APPN
Australian Plant Phenomics Network

Strategic Plan

2023-2028

plantphenomics.org.au

We are proudly supported by

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

APPN plant phenotyping infrastructure and expertise is strategically located at nine locations across Australia:

The University of Adelaide
Australian National University
Charles Sturt University
Department of Primary Industries and Regional Development
Government of Western Australia
Western Sydney University
La Trobe University
The University Of Queensland
The University of Sydney
The University of Western Australia

Contents

Foreword

We are pleased to present the 2023-2028 APPN Strategic Plan.

The Australian Plant Phenomics Network (APPN) is part of Australia's National Collaborative Research Infrastructure Strategy (NCRIS). The NCRIS-enabled APPN is a distributed network of national research infrastructure platforms offering open access to state-of-the-art plant phenomics technologies, tools and expertise, used by academic and commercial scientists.

This plan represents an exciting era of growth for the APPN team. In 2023 the federal government through its NCRIS program awarded APPN a major boost in funding to expand nationally and into new modalities of phenotyping science. With growth came a significant expansion from two Nodes in Adelaide and Canberra to a total of nine Nodes strategically located across mainland Australia. Our national network now includes:

- The University of Adelaide at Waite and Rosedale
- Australian National University at Canberra
- Charles Sturt University at Wagga Wagga
- Western Australian DPIRD at Merredin and Northam
- La Trobe University at Bundoora
- The University of Queensland at Saint Lucia and Gatton
- The University of Sydney at Narrabri
- The University of Western Australia at Perth
- The University of Western Sydney at Richmond

APPN is developing a truly national plant phenotyping asset that will accelerate progress in plant science and deliver real benefits for researchers, industry, farmers and consumers.

Rapidly improving the resilience and productivity of food crops and farming systems is considered vital to economic and food security in Australia and around the world. APPN's diverse infrastructure will help researchers to understand and develop crops with higher yields, greater disease resistance and/or tolerance to increasing heat, drought and salinity, so that farmers are equipped to meet general production constraints along with new challenges related to climate change and population growth.

With infrastructure in every mainland state, APPN will offer researchers an array of controlled and field growth environments across a diverse range of cropping climates. These sites will all provide sophisticated imaging systems, scanners and sensors, supported by in-house expertise in plant science/ botany, mechatronics, computer vision, machine learning and data science.

It means crop developments can be accurately assessed and validated from early genetic and controlled growth studies all the way to through to large scale field trials prior to commercial release.

APPN will enable researchers to accurately evaluate exciting new advances in grain, tree crop, horticulture and fibre crops across cool, temperate and tropical regions.

We are incredibly excited by the expanded capabilities of the Australian Plant Phenomics Network and our nationwide team of experts is poised to enable a step-change in Australia's food production, plant research and data science capacity.

This strategy reflects significant feedback from our team and an intimate knowledge of agriculture, infrastructure and innovation. The plan has been developed considering our operating environment, our strengths and weaknesses and our opportunities moving forward. We are proud to showcase our mission, vision and values along with our detailed goals, actions and KPI's.

Our team is geared to provide benefits to the Australian agricultural community, and we are proud to be one of Australia's leading infrastructure facilities.

Richard Dickmann
Chief Executive Officer

Dr Ron Sandland AM FTSE
Chair, Advisory Board

APPN Strategic Plan on a page

Mission

This mission statement specifically sets out APPN's unique role and contribution to the Australian agricultural research environment.

APPN infrastructure helps accelerate plant research outcomes that resolve agricultural challenges by:

- **Open infrastructure:** Providing researchers and industry with open access to leading plant phenotyping infrastructure and multidisciplinary expertise to deliver practical insights into crop performance.
- **Remote access**: Providing innovative mobile phenotyping services to remote field sites across Australia.
- **Frontier technologies:** Innovating, adapting, evaluating and offering frontier technologies to enable research excellence under Australian conditions.
- **Knowledge networks:** Developing new and improved plant phenotyping methodologies via a co-ordinated national network that encourages knowledge transfer, resource sharing and collaboration.
- **Data excellence:** Developing common approaches to the capture, analysis and storage of data, underpinned by FAIR (findable, accessible, interoperable, and reusable) data principles, to produce new national data sets and insights.
- **Skills and training:** Upskilling researchers, students, stakeholders and APPN staff to maintain Australia's leadership position in the world of plant phenomics.

Vision

"Australian plant science transformed using innovative phenotyping, automation and data science solving our nation's biggest agricultural challenges."

Our vision statement describes the future that APPN is working towards. While many people may contribute to achieving this vision, APPN and its staff consider that it can make a major and distinct contribution.

