



Professor Dawn Freshwater
Vice-Chancellor

Our Ref: 19/78398

14 October 2019

Committee Secretary
House of Representatives Standing Committee on
Agriculture and Water Resources
PO Box 6021
Parliament House
CANBERRA ACT 2600

By email: agriculture.reps@aph.gov.au

Dear Committee Secretary

Submission to the Inquiry into growing Australian agriculture to \$100b by 2030

I am grateful for the opportunity to make a submission to the House of Representatives Standing Committee on Agriculture and Water Resources inquiry into growing Australian agriculture to \$100b by 2030. In addition to our School of Agriculture and Environment, The University of Western Australia is host to our Institute of Agriculture, which conducts world-leading research in improving agricultural productivity.

Australia ranks fourth in the world behind Brazil, Argentina and the Netherlands as a net exporter of agricultural products. We typically export 60 to 70 per cent of our agricultural products, helping meet the food requirements of Australia's 25 million people, and another 60 million overseas. This makes Australia one of the most food-secure nations on earth. In addition to this, a conservative estimate suggest that Australia helps to feed between 400-500 million people in developing countries as a result of leading or participating in agricultural education, training, development, knowledge and technology transfer in partnership with developing countries and International Agricultural Research Centres (IARCs).

Agricultural productivity growth in Australia has plateaued at around half to one per cent, which is well below the two-to-three percent needed to meet the challenges ahead in terms of industry sustainability and growth, particularly in our current water-constrained climatic environment. Meanwhile, international competitors have been making rapid advancements in the productivity of their agriculture sectors. Only a concerted investment by governments in research and development will sufficiently boost agricultural productivity to enable Australia's agriculture production to reach \$100b by 2030.

We also need to develop versatility in our systems to manage risks associated with markets and climate. We need systems that enable producers to cope with ‘poor’ seasons and capitalise on ‘good’ ones. This will depend on scientific innovation as well as innovation in business and the partnerships across the industry supply chain and end-markets.

There is an urgent need to increase the level of agricultural R&D. Australian agriculture must be at the forefront of driving innovation and adoption in order to be sustainably profitable and to create the high-skilled, high-value jobs that will allow rural communities to thrive into the future. Agricultural innovation, combined with investment capital to implement innovations in the field, will be the primary means of boosting Australia’s agricultural productivity.

Australia India Strategic Research Fund project – Chickpea drought resilience

UWA was the only Australian university that was successful in the recent Department of Industry and Innovation’s Australia India Strategic Research Fund grant round. Our project is about the functional genomics of chickpea to enhance drought tolerance, and is directly relevant to Australia’s agricultural improvement and drought tolerance agendas. The Commonwealth Government’s \$500,000 contribution is around one-third of the total \$1.5m allocated to the project.

Chickpea is a rich source of protein (20-30 per cent), carbohydrate (40 per cent) and minerals. It is a major source of protein in the diets of many in the Indian subcontinent, and an important grain legume crop in rotation with cereals in Australia. Drought is one of the major stresses limiting chickpea production, and causes up to 50 per cent yield losses. Improving drought tolerance in chickpea is critical for improving its productivity in the Australian climate. The project is also exploring resistance to other chickpea stressors that currently limit their cultivation in Australia and in India, such as heat and salinity.

This research project is an example of the kinds of investments governments can make to boost Australia’s agricultural productivity.

National Mission on Future Crop and Community Resilience

The University of Western Australia, together with University of Adelaide and the Australian National University, believes that in the context of ever-changing markets and climate a *National Mission for Future Crop and Community Resilience*, to transform Australian agricultural resilience and thus productivity and rural communities, is essential to meeting the challenges of productivity and growth.

The Green Revolution – which led to large increases in agricultural output in the second half of last century – has now stagnated, with agricultural productivity growth having plateaued at 0.5-1.0 per cent, well below the two-to-three per cent needed in order to meet the challenges ahead. To produce the food needed by a growing global population, a mission-like investment is needed in agricultural R&D. While agriculture is responsible for 20 per cent of global GDP, only three per cent of R&D investment is spent on preparing it for the future. **The current level of research investment through established programs has not been, and will not be, sufficient to meet future food demand and for Australian agriculture to become a \$100b industry by 2030.**

To address this challenge, Australia needs a National Mission to develop and implement smarter ways of producing abundant, nutritious food using fewer resources. This will require

innovation, technological advancement, student training and capability building, and significant structural and culture shifts in Australia's leading agri-technology knowledge clusters, consistent with the decadal plan for Australian Agricultural Sciences (2017-2026) produced by the Australian Academy of Science.

Focusing and increasing the level of agricultural R&D will be crucial. Only with increased investment, focused on industry-aligned innovation and community adoption, will Australian agriculture remain sustainably profitable and create the **high-skilled, high-value jobs** that allow rural communities to thrive into the future.

UWA notes and welcomes the recently announced *ARC Centre of Excellence for Plant Success in Nature and Agriculture* – an investment that contributes to the foundation of a National Mission. However, on its own, that centre will not have the scale or breadth of disciplines to deliver the downstream productivity gains needed by Australian agriculture. Neither will it provide the socio-economic policy and modelling capabilities necessary to future-proof agriculture end users and rural communities.

