Virtual herding NEWSLETTER

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Virtual herding research update

'Enhancing the profitability and productivity of livestock farming through virtual herding technology' is a four-year project to evaluate the application of virtual herding (VH) technology across different production systems and examine the responses of different livestock (dairy cows, beef cattle, sheep) to various cues and stimuli to improve productivity and profitability in the livestock industries.

The project

The project received $2.6 million from the Australian Government through its Rural R&D for Profit program. A further $1.365 million has been provided by a number of Rural Research and Development Corporations and R&D providers. The R&D providers include the CSIRO, University of Sydney, University of New England, Tasmanian Institute of Agriculture, University of Melbourne and Agersens Pty Ltd, with additional contributions from Dairy Australia, Meat and Livestock Australia, Australian Wool Innovation and Australian Pork Limited.

The project aims to evaluate the on-farm application of virtual herding (VH) technology, demonstrate its implementation, and quantify and extend its benefits across Australia's major livestock industries.

Using VH, the research team will investigate the potential to constrain animals to certain areas (better grazing management and environmental outcomes), autonomously herd animals, or move individual or groups of animals in a herd differently to the rest of that herd. Fundamental research involving behavioural observations and physiological measurements will be critical to ensure that the technology does not compromise animal welfare.

Introducing project team members – Ms Nikki Reichelt

Ms Nicole (Nikki) Reichelt leads subprogram 5, 'Challenges for integration and adoption of virtual herding'. Nikki is a Research Fellow at the University of Melbourne and her farm experiences on her grandparents' property in the Wimmera district of Victoria, concern for our natural environment

and sociology background led to her interest in social research of complex rural landscape issues.

Nikki graduated from the Royal Melbourne Institute of Technology in 1992 with a Bachelor of Arts in Socio-Environmental Assessment and Policy. She then completed two Master's degrees to further her knowledge and skills in social research and environmental studies. Having worked in the government and NGO sectors for a decade, she returned to the university sector in 2008 as a Research Assistant in Landscape Sociology before transferring to the Rural Innovation Research Group (Faculty of Veterinary and Agricultural Sciences) at the University of Melbourne in 2015.

As a Research Fellow, Nikki has been working on collaborative projects in agricultural extension, climate change adaptation on dairy

Nikki Reichelt
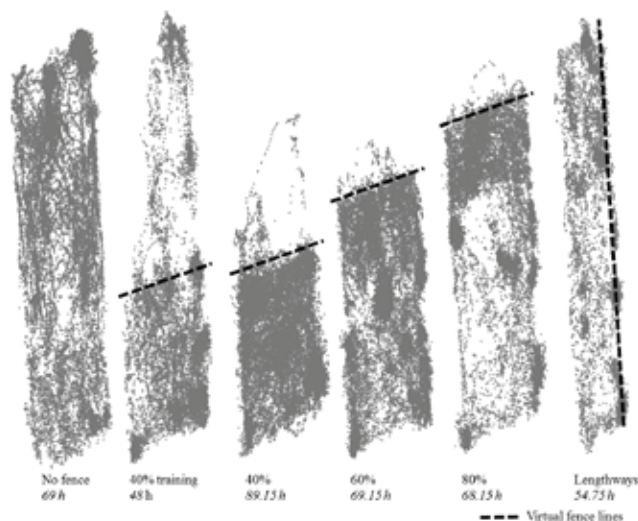
Location of cattle, after the beginning of the experiment (second 'map' on the left), when they were restricted to 40% of the paddock during the training period of 48 hours, and then the location of cattle over the subsequent 3 or so days after the virtual fence was shifted to allow the cattle access to 40%, 60% and 80% of the paddock and then finally after shifting the fence line longitudinally down the paddock.

farms and agricultural innovation systems approaches. Her current research involves developing an understanding of the learning, management and ethical challenges with the adoption and integration Virtual Herding technology from a range of perspectives: farmers, extension and advisory professionals, Australian general public and NRM policy community. This understanding will be complemented with a cost benefit analysis of implementing a virtual herding system on livestock farms through a series of case studies.

Update on sub-program activities

Sub-program 1: Optimising the animal response to virtual fencing technology

Dr Dana Campbell and Dr Caroline Lee, alongside CSIRO technicians Jim Lea and Troy Kalinowski conducted a trial in partnership with Agersens in 2017 to look at how heifers respond to virtual fence lines that periodically move. One of the benefits of virtual fencing technology is the ability to move fences to different places with the click of a finger. But if animals learn the specific location of a previous virtual line (rather than listening to collar audio signals) then they may not utilise paddock areas when the virtual line moves.

Six heifers were placed into a 6 hectare paddock and fitted with the commercial prototype automated collars developed by Agersens. After about a week of adjusting to the entire paddock area, animals were excluded from 60% of the paddock by a single virtual fence line across its width. It took the animals approximately 48 hours to learn the signals of the virtual fence (the audio and the electrical stimulus) and stay within the fence boundary. The fence line was then moved to exclude animals from 40%, then 20% of the paddock area. Finally, the line was switched lengthways down the paddock to exclude animals from 50% of the paddock area along one side.

