

The sharp edge: Committee to examine technological advancement in agriculture

Submission from the Australian Plant Phenomics Facility

Summary

The Australian Plant Phenomics Facility (APPF), funded by the National Collaborative Research Infrastructure Strategy (NCRIS), is at the leading edge of agricultural innovation when it comes to developing and using new technologies to improving crop performance and agronomic practices. Outputs from the facility are contributing towards increasing the effectiveness and productivity of plant breeding programs in Australia and enabling farmers to achieve higher yields with less impact on the environment. By facilitating the deployment of new technologies for monitoring field trials, measuring plant growth in the field (using motorised buggies and drones), accessing real-time information for decision making, and understanding plant growth in response to environmental stresses, the facility provides a competitive advantage for Australia.

Recommendation

The APPF strives to address the issues raised in the terms of reference of this enquiry and continued funding of the NCRIS scheme will allow this to continue.

Background

The Australian Government, through the NCRIS scheme, is currently funding the Australian Plant Phenomics Facility which is open to all Australian plant scientists. It offers access to an infrastructure that is not available at this scale or breadth in the public sector anywhere in the world. The facility leverages from improved access to new sensor technologies and exploits recent advances in robotics, imaging and computing to enable sensitive, high throughput analyses to be made of plant growth and function. New sensing technologies are integrated on an on-going basis to ensure that Australia remains at the international forefront of agricultural innovation. Research networks and established pathways to market ensure

outcomes flow to Australian primary producers for the long-term benefit to the Australian economy.

Our focus is on:

- enabling fundamental research for identifying genes of economic importance;
- screening of major staple crop species preserved and available in genebanks;
- developing crops better able to use applied fertiliser;
- developing crops with better tolerance to stresses such as heat, drought and salinity;
- improving decision making in crop management and sustainable practices in agriculture;
- unravelling traits to cope with climate change.

Addressing the terms of reference

Improvements in the efficiency of agricultural practices due to new technology, and the scope for further improvements;

Improving efficiency of agricultural practices in a crop production system involves producing more in an increasingly stressful environment (e.g. higher yield) while reducing inputs at the same time. This can be achieved through improved agronomy (growing crops better) and plant breeding (improving the crops themselves). Whichever method is used requires improved measurement of plant growth and yield. The APPF is developing new sensitive technologies to discriminate between plants and making this technology available to Australian plant scientists and the greater agricultural community.

Emerging technology relevant to the agricultural sector, in areas including but not limited to telecommunications, remote monitoring and drones, plant genomics, and agricultural chemicals;

The APPF is at the forefront of accessing and developing new technologies to enhance the competitiveness of Australian agriculture. Understanding crop performance requires accurate assessment of both plant growth and the environment in which plants are grown, key areas of APPF research. Rapid developments in plant genomics has led to a bottleneck in characterising plant growth related to genetic variation another focus of APPF.

Technologies included in the APPF portfolio include, but are not limited to:

- High throughput measurement of field trial performance with drones and custom made phenotyping buggies;
- Wireless sensor networks to remotely monitor environmental conditions and plant growth in field trials;
- State of the art plant growth facilities that allow the control of environmental conditions to speed up the development of improved plant varieties;
- Innovative imaging systems to assess plant health via proxy sensing technologies both in the field and in controlled environments;
- High throughput robotic systems to grow and measure plant performance based on image analysis.

Barriers to the adoption of emerging technology.

The adoption of new technology can be limited by lack of expertise required to deploy the technology. The APPF has expertise in a range of technologies at the forefront of advancement of agricultural practices. Another barrier to the adoption of emerging technologies is the lack of expertise required to assess which technologies to apply.

Technology suppliers aiming to sell solutions can set back adoption of technology by overselling the capabilities of their systems, when technology does not live up to expectations this can set back the adoption of worthwhile technologies. Having independent capacity available to help guide industry wide deployment of new technologies is vital and is available through the APPF.

Another limitation to the adoption of emerging technologies is cost, some of the new technologies are expensive, restricting access to the Australian agricultural science community. The APPF is a resource available to agricultural researchers throughout Australia, enabling access to technologies that would be unfeasible for individual groups.

Contact details

Dr Xavier Sirault

Director, High Resolution Plant Phenomics Centre
Australian Plant Phenomics Facility
CSIRO Agriculture
Cnr Clunies Ross St and Barry Dr
Canberra ACT 2601
Australia

Dr Trevor Garnett

Director of Technology Development, The Plant Accelerator
Australian Plant Phenomics Facility
The University of Adelaide,
Waite Campus
Glen Osmond, South Australia, 5064