Australian Farm Institute

Committee Secretary

House of Representatives Standing Committee on Agriculture and Industry

PO Box 6021

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Canberra ACT 2600

RE: Inquiry into agricultural innovation.

The following brief submission and more substantial attachments have been provided in response to the Terms of Reference of the Inquiry into agricultural innovation by the Australian Farm Institute.

The Australian Farm Institute was established in 2003 to conduct research into public policy issues impacting on the Australian farm sector, and to promote policy solutions that maximise the economic and social wellbeing of farmers. To do this, the Institute carries out, or contracts leading academics and consultants (both within Australia and internationally) to carry out research projects on specific farm policy issues, promoting the outcomes of this research to policy-makers.

The Institute has a commitment to ensuring research findings are the conclusion of high quality, rigorous and objective analysis. The Institute's research is overseen by a Research Advisory Committee consisting of experienced senior researchers and academics. The Committee identifies strategic issues, and oversee the quality of research contracted out by the Institute to ensure it is of the highest calibre and is conducted objectively.

Issues associated with agricultural innovation have been the focus of many research reports released by the Institute. These include;

- An analysis of the Competitiveness of Australian Agriculture
- Review of Australian Agriculture's Trade Performance
- Optimising Future Extension Systems in the Australian Grains Industry
- Assessing the Opportunities for Achieving Future Productivity Growth in Australian Agriculture
- Private Sector Investment in Agricultural Research and Development in Australia

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- Towards a Better Understanding of Current and Future Human Resource Needs of Australian Agriculture
- The Implications for Australian Agriculture of Changing Demand for Animal Protein in Asia
- Productivity Growth in Australian Agriculture: Trends, Sources, Performance
- Enhancing the Customer Focus of Australian Agriculture
- Vertical Contracting and Australian Agriculture: Implications for farmers and policy-makers

Copies of these and other reports are available to parliamentarians on request.

The Australian Farm Institute also publishes a quarterly journal containing papers discussing a wide range of policy issues relevant to Australian agriculture. Recent editions have contained papers discussing the following issues;

- **From little data dig data grows** – the role of digital information in the future of agriculture in Australia and internationally.
- **Will consumers stop agricultural technology?** – the challenges associated with the adoption of new technology in the agriculture sector and the role of consumer perceptions in that process.

Both of these publications discuss issues directly relevant to the Inquiry's Terms of Reference, and are appended for the information of members of the committee.

The Australian Farm Institute is a not-for-profit non-government organisation funded by farmers, agricultural organisations and agribusiness, and as such only has limited resources available to respond to the inquiry, which addresses some issues of critical importance to the future of agriculture in Australia. The following brief comments are made in response to the specific issues raised in the Terms of Reference, recognising that there is scope to substantially expand on these should that be appropriate.

The role of technology in increasing agricultural productivity in Australia.

Australian agriculture has available significant opportunity for growth over coming decades, in response to the growing demand by the middle and upper classes of developing nations for premium quality food and fibre products. However, the resources available (predominantly land and water) for utilisation by the agriculture sector in southern Australia have been greatly reduced over the past twenty years, and while potential exists to develop additional resources in northern Australia, these will take time to develop and some require substantial public infrastructure in order to be feasible. Consequently, the ability of the sector to take advantage of the growth opportunities over the next few decades will depend on;

- productivity growth within the sector (producing more from existing resources), or
- the successful intensification of existing enterprises (such as glasshouse horticulture or intensive livestock production and finishing systems).

New technologies, including genetic technologies for both animal and plant breeding and production, and digital and robotic technologies for the monitoring and management of agricultural production systems, will be critical to achieving success in either increasing the overall productivity of the agricultural sector, or in the intensification of agricultural enterprises.

There are existing challenges associated with achieving either productivity growth or intensification. In the case of productivity growth, broadacre agriculture has experienced a market slowdown in annual productivity growth rates since 1997, which economists and scientists have suggested is due to a number of different factors but an important one is the level of investment in agricultural research and development in Australia.

In the case of agricultural intensification, there are ever-increasing constraints being imposed on intensive agricultural production systems by community groups, Local Government authorities, animal welfare and environmental activists, and as a consequence of standards being adopted by major food retailers.

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

There is strong evidence available of the potential for improvements in agricultural productivity associated with the application of new technologies. The rate of adoption of genetically modified crops (estimated at 175 million hectares in 2013 in 27 countries and growing rapidly) (James, 2013) provides very strong confirmation of the advantages available to farmers from the adoption of this technology. In addition, as the Australian cotton industry has also demonstrated, the benefits of this technology extend well beyond the farm gate, with dramatic reductions in the use of pesticides conferring benefits on the environment and regional communities. The knowledge gains associated with research into GM crops has also provided major benefits to the livestock industries with the application of some of those technologies resulting in major improvements in productivity and genetic gains in specific livestock sectors – notably poultry, pigs and dairy.

