Novel concept to allow automation of grazing management within a dairy farm system

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Introduction

The aim of this project is to develop (i) a decision support tool (DST) with global positioning system (GPS) capability, that precisely measures herbage mass and allows accurate and automatic allocation of the grazing area, combined with (ii) an on-cow virtual fencing (VF) system (also with GPS), to allow the fine resolution control of each cow at an individual and herd level, and which could replace electric fences in grazing management and might lead to a fully automated system.

Calibration and validation of DST (also known as "Grasshopper")

The "Grasshopper" has been developed and it's operation sequence is shown in Figure 1. Calibration and validation of the "Grasshopper" against the Jenquip rising plate meter is currently on its way.
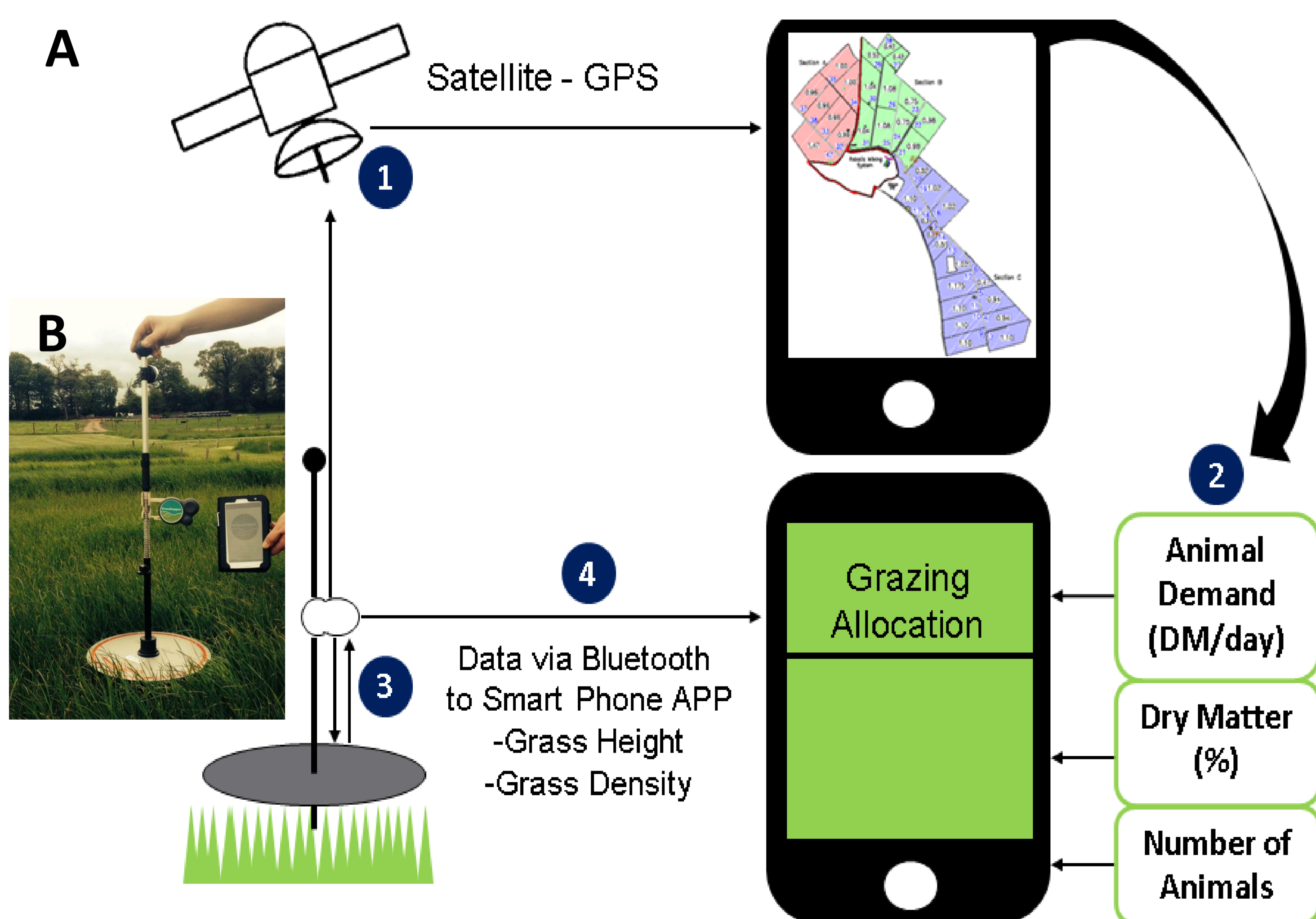

(1) The DST makes a connection to a satellite.
(2) On a smart phone app the operator pre-selects the measuring area and inputs other data required to calculate the herbage mass.
(3) Grass height measurements are then taken by the DST.
(4) The data is transferred to the smart phone app and the operator is informed of the grass height, herbage mass and where to place the (virtual) fencing wire within the paddock to achieve an accurate grazing allocation.

