



SRA Principal Researcher,
Dr Jaya Basnayake.

Project details

Key Focus Area

Optimally adapted varieties,
plant breeding and release

Project name

Improving early stage selection
of SRA breeding program by indirect
selection of plant vigour

Project number

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Chief investigator

Dr Jaya Basnayake

Eye in the sky to help modernise sugarcane plant breeding

It is hoped that the use of drones will be able to provide vital information on potential new varieties through the growing cycle, delivering benefits to new varieties that are bred for sugarcane growers and millers.

Cutting-edge technology is being used to assess how potential new sugarcane varieties perform through the growing cycle, with the aim of delivering better varieties sooner for the Australian sugarcane industry.

Currently, the main method of assessing the performance of a potential new sugarcane variety in the SRA breeding program comes at harvest time.

Just as growers and millers know the real test of a crop is when the harvester enters the paddock, the performance of potential new varieties is assessed the same way.

But can new technology, such as unmanned aerial vehicles (or drones), be used to capture data on how a variety is growing and performing through the season?

Drones are already being used by a small number of growers to assess their crops and minor weeds, and it is hoped that by combining these with other technologies they can be used to provide additional information to aid sugarcane breeding programmes.

At the moment, plant breeding works on very large numbers of clones with around 250,000 individual clones entering the first stage (Progeny Assessment Trials or PATs) of the breeding program, making manual data collection difficult.

But new technology called Phenotyping is being used in conjunction with drones to observe and measure differences in physiology, growth and other traits within a population of plants.

In effect, it provides a greater picture of the life cycle and could improve

the efficiency of selecting potential new sugarcane varieties.

"It is like bringing up a child. Being able to look at the person all through their childhood helps you understand their potential, rather than just looking at them as an adult," explains SRA Principal Researcher for Trait Development, Dr Jaya Basnayake.

Phenotyping is a challenging area of plant breeding and can be labour intensive as it requires manually harvesting and assessing plants for particular criteria or visual ratings.

However, the use of drones fitted with a range of cameras and sensors and integrated software is hoped to enhance this process and make it much more feasible.

The rapid and dense growing nature of sugarcane means that having the ability to capture information from the air is valuable.

“The aerial platform allows us to take measurements in a short time. Within 15-17 minutes we can survey seven hectares of crop,” Jaya said. “Our goal is to then provide that information to the plant breeders so they can better understand how those plants behave and incorporate that information into their normal breeding program.”

Using the drone platform as a research tool is expected to provide a mass of information that would allow potential new varieties to be assessed at an earlier stage in the breeding trials.

This trial work is currently occurring in the Burdekin, where Jaya is based.

Two factors that will be measured include canopy temperature (a proxy for canopy conductance) and crop vigour which if measured at the correct time can be associated with yield.

The project aims to validate the use of canopy temperature and canopy conductance as a predictor of yield with clonal assessment trials within the breeding program.

“This is a new concept for breeding, especially for sugarcane. It has been done with corn and wheat, in which the knowledge of physiological parameters has been incorporated into the breeding program to increase the predictability in yield,” Jaya said.

“But this is a first in sugarcane. We are responding to requests from industry to modernise the breeding program and find ways of further improving our trait selection.

“Most of this work is based on our experience and with other crops, but we know we are leading the way globally.”

The work that is occurring now will use a mini Clonal Assessment Trial (CAT) to compare ground based measurements with observations from the drone.

It will use multiple layers of data to see how the progeny perform and assess which ones are growing quickly, or slowly, as well as high biomass at three and five months.

The technology is currently somewhat restricted by the capabilities of the cameras and sensors on board the drone. That is why it is currently assessing ‘groups’ of varieties via the CAT stage.

Jaya said that as the research advances and the technology improves, the long-term goal is to use this method to select individual plants within a trial.

It is also hoped that the technology will reduce the variability in observed physiological traits that are influenced by weather. Each year, potential new varieties may perform very differently depending on the weather conditions.

By providing assessments through the growing cycle, this research hopes to even out some of those issues, and ultimately deliver better varieties for Australian sugarcane growers and millers.

More information

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Below left: The drone is a powerful tool to assist the research.

Below right: Images captured from the drone.

