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A \$50m fillip for the plant breeder game

By ALAN DICK

AUSTRALIAN plant breeding programs could reach unprecedented levels of efficiency and precision as the result of a rare \$50 million investment in high-tech facilities in Canberra and Adelaide.

Known collectively as the Australian Plant Phenomics Facility (APPF), the two centres will allow automated, non-invasive screening of potential parent lines for breeding programs for cereals, oilseeds, coarse grains and horticulture plants for key characteristics such as tolerance to drought and salinity.

APPF is by far the largest publicly owned facility of its type in the world, and both public and private breeding programs will use the information it produces.

"Big private companies have them but they don't usually share the information," said engineer and plant scientist at Canberra, Dr Xavier Sirault.

The centres use remote sensing equipment, including infrared video cameras, to assess physical attributes as the plant grows, such as growth habits, canopy area, root structure and temperature changes due to saline soil, without needing to pull the plants apart as happens with traditional research methods.

Software is being developed to

process results rapidly.

The work will help scientists understand physiological mechanisms behind traits such as salinity tolerance, identify genes responsible and develop gene markers for breeding programs.

The Canberra facility, known as the High Resolution Plant Phenomics Centre (HRPPC), is co-located at CSIRO Plant Industry and the Australian National University and has been operating since late August.

The Plant Accelerator at the Adelaide University's Waite Institute was officially opened in late January this year.

Project finance came from the Federal Government under the National Collaborative Research Infrastructure Strategy, the ACT and South Australian governments, CSIRO, and Australian National and Adelaide universities.

Research groups in Australia and overseas are queuing up to run projects through the facilities on a cost recovery basis.

One early project with the International Rice Research Institute in The Philippines, aimed at breeding high yielding rice varieties more efficient at using water and nitrogen, is being funded by the Gates Foundation, set up by Microsoft founder, Bill Gates.

The Canberra facility is focusing mainly on developing improved technology to screen plants by non-invasive means and handles relatively small numbers, while Adelaide is set up for broader screening of large numbers of plants – up to 160,000 a year.

Dr Sirault said the Canberra operation had four modules: one for assessing "model" plants whose genome had been sequenced as a guide to what to look for in commercial crops, others for crop shoot and roots, and a field module at nearby Ginnindera where remote sensing equipment would be used in trial plots.

"We have a little buggy that goes out over the plot armed with infrared cameras and other sensors," he said. "We can use it to measure plant response to stress and calculate the amount of carbohydrate or water in a crop."

Head of the Plant Accelerator at Adelaide, Professor Mark Tester, said researchers could follow the response of plants "to the abuses we throw at them – diseases, drought, salt".

His interest is in drought and salinity tolerance in wheat and barley; others want to research mangoes, sugar cane and grape vines.