Figure 1: A) Decision support tool (DST) network and communication infrastructure required to estimate precise herbage mass within a paddock. B) The Grasshopper and smart phone/tablet application in operation.

Development of virtual fence technology for intensive grazing

An automated grazing guidance system on the basis of VF technology is currently under development and testing. The VF technology with GPS and it's operation sequence is shown in Figure 2.
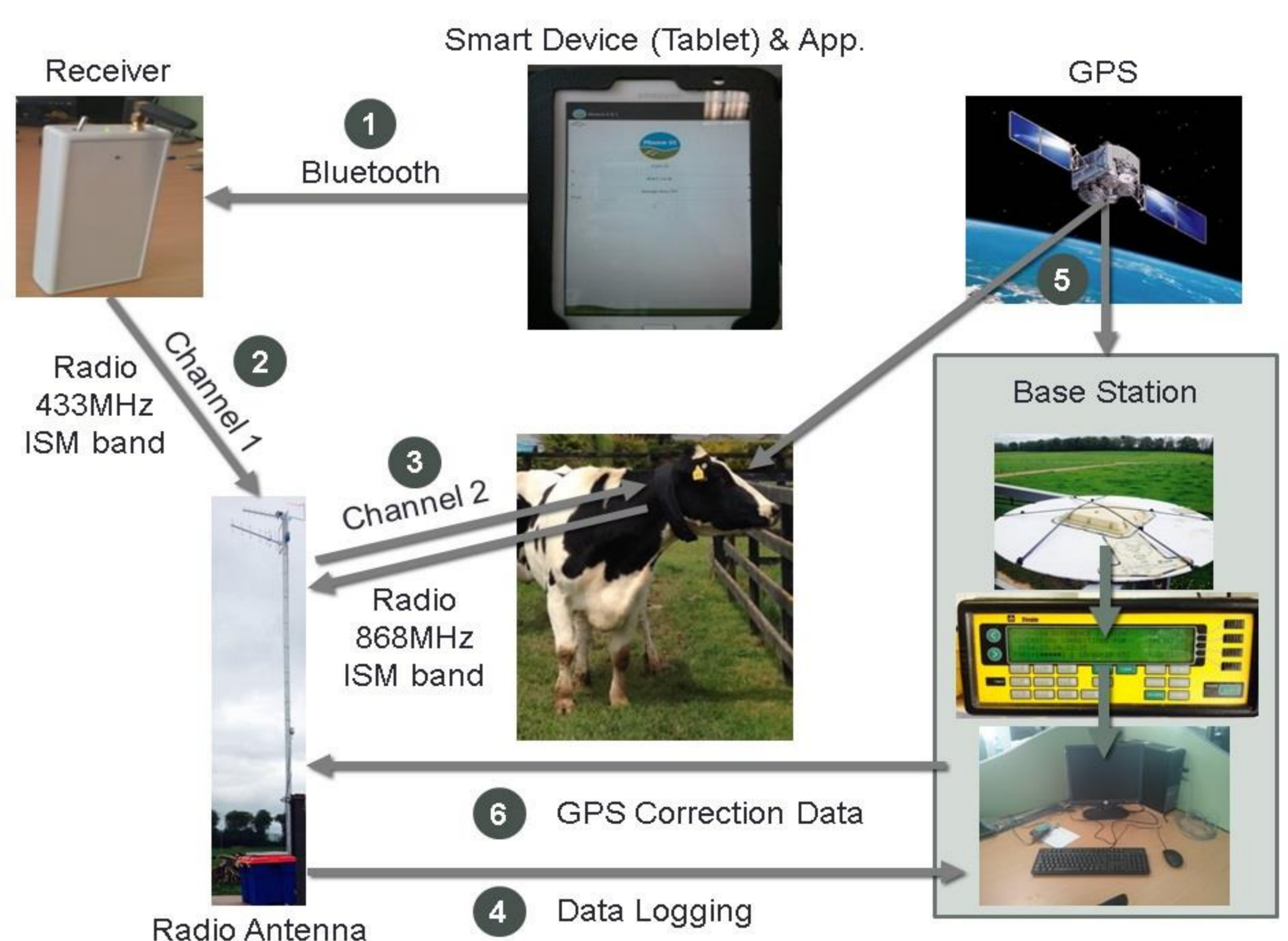
(1) Command sent from smart device to receiver,
(2) converted into a radio signal and sent to an antenna,
(3) command then sent from antenna to the cows VF collars and the response to the command is returned back to the radio antenna which
(4) transfers the data logged back to the base station via the internet cloud.
(5) GPS correction data is generated on-site before being processed for an individual cow.

Figure 2: Virtual fence (VF) communication network and infrastructure required to contain cows within an inclusion zone and to allocate pasture area for grazing.

Outlook

Research is progressing on the refinement of the DST and VF and in combining these technologies. It is anticipated that this study will optimize pasture utilization and advance the precision of grazing management .

Acknowledgements