Project 4.18 I Biomass Business II - Tools For Real Time Biomass Estimation in Pastures

Project Leader Professor David Lamb, Precision Agricultural Research Group, University of New England dlamb@une.edu.au
Dr Mark Trotter, Precision Agricultural Research Group, University of New England mtrotter@une.edu.au

Research Team Dr Andrew Robson, Precision Agricultural Research Group, University of New England andrew.robson@une.edu.au

Project Participants University of New England, University of Canterbury (NZ), Sundown Pastoral Company, Twynam Agricultural Group and New South Wales Department of Primary Industries

Objectives
- Develop regional, seasonal and species-specific calibrations that allow biomass to be calculated from active optical sensor (AOS) outputs
- Develop a self-calibration process that enables producers to generate their own location-specific calibrations from AOS outputs
- Develop a Mobile Device Application (MDA) supporting the use of AOS as a real-time biomass estimation tool
- Create an MDA-server system capable of accepting self-calibration data from an MDA, and providing, to the MDA, algorithm upgrades
- Develop and deliver producer training packages around the use of the integrated MDA and sensor system

Outcomes The project team will investigate the influence of different pasture species, mixed swards, pasture nutrition, location and seasonal conditions on NDVI as measured by an AOS. Algorithms developed from the relationship between NDVI and green dry biomass will be incorporated into an MDA, that when integrated with 'crowd sourcing' technology will allow growers to rapidly measure pasture biomass across a range or pasture types and growing locations.


