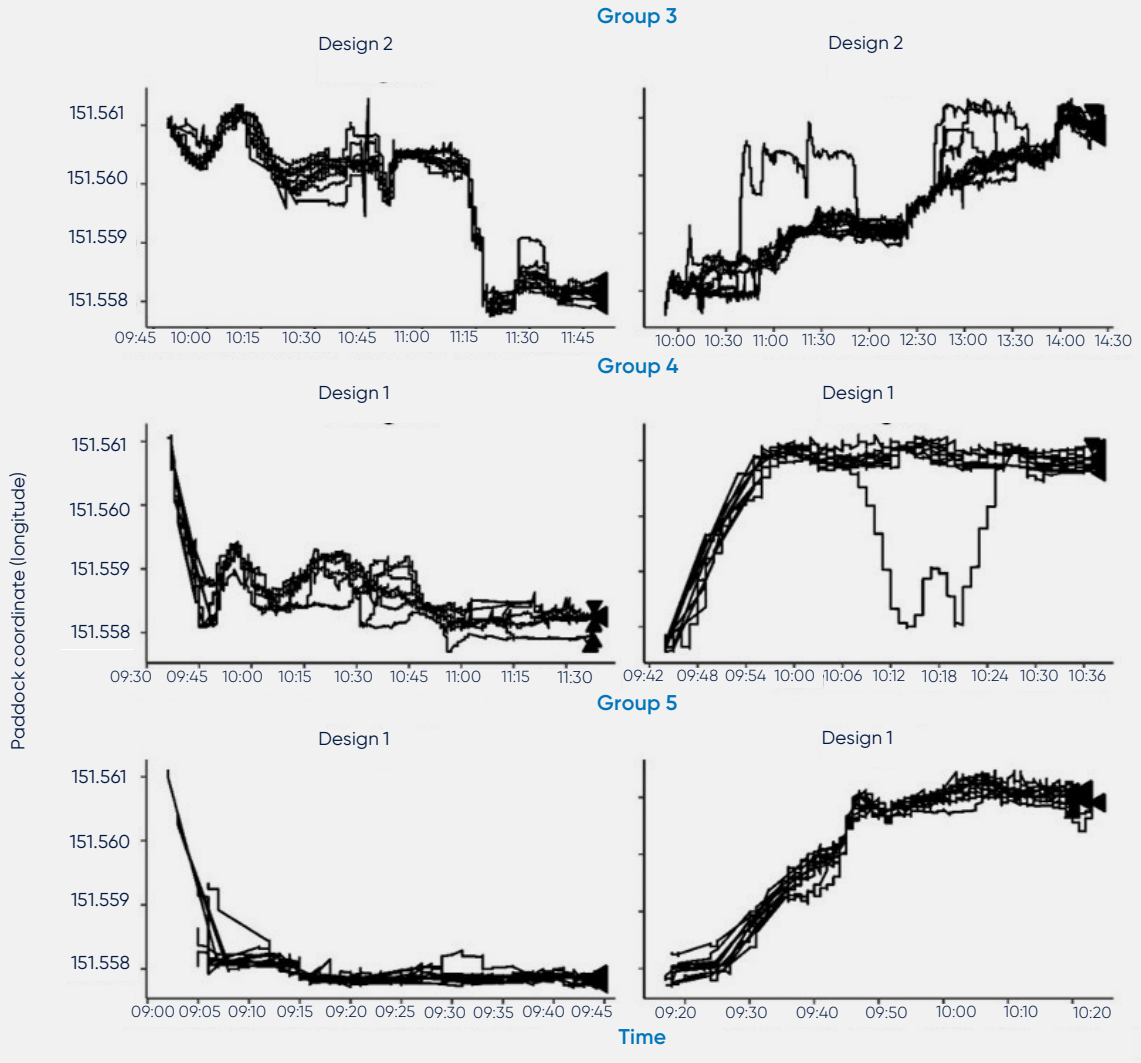
All groups of tested animals were held at the end of the paddock for 30 minutes once their herding was complete.