The potential to use genetic modification, and the technologies and knowledge arising from GM research, to improve agricultural productivity is substantial. There are a range of desirable production and quality traits that have been identified, with drought-tolerance being of particular interest to Australian farmers.

The application of digital and robotic technology in operating, monitoring and managing agricultural production systems has also generated large benefits in the intensive livestock, horticulture and cropping sectors, although is still in its infancy in less intensive production systems such as rain-fed cropping and broadacre livestock production in Australia. In the USA, where the technology has been deployed progressively over the past fifteen years, farmers are achieving between ten and fifteen percent productivity gains by using the technologies to manage crops at the sub-field level rather than the field average (Hale Group, 2014). These technologies are collectively referred to as

Precision Agriculture, and involve the use of remote sensing, digital mapping, data storage and integration, and the use of variable rate sowing, fertilising and spraying applications (VRA) to effectively manage crop production at the square metre scale rather than the paddock-average scale.

Digital technologies are also being increasingly adopted in the intensive livestock and dairy industries, and resulting in improvements in productivity. Robotic dairy systems, in conjunction with electronic animal identification, is enabling dairy cows to be managed and monitored on an individual animal basis rather than at the herd average level, with resultant productivity increases being achieved.

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 emerging technologies with the most immediate potential relevant to the agricultural sector are those associated with the use of digital technology. The costs of digital monitoring technologies and computer power has declined by a very large amount over the past decade, and is continuing to fall quite rapidly. The result is that digital monitoring systems for soil, water, plants and animals are becoming feasible from a cost perspective, even for low intensity production systems such as broadacre cropping and livestock production. These technologies enable much more objective and precise information to be collected about the various factors that are critical to agricultural production systems, and enable this information to be integrated in ways that assist the decision-making of farmers.

In a general sense, there are three elements involved in these systems. These are (1) the deployment of digital sensors to record relevant production information, (2) the collection, storage and integration of that information, and (3) the use of that information in subsequent decision-making and farm operations.

International experience has shown that the successful integration of these systems into an agricultural production system requires the accumulation of information under a range of different seasonal conditions and over multiple years, and ideally the use of data analytics to analyse large volumes of data to discern trends and associations. It also requires the successful integration of a range of different technical and scientific skills in order to develop fully-integrated systems. Critical to the successful development and adoption of these systems are;

- the availability of suitably skilled technicians,
- requisite scientific knowledge,
- computer storage and data integration software systems,
- good telecommunications access, and
- skilled farm advisors and other service providers.

It is probably reasonable to observe that in relation to most of these, Australian agriculture faces some limitations. This means that the adoption of these technologies will be slower than would be desired, and is likely to occur as a series of steps. There is a role for government in overcoming limitations in relation to scientific knowledge (through R&D investment) and in providing improved rural access to telecommunications and in particular quality mobile phone access.

Barriers to the adoption of emerging technology.

There are a number of barriers evident in Australia that are slowing the adoption of emerging technologies. These include;

- regulatory costs and controls associated with the registration of new chemicals and novel plants and animals. Of particular concern are regulatory differences between states, in particular in relation to GM crops.
- the progressive reduction in public investment in agricultural research and development and associated infrastructure – most particularly by state governments.
- constraints on production systems and technologies that are progressively being imposed by major retailers, generally for brand differentiation and often in response to small numbers of activists,
- related to the above, a failure of industry and its service and input providers to make sufficient efforts to engage in discussions with the wider community about new technologies in agriculture,
- the increasing disengagement of major universities in Australia from the agriculture sector; a consequence of policies that place greater emphasis on international publications and the attraction of high fee-paying overseas students, than on collaboration with, and impact on industry as an outcome of research activities, and
- the quality of telecommunications services, and in particular mobile phone services, in rural and regional Australia.

All of these are issues which can be addressed by government, or on which joint industry-government collaboration could achieve positive outcomes.

The Australian Farm Institute currently has a research project in progress examining the implications of Big Data for Australian agriculture. This project has involved a review of developments in Australia and overseas in the deployment of digital technologies in agriculture, and an analysis of the practical and policy implications of these developments for Australian agriculture. The research report arising from this work should be available in the first quarter of 2016.

References.

James, Clive. 2013. Global Status of Commercialized Biotech/GM Crops: 2013. ISAAA Brief No. 46. ISAAA: Ithaca, NY.

Hale Group, 2014. The digital transformation of row crop agriculture. A Report to the Iowa AgState Group, December 2014.