Submission to House of Representatives Standing Committee on Agriculture and Industry

Enquiry into the role of Technology in increasing agricultural productivity in Australia

Terms of Reference

1. improvements in the efficiency of agricultural practices due to new technology, and the scope for further improvements;
2. 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
3. barriers to the adoption of emerging technology.

Current Agricultural technology projects

The previous Labour government set up Commercialisation Australia (CA) which was continued by the current government under the name Accelerating Commercialisation (AC). These programs provide grants and business and expert mentoring support to new SME technology businesses across Australia. Compared to its relative size in the economy, agriculture has received a high proportion of grants.

Agriculture has received 79 grants represented 13% of all grants. The average grant size has been $414,000 and $32.7 million has been provided. These grants require at least matching funding so the programs have directly resulted in more than $65m being invested in agricultural related technologies. My estimate is that more than $100m has been invested as a result of the program.

In regional NSW where I am located, there has been $12.5m in grants including food and agricultural related grants of $10m. With matching and other funding the total investment generated exceeds $35m in regional NSW with food and agriculture representing more than $20m)

These programs are for commercialisation not R&D. The focus is innovation and creating commercial enterprises from the nations R&D and general inventiveness. Examples of the types of innovation and businesses the program has supported are intelligent machinery, carbon and new farming techniques and equipment, organic pesticides, grain measurement systems, new crops for farmers, irrigation and water, safety equipment and computer systems. Companies include Boss Engineering, Innovate Ag, Maverick Biomaterials, Safergate, Granular Products and Australian Mustard Oils

Examples of Projects

1. Lens 10 - Data integrity assurance and simulation product to improve accuracy and reliability of big data
2. Soil Carbon - Broad acre measurement of soil carbon and biological soil carbon sink methodologies
3. Entrepreneurs Studies - Establish an entrepreneurs training and learning school / course based on case studies
4. Innovate Ag - Organic pesticide derived from plant extract approved by APVMA for pest control in cotton
5. Boss Engineering - Unique swath air-seeder for large scale precision sowing

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6. Safergate - Unique collapsible cattle gate to reduce WHS injuries
7. Australian Mustard Oil - Building processing plant to process mustard seed into oil, essence, protein powder and bio-fumigants
8. Maverick Biomaterials – Production of heart value tissue from bovine animals
9. Aerofloat - Unique DAF technology for treatment of waste water from food processing
10. Next Instruments - Grain measurement systems for farmers and grain traders

Colleagues are associated with more than 60 other agricultural projects across Australia.

Efficiency of Agricultural practices due to new technology

New technologies have significantly improved agricultural productivity over the years with new grain varieties, new farming and animal husbandry practices and new communication and computer management systems. Productivity increases in agriculture have led the nation but many of these gains arise from research and development commenced and funded years ago. Today the pipeline is much smaller due to reductions in resources applied to R&D over the more recent years.

In some ways, this may be a saving because the future looks very different to the past, so I focus on the second term of reference and what is expected to be the drivers of future increases in productivity.

Emerging technology relevant to the agricultural sector

The terms of reference refer to examples of telecommunications, remote monitoring and drones, plant genomics, and agricultural chemicals. With respect, these examples are limited and the scope of change and productivity gains is potentially far wider with significant ramifications for agriculture and regional Australia.

Let me address a number of areas, outside the mainstream of Agricultural R&D (which I assume others will address).

1. Telecommunications, data collection and processing.

Agriculture needs reliable and efficient communications to effectively utilise the benefits of the technologies of the future. This remains an issue with on-going denial from the major telecommunication companies. (I have very poor mobile phone connections on my farm). Many of the productivity gains of the future depend on communications and until the issue is addressed, the potential gains will be illusionary.

Agriculture can and will collect huge amounts of data in the future. The volume of data will exponentially grow and the analytics tools will be developed to provide useable information. It is happening now and the demand is huge. I refer to grain yields and analysis, machinery performance, soil analysis and many other elements. Agriculture is a multi-disciplinary business with people with an amazing diversity of skills, greater than any other industry, and to increase productivity these people need reliable usable data. To my amazement I recently discovered that there is currently no program that assures the integrity of big data and hence I am supporting a business that provides such a platform.