Figure 1. Point source measurement of biomass and corresponding spectral information. All data collection is standardised by using a frame for mounting the Greenseeker hand held and Crop Circle AOS's and a sampling quadrant that encompasses the on ground footprint of both AOS's.
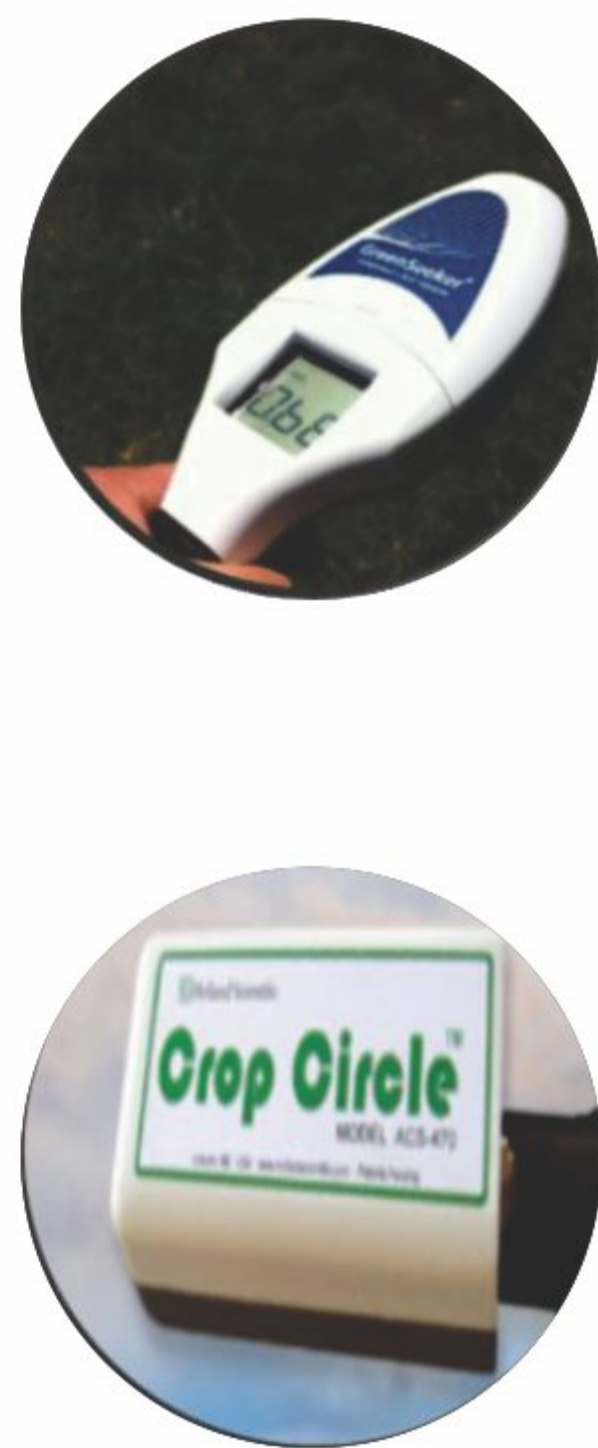
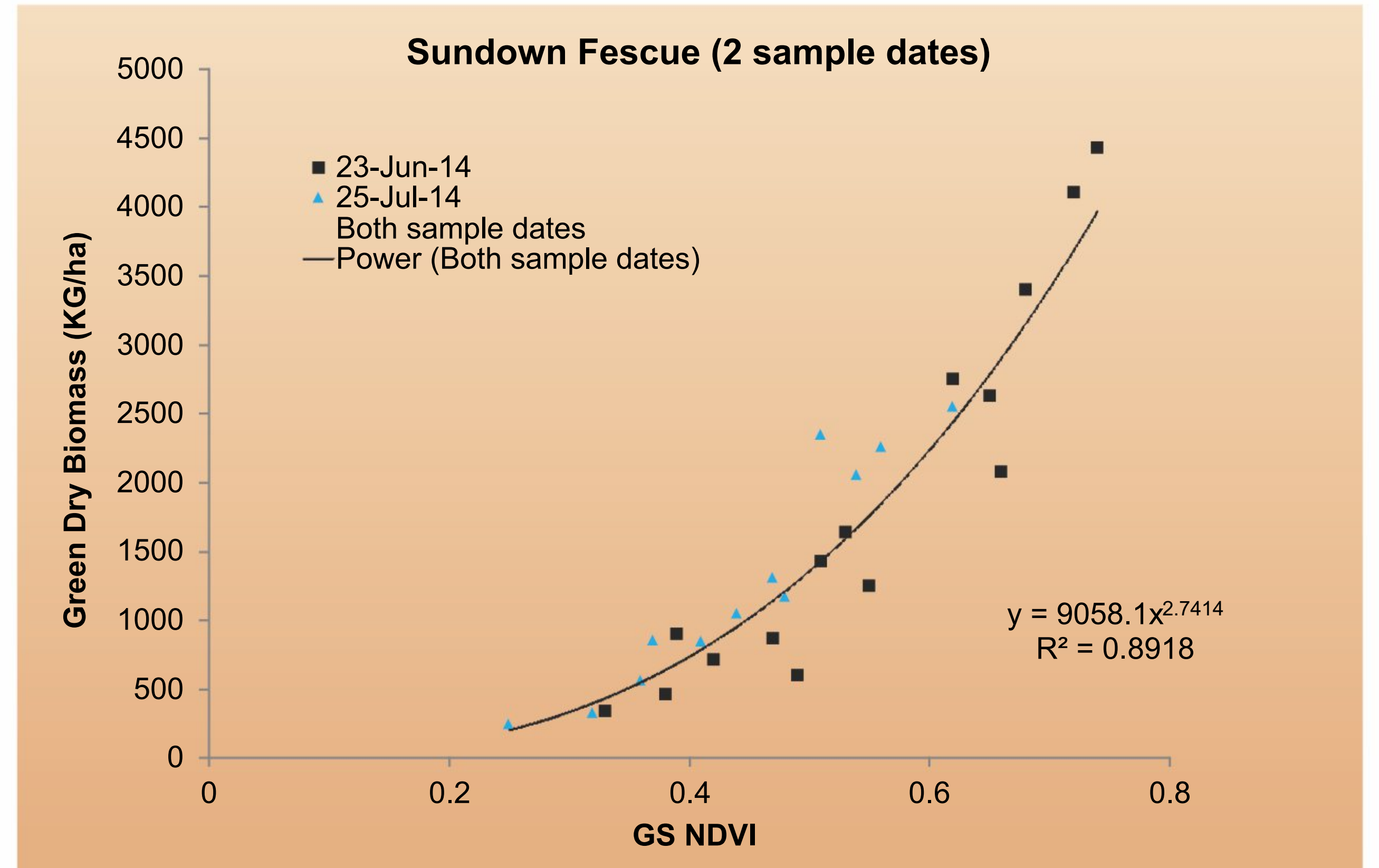**Figure 2.** GreenSeeker hand held and Crop Circle AOS.
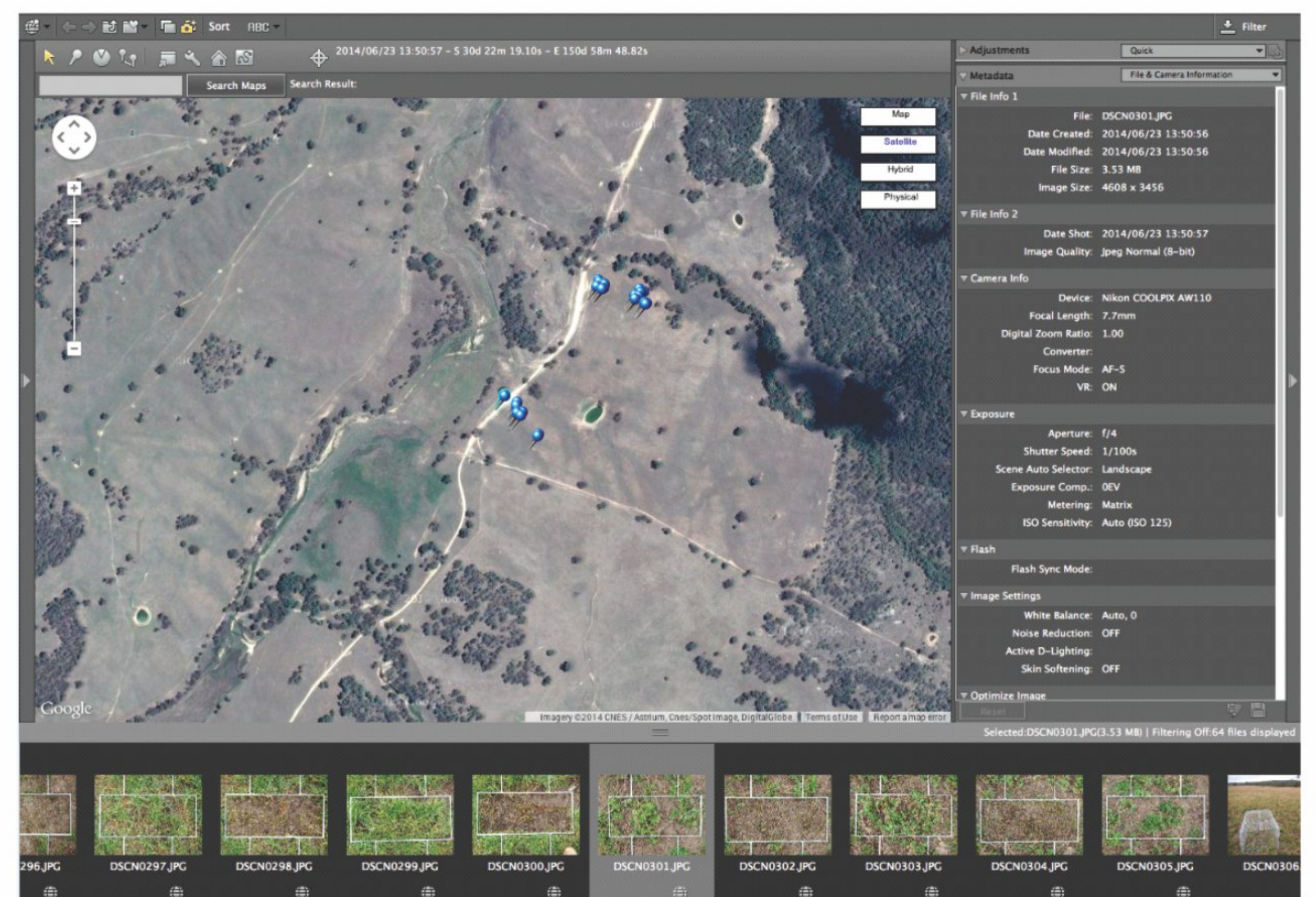
Figure 3. Example of a New England pasture with 15 sampling locations, shown as blue markers, providing a graduation from low to high NDVI and