Submission to the Inquiry into Agricultural Technology and Innovation

September 2015

NSW Farmers' Association
Level 6 35 Chandos Street
St Leonards NSW 2065

Ph: (02) 9478 1000
Fax: (02) 8282 4500

NSW Farmers' Association Background
The NSW Farmers' Association (the Association) is Australia's largest State farmer organisation representing the interests of its farmer members – ranging from broad acre, Livestock, wool and grain producers, to more specialised producers in the horticulture, dairy, egg, poultry, pork, oyster and goat industries.

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Executive Summary

> *"We have to recognise that the disruption that we see driven by technology, the volatility and change is our friend…if we are agile and smart enough to take advantage of it. There has never been a more exciting time to be alive than today and there has never been a more exciting time to be an Australian. We will ensure that all Australians understand that their Government recognises the opportunities of the future and is putting in place the policies and the plans to enable them to take advantage of it."* **Prime Minister-designate Malcolm Turnbull, 14th September 2015**

Agriculture underpins Australia's largest manufacturing industry (food and beverage processing) and it added $25 billion to the economy in 2013/14.[1]

NSW Farmers represents all sectors of agriculture in NSW and has unique insight into the cross-cutting technological needs of the industry. There are 33,000 producers in the state, all calling for innovation solutions relevant to their business and to achieving their common goal which is generating sustainable farm gate return. However, the majority of these farmers are remote from, and are excluded structurally from, the innovation process in any practical sense.

This submission highlights the value of the broader application of technology for small to medium enterprise (SME) producers and outlines what we believe should be the Australian Government's policy and program priorities when seeking to increase the value of agriculture to the Australian economy.

We argue that more rapid and focused adoption of technology is critical to Australia's competitive advantage in food and fibre markets. Further, technology can help align economic and sustainability objectives in agriculture: our farmers need technology that enables them to underpin Australia's brand claims in terms of the sustainability, quality and safety of our food and fibre products. They particularly need reliable telecommunications coverage to support this.

The fundamental cross cutting issues surrounding technology apply equally to all farming systems, be they cropping or pastoral, intensive animal or horticultural. A key theme in this submission, therefore, is the need for policy and programs that are technology rather than segment or jurisdictionally focussed. For example, a national program to develop ICT capacity for all farmers, rather than disconnected ICT programs duplicated for each subsector or region of agriculture.

As the government's *Agricultural Competitiveness White Paper* makes clear, "as the mining construction boom moderates it will be important to foster growth in other export sectors, including agriculture."[2]

As an industry and a culture agriculture needs to embrace change processes that are certain to be challenging on many levels.

[1] Commonwealth of Australia 2015, *Agricultural Competitiveness White Paper*, Canberra p. 4
[2] *ibid.*

Recommendations

Recommendation 1: That an innovation hub is created for agriculture (food and fibre production) linked collaboratively with Food Innovation Australia.

Recommendation 2: That a dedicated ICT capacity building program is created for the farm sector

Recommendation 3: That ICT professionals are involved in the early stages of regulatory reform processes to ensure that resulting policy can be implemented within integrated electronic service delivery systems of sufficient capacity.

Recommendation 4: That funding is provided to farm industry bodies to support farmers in working with digital innovators to develop integrated "paddock to plate" QA, marketing and authentication solutions

Recommendation 5: That a national agricultural transport optimisation program is implemented, including a mechanism for farming communities to feed data into CSIRO's TRANSIT tool

Recommendation 6: That a capacity building program is funded to improve understanding of genetic technology and engage stakeholders in constructive debate around solutions.

Recommendation 7: That a think tank of policy makers and technologists is convened to analyse commercial priorities for agrichemical R&D and policy.

Recommendation 8: That the Federal Government via the COAG energy productivity process provides strategic incentives aimed at increasing energy productivity in agriculture.

Recommendation 9: That incentives for advanced manufacturing in food and fibre are embedded in regional development policy, and national industry development and infrastructure policy

Recommendation 10: That consideration is given the creation of sustainable food and fibre precincts in regional hubs

Recommendation 11: That the government commissions a technical study that creatively addresses solutions to regional connectivity on the basis of business analysis of farmers ICT needs.

Recommendation 12: That policy is introduced that ensures provision of minimum essential bandwidth to farmers, coupled with transparent reporting of performance metrics and shaping measures applied by providers.

Recommendation 13: That the government seeks to stimulate and support Australia innovators and technologists to found and operate Australian-owned firms that operate collaboratively with farmers and which provide genuine competition to the global agribusiness giants.

Recommendation 14: Than an effects test is introduced to revitalise competition in Australia and facilitate innovation and productivity in SME farm enterprises.

Recommendation 15: That R&D incentive programs give preference to Australian innovation providers and projects that focus on niche market development with high value adding potential.

Recommendation 16: That the R&D or RD&E model typically applied in rural research and development is replaced by a cascading, customer centric ERD&E model

Recommendation 17: That the Federal government implements a national industry driven technology capacity building and adoption program focussed key strategic areas, being ICT, genetics, export and trade processes, marketing, energy productivity and agrichemicals.

Recommendation 18: That the government provides base funding to support the Aginnovators peer network, its extension portal and Partner Paddocks database.

