*(Below) One of SRA's drone pilots,
Johan Deutschenbauer collecting data with
the unmanned aerial vehicle.*

A NEW EYE IN THE SKY
FOR SUGARCANE BREEDING

DRONES ARE STARTING TO BUZZ IN THE SKY ABOVE SOME SRA
VARIETY TRIALS, PROVIDING VALUABLE DATA FOR RESEARCHERS
TO HELP THEM DELIVER BETTER OUTCOMES FOR INDUSTRY.

These photos are from the same variety trial in the Burdekin, six months apart.

On the left, the crop is six months old and on the right the crop is 12 months old, heavily lodged and approaching harvest.

For sugarcane breeders, the objective of a clonal assessment trial (CAT) like this is to narrow down the 2500 or so potential varieties to about 250 strong performers that can progress to the final assessment trial (FAT) stage.

But collecting data from the tangled crop on the right to assess yield, CCS and fibre can be a significant challenge that has always been part and parcel of sugarcane breeding, especially in the Burdekin.

On top of trying to collect accurate data from large and lodged cane, there is also the potential for errors in measurements due to factors such as paddock variation or other environmental factors that can impact the selection of potential new varieties.

However, SRA researchers have recently begun to explore ways to collect accurate information on variety performance, well before the harvest stage, with the hope of making the process simpler and more accurate, which will lead to improvements in the breeding program.

This is now becoming a reality through specialist equipment such as unmanned aerial vehicles (UAVs), also known as drones, equipped with an array of advanced cameras and sensors.

These tools are being used as one of a suite of measures that is modernising and improving the Australian sugarcane breeding program led by SRA.

This work has been centred on the Burdekin in recent years under the leadership of Dr Jaya Basnayake. Following Dr Basnayake's recent retirement, Sijesh Natarajan has taken on the reins of this SRA-funded research investment, via a new project that commenced earlier this year called *Validating high-throughput phenomics technologies for sugarcane clonal selection.*

"There have always been challenges with collecting data from clonal assessment trials and the conditions we face in the cane industry dealing with a very large biomass crop," Sijesh said.

"Through this work, we are working toward a point where we are collecting much more information about variety characteristics and ensuring that the best possible clones make it through to the next phase of the breeding program."

The drones collect data that is not possible with traditional methods. They are equipped with cameras that can measure different wavelengths of light, temperature, and also make a visual assessment.

Using a pre-programmed flight path, they can cover a 5-6 hectare trial in under 20 minutes, with the thousands of images then stitched back into a detailed picture using sophisticated computer software.

It is hoped that the use of the drones and their cameras will make the process easier and more precise, ultimately leading to better sugarcane varieties for growers and millers.

Sijesh said that one of the critical components of the new project was to determine how the assessments from the drone compare to the traditional assessments.

"Currently there is only a 40 percent overlap between potential selections from the traditional methods and from the drones. Our statistical predictions indicate that drone-based selection is better, but we need to validate this through experiments," he explained.

"The research has moved from the discovery phase to the validation phase, and we hope that by the end of the current project we will be into the implementation phase."

Overall, he said the project was targeting an increase in yield and improving the rate of genetic gain in the breeding program.

"This work is enabling us to have a greater understanding of the interaction between genotype and the environment, while shifting selection to a method that is more comprehensive and precise.

"It also offers the potential of using the sensors on the drones to look at new variety traits that haven't been considered before.

"Cane as a crop lends itself to taking advantage of this technology and we are working hard at using these tools to deliver a practical outcome for the industry." ∎

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