House of Representatives Standing Committee on Agriculture and Industry

Inquiry into agricultural innovation

Submission by

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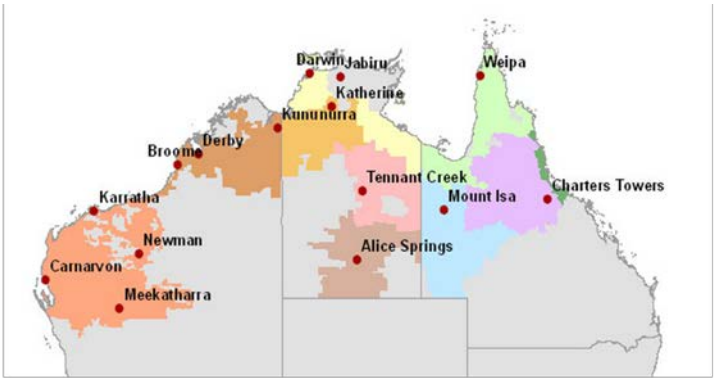
Terms of Reference

The Committee will inquire into and report on the role of technology in increasing agricultural productivity in Australia. The inquiry will have particular regard to:

- improvements in the efficiency of agricultural practices due to new technology, and the scope for further improvements;
- emerging technology relevant to the agricultural sector, in areas including but not limited to telecommunications, remote monitoring and drones, plant genomics, and agricultural chemicals; and
- barriers to the adoption of emerging technology.

Introduction

Northern Australia and particularly Queensland produce the largest amount of cattle with approximately 15 million head of cattle produced in 2014. The off farm meat value was worth approximately $12.75 billion for consumer expenditure plus export value (Meat and Livestock Australia, 2014). There is a high demand for Australia's beef products, so much so that Queensland has set targets to double beef production by 2040 (Chilcott, Waide, & Berglass, 2014). In addition, the Australian Government has signed a live trade agreement with China that will see around a million head of cattle transported to the slaughter market. This submission aims to address the terms of reference for the report of the role of technology in increasing agricultural productivity in Australia.



Northern Australian Beef Producers
(ABARES, 2011, Google Images)

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

There are many new technologies on the market that can be adopted by beef producers in Queensland to manage cattle. However, the adoption of rural digital technologies is slow. It is uncertain as to whether this can be solely attributed to the paucity of internet access in rural areas or if producer's attitudes also attribute it to barriers to technology adoption. Producers tend to be very private and reserved, they dislike pretensions, and are cautious and alert to criticism, which may be a barrier to learning new technology (Shrapnel & Davie, 2001). The efficiency gains from utilizing remote monitoring are well proven, yet the adoption rates are still extremely low in the beef industry. We know that there is a lot of rural digital technology on the market, and we know that it is not being utilised by producers.

Several products currently on the market improve the efficiency of agricultural practices. In particular, these are water sensors, fencing sensors, weather stations, remote cameras and monitoring systems, drones, walk over weighing systems, as well as GPS tracking, and roll over sensors. Efficiencies of these products stem from time saving, instant access to sensors, and visual access to stock and equipment as well as pre-determination of cattle weights for sales. In addition, the producer can track staff and family using quad type vehicles for accidents and potentially getting lost in the Australian bush. As well as remote management, security and the well-being of staff and family, the producer can remotely manage water supplies and other sensor equipment should the producer need to leave the property for any amount of time. This allows the producer freedom to investigate the industry and markets, or simply take a break from the property, which in turn contributes to the well-being of the producer and the producer's family.

Recommendation
Continue to invest in development of available and emerging products to assist producers to adopt digital technology tools. Investment should also enable best practice guidelines in pricing strategies, marketing and use of new digital technology, forecast modelling and collaborative farming.

Emerging technology relevant to the agricultural sector, in areas including but not limited to telecommunications, remote monitoring and drones, plant genomics:

Many of the current rural digital technologies are reliant on cloud technology and depend on unreliable connections to the Internet to work. Many of the producers are interested in the technology but fail to adopt because of challenges faced with accessing the internet and receiving the data. In addition, rural families are feeling the effects of substandard internet connectivity and this is having a negative effect on their well-being.

