

Inquiry into Technological and Service Innovation in WA - Agriculture Sector Submission

The WA Division of Ag Institute Australia (AIA)¹ is pleased to make a submission to the Government of Western Australia's Inquiry on Technological and Service Innovation, focusing on the state's agriculture and food production sector.

AIA is the peak body representing the professions of agricultural and natural resource management. Its members include research and extension scientists, advisers, policy managers, consultants, agribusiness and farmers. Many of its members work in rural communities.

AIA provides strong, independent, balanced and factually-based representation and advocacy on a wide range of issues affecting the profession and agriculture generally. In recent times these have included agricultural education, rural communication, the Murray Darling Basin Plan, farmer response to greenhouse gas emissions policy, and rural research, development and extension (RD&E) policy.

This submission builds on AIA's substantial background and experience in all areas of agricultural development as well as the outcomes of a recent AIA innovations conference held in Perth - Attachment 1.

Inquiry Terms of Reference

The inquiry has particular regard to:

- What drives innovation;
- Collaboration between government, universities and business;
- How research can lead to the development of new products, services and jobs;
- The challenges associated with financing and commercialising new technologies, products and services; and
- Models of development by which technological and service innovation could be encouraged in WA.

¹Ag Institute Australia is the business name for The Australian Institute of Agricultural Science and Technology.

Introduction

The long-term decline in the terms of trade for food and fibre products requires continual gains in gross factor productivity on-farm and in processing industries. Productivity gains in agriculture depend on innovation. While productivity gains in certain agricultural production systems have been substantial (over 1.5% per annum), they have been more modest in others. Over the last decade, for example, the cotton industry gains in productivity have exceeded 1.5% per annum, but the gains in gross factor productivity in grains and animal production have been about 1% per annum. In the grains and animal production industries, gains in the efficiency of water use and labour efficiency have been substantial. These gains in productivity and efficiency are directly related to innovation.

Productivity and efficiency gains have been derived from a mix of transformational and incremental innovations and the source of these innovations has been varied and unpredictable. However, they have all depended on strong strategic investment in public sector and private sector research, effective collaboration between the public and private sectors and close engagement between science, agri-business and producers.

In many cases, the transformational technologies have been created in the public sector, often at universities and organizations like CSIRO and state departments of agriculture, then they have been developed and commercialised by the private sector and subsequently embraced by farmers.

Significant examples include the use of Genetically Modified (GM) crop varieties, the development of Global Positioning System (GPS) technologies now widely adopted in precision farming systems, zero tillage and controlled traffic farming methods. Examples for the livestock industries include advances in genetics such as estimated breeding values and meat eating quality, including Meat Standards Australia (MSA).

These transformational innovations have had their origins in basic research, but depended heavily on commercialisation and technology transfer within agribusiness, and on-ground practical implementation by producers to drive their adoption.

The examples highlight the need for collaboration between the public and private sectors and the need to engage with farmers and their advisers throughout the development and adoption process.

Improvements in efficiency of agricultural practices due to new technology, and the need for continual improvement.

The use of new technologies has always been a feature of agriculture, but the past 40 years has seen a revolution. We will cite just a few examples:

1. No till or minimum tillage farming has revolutionised crop farming systems in terms of productivity and in the care of land resources. These practices have increased productivity, improved water infiltration and reduced soil erosion. They have also reduced farm risk. Because these practices require increased reliance on herbicides they have resulted in a build-up of herbicide-resistant weeds and so these production systems require on-going RD&E.
2. Variable rate technologies provide for more effective application of fertilisers according to land capability and crop need. They provide efficiency but require continued work in equipment engineering and electronics, land capability survey, as well as farmer training in their use. Similarly the timing of fertiliser application has been improved through the use of within-season forecasts and yield prediction models. These technologies can certainly improve efficiency but come at a cost. We have seen in recent years some farmers and consultants returning to alternative systems using crop legumes and pastures as a source of nitrogen and as a disease break. Farm systems groups working closely with consultants, industry and government agencies are well suited to this work, but again need direction and encouragement.
3. The regulatory and societal requirements of livestock farming are growing in complexity, and as a result there is a significant need for ongoing technological development to both underpin productivity gains and to protect animal welfare and environmental values. Precision Livestock Management (PLM) is in an early stage of development and application in Western Australia, and offers the opportunity to move away from intuitive decision-making. Automation, the use of sensors and detectors, agricultural robotics (e.g. <http://confluence.acfr.usyd.edu.au/display/AGPub/Welcome+to+Agriculture+at+ACFR>) laser imaging technologies, use of unmanned aerial vehicles and satellite and infrared/thermal remote sensing imagery, all offer the opportunity to collect fine-scale data on animals and farm resources. This will also allow the monitoring and management of production systems at the landscape scale, to facilitate productivity gains, to enhance resource-use efficiency, leading to more precise flock/herd and land management decision-making, and better sustainability outcomes. Continued support must also be provided to better understand diseases and disease control, epidemiology and disease management to underpin biosecurity.
4. At the unit of production scale, PLM is made possible by monitoring each individual animal, and will become more effective by continuing research efforts to target genetic, disease control and nutritional outcomes in order to optimise animal production. At the farm level, efforts are needed to rekindle pasture breeding and agronomy, and farming systems integration. Tools to automatically and remotely measure and monitor the liveweight and condition of livestock, and be able to predict future pasture and range condition would allow producers to make more accurate, informed and timely decisions.