Values

While our Mission and Vision sets out the 'What' and 'Why' of our network, our Values declare 'How' APPN operates.

APPN's values are based on two overarching principles:

- As part of NCRIS we must be national in scope, primarily focussed on targets of the common national good and collaborative in nature.
- We seek a 'one-APPN' culture that should be common across facilities and serve the overall interests of APPN.

APPN is committed to five core values that we see as critical to our success as an organisation:

Integrity
We hold ourselves to the highest standards of honesty, integrity and scientific excellence in everything we do.

Innovation
We continually encourage innovative ideas and practices that can deliver real world advances in plant phenotyping.

User focus
We provide high quality services that are responsive to the needs and expectations of our users and partners.

People
We create a safe, positive environment for all those involved in our network, and remain mindful of the impact and importance of our work in the wider community.

Collaboration
We promote a highly engaged community of practice focused on achieving the very best plant phenotyping methodologies and scientific outcomes.

These values provide high level guidance for our team.
APPN also fosters a cultural framework that links these values to our operating principles, procedures and individual actions.

Plant phenomics

Breaking through research bottlenecks

Phenomics data accelerates the discovery of molecular markers and the development of novel germplasm to support improvements in crop performance, yields and sustainable farming practices.

Plant phenotyping can be as simple as observing crops in the field from season to season – and has been practised for millennia. Scientific and laboratory phenotyping is usually far more exacting and can require detailed analysis of hundreds of plants per project.

In their paper 'Phenomics – technologies to relieve the phenotyping bottleneck' (Furbank RT & Tester M (2011) *Trends in Plant Science*, 16, 635-644), Robert Furbank and Mark Tester described plant phenomics as follows:

> *"Plant phenomics offers a suite of new technologies to accelerate progress in understanding gene function and environmental responses. This will enable breeders to develop new agricultural germplasm to support future agricultural production."*

They went on to say:

> *"Plant phenomics is the study of plant growth, performance and composition. Forward phenomics uses phenotyping tools to 'sieve' collections of germplasm for valuable traits. The sieve or screen could be high-throughput and fully automated and low resolution, followed by higher-resolution, lower-throughput measurements. Screens might include abiotic or biotic stress challenges and must be reproducible and of physiological relevance. Reverse phenomics is the detailed dissection of traits shown to be of value to reveal mechanistic understanding and allow exploitation of this mechanism in new approaches. This can involve reduction of a physiological trait to biochemical or biophysical processes and ultimately a gene or genes."*

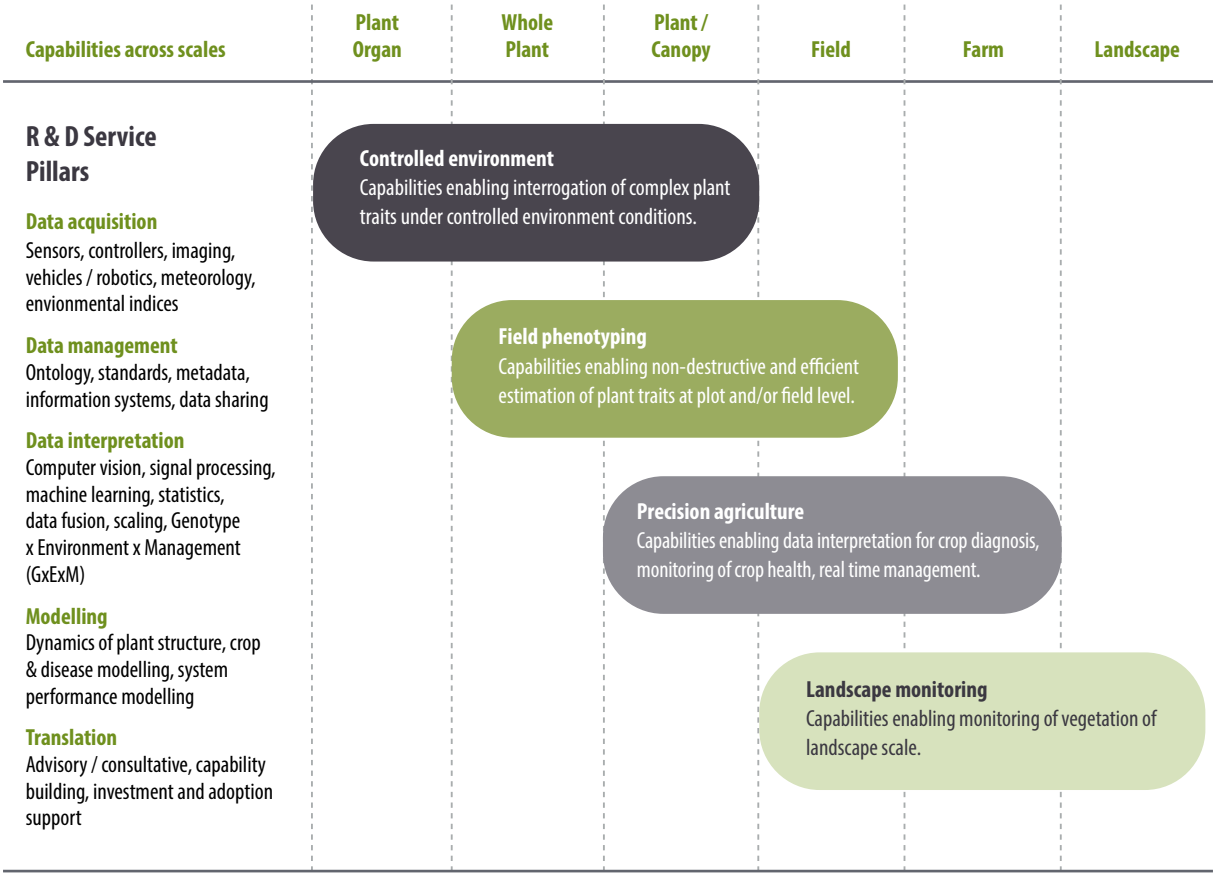
APPN provides infrastructure to automate and digitise these processes, allowing them to be performed at volume and non-destructively so the same phenomics can be observed temporally through the entire lifecycle of the plant.