Recommendation

One solution is to set up an on farm intranet, which is not reliant on the Internet, NBN, or Satellite technology to be successful. The on farm intranet links buildings, bore cameras, sensors, and other technology on farm to one single computer located in the producers homestead. This system allows the producer to use their own information to make decisions about cattle management. One limitation to the on farm intranet is that the data collected cannot be used for billing or research. However, producers are seeking a simple solution to having technology on their properties. The intranet would be a simple and currently available solution. Producers are looking for a simple to understand product that will help them with cattle production and are somewhat overwhelmed by the big picture that often accompanies the current digital technology products. If necessary, connection to the Internet can occur later.

A second, but not simple solution is to provide stable, high quality and speed internet to rural areas of Australia.

Barriers to the adoption of emerging technology:

Several factors affect the adoption of rural digital technology by cattle producers. Importantly there is an incongruity between researchers and producers. Researchers and producers are often on a different level of understanding of the products and researchers fail to unpack the entire product information at a level that implies ease of use. Aubert et al., (2012) and Lamb et al., (2008) cited mismatched compatibility and lack of expertise as common barriers to adopting emerging technology. Similarly, Lamb et al., (2008) found that developer push rather than user pull was a barrier to technology.

Developer pull sees the technology developer (or the researcher) engage the producer in all aspects of the development and evaluation of the product. In turn, those producers are typically aware of the products attributes and from this process become early adopters. Whereas, developer push does not always see the appropriate information given to the producer, therefore barriers to adoption occur from either a misrepresentation or misinterpretation of the information (Lamb et al., 2008).

Farming technology adoption is also influenced by seven individual factors: socio-economic factors, agro-economic factors, institutional factors, informational factors, producer perception, behavioural factors, and technological factors (Tey & Brindal, 2012). These factors are discussed briefly below with recommendations for each factor listed.

Where a recommendation is made, special attention should be given to woman producers. Hay and Pearce's (2014) study found that women were the drivers of technology in rural settings. The research found that women used technology three times more than men and that men view women's role with technology as valuable and important to the business and the family. Women felt that using technology was personally fulfilling, valuable and they felt empowered using and understanding the emerging tools. Men on the other hand felt that they were incapable or uninterested in learning or adopting technology. However, they could see the benefits of the women using technology especially towards productivity and profitability. Note: Hay is continuing the research into technology adoption by rural women and men and in 2015 has observed a shift towards men using mobile technology in the form of smart phones. When asked if the men had set up their own phone in terms of the apps that they were using they stated "no my wife does it and show's me how to use it then I am fine", indicating women as the drivers of technology in rural families.

Socio-economic factors: The producer's personal background may also be a barrier to technology adoption. Highly intensive technologies require a high level of engagement, therefore the producers capacity and ability will clearly influence his or her adoptive decisions (Tey & Brindal, 2012, p. 723).

Recommendation: Identify deficiencies and provide training. It is important that both women as well as men are recognised as decision makers and that each will require different training needs. For example, women are more likely to participate in group training, where producer men will more likely be successful with one on one training or training in short bursts.

Agro-ecological factors: considers property size, type of production and financial status. If the producer can check the water points in a few hours, he/she may not be willing to outlay the costs of the rural digital technology. However, if the technology reduces time and interval of travel, then the technology will be adopted.

Recommendation: Offer real money incentives to larger property owners to encourage adoption of time saving and safety related rural digital technology. Reducing travel to and from water points, often on unsealed rough roads over long distances, may result in fewer accidents (Centre for Accident Reasearch and Road Safety - Queensland, 2012).

Institutional factors: the farm may be in an area that is subject to development or drone certification; therefore, the decision to adopt new technologies may be affected.

Recommendation: Assist the producer by reducing red tape to establish ground rules that affect their property.

Informational factors: might include information from extension services, on-sellers, or product consultants. If the information is too complicated, the producer may engage a contractor to do the work. In addition, information on the technology might not be readily available causing a negative effect to adoption.

Recommendation: Provide training and education about rural digital technology. Re-instate extension officers to provide easy to follow information about the products, this could include a contract for maintenance on the digital technologies to be funded by the technology producers at a nominal cost.

Producer perception: if the farmer perceives the technology to be useful and easy to use then adoption will willingly happen.

Recommendation: Ensure that all information is set out in clearly written form. Provide opportunities for one on one training for producers.

Behavioural factors: are influenced by time and capital, and willingness and effort, when this influence is positive, adoption of technology will ensue. By contrast if influences are negative, then the opposite occurs.