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5. At the landscape scale, research is being undertaken to improve the understanding of animal and herd behaviour so that impacts on the environment are better understood. Improved livestock management decisions at this scale can significantly and positively impact on environmental values such as land condition and biodiversity. Continuing research funding is needed to build these robust and reliable technologies, and to integrate them into management systems, so that Australia can continue to benefit from the large export earnings contributed by the livestock sector.
 6. There has been a revolution in irrigation methods in the last 30 years with systems such as micro irrigation, laser levelling, and water applied according to crop requirement. This has not only improved irrigation and crop water use efficiency and productivity but reduced salinity and water use. This has had enormous environmental benefits and has been a real success story with much of the technology developed in Australia. However, with the loss of the Land and Water Corporation and the conclusion of the Irrigation Futures CRC at federal level, the emphasis has gone out of irrigation RD&E (as well as soil and land management generally), and needs urgent attention. These are areas which have broad rather than specific industry application and are often long term, both of which make them unattractive to industry-based Research and Development Corporations (RDCs). Funding for irrigation R&D needs to be re-established.
 7. GM technologies are having a major impact on canola and cotton production in Australia, and there is potential for these technologies to increase productivity in other crops. Research continues on genetic solutions to address drought and salinity challenges but the concern remains that some state governments' policies will put such research and its subsequent adoption at risk. As the Minister for Agriculture and Food, Hon Ken Baston, MLC, reiterated in opening the recent AIA innovations forum, the Government of Western Australian is supportive of sensibly regulated GM technology; the AIA can only applaud this policy. Continued joint development is essential given Australia's unique environment and agricultural systems which make it difficult to apply research results from overseas without substantial adaptation.
 8. Horticulture is an area with enormous potential for further improvement. To achieve this potential, the capacity for teaching and RD&E across Australia needs significant investment. There are few courses at university level, and major research facilities have diminished capacity at public and private levels. With the loss of capacity in CSIRO and State Departments of Agriculture there is now a lack of capability to develop and extend innovation across a major industry sector. What is at stake is much of Australia's potential to meet its own and world food targets for years to come, as well as effectively manage its scarce land and water resources deployed in horticulture.

Recommendations

Recommendation 1. Government should continue to invest public funds into RD&E

Because innovation is essential to improving productivity in agriculture, continued investment of public funds in RD&E is required. Increased investment of public funds will also protect the contribution agriculture makes to the economy and increased funding should be targeted at improving the rate of productivity gain and maintaining competitiveness of Western Australian agriculture in global markets. Public funds invested in RD&E have excellent returns on investment (usually in excess of \$9 for each \$ invested).

Recommendation 2. Government should focus some of its investment in RD&E into enabling and supporting collaboration

Collaboration between the public institutions, the private sector and primary producers is essential in delivering benefits from investment in RD&E. This requires specific attention. For example, continuing public investment into the work done in R,D&E by farmer groups across WA will deliver significant gains in innovation leading to enhanced agricultural productivity. These groups are now the focus of collaboration between science, agri-business and on-ground implementation.