Naturally dynamic growing environments can also delay or compromise research into a specific response by the subject plant. APPN's controlled growth facilities allow researchers to accurately manage specific conditions so growth times can be optimised and phenotypic responses to a specific influence can be more easily isolated.

Solutions and opportunities

Digital plant phenotyping combines high precision sensors, data management and robotics to dramatically accelerate the quality and rate of data captured from experimental plant science research trials.

These techniques can accelerate and improve research trials at all scales, from small experiments conducted within controlled environment facilities, through fixed and mobile field sites to landscape level assessments.



By measuring how plant performance is influenced by genetic makeup, the growing environment and management practice, phenomics can help tackle the most pressing agricultural challenges.

Phenomics data capture enables the more rapid discovery of molecular markers and faster germplasm development, aimed at improving crop yields and resilience of crops to biotic and abiotic stresses such as drought, salinity and pathogen attack.

About APPN

APPN provides infrastructure and solutions to tackle some of the key challenges facing Australian agriculture.

APPN is a coordinated national network of nine research infrastructure nodes hosted by renowned plant research organisations across Australia.

We provide open access to state-of-the-art plant phenotyping technologies, underpinned by multidisciplinary expertise and FAIR data principles, to enable research excellence and innovation, and to accelerate research output.

APPN is funded through the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS).

Our purpose is to provide access to globally-leading research infrastructure and supporting services in sensing, imaging and analytics that enable impact in plant science and digital and precision agriculture.

Our vision is Australian plant science transformed using innovative phenotyping, automation and data science solving our nation's biggest agricultural challenges.

MAP KEY

Plant phenotyping capabilities

- National suite of controlled environment facilities
- Network of nationally coordinated field sites
- Mobile phenotyping units to serve rural areas and field trials
- National Climate Observation Unit Network
- Collaborative Data Network

A The University of Adelaide
B Australian National University
C Charles Sturt University
D Department of Primary Industries and Regional Development
E La Trobe University
F The University Of Queensland
G The University of Sydney
H The University of Western Australia
I Western Sydney University

Capabilities

The technologies and expertise developed by the APPN are world-leading, internationally recognised and have ensured Australian science is an attractive partner for international collaboration.

APPN provides the full spectrum of modern growth facilities, from temperature controlled environment facilities through to state-of-the-art, automated, high-throughput and deep phenotyping technology in large-scale Smarthouses.

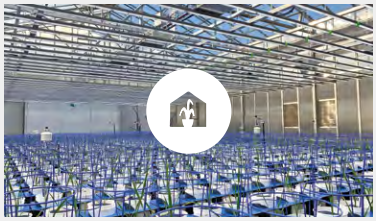
We offer a network of nationally coordinated field sites and mobile phenotyping units. We also have a distributed network of climate observation units.

APPN provides a suite of static and mobile cameras and sensors to support high-throughput and deep phenotyping in the field from the air and on the ground, including use of unmanned aerial vehicle (UAV) platforms and large scale crop phenotyping and analysis.