Recommendation 19: That the government provides policy support and other facilitation for joint ventures in the food and fibre value chain that assist farmers in implementing advanced technologies and have the net result of increasing farm gate value

Recommendation 20: That taxation reforms include lowering the tax rate on start-up income, zero capital gains tax for start up investors, and mechanisms that enable investors to offset losses high risk technology ventures.

Recommendation 21: That R&D tax incentives are restricted to companies that are incorporated in Australia and are not foreign owned subsidiaries

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1. Disruption & Innovation – Market Power and the Farm Gate

1.1 Disruption - opportunity for whom?

Australian agriculture is on the cusp of massive disruption. Technology convergence across the fields of big data, sensing, energy, robotics, genetics and chemistry is transforming food and fibre production, enabling multifactor productivity gains that were inconceivable a decade ago.

This technology convergence demands rethinking the way industry, science and technology are administered across portfolios and departments. A priority in this regard is ensuring effective synergies between agricultural programs and the broader industry, science and information technology effort. In short, we must stop seeing agriculture as different and somehow separate to the rest of industry.

A practical question facing farmers and bodies representing farmers, however, is how to access cutting edge innovation in areas such as ICT, advanced manufacturing and marketing. Agribusiness has an innovation hub funded by the Department of Industry; agriculture has no equivalent body.

A hidden assumption in this structural division between agribusiness and agriculture is that farmers should stay on their side of the farm gate: that their role in the value chain ends once the raw material leaves the farm. There are many examples of farmers breaking the mould in this regard and setting up their own, 'boutique', vertically integrated marketing pipelines. Such farms, however, represent a tiny proportion of total production and are succeeding in the face of significant barriers.

In this submission we challenge the committee to focus on the strategic aim of public investment and public policy pertaining to agricultural innovation. The Minister for Agriculture has made clear that the single guiding principle of government policy in relation to agriculture's is for improved farmgate returns. In line with this the committee must consider the central policy question of who is intended to be the primary beneficiaries – the farmers themselves or agribusiness? If it is deemed that foreign-owned agribusiness should be a primary beneficiary we need to ask how that objective aligns with the abovementioned policy priority with specific reference to where the profits and IP will go, and how the growing dominance of these firms in the value chains of Australian agriculture. There is also a strategic and unanswered policy question in this space as to how this issue interacts with broader societal objectives around sustainability and self sufficiency.

More broadly: where does Australia's greatest competitive advantage lie with regard to technology in agriculture? What, in practical terms, does Australia need to do to achieve its aims of doubling agricultural productivity? Further, how do we measure and value that productivity – quantity of the product produced, the gross sale value, the net value returned to society? Do the policy makers responsible for trade and economic development ever sit at the same table as those responsible for sustainable agriculture and environment?

The Agricultural Competitiveness White Paper states that the "Government wants healthier market competition, better regulation, and an improved tax and investment environment *to increase farm gate returns*" (our emphasis)[3]. At the same time it acknowledges that "supply chains are characterised by high business concentration

[3] *ibid*. p. 7

beyond the farm gate".[4] The Government has concentrated its white paper action items on the welcome addition of fire power for the ACCC, tax measures and foreign ownership registers.

However, if the Government's objective is really "a fairer go for farm businesses" then preparing Australian farming for the future will also demand a coordinated R&D strategy aimed at increasing the market power of producers, stimulating Australian entrepreneurship and accelerating disintermediation and process optimisation at all levels in the value chain. Just as the advent of technological innovation was not a central issue for farmers a decade ago, its correlation with farmgate returns has not been sufficiently central to considerations of the sector's strategic direction. This must change.

This focus, coupled with decisive strategic investment, is critical to empowering our producers to compete directly and more profitably in high value global niche markets for quality assured, sustainably produced food and fibre.

1.2 Increasing farmers' market power is critical to innovation

Australia's farming families are the source of the food you eat, they are a vital generator of so much economic activity right across the supply chain, and ultimately they help to balance the books for our economy.
Minister Barnaby Joyce, Media Release, 30 September 2014

In the not-too-distant future, deployment of robotics, automation, sensor technology, integrated quality assurance (QA) and marketing systems, energy and water productivity, will drive competitive advantage in many segments of agriculture. We are seeing the beginnings of this in the grains sector with precision agriculture, in horticulture, with automated control systems and data driven optimisation of water, nutrient and energy inputs, in aquaculture with environmental sensors enabling more accurate response to pollution events.

Machine to machine communication opens up new ways of integrating information flows across paddock, processing and marketing processes in the value chain. This in turn enables disintermediation, with a host of new opportunities for farmers to collaborate in upstream value adding processes and thereby achieve a larger share of the end value of products.

Meanwhile robotics innovators at the University of Queensland and University of Sydney, and in many centres overseas are developing machines that ultimately will make it possible to automate a majority of manual farming tasks.

The technology is dazzling: the first question raised by farmers, however, is who will be providing the capital and human resources required to own, operate and support these machines?

For example, a key prospective technology is autonomous farm vehicles for broad acre cropping. Such vehicles will be powered by electricity, far lighter than current tractors and harvesters (with benefits for soil and energy), and fully integrated with sensor technology and precision agriculture decision support systems. They will also be expensive to purchase and will require specialist skills to set up and maintain.