Recommendation 3. Because innovation from research is difficult to predict, investments must be made carefully, but not prescriptively

While some RD&E is aimed at problem solving, the innovations that have had a major impact on agriculture in the last two decades have often originated from “blue-sky” research that has originated in the public sector (universities, CSIRO, State Government institutions) and effectively commercialised by the private sector. Public investment in science and technology needs to allow for innovation in how the funds are used.

Recommendation 4. Government funds should be invested in people, not only in projects

Invest in people, not only in projects. AIA accepts the need for accountability in how investment in science and technology is deployed, but closely managed project oversight stifles innovation. Because overall reduced funding into agricultural RD&E has led to a decline in capability to undertake RD&E, more government funding needs to be directed to employing personnel, not just investing in operational aspects of projects.

Recommendation 5. The WA Government should insist that adequate telecommunications be provided to rural and regional areas as well as to highly populated regions.

There is no doubt that the use of robots, drones, telecommunications, etc., will grow. Much of this new technology depends on high-quality telecommunications technology and much of

rural Australia is not sufficiently well covered by mobile phone networks. For example, the latest model tractors with GPS guidance, field mapping, etc., rely on telecommunications for data upload and access. Good mobile phone coverage for data is no longer a luxury, but a necessity for modern business. The WA Government needs to lobby for improved electronic communication capability across rural WA.

Recommendation 6. Facilitate collaboration between science, agri-business and agricultural production systems

Given that much of the improvement comes from improvements in management rather than from individual technologies, an understanding of the farming systems within which farmers make decisions is critical. Too often there is a focus on the benefits of individual technologies and we do not appreciate the multiplier impact of a number of such technologies in the system. The combination of new varieties, no till, time of sowing, and timely application of herbicides and fertilisers is a case in point. Farmers are now realising the importance of this interaction not just in terms of production but in profits and the management of risk. This has important implications for research and extension in the manner in which information is presented, and highlights the importance of collaboration involving farmers, scientists and consultants from both the public and private sectors. Through its support for farmer groups, government can facilitate this collaboration.

Recommendation 7. Metrics for University performance must be reset to include industry impact as well as recognised publications

Articles in scientific journals might be a yardstick for success by universities and some other research bodies, but are rarely read by anyone else or are in a form that is difficult to understand. This applies to farm advisers who often need to be the first audience to be convinced of new developments.

While universities have a crucial role in education, they also have an essential role in research and they should be provided with incentives to deliver outcomes for industry in addition to incentives to deliver scientific findings. This will require a change in the current metrics of university performance from a focus on publications and citations to a culture of rewarding research impact. Government can encourage this change through its involvement in collaborative programs such as Cooperative Research Centres (CRCs).

AIA recognises the inherent difficulties in measuring industry impact, and that it can take time for activities to produce change and for this change to become a measurable benefit. None-the-less, various well-established metrics can be used to assess impact and likely impact along the chain of innovation.

Recommendation 8. Additional funds should be invested in public sector extension to secure the greatest advantages from innovation

Extension is an essential component of innovation in agriculture and requires investment of public funds. The private sector is well placed to provide farm advisory services wherever they can derive benefit for their investment. A strong need for public sector extension services remains in those areas where the private sector cannot derive a profit from their activities with farmers. The areas which do not readily provide an income for the private sector include managing our landscape for future generations, regional approaches to pest and weed management, biosecurity, empowering producers with better knowledge, early stage innovation, etc. State governments continue to have an essential role in these areas.

Advanced training in extension methodology must be fostered and supported. Advanced skills in extension are applicable in the public and private sectors.

Recommendation 9. A specific effort by government and agricultural RD&E organisations must be made to ensure close engagement with farmers in the processes of RD&E

Farmers can have an instrumental role in innovation, by helping define the problem or by contributing their own creativity.

The involvement of farmers in the innovation process is an essential step which is a balance between technology pull and technology push. Care must be taken not to focus on short-term projects or on projects that are really “re-inventing the wheel”. It could be argued that the current decline in productivity growth is a result of too much effort being put into immediate problem solving at the farm level, at the expense of more strategic, mission-oriented research aimed at responding to the drivers and emerging trends that shape future productivity.

AIA believes the balance can only be effectively achieved if the users of the new technology are closely engaged with the developers of the new technology; or they work on projects together.