Each node has unique specialised facilities that interlink to provide a complementary, seamless service to users and are underpinned by FAIR and open data platforms.

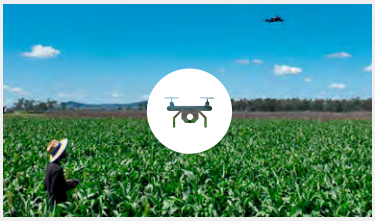
Core capabilities

Plant phenotyping capabilities



National suite of controlled environment facilities

Network of nationally coordinated field sites



Mobile phenotyping units to serve rural areas and field trials

Climate CropServatory network and innovation framework

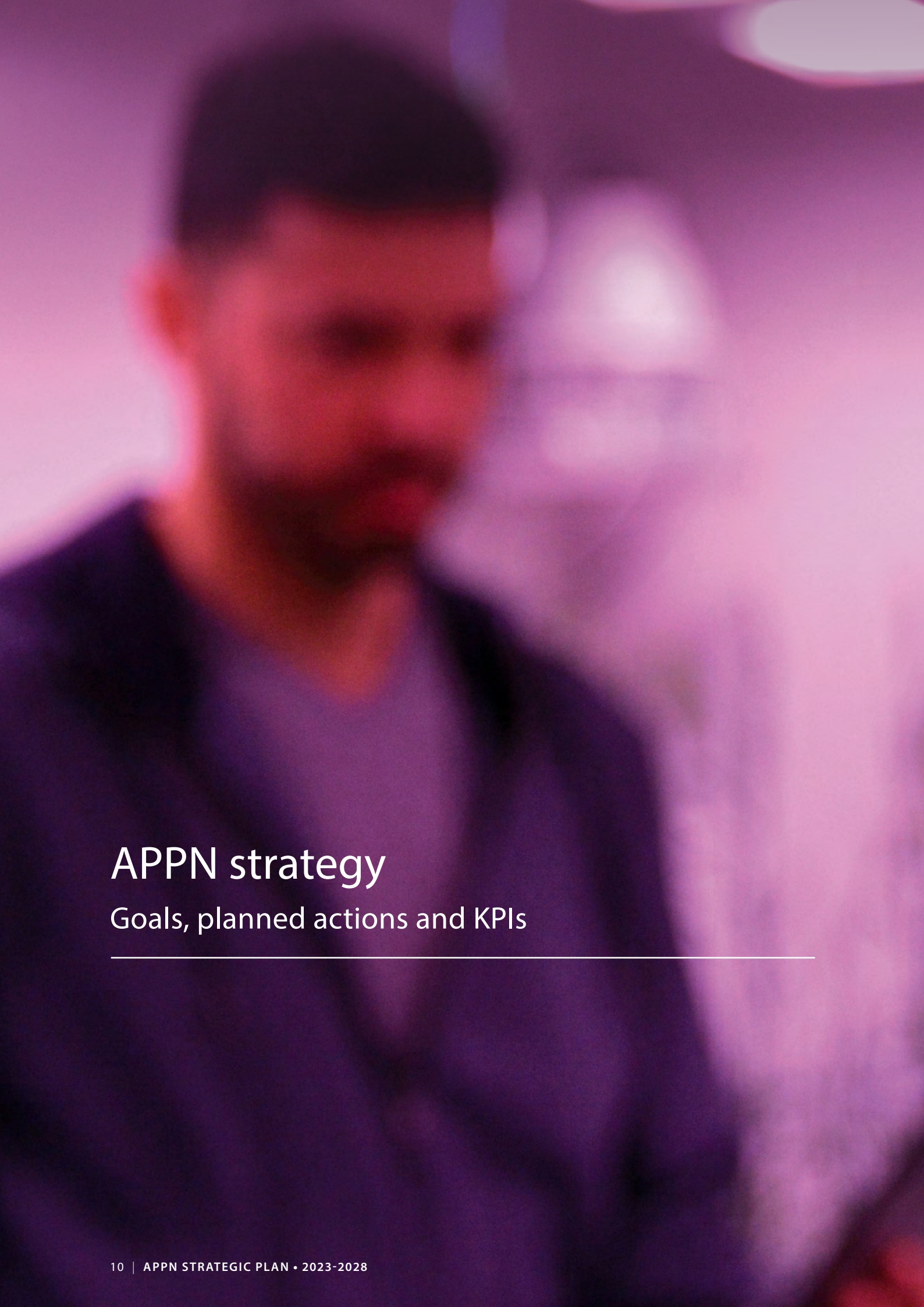
Distributed national network of climate observation units

Emerging and frontier technology proofing

Collaborative national plant phenomics missions

Underpinning collaborative data network

FAIR and open data platforms



APPN strategy

Goals, planned actions and KPIs

OUR GOALS

GOAL 1: Infrastructure

Deliver world leading, fully integrated and open phenotyping infrastructure across Australia.