[4] *ibid.,* p. 26

The next generations of agriculture students are being equipped with the technical and conceptual skills necessary to succeed in this new world of agriculture. The critical question is who will they be working for – themselves as owners and operator of farms, or for vertically integrated corporations?

The hope is that some family farms will be able to flourish in the new, digitised economy. However, the reality is that the cost of innovation on the farm can only be offset by price premiums up the value chain. Currently these do not flow back effectively or sufficiently to farmers. In the current business environment, when farmers achieve efficiencies on farm, this is clawed by agribusiness. This issue goes to the overarching recommendation of this submission. That is, that policy decisions must be developed to enhance the capacity of the agricultural sector and farmers in particular to improve the profitability of their businesses through innovation.

Large agricultural corporations are well positioned to deploy the latest and best technology, as are foreign investors planning to establish vertically integrated ''paddock to plate'' operations. A majority of producer SMEs, however, individually lack the capacity and access to capital required to remain competitive as technology extends its reach into agriculture. This is a classic market failure requiring explicit intervention.

Policy measures aimed at constraining predatory and anti-competitive behaviour by agribusiness have proved ineffective, or in the case of the effects test, have not yet been taken up by government. In the absence of further meaningful policy reform, much of the solution lies in empowering farmers themselves to become participants in the digital economy.

We argue that significant public investment must be focussed on providing better access to technology and building capacity that increases the market power and farm gate value received by our SME producers, particularly family farms, so that they can afford to innovate.

Importantly, this assistance should not be spent on 'handouts', but on strategic investment in the deployment of technology that empowers farmers to engage more directly with the digital economy and to work collaboratively with agile Australian-owned technology providers across the spectrum of innovation.

There is a pure economic justification for this: as argued below, the maintenance of our family-farm-based production system is integral to the brand of Australian food and fibre and achieving price premiums in global niche markets and on ensuring that the benefits of Australia's potential agricultural boom are owned and shared among Australia's rural communities.

A cross cutting innovation hub is needed for agriculture focussed on the innovation needs of farmers and food and fibre production and linked collaboratively to Food Innovation Australia.

Recommendation 1: That an innovation hub is created for agriculture (food and fibre producers) linked collaboratively with Food Innovation Australia.

1.3 Family farms and competitive advantage in high-value export markets

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Australia's brand reputation for high quality, safe food and fibre ultimately rests on what happens in the paddock, greenhouse, animal or aquaculture facility.

There is no doubt that our global competitors can produce agricultural commodities cheaper than we can and that we are minnows in terms of production capacity. Our farmers, therefore, need to focus on producing goods that command higher prices.

Australian agriculture's best bet in this regard is to target emerging "mega niche" markets for luxury and well-being foods. This plays to our strength, which is a personalised farming culture, where the trusted business owners are intimately engaged in production and can stand by their product.

Our family farming culture gives Australia a marketing edge. Private individuals own and operate the majority of properties and have deep personal knowledge of and responsibility for the land and water resource, the production process and the quality of the goods.

This is in contrast to our competitors in bulk commodity markets whose agricultural systems are heavily corporatized, with farm managers typically lacking decision authority around choice of technology and farming practice.

Importantly too, it is this contrast which underpins the market failure in play here. The corporate sector is positioned to commercialise the opportunity of innovation. Conversely, the family farming sector is highly fragmented, creating market failure.

While a small proportion of Australian producer SMEs have achieved vertical integration and are selling self-branded niche products successfully into both local and global markets, the great majority are price takers and have little involvement with their produce post farm gate.

We believe that this needs to change rapidly if Australia is to take full advantage of the opportunity presented by booming demand for fine, quality assured food and fibre.

As is discussed below, increasing farmers' access to and mastery of new technology, particularly digital technology (and literacy), is critical to this objective.

2. Priorities for Technological Innovation

2.1 Information and communication technology (ICT)

Information and communication technology (ICT) impacts every aspect of agriculture from precision agriculture and automation on-farm, through to disintermediated, direct marketing solutions.

Currently there is no government fund or body focussed on helping farmers engage with the digital economy as a whole and on an ‘’agile’’, commercial basis.

2.1.1 Information science

In a digitised food and fibre production system and supply chain, machines will be in constant communication with each other without human intervention. The optimisation made possible by the Internet of Things (IoT) is entirely dependent, however, on the quality of the information science.

Australia can lead the way in developing the data models, decisions support tools and ICT infrastructure needed to implement the IoT in the food and fibre value chain.
Data61, CSIRO and other bodies are doing important work across the spectrum of digital technology and information science relevant to agriculture (*e.g.* remote sensing, automation, logistics, RIFD, decision support, inferential optimisation). However, there is currently a massive gap in the engagement, extension and skills space.

The next stage of development entails explicit, active engagement with farming practitioners to ensure relevance to industry.

2.1.2 Big data and farming

Sensor technology, big data, machine to machine communications and inferentially driven decision support tools have immense potential to assist farmers in optimising production processes, increasing profitability and reducing environmental impact.

Farmers across every sector need access to best practice management systems and decision support tools that enable them to deploy digital solutions and connect seamlessly with upstream compliance, supply chain and marketing processes.

Digital solutions, particularly if mandated, must be designed in close consultation with the farmers themselves to ensure they are both practical and profitable.