Big data and its processing and analysis are the future, like nothing before because we have the capacity to collect, process and analyse the data. This will provide new decision making tools that will make our decisions more accurate and precise, with the consequent increase in productivity.

2. Autonomous Machinery, robotics and drones

We do not need people to sit in tractors or any other farming vehicle. Autonomous driven vehicles are here to stay and the labour and labour cost saving will have ramifications for farmers and their traditional workforce. A field can be ploughed by 5 tractors at once driven from a computer in an office by one person. Refuelling and filling seeder's etc. will be the only manpower requirement. Vineyards will be mowed by autonomous mowers.

Drones will check the water troughs, feeders and tanks and the condition of livestock with direct feed back to the home computer. Robotics will sort the fruit more efficiently than any humans could ever do.

So changes will occur but that creates the opportunities discussed below.

3. Soils and Carbon

Soils are the future for both food production and carbon sequestration. For food production soil fertility is crucial but the two are inter-related because higher carbon levels means more organically sustainable and productive soils. The future is in soil biology not soil chemistry and there will in the next 5-10 years be a fundamental shift in soil science.

Soils are the largest carbon sink after the oceans, with more than twice the carbon of above ground plant matter and the air combined. Australia leads the world in soil carbon definition and measurement methodology and new technologies will make Australian farmers into carbon farmers and give them a valuable new income source in addition to the wind and solar farm incomes they are currently receiving, albeit selectively.

4. Organic Agriculture

There has and continues to be a total lack of scientific data that supports the benefits of organic products in agriculture (the costs are too great and no-one has put up the money). However the APVMA is expected to shortly approve the first organic pesticide compound for pest control in cotton. This is a major breakthrough for two reasons. First the necessary testing and trials where conducted to conclusively show the effectiveness of the organic product and secondly, a compound and not a single active chemical / ingredient are to be approved. This effectively opens the door to a new form of pesticide and herbicide treatment in agriculture.

5. Animal Genetics and Management Practices and improved processing with new products.

Animal genetics and improved animal husbandry and pasture management practices offer greater potential for productivity gains than grain in the short to medium term. Improved weight gains through genetic selection, improved pasture and feed nutrition and greater value add through new products will provide these gains. However, advances in these areas take time to feed through to increased productivity, so gains will be progressive.

There is a significant emerging competitor to the meat industry, which will arise from the huge investment currently being undertaken in the US and Singapore into artificial meats made from plant protein. If and when this competition becomes commercial (which is expected in the next 3-5 years), livestock produced red meat may be forced to become a luxury product as current manufacturing beef and similar low grade products are replaced by factory produced meats.

6. New crops

There is significant opportunity for new products both from broad acre and intensive agriculture. In broad acre, mustard and industrial hemp are two examples. In intensive agriculture, Asian vegetables, algae and horticulture generally have huge potential.

All these areas face barriers to adoption and challenges because they disrupt existing practices.

Barriers to the adoption of emerging technology.

Australia has good researchers and inventors, we make great discoveries but we are appalling at commercialising these developments.

While each technology will have its own barriers, the common barriers to commercialisation are as follows

1. Lack of entrepreneurial management and skills

After 40 years in new business creation and technology, I am convinced Australia lacks visionary entrepreneurs. The statistics on new business creation support this view. So what is a visionary entrepreneur?

A visionary is someone who sees something in the future that others do not.

An entrepreneur is someone who has 'grit', focus, determination, belief and patience; someone who listens, thinks, acts and is flexible; someone who won't accept no for an answer, who seeks to achieve, who is positive.

There is also the Australian culture which is first negative and critical of anyone who is prepared to 'have a go'. Australian's fear failure and failure is seen as a sentence and not the learning curve it is. Australian bankruptcy laws are draconian with heavy penalties, no consideration of risk reward and the experience gained by the 'victim'.

The solution is creation of a technology entrepreneur's institution targeted at agriculture and based on case studies and rugged boot camps, supported by the successful agricultural entrepreneurs. Entrevators is currently evaluating a proposal to create an Entrepreneurs Training, Advisory and Mentoring Services (ETAMS) Institution.