GOAL 2: Collaboration

Strengthen data sharing and collaboration across the ag research space by addressing institutional, infrastructure and human barriers.

GOAL 3: People

Increase stakeholder outreach, community education and skills development to accelerate HTP deployment in Australia.

GOAL 4: Impact

Broaden, deepen and measure APPN impact in accelerating ag research outcomes.

GOAL 1: Infrastructure

Deliver world leading, fully integrated and open phenotyping infrastructure across Australia.

ACTIONS	KPIs
2.1 Fully deploy cutting edge phenotyping infrastructure according to the agreed plan.	• 7 controlled environment sites. • 5 fixed field sites. • 6 mobile sites. • CropServatories as agreed with key partners and Nodes are deployed.
2.2 Meet utilisation targets.	• Utilisation and self-funding goals are achieved, as set out by each Node.
2.3 Proactively search and evaluate new technology.	• An active global horizon tech scanning program is established to identify relevant emerging technologies for funding. • The frontier technology opportunities funds are fully utilised by APPN Nodes.

GOAL 2: Collaboration

Strengthen data sharing and collaboration across the ag research space by addressing institutional, infrastructure and human barriers.

ACTIONS	KPIs
3.1 Submit National Digital Research Infrastructure (NDRI) bids for adequate central and Node support for FAIR data management, storage and basic analysis.	• Successful bid.
3.2 Develop consistent data management architecture, storage and processing to simplify and strengthen cross-Node information sharing.	• All Nodes are contributing consistently packaged datasets that can be opened and visualised with the same APPN tools. • At least 50% of all APPN-hosted studies make at least a subset of the data open for use by other researchers as part of an APPN national data collection.
3.3 Evaluate and strengthen data analytics to convert data to knowledge.	• A library of shared standardised automated algorithms that convert data to traits and knowledge ready for analysis developed. • Collaborations with image analytics hubs (Analytics for the Australian Grains Industry, cross-NCRIS) to support the development of new trait algorithms (including assessment of AI, machine learning and large language model approaches) are evaluated and established as appropriate.
3.4 Promote the national missions funding to strengthen internal collaboration and leverage additional funding.	• A portfolio of projects involving the majority of Nodes is established.
3.5 Strengthen appropriate levels of pre and post experiment statistical support for APPN projects.	• Satisfactory solutions for statistical and biometric support available for all Nodes.
3.6 IP policies and practices are created to strengthen focus and support sharing of phenotyping methodologies.	• APPN IP policies and practices reviewed and updated/established. • APPN staff IP training program implemented. • APPN IP correctly recorded in IP registers, and appropriate actions to protect/exploit are undertaken. • APPN website includes a series of APPN technical bulletins documenting standards, best practices and protocols adopted by the APPN network.

GOAL 3: People

Increase stakeholder outreach, community education and skills development to accelerate high throughput phenotyping (HTP) deployment across Australia.

ACTIONS	KPIs
1.1 Build an APPN and NCRIS culture committed to: • achieving our vision. • creating healthy communities of practice and learning. • supporting career development internally and across NCRIS.	• Implement four Expert Working Groups, annual forums and staff virtual meetings and evaluate benefit. • Staff survey undertaken, evaluated and responded to. • Professional training for APPN staff conducted and evaluated for impact. • The Academy of Research Infrastructure joined and supported to strengthen the position of professional staff.
1.2 Undertake a workforce review to ensure adequate staffing for efficient, safe and sustainable operations.	• Review completed and response implemented. • Support Node-led workplace safety programs with phenomics domain material and training.
1.3 Strengthen outreach programs to drive interest in ag research infrastructure and phenotyping in particular.	• Establish a multi-tiered stakeholder outreach program and measure engagement. • Support training centres, PhD and undergraduate science programs and monitor impact.

GOAL 4: Impact

Broaden, deepen and measure APPN impact in accelerating ag research outcomes.