Recommendation 10. The WA Government should explicitly support Professional Accreditation for agri-business consultants

Related to this concept is the training and accreditation of agricultural professionals, especially field researchers and advisers. Agriculture is one of the few professions where accreditation is not a prerequisite to providing advice and yet such advice can have a large impact on the business. A useful comparison is with the financial advisers who must be

licensed. The maintenance of professional standards through accreditation is critical to the provision of evidence-based, quality, reliable management and technical advice to agriculture.

AIA is currently developing such a scheme but the AIA professional accreditation scheme would benefit from strong WA Government support.

Other Important Policy Issues

Agriculture has always been a fertile ground for innovation, but the impetus in recent times seems to have slowed. To rebuild this sense of innovation requires encouragement and the right environment which excites the minds and rewards ideas.

1. Agricultural Innovation Council

We need to renew our history and change the culture. This could be achieved by the formation of a WA Agricultural Innovation Council with membership from academic, public, private and farming sectors. It would appoint high profile “champions” and have a (very small and independent) secretariat with some funds to assist in forming productive collaborations and for such initiatives as Innovator Awards. It would be jointly funded by the public and private sectors.

2. Managing rural adjustment

The influence of Government in rural adjustment can unwittingly act as a serious impediment to adoption of technology. When adjustment is *impeded*, the most significant adverse impacts are often on the capacity of the most talented and able in a district or an industry to innovate. Social welfare issues should be handled separately outside the rural adjustment policy (including drought). The Government needs to understand and recognise these unintended consequences of their policies, which are often in response to emotional and political imperatives such as drought.

3. Restoring certainty to career prospects

Innovation can be a “long term” business where the first elements of a good idea take years of testing and development before a useful practical innovation is adopted. This means long-term investment in RD&E. The “Transformational Innovations” mentioned above took years to develop and refine, but the investment in these technologies had paid very substantial dividends. Relevant to this is the need for young Australians to identify a career in science as a worthwhile endeavour. This means that they must see the opportunity for a well paid career with rewarding job opportunities and the opportunity for professional advancement.

The reductions in funding to public agricultural R,D&E diminishes career prospects for young scientists. This is exacerbated by R&D corporations focussing solely on short-term project funding. This approach leads to temporary appointments, unhelpful career changes and

diminishes the attractiveness of Agricultural Science and Natural Resource Management Science to capable young people interested in a career in science.

This situation has led to a shortfall of professionally qualified applicants seeking jobs in the sector and then has encouraged some employers to employ under-qualified staff in professional roles, with consequent serious risk to the future of WA agriculture.

ATTACHMENT 1

AIA WA Division, Innovation in Agriculture Forum, 19th August 2015

Summary of Findings and Conclusions

Implications for Producers

With the severe reduction in public sector extension services, adoption of technology and better farm management could be greatly improved by more collaboration within the supply chain to facilitate the flow of information:

- Fostering peer group networks in the form of discussion groups and social media to share information and set physical and financial indicators of achievable performance targets;
- Strengthening communication between producer and researcher to capture the strengths of the different players and to understand the benefits of innovation;
- Using local validation of innovation to give risk-averse producers confidence in new technology; and
- Recognising the role of accredited private sector extension services as part of the innovation adoption process, especially in the (higher risk) mixed farming zones, in interpreting, sorting and applying the more complex business management options.

For Researchers

The messages for the researcher community were quite strident with the overarching sentiment being the need for much greater collaboration involving all stakeholders in the supply chain, especially by the scientists, whose work underpins innovation. The litany of recommendations to improve collaboration included:

- Listening to farmers to understand the application context of research and ensure it is relevant and practical, and make research results readily available to the extension system by their publication in appropriate, less obscure journals;
- Invest in base science to benefit applied science; being prepared to integrate with industry; and
- Researchers need meaningful engagement, be passionate and prepared to think outside the box, challenge the established paradigms.

For Policymakers

- Retaining valuable scientific wisdom and knowledge by reducing short-term project-duration employment strategies, especially in the public service agencies, through better funding policies so less time is lost through fund-seeking and career structure more secure; need of an NHMRC equivalent.

- Framework for investment needs to be in the long term, with flexibility needed to allow for project deviation and lead times for outcomes can be very long.
- Acknowledge value of growers taking charge of the agenda.
- Need to attract more students from primary school on, and develop youth through mentoring networks.
- Improve the funding model to encourage collaboration across disciplinary silos, and avoid duplication.
- Resource the “blue sky” work, embrace risk in investment, and seek and support entrepreneurship and space to innovate.