Many of the systems so far developed for agriculture (*e.g.* decision support tools, electronic identification for livestock) have been designed ‘top down’ to fit academic, policy or agribusiness agendas. As a result, they seldom allow farmers to work the way they need to and fail to make concrete contributions to farm gate value.

2.1.3 Disintermediation

ICT makes it possible for Australian farmers to break out from behind the farm gate and claw back market power.

Digital technology is profoundly disruptive to agribusiness because it enables disintermediation throughout the value chain, cutting out redundant steps and ticket clippers. The traditional roles of agents, brokers, marketing bodies and exporters are being changed by technology that enables farmers to market their product directly,

paddock to plate, associated with a packet of data that stream lines compliance and trade transactions, and enables advanced marketing solutions.

As this plays out, it is critical that family farmers leverage the value they hold in their farm-scale data to increase farm gate prices.

A dedicated funding program is needed to assist farm representative bodies such as NSW Farmers in working with peak digital innovation providers to help operationalise digital technology in the sector and accelerate adoption. The program would engage with farmers to increase their access to and understanding of the digital economy in all its aspects, including intellectual property, decision support, machine to machine communications, automation, direct marketing and product authentication/branding.

Recommendation 2: That a dedicated ICT capacity building program is created for the farm sector

2.2 eGovernment

Agriculture, more than any other industry, can benefit from seamless electronic service delivery. Like the tyranny of distance, the tyranny of 'red tape' can be reduced substantially by effective deployment of ICT across government. We therefore welcome the proposed Productivity Commission review into the regulation that is limiting growth in Australian agriculture.[5]

Priority areas for deploying digital technology to help integrate, streamline and harmonise regulatory process across jurisdictions (local, state and federal) and portfolios are:

- Environment and planning
- Transport
- Biosecurity
- Trade

It is essential that policy harmonisation and processes across these areas takes into account the special requirements for implementation of regulation within computing systems.

Recommendation 3: That ICT professionals are involved in the early stages of regulatory reform processes to ensure that resulting policy can be implemented within integrated electronic service delivery systems of sufficient capacity.

2.3 Quality assurance, marketing and product authentication

As Australia builds on its brand for high quality food and fibre, assaults on product integrity will intensify. Counterfeit products, even for fresh food are already wide spread in many of our most valuable export markets. Discussions between MLA and NSW Farmers have indicated that sophisticated export markets such as Korea have strong and robust labelling requirements making fraudulent use of farmer brands unlikely. However, MLA has noted that this issue will continue to be a watching brief in for the use of farming brands in emerging export markets.

[5] Commonwealth of Australia 2015, *op. cit.*, p. 38

We believe that significant strategic investment is urgently needed in quality assurance and product authentication solutions that track products from paddock to plate. Tamper proof, hidden IDs solutions needed that make it possible for customers to verify the provenance of our products and access complete sets of QA, compliance and marketing data in digital form.

Recommendation 4: That funding is provided to farm industry bodies to support farmers in working with digital innovators to develop integrated "paddock to plate" QA, marketing and authentication solutions

2.4 Biosecurity

There is an opportunity for Australia's biosecurity effort to be streamlined and harmonised across segments and jurisdictions. In noting this, we do recognise the significant legislative change at state levels which complements the once in a generation investment in biosecurity announced in the Agriculture White Paper.

However, there are opportunities to better leverage the power of digital technology in this space. For example, there is no integrated spatial database and management system for invasive plant and animal control in Australia. Data is fragmented across literally hundreds of control authorities and there is little or no capacity for coordinated intervention. The problem is compounded by different legislation across jurisdictions.

In cases where digital technology is proposed as part of the solution, the process is typically not thought through.

A case in point in the proposal by the Victorian government to make eRFID tagging mandatory for all pastoral industries, including goats.

Case study: mandatory electronic radio frequency identification (RIFD) in Victoria

Recently, the Victorian Government signalled a proposal to make RFID tagging mandatory for sheep and goats, ignoring that the technology depends on adequate telecommunications connectivity and the ability to read tags in fast, erratically moving animals in saleyards.

RFID is a complex field, requiring a policy framework that is truly aligned with the nature of the technology, its strengths, limitations and innovation pathway for different industries. In its current state of development, RFID is only suitable for certain species and farming systems. Policy that does not recognise this will have massive negative unintended consequences for the pastoral sector.

Even if current RFID technology was adequate, the goat industry (worth $241 million in 2013/14) exports 90% of its product to the USA, where mandatory RFID tagging in Australia would jeopardise the rangeland status under USA law and effectively shut down the export industry.

RFID and other digital technologies have a role in the pastoral sector. However, the entire innovation process must be properly thought through, and industry involved at ground level in the process.

