**Image Analysis for Mapping of Lentil Branch Architecture**

Dimech AM1, Kaur S1,2, Breen E1

*adam.dimech@agriculture.vic.gov.au*

1Agriculture Victoria, AgriBio Centre for AgriBioscience, Department of Energy, Environment & Climate Action, Bundoora 3083, Victoria, Australia

2 School of Applied Systems Biology, La Trobe University, Bundoora 3083, Victoria, Australia.

Crop architecture traits such as increased plant height and leaf size, and reduced branching are known to be positively correlated with yield in lentil. Glasshouse-grown plants were imaged regularly to evaluate lentil branch structure using a LemnaTec Scanalyser phenomics platform. A novel method for mapping and quantifying individual branch structures at regular intervals in young plants was developed using open-source software.

Branch structures (angle and length) were accurately quantified, forming novel phenotypes useful for further analysis. After the first four weeks of development, occlusions reduced the ability of the method to detect individual branch structures, but the information collected remains useful for trait estimation and prediction.

A pipeline was developed that analysed morphological skeletons generated from images of lentil plants. This program was incorporated into a PlantCV image analysis pipeline that measured the number, angle, geodesic and Euclidian lengths of individual branches, using queue-based data structure algorithms.

The accuracy of the method was determined against the ground truth obtained from a manual count of the same images; a visual inspection of the skeletons representing the main branches overlaid against the original RGB images and correspondence between images of the same plant taken from two angles 90-degrees apart.

We further envisage that this method, using image analysis, and the subsequent detection of novel phenotypes could be applied to other dicotyledonous species to further understand plant development and responses to environmental change.