To achieve the \$100b by 2030 goal, Australia needs large-scale, multi-disciplinary investment in industry-aligned research and innovation – investment that is well beyond anything previously done in Australia. History tells us – the Green Revolution being a prime example – that large leaps in productivity require coordinated investment delivered through mission-like programs focussed on improving productivity and achieving resilience in agricultural communities.

Advances in synthetic biology (gene editing and transformation), coupled with changes in the regulatory environment controlling genetically modified crops, mean that we will soon have an opportunity to create climate-resilient 'smart crops'– crops capable of growing during periods of drought and extreme temperatures, and able to tolerate adverse soils. The crops of the future will also enable farmers to alter the types of products their crops yield during cultivation, to account for different weather conditions. This will help to insure agricultural production against adverse seasonal conditions, and to improve national agricultural productivity through an expansion (or at least, mitigating against a reduction) of agricultural land that is productive.

These synthetic biology advances, together with improved climate forecasting, knowledge of environmental variability across farming landscapes, and autonomous farm vehicles and harvesting systems capable of precision planting, tilling and harvesting, will enable farmers to optimise production at a micro-climate level, affording greater local control in both good years and bad ones.

For many regional areas, agriculture underpins the local economy, providing employment on farms and in related industries and sectors. Because of this, reduced crop production (e.g. due to droughts, floods, saline soils, heat waves, frosts) can have a profound effect on regional jobs and community wellbeing. A *National Mission for Future Crop and **Community Resilience*** will necessarily have spill-over benefits to rural communities. It is essential that those communities remain central to the mission – to drive adoption and uptake of new technologies and to ensure that the social changes and adaptations occur smoothly and effectively.

The convergence of diverse technologies (synthetic biology, big data, satellite imagery), socio-economic, and more explicitly social capabilities under the proposed National Mission will necessarily drive adoption to ensure that resilience in communities is achieved. Moreover, to maximise benefits to regional economies, innovation precincts need to be developed with the ability to upskill regional workforces in areas such as machine learning, artificial intelligence and development of new crop types. Importantly, the advent of 'smart crops' will provide opportunities for regionally-based agricultural scientists and consultants working with farmers to optimise crop selection to suit upcoming seasons, develop new management practices, and ensure productivity is maximised across heterogeneous landscapes.

Between ANU, the University of Adelaide and the University of Western Australia, we believe we have formed the core of a national capability to drive the *National Mission for Future Crop and Community Resilience* outlined above. Of course, we would expect a National Mission to bring together Australia's best relevant researchers, irrespective of the institution or sector to which they belong. The current team has been built upon collective strategic intent, developed from shared experiences through crop-science focused ARC Centres of Excellence, combined with their wider capabilities in environmental, computer and social sciences, engineering, and policy development. It also brings together a blend of geographies, communities and climates with the key national institutions that can both generate the appropriate technologies and train and produce cohorts of graduates with the skills to apply to a transformed Australian agricultural sector of the late 2020s and into the 2030s.

Investment in a *National Mission for Future Crop and Community Resilience*, when leveraged by non-government sources including translational partnering with industry, would enable transformative outcomes to be achieved across our entire crop-based agriculture sector. The National Mission would necessarily and desirably align and interconnect with the National Agricultural Workforce Strategy, the newly-announced ARC Centre of Excellence for Plant Success in Nature and Agriculture, Industry Growth Centre (Food Innovation Australia Limited) Sector Competitiveness Plan, and the Australian Academy of Science Decadal Plan for Australian Agricultural Sciences.

Agriculture and agribusiness skills

A number of factors impact on the current supply of skills in agriculture and agribusiness. While these include education and training, other factors such as demographics (the ageing profile of landholders), investment finance (most owner-operators are small and cash-poor and have not been able to afford investment in new technologies), a lack of understanding of markets on the part of producers, and labour rates (especially in food processing) have reduced Australia's competitiveness.

Australia's agriculture and agribusiness sectors need inputs from disciplines as diverse as botany, zoology, geography, econometrics, mining, water science, mechanical engineering, chemical engineering, food technology, forestry, fibre science, DNA profiling, reproductive technologies, fermentation science, veterinary science, plant pathology, entomology, molecular biology, nanotechnology, and so on. It is no longer possible to encompass all these disciplines in a single university faculty or department. Agricultural faculties require highest-level scientists, who can cross disciplinary boundaries and form research alliances with other faculties.

The Committee may care to consider what funding and priority governments at federal, state and territory level should give to agriculture and agribusiness higher education and vocational education and training. A suite of options for such prioritisation could include:

- HECS-HELP discounts for students of agricultural sciences;
- CSIRO and State Government agriculture departments conducting agricultural research and research training in conjunction with universities;
- Scholarships tied to joint research work, with research training that provides a career path for graduates; and
- Specialised support for teaching technical aspects of agriculture in vocational colleges.

Finally, I am grateful for the input of Professor Kadambot Siddique and Professor Harvey Millar in preparing this submission. Both of them would be willing to provide further assistance to the Committee if that would assist.

Yours faithfully



Professor Dawn Freshwater
Vice-Chancellor