

Australian Plant Phenomics Facility Accelerates Saudi Arabian Soil Salinity Research

Challenge

Dryland salinity, the gradual loss of farm and grazing land to rising salt, is a massive problem, hard to comprehend and harder still to stop. There is salt everywhere in Australia; vast amounts of it, mostly located underground¹.

Agricultural productivity is severely impacted by increased soil salinity, a major challenge at a time where grain production is struggling to meet global demand.

Scientists around the world are investigating how salinity affects plant growth in an effort to develop crops that are able to thrive in sub-optimal soil conditions.



How did the facility help?

Professor Mark Tester and his research group at the Center for Desert Agriculture at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia work closely with experts of The Plant Accelerator® at the Australian Plant Phenomics Facility located on the Waite Campus of the University of Adelaide.

Research undertaken at KAUST aims to improve desert agriculture by increasing the tolerance to salinity of existing crops, such as wheat, barley and tomatoes. Whilst Professor Tester's group is undertaking large scale experiments in the field in Saudi Arabia, the group is also running four consecutive experiments at The Plant Accelerator® to investigate salt tolerance in over 4,000 barley plants.

The Plant Accelerator® offers automated greenhouses that are fitted with high-throughput plant phenotyping infrastructure where plants are grown in different environments (e.g. saline soils) on conveyor systems, able to transport them to automated watering and imaging stations. The images taken during plant growth are analysed and translated into data that provides researchers with information on plant performance over time.

The Plant Accelerator® is the only publicly available facility of its kind and scale in the world enabling researchers such as Professor Tester's team to accelerate their research findings through access to novel technologies.

Outcome

The experiments being undertaken at The Plant Accelerator® will uniquely provide quantitative information on the effects of salinity on several aspects of plant responses to salinity. These measurements cannot be obtained by any other facility globally. Being able to understand the

¹ <http://www.abc.net.au/science/slab/salinity/default.htm>

genetic basis of these responses to salinity will enable plant breeders to introgress these previously unstudied traits into crops such as barley and wheat, and thus increase salinity tolerance of these crops. It is hoped that further experiments with tomatoes and rice will be undertaken in 2015.

The work has led directly to a close international collaboration between Australia and a new world-class University in Saudi Arabia, KAUST, and involved the visit to the Australian research facility of a student and a postdoctoral scientist from Saudi Arabia.

The staff at The Plant Accelerator® have been extremely helpful and skilled, being far more than “just” a provider of a service. They have contributed significantly to the intellectual and technical development of the project, which has become a collaboration, and they have done this very efficiently and in a very friendly manner. The research infrastructure of the APPF is superb. I look forward to returning in 2015 for more experiments.

Professor Mark Tester, King Abdullah University of Science & Technology, Saudi Arabia

Background

The Australian Plant Phenomics Facility (APPF) was established in 2007 under the NCRIS 2006 program. As a world leading centre for innovative plant phenomics research, the APPF helps accelerate the development of new and improved crops, healthier food and more sustainable agricultural practice.

With nodes in Adelaide and Canberra, the APPF facilitates new research programs in plant and agricultural science by providing access to high quality plant growth facilities and state-of-the-art automated phenotyping capabilities in controlled environments and in the field. The facility offers high level consultation and expertise in plant phenomics including project design, statistics, automated imaging, image analysis and data management.

The APPF employs a multi-disciplinary team of experts (30 FTE) in the fields of plant science and biotechnology, mechatronic engineering, bioinformatics and computational science, horticulture, business management and equipment maintenance.

The facility is available to publicly funded and commercial organisations worldwide and to date has provided access to phenotyping services to 25 universities and public research organisations from Australia, Germany, Mexico, USA, the Philippines, Canada, Saudi Arabia, Scotland, as well as ten agribusinesses from Australia, France, Switzerland, Belgium, Germany and the USA.

Commonwealth funding for the APPF has included \$14.85 million over the period 2007/08 to 2011/12 under the NCRIS 2006 program, \$3.28 million for the period June 2013 to December 2014 under the Collaborative Research Infrastructure Scheme, and \$3.44 million for the 12 months 2014-2015 under the NCRIS 2013 program.