ACTIONS	KPIs
4.1 Better demonstrate and measure impact.	• Estimates of the increase in research efficiency enabled by APPN are developed. • A minimum of one impact case study per Node per year delivered. • Impact measurement software and methodologies developed, evaluated and deployed. • Steps taken to increase attribution of APPN in all publications and all publications are recorded in a visible database.
4.2 Broaden the application of phenotyping within APPN's current scope.	• Phenotyping in novel fields such as disease, bio-rationals, soil and root health, horticulture, pasture and nutrient efficiency is explored and delivered when appropriate.
4.3 Expand the scope of APPN's phenotyping to address new and/or missing areas of Australian ag.	• Options to expand into important missing geographic and/or scientific areas in Australian ag are evaluated and actioned appropriately. • Phenotyping in emerging environmental markets explored, evaluated for APPN contribution and actioned as appropriate.
4.4 Evaluate novel pathways to deliver impact.	• Investigate options to deliver impact via state government programs, farmer groups, commercial advisory, start-ups and traditional ag-tech. • Options for collaboration are fully evaluated, assessed, and actions taken as appropriate.

Strategic environment analysis

The APPN team has developed and adopted infrastructure which can underpin, automate and improve the way we tackle plant research and crop improvement.

Critical challenges

The challenges facing Australian agriculture today include rising demand, greater regulation and increasing cost of inputs. However, a more pressing issue is a rapidly changing environment that means we need crops with greater tolerance for degraded soils plus improved water use efficiency and the ability to withstand hotter, drier and windier conditions that may be coupled with wider temperature fluctuations and frosts.

In the face of these requirements, many conventional plant science research processes remain stubbornly slow, approximate and laborious. This makes it very difficult to meet the necessary rate of genetic and crop management improvement.

A snapshot below of the compelling challenges and opportunities that we face

UN predicts global population growth to 9.7bn by 2050[1]

Climate variability impact – ABARES finds a 23% climate-related loss in Australian farm-gate profit per year since 2001[2]

Environment protection – agriculture contributes 20% of all global greenhouse gas emmissions[3]

National Farmers Federation Roadmap target – to exceed $100 billion in farm gate output by 2030[4]

Functional foods and personalised nutrition worth $690-$770 billion globally by 2025[5]

The tropical economy is growing 20% faster than the rest of the world – Northern Australia opportunity[6]

Agriculture supports 250,000 Australian workers, with labour shortages[7]

Australian production of wheat and barley alone worth $8b p.a. gross in 2019/20[8]

This is not just about agriculture

The botanical and plant-derived drugs global market has the potential to grow by US $13.67 billion during 2020-2024[9]

Australia's legal cannabis market forecast to grow from US $52 million in 2018 to US $1.2 billion in 2027 (the 5th largest in the world)[10]

The global plant-based vaccines market is estimated to be valued at US $43.7 million in 2021 and is expected to surpass US $581 million by 2028[11]

PESTLE analysis

Category	Comments
Political	• Change in focus from productive agriculture to focus on 'sustainable outcomes'. Shift from production/ha to production/inputs = efficiency. • Australian productivity and R&D expenditure/$ produced are both declining underlining the need to increase research efficiency. • Government science statement focussed on universities as engines of skills, industry and regional development rather than innovation per se (=impact focus).[1] • National security and sovereign supply chains focus remain important given security issues and protection from biosecurity threats. • Cost of living and specifically food are important issues.
Economic	• Australian agriculture of major importance. 55% of land use and 25% of water extractions, around 70% of output, is exported and accounts for 11% of goods and services exports. • The size of the middle class in Asia (China) is growing (65% of global share by 2030) with high purchasing power. • Climate change has caused agricultural profits to fall 23% over the 20 years to 2020, compared to historical averages.[2] • Genetic gain of wheat at 1% globally is behind wheat demand increasing by 1.7% annually.[3] Similar trends apply to many public breeding programs and crops.[4] • Australian ag competitiveness depends on world leading input, labour and water efficiency. • Australian Agritech sector is weak by world standards and currently declining. • Carbon economy and natural capital will grow in importance.
Social	• Feed the growing and ageing populations (Australia / Asia) with functional and nutritional foods, personalised to their taste, health and lifestyle preferences. • Growing focus on quality, nutritious and natural foods (i.e. low inputs, low technology). • While not assured, societal acceptance of 'high tech' ag and food (GM, gene editing, machine learning, AI and data driven 'big ag') critical to meet production, climate change and disease challenges. • Attracting new students to STEM and ag research is critical to address challenges.
Technological	See next page.
Legal	• EU regulations re pesticide usage are rapidly changing; environmental and trade imperatives may drive similar regulatory trends in Australia. • Climate change policies, emission regulations and carbon markets will be drivers for progress towards carbon neutral agriculture. • GM, including gene editing de-regulations progressing slowly at a pace intermediate between EU and US. • Biosecurity regulations remain difficult limiting import of global genetic materials. • Emerging 'plants as factories' concepts offers opportunities and challenges.
Environmental	• Climate change drives need for rapid crop adaption to heat, moisture stress, frost. • Climate change and carbon markets have implications for Australian ag exports. Aus ag is addressing through emissions reduction plans. Zero Carbon CRC set up. • Climate pressure on biodiversity drives demand for nature capital market emergence. • Broader demand for more nutrient and resource-efficient agriculture (N, P, K, H_2O, pesticides).

