Measuring pasture intake with Drones

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Queensland Department of Agriculture and Fisheries staff based at Gatton are substituting traditional methods for measuring pastures, such as transects and rising-plate meters, for drones equipped with small cameras (Photo 1). They not only believe they can accurately determine the available pasture crop mass in our paddocks, but also estimate how much of it our cattle have consumed and how much was left behind. For this objective, the researchers at DAF are currently flying a drone over lucerne and kikuyu field trials and gathering imagery that then can be processed at a later stage via a process called photogrammetry, into digital elevation maps (DEM) (Photos 2 and 3 – page 3). These maps display the height of the pasture across the paddock before and after cattle have grazed them. To ensure the best height accuracy, the drone and its camera have to be flown very slowly, usually less than two metres per second, to avoid any abrupt breeze that may shake the drone and introduce distortion to the imagery.

These DEM maps then go through a second process, this time a geographical information system (GIS) mapping package, that takes the heights of the pasture and converts them to biomass (kg dry matter (DM)/ha). The conversion of height to biomass is calculated through a set of calibration formulas developed from field measurement for each pasture or crop. The DAF team is currently developing calibration formulas for lucerne and kikuyu pastures, and will be tackling ryegrass this winter. Preliminary results already show a good correlation between lucerne height and yield pre-grazing and a very strong relationship for pasture utilisation, with potential for improvement for both equations.

The result of the process is two maps, the first shows the crop's mass (kg DM/ha) distributed over a paddock and the second, displays how much was consumed and how much was rejected by the livestock. This information is valuable, as the first map permits the farmer to balance pasture availability to the amount of grazing pressure being applied to each individual paddock and the second map assists with determining if the livestock are eating the amount allocated.

The current method for taking pasture imagery and generating these pasture intake maps is still too time consuming and convoluted to make it a tool that is easy for farmers to use. The first objective for DAF is to refine the current process until a satisfactory level of accuracy is achieved and then use the findings to assist with collecting more accurate data within research experiments. Ultimately, researchers may be able to simplify and remove some of the intermediate steps that will allow drones to be used on farm with an immediate measure of pre and post-grazing yield plus pasture intake and utilisation.

Photo 1: *The drone with a high resolution camera and ground control points with accurate GPS locations are necessary to accurately measure pasture height.*

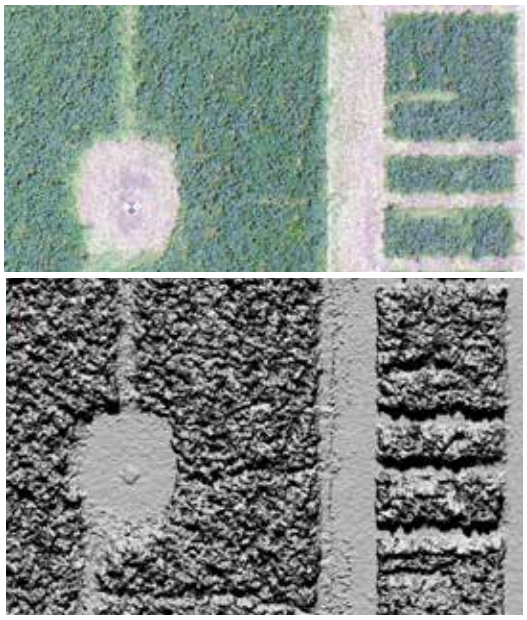

Photo 2. *Original aerial photo and digital elevation map of lucerne plots.*

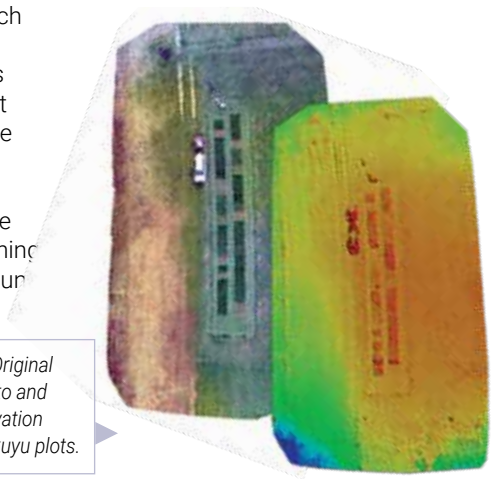

Photo 3. *Original aerial photo and digital elevation map of kikuyu plots.*