2. Lack of capital

The Australian Government spends more than A$9b on R&D but spends less than $200m on commercialisation. This is all wrong and Australia is an international joke when it comes to technology based risk investment and commercialisation of its taxpayer funded research.

Institutional investment in agriculture in Australia has been either non-existent, been too short term or has failed to produce acceptable ROI's. Investment in agricultural technologies has been non-existent except with government and grower funded organisations support.

Most Management and Investment Schemes generally failed because the investor motivation was tax driven. The agricultural sector has a huge asset base and wealth but little cash. This sector has singly failed to use its wealth to commercialise R&D and there is scope for consideration of Government's role is releasing some of this wealth into the commercialisation activity.

The Labour government established the Commercialisation Australia (CA) program and the current Government has re-organised this program and created Accelerating Commercialisation (AC) within the Entrepreneurs Programme. Both grant programs aim to support commercialisation of intellectual property across Australia. Both programs were merit based and in each case strong applications significantly exceeded the funding available.

Capital will only be provided if experienced management teams can be assembled. Entrevators is evaluating this issue and seeking solutions in consultation with industry.

3. Others

There are numerous other issues but the above are the most important.

General View

I fundamentally disagree with the opinions expressed by big business 'business leaders' in relation to adoption of new technologies to increase productivity. Big business wants more R&D and government incentives for R&D. All big business wants government to provide more R&D because it allows them a relatively free ride in the high risk business of R&D. The question is what is happening with the commercial development of products from existing R&D. The truth is that the expenditure on commercialisation activities is so low that most R&D never gives rise to any commercial product or application or it is licensed to an overseas business. The reasons are

a. The lack of risk funding (and even any interest in SME's or new businesses) from big business and the risk aversion of the big business leaders. Big businesses leaders generally are not entrepreneurs and have not ever created a business. They know how to manage a big business, a valuable skill, but that does not create the risk taking character required and they totally lack an understanding of SME's.
b. The lack of incentives for financial investors to support early stage risk commercialisation activities
c. Financial market confidence in SME management and entrepreneurial skills

In agriculture, R&D expenditure in Australia in the late 1970's was approx. $800m. In 2007 it was $830m and it remains at similar levels today despite strong evidence of productivity gains from such R&D. (ref Future Directions International). The benefits of the 1970's R&D are being reaped now but in 5-10 years the reward will be very limited. However the time from discovery to market has become much shorter for some products (and longer for others) so Australia need to focus on 'low hanging fruit' to fill the gap that is about to occur.

I could go on but I won't because I think I have made enough points.

Funding for increased commercialisation could come from two sources

1. Remove the used equipment 100% write off for equipment under $20,000. Retain it for new equipment.
2. Tighten the R&D tax incentive and force commercial evaluation of any project that last more than 5 years and exceeds $5m. This could yield up to $200m from the $1.7b currently spent.

If requested I can prepare a detailed paper on agricultural innovation or appear in person to answer your queries.

I hope these comments assist your deliberations.

Yours faithfully

David L MacSmith

CEO Entrevators Pty Ltd

23 September 2015

Appendix A

Authors Background

2015 – Participant in Australian Futures – Actions in Agriculture study on the future of innovation in NSW agriculture supported by Fairfax Foundation

2012 - 2015 Commercialisation Advisor in the Entrepreneurs Programme , Department of Industry, Australian Government and Director of Entrevators Pty Ltd, a specialist technology commercialisation advisory firm.

2003 – 2012 Farmer and investor

1993-2003 Founder and Executive Chairman NASDAQ and ASX listed software company, Catuity Inc,

1983-1993 Founder and Managing Director of Technology Investment Management Ltd, a technology venture capital funds management business with $200m invested in more than 50 projects and businesses in Australia.

1981-1983 New technology commercialisation and investment in the US and Australia

1979-1981 Logistics Director for building of Royal Saudi Air Force HQ in Riyadh Saudi Arabia

1976-1979 Multiple roles in World Bank sponsored live sheep and meat export venture in ME.

1970-1975 University degree in law, accounting and economics