With all the new fence lines, the animals were successfully excluded from the specified area. It took approximately 4 hours before animals first touched the new fence line indicating the animals were not learning the specific location of the fence. For the majority of time, animals were excluded from the specific areas by responding to the audio cue alone and thus the animals avoided the electrical stimuli. These results are very positive for farmers that wish to implement short-term temporary fences.

A full report of the study is published in the open access journal, Animals 7: 72–83. 'Tech-savvy beef cattle: how heifers respond to moving virtual fence lines'. The figure above indicates the location of the animals at each movement of the virtual fence.

Cows grazing at Elliot Dairy Research Centre in Tasmania

Sub-program 2: Determine best livestock and pasture management for intensive dairy and beef through more controlled pasture allocation

Dr Megan Verdon, Mr Mark Freeman and postgraduate student, Ms Maduka Whella from the Tasmanian Institute of Agriculture have completed an experiment that examined one possible application of VH technology. They simulated the application of the technology to rotational grazing on dairy heifer rearing blocks, by manually shifting fences at various intervals.

Over the 3–month experiment, researchers manually shifted two herds of 40 pregnant heifers onto fresh pasture at difference frequencies. The first herd was provided with fresh pasture twice per week, while the second received fresh pasture daily.

Heifers were fitted with MooMonitor® collars (Dairy Master, Tralee, Ireland) which continuously record ruminating, feeding and resting behaviours. The heifers were weighed at the beginning and again at the end of the experiment and their body condition was also scored fortnightly. Estimates of pasture consumption were made daily using a rising plate meter, and pasture re-growth monitored for up to 10 weeks post-grazing.

The daily allocation of pasture to pregnant heifers increased weight gain over the 3 month experiment (by nearly 8kg) and pasture re-growth, particularly in the first 3 weeks post-grazing. However, no differences in body condition or pasture utilisation were detected.

Feeding pregnant dairy heifers their pasture allowance daily reduced the time the spent feeding per day but increased the time they spent ruminating per day, without affecting time resting. A more detailed examination of behaviour revealed that the heifers that received fresh pasture twice per week spent the most time grazing in the first 24 hours of a fresh allocation, consuming 65% of their total 3–4 day pasture allocation in this time.

These findings demonstrate that providing new pasture allocation every day rather than twice each week can benefit heifer and pasture productivity. The daily allocation of fresh pasture may have reduced pasture wastage due to trampling and fouling, provided a more consistent supply of pasture and minimised periods of fasting experienced by heifers.

However, there is likely a limit to which grazing can be intensified before productivity becomes negatively affected. Previous research conducted by TIA suggests that very intensive (i.e., allocating new pasture 7 times per day by manually shifting fences) grazing regimes reduces productivity of lactating dairy cows and disrupts their natural behaviour patterns. Later studies will investigate whether the application of the E-Shepherd® cattle collars (Agersens, Camberwell, Victoria) to provide more frequent pasture allocation to lactating dairy cows may improve productivity.

Latest news

› The DAWR research program has recently purchased 150 of the latest version of the e-Shepherd™ collars from Agersens. These VH devices, associated infrastructure and base stations have now been installed at each of the three key R&D sites at Armidale, Elliot and Camden. Animal studies to investigate the use of collars to herd cattle began at Armidale on 25 June. At the University of Sydney facilities at Camden, other animal studies to examine the effect of hunger on response to the VH technology and the response of animals to the collars when in groups or as individuals have also started in early July.

› After the successful livestock producer workshops last year, Nikki Reichelt from the University of Melbourne, is planning several future workshops with other sectors. Two NRM workshops will be held in Melbourne and Toowoomba on 31 July and 16 August, respectively. In addition a workshop to engage with the extension and farm advisory sector about VH technology is planned to be held in Melbourne on 21 August.

› Agersens presented the eShepherd virtual fencing system at Beef Australia 2018 in Rockhampton, Queensland on the 9 of May. The former Deputy Prime Minister, the Honourable Tim Fischer AC, unveiled the future of precision agriculture, showcasing the eShepherd system. The event was very well attended with representatives from CSIRO, AUSTRADE and other government bodies, as well as station owners interested to see virtual fencing implemented on their properties. Agersens have plans to undertake some animal trials with these station owners in northern Australia in 2018.

› Engagement with the Farmer Panel continued with the fourth of a series of webinars run on 21 June 2018. About 25 people have registered at each webinar, with between 12 and 18 people attending each webinar.

› The fifth Milestone Report for the project is being prepared and will be submitted to the Department of Agriculture and Water Resources before August 2018.

Further information

Visit the Virtual Herding Program online at Dairy Australia.

The site contains information about project activities and recent news about the Project, including copies of a number of presentations that members of the Project Team have made to industry over the past few months.