2.5 Technology in transport and logistics

Farmers tend to be at the bottom of the food chain with regard to transport services. Located literally at the ends of road and rail networks, farmers suffer massive costs and losses around transport risk. A program is needed to deliver some easy and relatively low cost wins around smart logistical solutions for agricultural transport and goods handling. Bodies such as Data61 and Global Standards 1 have valuable capacity around tracking technology, integrated data platforms and route analysis. NSW Farmers would welcome funding for programs where industry works with innovation providers to develop and test solutions. We particularly welcome the application of CSIRO's TRANSIT tool to 'help identify opportunities' for Commonwealth transport route projects that provide the greatest return for investment.[6]

A national agricultural transport optimisation program is needed involving:

- Comprehensive mapping of rural road and rail networks, correlated with the rule sets that apply regarding usage
- Identification of choke points and modelling to reveal strategic investment in policy harmonisation, improved infrastructure, and potential for intermodal transfer hubs
- Analysis of the allocation of rail and port priority, and measure to correct anticompetitive behaviours in that regard
- Investment in digital transport logistical solutions that allow tracking of farm produce and inform optimisation of supply chain processes
- Investment in ''community of practice'' solutions that support networks of transport providers to collaborate in service delivery

Recommendation 5: That a national agricultural transport optimisation program is implemented, including a mechanism for farming communities to feed data into CSIRO's TRANSIT tool

2.6 Genetic technology

We believe there is a need to explore sustainable policy solutions and effective innovation which includes the use of gene technology.

Genetic science and technology has played a central role in the evolution of agriculture (and biological science in general) since prehistory. Public disquiet regarding the technology (and suspicion within the farm sector) stems from multiple causes including the scope of engineering now possible, the patenting of genes and the lack of clear information in the face of the sheer complexity of the science which now embraces many sub-disciplines and types of technology.

There is a need to factor in the ideological views of community that may or may not be open to GM technologies. We note that much scientific rigour is involved with assessment of gene technology, however effective communication and education is required to distribute this to growers and the wider community. For example, a variety of grain with higher nutritional values and lower water needs is less likely to be opposed than a patented sterile seed that is resistant to potent pesticides.

This is highly complex issue with no black and white solutions.

[6] Commonwealth of Australia 2015, *op. cit.*, p. 70

We believe incentives are needed, and barriers must be removed, for Australian researchers and firms to develop GM solutions that genuinely increase the sustainability of production.

There must also be a commitment to developing policy and operational solutions for farmers who see their economic future in the evolving GM free market.
An effective extension and outreach program is needed to increase understanding of the many and various applications of the technology and to develop industry support for specific solutions.

This program must engage the public and farmers in exploring the issues on an informed basis and must be a genuine commitment to capacity building and solution development, not a PR exercise.

Recommendation 6: That a capacity building program is funded to improve understanding of genetic technology and engage stakeholders in constructive debate around solutions.

2.7 Agrichemical usage

Many Australia farmers are striving to minimise their agrichemical use for both cost and sustainability reasons. In general terms, we believe R&D investment and policy should prioritise technologies that minimise chemical usage, enable greater precision in application and improve safeguards and accounting. This endeavour complements Australia's aspiration to be the source of choice for safe, healthy food.

A global trend in technological innovation is the enabling of agile, application specific solutions. We hope to see Australian agrichemical firms emerging that deploy local IP to provide products tailored to Australia's unique environment and needs. Innovation and convergence across genetic, chemical and pharmaceutical technologies is critical in this regard.

In parallel with technology innovation, policy innovation is needed to drive harmonisation of rules and best practice across jurisdictions and segments and to resolve competitive advantage issues surrounding the rules that apply to imported versus domestic produce and to exported products.

Convening a think tank of policy makers and technologists to analyse commercial priorities for agrichemical R&D and policy should be formed. This should address:

- Priorities for public and private investment
- Harmonisation of rules and best practice across jurisdictions and segments
- Technical trade barriers and competitive advantage issues surround the rules that apply to imported versus domestic produce and to exported products in key markets.

Recommendation 7: That a think tank of policy makers and technologists is convened to analyse commercial priorities for agrichemical R&D and policy.

2.8 Energy

Energy is a dominant input cost for agriculture, with farmers exposed to rising costs for electricity, gas and diesel. Further, NSW Farmers has longstanding policy on the importance of reducing costs around energy. There is an urgent need for technological innovation across:

- Electrification of vehicles and pumps and related optimisation using digital control systems and automation
- Deployment of renewable and particularly solar energy for irrigation pumping, including emerging battery technologies
- Waste to energy for intensive animal production
- Smart grid solutions for regional electricity distribution including virtual private networks and demand management collaborations around renewables.

Recommendation 8: That the Federal Government via the COAG energy productivity process provides strategic incentives aimed at increasing energy productivity in agriculture.

2.9 Value adding in regional Australia

Product authentication in high value export markets demands investment in advanced Australian food processing facilities. Chinese buyers in particular want certainty that the product was packaged at source and is fully tamper proof.

This shift in the economics present opportunities to reinvent Australian food processing applying advanced manufacturing and industrial ecology principles.

NSW Farmers is calling on government to seed investment in new advanced processing facilities that recycle water and waste, use renewable energy, and deploy automation and smart optimisation solutions to minimise labour and other input costs.

Based in regional centres, such firms could partner with farmers to produce value added food and fibre products to the highest authenticated standards, with benefits flow back to Australian farmers and regional communities. For example, fine textiles, small goods and milk products.

To progress from vision to reality, sophisticate planning and analysis is critical both to raising finance and achieving synergies across commercial, employment and amenity outcomes. We advocate a master planning approach to locate sustainable food and fibre precincts in expanding regional hubs. Purpose built precincts, tailored to regional strengths, would enable agricultural production to be collocated with value-adding facilities and waste and water recycling plants, with economies of scale around ICT and infrastructure (see Tamworth case study below).