1 https://www.industry.gov.au/publications/national-science-statement-2024#the-5-imperatives-4

2 ABARES farmpredict model (Hughes, Lu et al. 2021)

3 Crop Breed Genet Genom. 2019;1:e190005. https://doi.org/10.20900/cbgg20190005

4 doi: 10.1007/s00122-019-03317-0

Technological

Innovation is a constant factor in the technologies that are relevant to plant phenomics. As such, an assessment of their importance is a critical element of APPN strategy.

Technology	Description	Relevance
Phenotyping sensor development	(UAVs) delivering 'lean' field phenotyping. New sensors (short wave infra-red) offer remote sensing of water and nitrogen, addressing fertiliser efficiency and food quality issues. Other tech such as induced fluorescence, (reliable) thermal detection and others offer a range of options at ever increasing resolution.	High
Consistent data management, transmission, packaging and storage	Prodigious complex data must be cleaned, geo-rectified, organised and made accessible according to FAIR principles. Modern data lakehouses and other technologies are high potential. Adequate modern data storage needs to be identified.	High
Data analysis of the streams of data	Conversion of rectified data to crop traits that are analysis ready within crop and multilayer models is highly important. AI and machine learning approaches critically important.	High
Synthetic biology	High throughput enabling scientists from across disciplines such as biology, protein chemistry, bioinformatics and engineering, to rapidly develop new plant options.	High
Environmental drone/ EO monitoring	Environmental observational infrastructure equipped with next-generation sensing and earth observation capability. Clear need of Cal-Val services, possibly provided by APPN CropServatories. Need to be open to military tech cross-over opportunities.	High
Biostimulants / bio-rationals	Enhances nutrition efficiency, abiotic stress tolerance and crop quality. May require new laboratory practices.	High
Soil microbiome	Refers to the highly diverse soil ecosystem composed of interacting communities of bacteria, archaea, viruses, fungi and protozoa, which may be manipulated to enhance plant growth	High
Abiotic stresses	Modelling abiotic stresses aims to identify mechanisms and/or chemicals that can reduce abiotic stresses resulting from, for example, salt, heat, drought and nutrient deficiency.	High
Biotic stress phenotyping	Remote disease phenotyping addresses an increasing challenge facing Australian agriculture driven by climate change and greater productivity.	High
Intercropping	A multiple cropping practice involving two or more crops grown in proximity to potentially increase yield and improve pest management.	Moderate
Soil engineering	Dramatic rise across Australia of soil renovation to overcome ancient soil horizon barriers. New engineering paradigm/solution.	High
EO satellite explosion	Rapid improvement in number, cost, accuracy and quality of EO (earth observation) data products. Some elements (e.g. thermal) much better from satellite.	High
Machine learning/ large language models	While early days, it is clear there is a lot of focus in the US on the use of these in synthesising research and trial results and providing recommendations to farmers.	High
Sprayed RNAi	First registration of such a product in the US on 22 December 2023. Significant new entrant into biological control space.	Medium
Distributed and probe mounted soil analysis	Driven by carbon capture, there is a large range of probe-mounted sensors that directly measure soil attributes, obviating the time and cost of lab-based analysis.	Medium/ High
Spatial transcriptomics	Option to remotely sense and estimate transcriptome activity.	High + (Nascent)
Automation of drone and ground based sensing	High assessment cost of sites means fully automated operations are attractive. "Drone in a box" offers solutions, but this means expensive drones are fixed in one location. Long range deployment of drones may offer solutions provided Civil Aviation Safety Authority (CASA) allows.	High

SWOT profile

Based on APPN's capabilities and PESTLE analysis a SWOT sets out key internal and external factors affecting the strategic horizon for APPN.

