Submission No: 82.

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The Secretary of the Committee
House Standing Committee on Industry,
Science and Innovation
Parliament of Australia
Canberra ACT 2600

Re: Inquiry into Australia's international research collaborations

Below is my personal submission to the Standing Committee on Industry, Science and Innovation for the Inquiry into Australia's international research collaborations.

I very much appreciate the opportunity to be part of this important inquiry.

I would be happy to provide further evidence or testify if needed.

Kind regards

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A personal perspective to the *Inquiry into Australia's international research collaborations*

In the 21st century's globalised world, it is more important than ever to be engaged in collaborative international research. Issues which were once confined to national borders have now become truly international – health, security, biosecurity, food security, climate change and environmental sustainability are just some examples. Solving these problems requires the collaborative effort and commitment of researchers from all around the globe, supported by their governments.

In Australia, we have world-class infrastructure, including some cutting-edge technologies and research expertise in many fields of science. This strong starting point positions us well to engage with the wider international community in both developed and less-developed nations.

This report aims to provide a personal perspective in responding to relevant sections of the inquiry, and to put forward some suggestions/recommendations aimed at improving and expanding our international research engagements.

This is a personal submission and is not intended to represent the views of Murdoch University.

1. The nature and extent of existing international research collaborations.

The nature of my international research collaborations falls into several categories:

- active collaborations where I contribute cash to overseas research partner/s with a matching in-kind contribution, i.e. infrastructure and personnel, from the overseas partner/s. This type of collaboration requires MTAs and/or contracts for bilateral agreements, and always leads to tangible outputs that will benefit Australian society.
- active collaborations, often without financial contributions, but where goodwill and established professional relationships enable the conduct of small experiments towards a common goal. These arrangements, generally without any contract, often provide valuable information for both partners with the end result being a joint publication.
- collaborations through information and material exchange.

In my existing work towards increasing profitability for Australian farmers, I have active research collaborations with researchers from the following institutions and countries:

- Colorado St University, Fort Collins, CO USA
- United State Department of Agriculture, Stillwater, OK USA
- CSIRO European Laboratory, Montpellier, France
- INRA, Clermont-Ferrand, France
- International Centre for Agricultural Research for Dry Areas, Aleppo, Syria
- Kenyan Agricultural Research Institute, Njoro, Kenya
- ARC-Small Grain Institute, Bethlehem, South Africa
- Ethiopian Institute of Agricultural Research, Kulumsa, Ethiopia
- La Plata University, La Plata, Argentina
- Ege University, Izmir, Turkey
- MAM Biotechnology and Genetic Engineering Institute, Istanbul, Turkey

Collaborations also exist with colleagues from UK, Scotland, Germany, France, Italy, Iran, Czech Republic, Lithuania, México, USA, Turkey, India and China at the level of information and material exchange.

2. The benefits to Australia from engaging in international research collaborations.

Australia obtains multiple benefits from participating in international research collaborations. They:

1. enhance Australia's international research reputation
2. enable a transnational research approach to solving common problems
3. provide access to international knowledge and expertise
4. provide access to international infrastructure and technology
5. enable Australia to compare its research quality and expertise with that of other nations
6. provide a stimulating environment which triggers new ideas, technologies and innovations
7. provide social and economic benefits to Australia
8. engender greater understanding of the causes and impacts of development in developing nations.

As an example related to my specific area of research, agriculture – international research collaborations can play a role in alleviating poverty by providing food security in developing countries. Such research activities have long-term positive spin-offs for Australia in both security and economic terms.

More far-sightedness and creative thinking as to the long-term benefits to Australia of international research collaborations will yield more social and economic returns of this kind.

3. The key drivers of international research collaboration at the government, institutional and researcher levels.

International collaborations are global phenomena that can be driven at multiple levels from federal and state governments, to relevant institutions, to researcher level. Each of these levels has a key role to play in the development of a global perspective in any organisation.

The availability of key research staff with global views and appropriate communication skills is vital to achieving productive and constructive international research collaborations.