Case study – a sustainable food precinct for Tamworth

NSW Farmers has been seeking prefeasibility funding with Namoi Council and other industry stakeholders to facilitate creation of a "sustainable food precinct" in Tamworth.

The proposed development would co-locate new chicken sheds with processing and recycling facilities in a purpose built precinct that uses advanced sustainability technology to achieve water and energy self sufficiency.

Massive expansion in chicken meat production and processing, with as many as 400 new production sheds in the pipeline, means additional jobs, increasing housing demand, and is great news for the regional economy. It also creates a suite of planning challenges for Council and industry.

Chicken meat production involves costly waste management problems, including amenity issues around the coexistence of industry with residential accommodation. Further, the new production and processing facilities require energy, which presents an opportunity to meet new demand by recycling the waste in a gasification plant.

The project would address real-world local government and industry problems surrounding the zoning of noxious industry, waste management, energy supply, water and transport efficiency. It would also reduce infrastructure and development costs, streamlining approvals, and present marketing opportunities.

To go any further, the project demands intensive analysis and a master planning exercise to enable development of firm business plan. Unfortunately, existing funding and incentive programs don't cover the alignment and prefeasibility steps required to get visionary projects such as this to implementation. The conundrum facing the sustainability sector is that ''wicked problems'' require complex, agile and sophisticated solutions. Despite the talent and good will of people working within funding bodies, such solutions typically don't fit the administrative models that they have to work within.

Recommendation 9: That incentives for advanced manufacturing in food and fibre are embedded in regional development policy, and national industry development and infrastructure policy

Recommendation 10: That consideration is given the creation of sustainable food and fibre precincts in regional hubs

3. Barriers to innovation and adoption

3.1 Inadequate telecommunications

Farmers are tired of being described as digitally illiterate. In fact, farmers are early, eager adopters of digital technology. Given the tyranny of distance, they are highly motivated to engage with the digital economy in all its forms. At present, a majority of them are blocked at the first step, struggling just to achieve reliable connection. Since NSW Farmers Annual Conference in 1998, the Association has been formalising policy for better telecommunications for the bush.

The highest priority of innovation in agricultural technology is improving ICT connectivity. In today's accelerated economy, poor connectivity creates cascading disadvantage across business decision making, marketing, education, and the ability to deploy tools being used routinely by competitors.

The threshold priority for connectivity in regional Australia is providing **all** farmers with at least **some** bandwidth on a reliable basis. Many farmers can't even make a phone call, or send and receive text and email. This is a different problem to the national broadband challenge.

3.1.1 NSW Farmers Telecommunications Survey

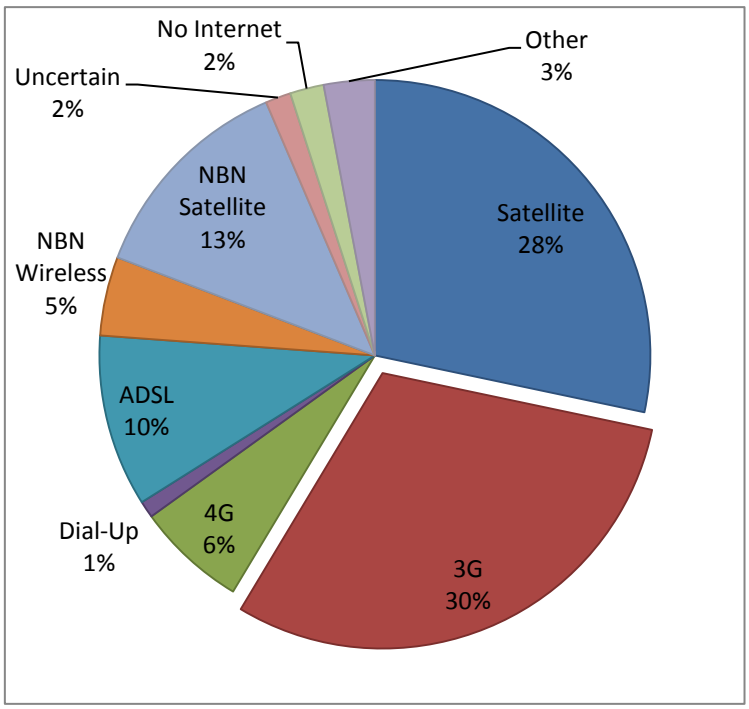
In June 2014 NSW Farmers released it latest telecommunication survey[7]. The data demonstrates the deep digital divide that farmers face in simply accessing reliable and readily accessible telecommunications on farm. Only 36% of survey respondents were able to access 3G or 4G internet, with a further 5% on NBN wireless. The remainder accessed the internet through the last generation dial up or ADSL technology, or through satellite services (41%) which are subject to capacity constraints and regularly result in farmers having their usage 'shaped' once they reach their monthly download limit.

> 2014 NSW Farmers' Survey Feedback
>
> *"Telstra continues to push the latest mobiles that are capable of all sorts of functions, however we merely need to be able to make and receive calls effectively for starters"*

The data capacity constraints and limits associated with satellite or shared spectrum services create very real issues for farmers in regional Australia. Once they have hit their monthly download limits, farmers are prevented from accessing many services or activities that are an integral part of modern agribusiness such as mobile/computer banking, cloud based accounting, live auction participation, or access to information on weather or commodity markets. Furthermore, they are often unable to access even basic business email functions, not to mention being denied access to the use of the internet for education, health or social uses.