Recommendation: Provide funding opportunities to producers to hold producer run field days. The producer will save time and capital by purchasing the rural digital technology. Allowing producers to connect on a producer level may create altruistic followers of rural digital technology and in turn reap the benefits of time saved, increased production and freedom.

Technological factors: include the type of technology available and the operator required to use them e.g., computers. Computers are used to analyse the data that is collected by the rural digital technology, therefore if the producers has a negative relationship with computer technology, he or she is unlikely to adopt the technology

Recommendation: Identify deficiencies and provide training. It is important that both women and men are recognised as decision makers and that each will require different training needs. For example, women are more likely to participate in group training, where producer men will more likely be successful with one on one training or training in short bursts.

Bio

William Harrington is a 4th generation grazier from Richmond in North West QLD, who has been designing and manufacturing products for primary producers since 2005. He started with an NLIS tag reader "The Pipe Reader". William is the Director, Engineer, and Founder of Harrington Systems Electronics (HSE). The company manufactures several products including the uSee remote monitoring system and NLIS Pipe Readers. The uSee system is a simple, easy, and cost effective remote monitoring system that is designed to help improve efficiency in the industry. HSE's newest product is the DoubleN granular herbicide applicator for control of Prickly Acacia. William is also a director and primary software developer for Farm Apps with the FTrack smartphone app.

William is also a producer. His family runs approximately 2000 head of cattle on two stations, "Olga Downs" and "Kolonga" stations (on approx. 16,000ha). William grew up, lived and worked at "Olga Downs" his entire life. This is also, where Harrington Systems Electronics is based. HSE has customers all throughout Australia and several overseas, with our main products - uSee remote monitoring cameras and tank sensors. Customers include beef producers, irrigators, environmental groups, several leading universities, and the CSIRO. William has been heavily involved in the development of the FTrack application and is currently starting to market the DoubleN applicator.

Rachel Hay is a PhD Student from Townsville and studies the engagement of women and technology in agriculture. Rachel's interest in the beef industry and in technology stems from early experiences working alongside her father at CSIRO and as a volunteer on a local cattle station.

Rachel's research originally looked at why rural men were not adopting technology. We know that men in cities use technology every day, so why are men in rural areas not using it. We also knew that someone was using technology in rural areas; therefore, we looked towards the women. Rachel's first study showed that women graziers are embracing rural technology producing economic advantages for farming as well as lifestyle. A copy of the paper is attached to this submission.

References

Aubert, B. A., Schroeder, A., & Grimaudo, J. (2012). IT as enabler of sustainable farming: An empirical analysis of farmers' adoption decision of precision agriculture technology. *Decision Support Systems, 54*(1), 510-520. doi: http://dx.doi.org/10.1016/j.dss.2012.07.002

Centre for Accident Reasearch and Road Safety - Queensland. (2012). Rural and Remote Road Safety. In Q. U. o. Technology (Ed.). Online: Queensland University of Technology.

Chilcott, C. D., Waide, C. M., & Berglass, R. M. (2014). Draft Beef Industry Action Plan 2014-2016. In F. a. F. Department of Agriculture (Ed.). Online.

Hay, R., & Pearce, P. (2014). Technology adoption by rural women in Queensland, Australia: Women driving technology from the homestead for the paddock. *Journal of Rural Studies, 36*, 318-327. doi: http://dx.doi.org/10.1016/j.jrurstud.2014.10.002

Lamb, D. W., Frazier, P., & Adams, P. (2008). Improving pathways to adoption: Putting the right P's in precision agriculture. *Computers and Electronics in Agriculture, 61*(1), 4-9. doi: http://dx.doi.org/10.1016/j.compag.2007.04.009

Meat and Livestock Australia. (2014). Fast Facts 2014: Australia's Beef Industry. North Sydney, NSW 2060: Meat and Livestock Australia Limited 2012.

Shrapnel, M., & Davie, J. (2001). The influence of personality in determining farmer responsiveness to risk. *The Journal of Agricultural Education and Extension, 7*(3), 167-178. doi: 10.1080/13892240108438818

Tey, Y., & Brindal, M. (2012). Factors influencing the adoption of precision agricultural technologies: a review for policy implications. *Precision Agriculture, 13*(6), 713-730. doi: 10.1007/s11119-012-9273-6