All animals were first trained to a single stationary virtual fence within the paddock to ensure they were familiar with the device signals before attempting herding with fences that moved.

The most successful design was the single fence that moved behind the group as they grazed down the paddock. Animals were herded at their own pace so sometimes it was rapid (i.e. if animals were walking), but on other occasions it was slow if they were spending time grazing. General behavioural observations indicated the animals were not overtly stressed or aroused by this design. Where the animals only had a backing fence (Design 1) groups four and five only took around 15 minutes for all animals to travel down the 300 m paddock, and up to 30 minutes for most animals to return back up the paddock (Figure 1).

Although it was beneficial to have the group kept tightly together with both the front and back fences (Design 2), animals in group three took over 90 minutes to travel down the paddock and over 4 hours to return back up the paddock (Figure 1). The speed of movement was markedly reduced in Design 2 because the animals were getting signals from both the back and front directions.

Figure 1 Some examples of the group movement across time with different herding designs. Design 1 was simply a backing fence while Design 2 consisted of a back fence and a front fence. These plots show lines for each animal moving down the paddock over time (on left) and then return back up the paddock (on right).



Implications of using VH technology to herd cattle

It is critical to have the animals trained to the cues prior to using the technology to herd. Furthermore, the fences cannot become too complicated. Cattle in herds typically stay together and will be socially influenced in their responses to virtual fencing signals. If animals are separated by distance within the paddock and are then prevented from joining the herd by virtual fences, this can result in animal confusion and visible distress (e.g. a back fence is set behind some animals but not others because the group is spread out).

Since this experiment has been conducted, improvements in the speed of connectivity between the devices, base station, and user-interface will minimise the time taken to change the fence lines thus allowing a quicker and more efficient herding process in animal movement as a new fence is moved during herding.

A front and back fence may then become a viable option for moving cattle around a farm. Fences that automatically update based on animal position within the paddock may also be possible (herding fences were manually activated in the research trials).

Figure 2 Cattle used to test virtual herding in a 6 ha paddock at CSIRO, Armidale. Herding was more challenging when some animals were distant from the main group.

CASE STUDY

Herding Sheep

The trial used 12 Merino ewes that had not been previously exposed to a virtual fence. The sheep were first trained in pairs to a front virtual fence to make sure they had learnt the system before it was used to herd them. For herding, sheep were split into flocks of 6 and herded across a paddock (approximately 140 m x 80 m) using the single back fence method which was based on the sheep located at the back of the flock. This method implements a single virtual fence which sequentially follows behind the animals as they move down the paddock.

Once the flock of sheep reached the end of the paddock, they were held there with the virtual fence for 30 minutes before the fence was removed and they were walked back up to the other end of the paddock using the back-fence method again. This was repeated for a second day.

Herding was highly dependent on the flock's motivation to move, with herding across the paddock ranging from 10 minutes to 1 hour. Herding was slow if sheep were camping or grazing, however if one sheep in the flock of six initiated movement then the remaining sheep tended to follow and reached the end of the paddock quickly. Once at the end of the paddock, sheep were successfully contained for 30 minutes. When the fence was removed to allow them to re-traverse the paddock, they quickly were able to walk through the location of the previously existing fence. Movements across the paddock were similar on both testing days.

Figure 3 Flock of sheep being herded using the virtual fence in a small paddock at CSIRO, Armidale. Merinos graze quite closely together making the back-fence implementation consistent. The orange tape indicates the back fence and once all sheep have crossed this, they would receive the warning cues for the virtual fence if the tried to walk back.

Implications of using VH technology to herd sheep

Sheep were able to be moved up and down a paddock in the same day and kept at either end without breaking through the fence. Having the back-fence implementation based on where the last sheep in the flock was located reduced confusion and stress of any sheep that grazed further ahead of the flock that tried to return to the formation.

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2542.5 | Oct 2020