The key driver at *every* level is to make Australia prosperous and productive and internationally competitive in science and innovation areas.

The key drivers at the respective levels are as follows:

Federal Government

1. gaining international reputation and respect
2. providing access to emerging markets
3. developing internationally competitive Australian industries
4. ensuring national food/energy security
5. ensuring international food/energy security for Australia's stability
6. ensuring Australian science and innovation benefits Australians

7. educating future scientists
8. accessing infrastructure and cutting edge technologies
9. humanitarian reasons
10. establishing global networks for future scientists
11. big goal – contributing to world peace and improving international relations.

State Government

Regional issues in each state differ in Australia. Since these issues become "big ticket items", local governments are obliged to invest substantial funds in them. Thus states have their own research needs in areas such as water supply, resource development and agriculture, for example. State Government funds applied to research in local areas of interest/need could also be used/leveraged to attract international research collaborations.

Institutions

Institutions need to *build their reputations* in either research or teaching or both.

Recent government funding schemes have taken each university's student loads and publication records as the main criteria for determining funding amounts. It needs to be understood that both teaching and research capacity and output depend on each institution's resources and existing infrastructure.

Coupled with the need to attract more international students, most universities are proactive in building better international relationships. My own university – Murdoch University – has nearly doubled its percentage of international collaborations on journal articles from 22% to 43% in the past 10 years. International student intake has also increased by 20% in the last five years.

Universities are increasingly active in establishing bilateral agreements such as MOUs with overseas institutions. MOUs allow researchers to engage relatively easily, particularly with overseas partners from developing countries.

Other key drivers for institutions are:

1. accessing world class facilities
2. attracting additional government funding
3. attracting international research funding
4. creating self-sustainable income through innovations and discoveries
5. benefiting from student and staff exchanges.

Researchers:

1. conducting transnational research projects is highly rewarding professionally, intellectually and culturally
2. gaining increased prestige and reputation from producing joint publications with well-regarded international researchers
3. accessing knowledge and infrastructure
4. deriving personal satisfaction from the ability to make a global impact
5. building international reputation
6. gaining international mobility
7. accessing international students and research projects.

4. The impediments faced by Australian researchers when initiating and participating in international research collaborations and practical measures for addressing these.

1. The tyranny of distance – Australia's remoteness. Face-to-face meetings are essential, both to commence a collaboration and also to sustain it, but they are expensive financially and time-wise.
2. Lack of emphasis on providing international research experience during postgraduate training.
3. Declining numbers of Australian PhDs joining academia – according to the ANU President (National Press Club address), there are more Australian-based PhDs retiring/leaving than there are new doctoral researchers entering Australian research areas.
4. Lack of funding for international students.
5. Insufficient infrastructure to support commercialisation and manage intellectual property issues.
6. The de-collaborative impacts of national inter-institutional competition for available resources for international research engagements.
7. Insufficient support/encouragement for attendance at/organisation of international conferences.
8. Lack of discretionary funds and spending flexibility in existing research funding.
9. Issues with bilateral agreements between nations.

Recommendations/solutions for the improvement of above impediments are given in the next section.

5. Principles and strategies for supporting international research engagement.

Strategies could be implemented at federal and state government, institutional and individual researcher level. I have made broad, general recommendations at the federal and state government level, and some specific recommendations for institutes.

State Government

Establishing research fellowships (in the case of WA) and centre of excellence programs within the states has been extremely useful for providing new resources and research capacity for establishing national and international research collaborations. The key challenge has probably been assessing the centres' progress. Science advisory boards comprising apolitical scientists should be established for this purpose.

Federal Government:

1. Globalization in science and innovation is rapidly progressing as evidenced by European Union programs targeting India, China, Australia, USA and Canada. Australia should urgently establish programs for supporting international research initiatives, and provide further support for the existing ones to improve our global engagement in science and education areas.
2. Identify key institutes with extensive international research collaborations, and ensure their experiences benefit capacity-building for Australia as a whole.
3. Identify key research groups and institutes across Australia, and ensure that they are adequately supported to maintain their ongoing collaborations.