[7] The survey was completed by over 600 respondents providing substantial and detailed insight into the state of regional telecommunications in NSW. It followed surveys conducted by NSW Farmers in 2011, 2008, 2005, and 2002.

Available internet connection



3.1.2 Capacity constraints on shared spectrum services

For many in rural and regional Australia, it is capacity constraints on shared spectrum services (such as satellite) that are now becoming the greatest concern with internet service. Many farmers have reported being frequently unable to access an internet connection during 'peak' times of the early evening when many others in an area or community are also attempting to access the internet.

Alternatively, farmers have reported being cut off from their service, or slowed to dial up speeds, when they breach their download limit for the month. This action is taken by telecommunications companies in an attempt to drive a rationing of internet usage, in full knowledge of the capacity limits that the service offering faces.

3.1.3 Realistic solutions to improve connectivity

We are calling for the urgent formation of a think tank and technical report to addresses solutions to regional connectivity, reporting to government before December 2015.

This work should focus on business analysis and prioritisation of farmer needs. It may be that relatively low bandwidth on line/offline gateways can enable farmers (and their machines) to effectively engage with the digital economy without access to broadband. In this case, part of the solution may involve a combination of private farm-scale networks (for human and machine communication on farm) linked to lower band width connection to the outside world.

Recommendation 11: That the government commissions a technical study that creatively addresses solutions to regional connectivity on the basis of business analysis of farmers ICT needs.

Recommendation 12: That policy is introduced that ensures provision of minimum essential bandwidth to farmers, coupled with transparent reporting of performance metrics and shaping measures applied by providers.

3.1.4 Dominance of agribusiness incumbents

Incumbents in the agribusiness value chain are not motivated to enable disintermediation of processes and technology that might increase the independence and market power of producers.

This is a market failure issue that cannot be corrected under our current competition policy settings. Targeted funding and policy changes are needed to level the playing field for Australian entrepreneurs.

Recommendation 13: That the government seeks to stimulate and support Australia innovators and technologists to found and operate Australian-owned firms that operate collaboratively with farmers and which provide genuine competition to the global agribusiness giants.

Recommendation 14: Than an effects test is introduced to revitalise competition in Australia and facilitate innovation and productivity in SME farm enterprises.

3.2 Structural imbalance in the R&D sector

The present structural imbalance in access to agricultural R&D and capital for innovation has been growing for decades.

Drip feed funding provided to our peak innovation bodies, coupled with policy that requires them to recover costs via commercial partnerships, has the practical effect of consolidating the dominance of transnationals in Australian agribusiness.
Since there is virtually no venture capital available in Australia for high risk agricultural R&D, it follows that the only firms willing to joint venture with our innovation bodies, are transnationals.

Australia both benefits from and is dependent on the billion dollar research budgets of transnational agribusiness. Not withstanding the mismatch in capacity, we believe it is essential for Australia to support alternative, ‘home grown’, sources of agricultural science and technology. The focus in this regard should be on agriculture technologies that support consolidation of Australia’s reputation for quality assured niche foods and which help to increase farm gate value.

That R&D incentive programs give preference to Australian innovation providers and projects that focus on niche market development with high value adding potential

Recommendation 15: That R&D incentive programs give preference to Australian innovation providers and projects that focus on niche market development with high value adding potential.

3.3 "Stranded" R&D

Successive government have attempted to implement policy that helps ensure public investment in agricultural R&D translates into rapid and effective adoption. While some progress has been made, fundamental problems still exist around the scope and nature of engagement by farming practitioners in the design, delivery and dissemination of R&D outcomes.

We believe that it would be fruitful to learn from the "lean" development methodology deployed in ICT, which is customers centric, and which involves cascading iteration of engagement throughout development processes: effectively, an "Engagement, Research, Development, and Engagement" model (ERD&E). Implementing such a model would entail significant change in the culture of our R&D bodies.

Recommendation 16: That the R&D or RD&E model typically applied in rural research and development is replaced by a cascading, customer centric ERD&E model

3.4 Extension and outreach– need for a new model

A corollary of the capture of technology in agriculture by agribusiness is that agribusiness has become a default provider of extension advice. We believe it is unwise to rely on sales agronomists and sales engineers to lead our industry into the future. Having said this, we acknowledge that the increasing complexity and breadth of technology in agriculture presents massive challenges to government extension services, to peak R&D bodies and to bodies such as NSW Farmers.

We know that there is massive latent demand for specific expert advice and information that addresses the plethora of questions that face farmers in these turbulent times. Genuine and deep collaboration is needed to deliver an effective program to take Australian farmers into the future.

The new model needs to address the following factors:
We want our top government funded scientists and technologists to be focussed on problem solving and generating novel Australian-owned IP. Policy that shoe horns 'boffins' into extension roles is counter productive since: a) they are unlikely to be good at it; b) it diverts them from their core activity.

Skilled trainers and communicators who also have deep domain knowledge are needed to design and deliver programs. There is little point in funding generalist extension officers who have no real technical expertise in critical innovation fields

Farmers are time poor and reject information that does not address their day to day needs, and business imperatives.