corresponding biomass. Digital photos taken of each sample site pre and post cut provide an indication of biomass density, amount of standing dead matter and pasture composition.
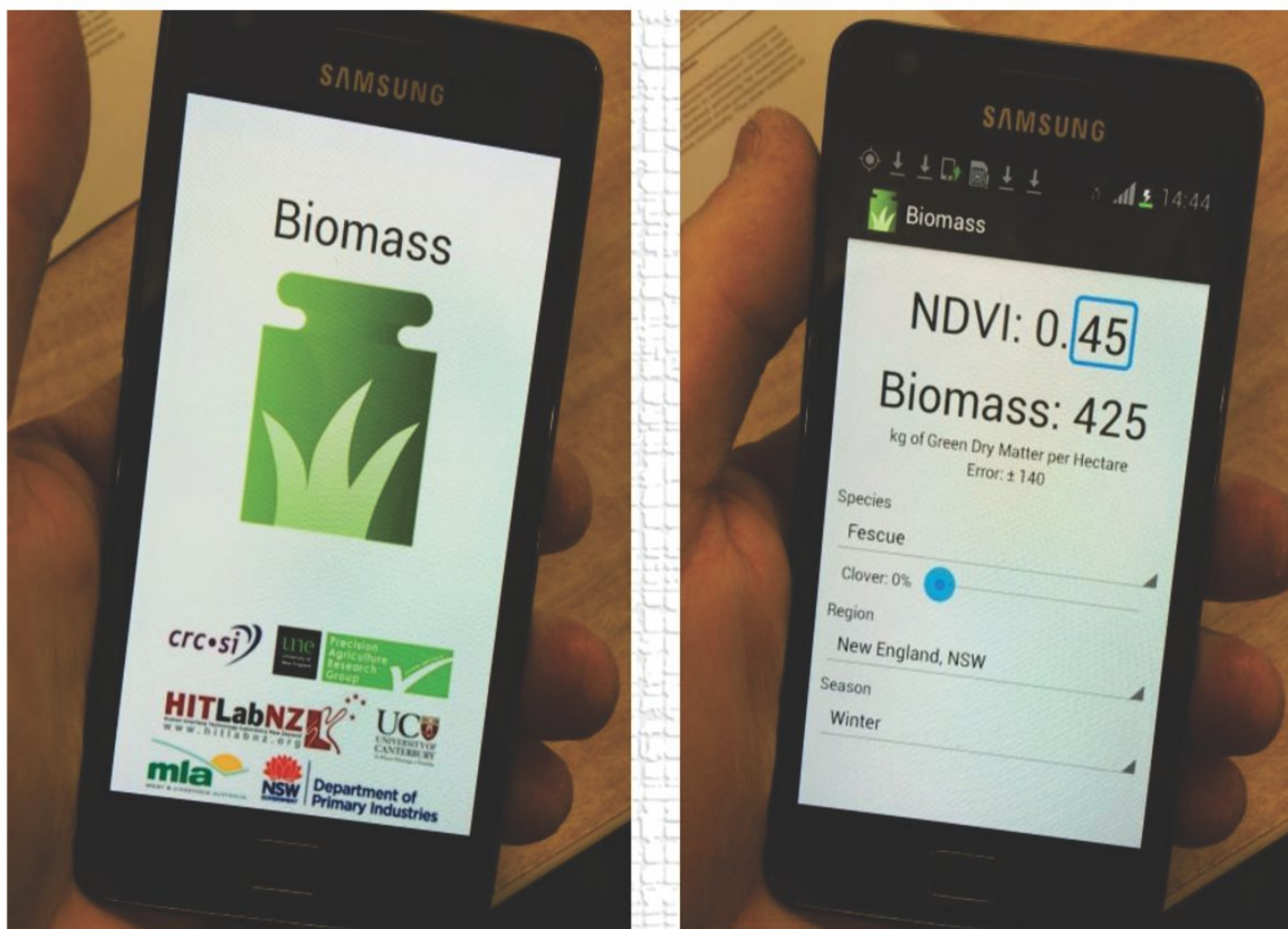
Figure 5. MDA developed for converting measured NDVI into green dry biomass using algorithms such as that presented in Figure 4.

Figure 4. Scatter plot identifying the relationship between NDVI and green dry biomass measured from a NSW Fescue crop sampled on 23 June and 25 July 2014.

$$y = 9058.1x^{2.7414}$$
$$R^2 = 0.8918$$

What is measured by the AOS?

The Greenseeker AOS measures NDVI (Normalised Difference Vegetation Index). This index provides an accurate measure of plant biomass by measuring both plant structure within the near infrared region of the electromagnetic spectrum and chlorophyll content via absorbance within the visible red.

Summary

This project delivers a novel integration between the non- destructive measure of pasture biomass through AOS technology and the rapid delivery of that information through an MDA. The addition of a 'crowd sourcing' framework allows graziers to undertake a rapid self calibration for their own specific pasture type, and growing region.