4. Establish science advisory boards at state and federal government levels to ensure appropriate advice is provided to policy makers. Federation of Australian Scientific and Technological Societies (FASTS) and/or Australian Academy of Sciences or Australian Technological Society of Engineering could play a role in establishing such boards. They would provide advice on the development of science and innovation and on international research matters including current research trends.
5. Encourage collaborations with both developed and developing countries. Research investment in developing countries will create mutual long-term political, economic and social benefits.
6. Providing short-term training grants for tomorrow's leaders in the developing world would allow greater access by Australian researchers to those countries in the future.
7. Establish more government-to-government bilateral agreements as these can greatly facilitate collaborations. Alert scientists to considering this possibility when undertaking international research.
8. Develop plans and implement actions that will ensure a capable scientific workforce is available in perpetuity.
9. Provide funding for international students. Australia needs to access a large pool of candidate students to become the next generation of scientists in Australia.
10. Provision of government funding is the starting point for our international scientific collaborations. Research outcomes in projects need to be monitored to determine whether funding is being used productively and whether ongoing funding is warranted (e.g. science advisory board assessments).
11. It is important that researchers at *all levels* of their careers be supported, not merely long-established researchers.
12. Ensure a nationally balanced investment among the states. Long-term lack of investment, particularly in the agricultural sciences in WA, will engender longer-term social problems, with a widening gap of infrastructure investments between WA and the eastern states. (Personal observation)
13. Maintain a balance between support for a wide range of relevant international research collaborations, rather than concentrating funding on "big ticket" political or populist issues.
14. Provide grants/funds for retired, renowned scientists to visit research groups and postgraduate students so students can benefit from their long scientific experience.
15. Provide core funding to every PhD candidate to ensure he/she has one international study/research experience. Universities should have a prerequisite that every PhD candidate must have overseas experience, or at a minimum, have some research experience in an institute other than the one they are graduating from. This could be one month to one year training – preferably one year as that would allow students to conduct collaborative research.
16. Develop systems to overcome the de-collaborative impacts of inter-institutional competition in Australia so the resources available for international research engagements are used effectively and efficiently.
17. Establish programs that encourage scientists to join and/or organise international associations and conferences. Participation in such activities has positive impacts for the entire research community.
18. Researchers need to have access to some discretionary funds (with approved justification) from time-to-time. Some flexibility in spending existing research funds on developing emerging collaborative arrangements may also be useful.

19. Develop a system wherein a researcher or a group of scientists can propose a bilateral agreement with a particular country to capitalise on opportunities that may emerge as a result of a research collaboration.
20. The ARC should continue the federation fellows and future fellowships programs to attract successful overseas scientists to move to Australia while providing them with good start-up funds. Funding should also specifically target researchers with excellent track records who have unstable employment contracts (fixed term or casual).
21. Science and innovation investment programs require 5, 10, 15-year plans. We must ensure that changing governments continue established programs from previous administrations.

Institutes

1. Establish an international research focus group.
2. Actively promote relevant leaderships in national and international platforms, and encourage visits from international scientists.
3. Encourage research leaderships to collaborate with other national and international institutes through identifying complementary skills in relevant areas.
4. Establish a publication support team to assist researchers to publish and present their research outputs/products as publications and as presentations in national and international platforms to make a worldwide impact.
5. Encourage scientists to take leaderships roles using their experiences through national and international partnerships.
6. Establish student/staff exchange programs.
7. Ensure staff with international opportunities also have good cultural training.
8. Develop a research culture for young MS, PhD students and post docs so they can work or research for their further professional development anywhere in the world. Encourage staff to think globally.
9. Encourage staff to take leadership/organize national and international workshops/conferences. These activities will promote your research and enable staff to build new contacts.
10. Building and supporting human resources is extremely important to being globally RND competitive. Researchers with international research potential should be provided with a more stable work environment to strengthen their focus on conducting their competitive research business.