Strengths	Weaknesses
• Existing major infrastructure that fills a gap in the market. • National linked network sought by funders. • Respected for high quality service. • Proven impact in quantity and quality of phenotyping publications. • Operating in a domain of increased importance in future. • Trained, passionate and engaged team. • Viewed as relevant and strategically aligned by our host institutions.	• Challenge to show impact and translation. • Heavy dependence on NCRIS for core funding. • Heavily dependent on GRDC for project funding. • Revenue mainly derived from individual projects rather than major programs. • Seen as a provider, not a strategic partner. • Opex limitation to scale up to new industries. • Workload.
Opportunities	**Threats**
• Ag still major economic and export driver. • HTP links to need to digitise and automate both ag research and production. • Bio-rational products require wide testing. • Increasing soil health and soil carbon focus. • HTP attracts and trains new scientists. • Disease/biosecurity phenotyping. • Prepare ag for a future climate. • Synbio/Plant factories new push. • New sensors, earth observation (EO) resolution and tech. • Consider use of interest earned/new funding to support additional staff needed to drive strategy implementation.	• Reduction in funding of public and/or agricultural research. • Demand to show impact and translation. • Plant phenomics scientific fit/merit still inadequately understood. • Increasing focus on EO Satellite + AI and modelling may leapfrog phenomics. • Difficult to engage horticulture and other major industries. • Variable state government ag support.

Accelerate your research by partnering with us

Our extensive facilities offer the capacity to rapidly, accurately and objectively assess plant performance using non-destructive digital technologies.

This means research crops can be assessed repeatedly through their entire growth phase, to provide a valuable temporal dimension to the plant performance data.

High-throughput phenotyping

We offer a range of capabilities for high-throughput phenotyping, from model plants to crops. Using automation and the latest camera and sensor technologies, researchers can monitor plant growth and performance at high throughput, to screen large populations of plants for novel genes that improve plant health and increase yield under adverse conditions with less inputs.

Deep phenotyping

Understanding plant physiology and responses to different stresses is essential to identify novel traits that improve stress tolerance. Our cutting-edge sensor technology, combined with the latest developments in image and data analytics, helps researchers tease apart the individual components of plant development and stress response.

Field phenotyping

Using both aerial and ground-based phenotyping platforms, APPN technology helps agricultural researchers test crop varieties in the field. Cameras and LiDAR technology are used to identify those lines with promising characteristics for agriculture in the coming decades. Combined with data management and analytical tools, our technology helps researchers make informed decisions about the performance of their plant material in the field.

Data management, analysis and visualisation

We offer the full scope of data management, from statistically designed layouts and best practice protocols at the outset through to innovative data management and visualisation tools on completion – all to maximise your results.

Controlled growth environments

By precisely controlling temperature, light, nutrient and irrigation for individual experiments, researchers are able to isolate specific growth responses and correlate them to genetic traits.

Fluorescence imaging

High resolution cameras and handheld scanners enable measurement of photosynthetic performance at plant scale, to non-destructively monitor physiological and metabolic processes.

Hyperspectral imaging

High throughput hyperspectral imaging provides insights into plant responses to their growth conditions – highlighting physical health as well as early indication of biotic or abiotic stress.

RGB 3D and thermal imaging

Advanced 3D imaging systems provide fine-scale assessment of plant architecture, growth and key physical parameters such as leaf area – all contained in data point clouds for subsequent analysis.

What does success look like?

The success of APPN can be most simply defined as the success for our clients, stakeholders and staff.

Government, our host organisations and investors value us

- We can provide evidence as to our ability to significantly accelerate and improve the process of plant research.
- Our investors receive clear signals from the Australian agriculture research sector that we are necessary.
- Universities and research organisations vie for the competitive advantage of hosting us.
- We are deemed essential partners when it comes to defining and solving problems facing the agriculture sector through research.

We are the facility of choice

- People come to us, and come back to us, because we make their lives easier – they trust, value and prefer us to alternative options.
- Industries trust us to solve their problems – we are outcomes focused and agile.
- We enable and facilitate research excellence and we are a catalyst for innovation.
- We offer decreased barriers to entry for researchers, organisations and companies looking to tackle agriculture sector problems.

We are Australian and global leaders

- APPN is at the heart of Australian technology development generally, and specifically in the areas of phenotyping, sensing, imaging and agri-informatics for precision and digital agriculture, providing essential services and solutions and coordinating national responses to grand challenges.
- Our actions, investments and choices become defining strategic signals across Australia and beyond – others look to us to see what we are doing.

Within this framework we expect to meet our Goals, achieve our Mission, realise our Vision and remain true to our Values.

Australian Plant Phenomics Network
University of Adelaide
School of Agriculture, Food & Wine
Building WT81, Hartley Grove, Urrbrae 5064 Australia
P +61 8 8313 0793 | **E** appn@adelaide.edu.au

Discover more:
plantphenomics.org.au