Farmers typically "learn by doing" and by example.

We propose a suite of national strategic capacity building programs addressing the following fields.

- ICT and the digital economy

- Genetics
- Export and trade processes
- Marketing
- Energy
- Agrichemicals

These programs would work across Australian and global R&D bodies to translate the latest and best innovation into relevant and accessible forms. Capacity building would focus on case studies, on-site demonstration, and peer leadership, and would be reinforced by the full suite of digital communications technologies. Our recommendation would be to design and provide these using an 'agile' rather than monolithic, static methodology. In others, invest in deep analysis of client needs and adjust delivery in response to evolving client needs. The key clients in this regard would be farmers and innovation providers, with the programs providing the bridge.

NSW Farmers hopes to extend its existing services in this space. In 2014, NSW Farmers established the AgInnovators network and web portal. Supported by CSIRO, Data61 and other key bodies, the network is focussed on:

- Linking innovators across the food and fibre value chain via research based collaborations;
- Providing accessible information about technology and business innovation from Australian and global bodies (this includes resurfacing and promoting RDC collateral);
- providing extension services on key strategic issues.
- Linking R&D providers with farmers via its proposed Partner Paddocks[8] database and researcher/practitioner matchmaking service.

Recommendation 17: That the Federal government implements a national industry driven technology capacity building and adoption program focussed key strategic areas, being ICT, genetics, export and trade processes, marketing, energy productivity and agrichemicals.

Recommendation 18: That the government provides base funding to support the Aginnovators peer network, its extension portal and Partner Paddocks database.

3.5 Business planning and finance

The paradox currently facing Australian agriculture is that on one hand opportunity has never been greater; on the other it has never been harder for farmers to chart the path forward and make decisions regarding capitalising their businesses.

[8] Partner Paddocks is intended as matchmaking service for researchers/developers seeking collaborators in field work. The concept is part of the established aginnovators.org.au network but has not yet received core funding. By making it easier for researchers and developers to find suitable farmers to work with, we believe Partner Paddocks will significantly assist with both the design and adoption stages of innovation and as such, will help address the problem of 'stranded research'. Farmers will provide their interests and details about their farming system to a trusted party (NSW Farmers) on the understanding that registered users will be able to search the database for suitable collaborators in field work and R&D processes. Partner paddocks will provide secure communications between potential collaborators and will assistance to farmers around IP and related issues where relevant.

Constant downward pressure on farm gate prices means that many farmers are reluctant to invest in innovation with long payback periods and uncertain returns.

Even if farmers have a relatively high appetite for risk is likely that their bank does not. A threshold problem for farmers who are ready to innovate is the difficulty of accessing capital. Most rural banks have low appetite for risk and demand short payback periods. In this business environment, foreign capital has a clear advantage.

A related issue is the mismatch between the cost of advanced technology and the financial capacity of most family farms. In this regard, we hope to see initiatives that foster joint ventures between farmers, investors, and technology providers.
Achieving the growth targeted for the sector demands exploring new business models. With effective strategic guidance, these models can reinvigorate and preserve the core strengths of our "family farming" system.

Recommendation 19: That the government provides policy support and other facilitation for joint ventures in the food and fibre value chain that assist farmers in implementing advanced technologies and have the net result of increasing farm gate value

3.6 Taxation policy and barriers to Australian entrepreneurs

NSW Farmers would like to see more Australian firms developing IP and providing solutions that are directly relevant to the strategic needs of Australian agriculture. Current taxation policy is not conducive to venture capital in high risk endeavours. There are structural reasons why nations such as the USA, Singapore and the UK are better at innovation. Without tax reform that makes domestic investment capital available to small cap startups, we will keep losing our brightest technologists and best IP to foreign owned firms that sell the products back to us at inflated prices.

Changes to taxation policy would help level the playing field and enable Australian tech entrepreneurs to gain the necessary foot hold. In this regard consideration should be given to lowering the tax rate on start-up income, zero capital gains tax for start up investors, and a way for investors to offset losses. This would help bring Australia in line with our global technological competitors.

Recommendation 20: That taxation reforms include lowering the tax rate on start-up income, zero capital gains tax for start up investors, and mechanisms that enable investors to offset losses high risk technology ventures.

Recommendation 21: That R&D tax incentives are restricted to companies that are incorporated in Australia and are not foreign owned subsidiaries

Conclusion

In summary, new technology is presenting unique challenges to Australian agriculture. Decisive leadership is needed to break down silos, resolve sources of conflict and drive collaboration

Change is a stressful process, with stress aggravated by communication difficulties, agendas at cross purposes, and real and perceived threats to the status quo. Strategic innovation programs in agriculture, therefore, must recognise the importance of communication and capacity building.

While there always will be a need for segment and geographically specific R&D, as a national priority, we must shift the weight of funding and research effort to cross cutting programs that release the benefits of technology convergence and drive deep collaboration across innovation providers.

The following are strategic priorities in this regard:

- ICT and the digital economy
- Genetics
- Biosecurity and trade processes
- Marketing/branding/product authentication
- Sustainable production (optimisation, best practice and quality assurance)

Aligning industry to achieve progress and shared understanding across these fields will help ensure that the future of Australian agriculture is charted by Australia rather than external interests.