



CHALLENGES AND OPPORTUNITIES IN INNOVATION FOR CONSULTANTS

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In order to identify the challenges and opportunities for consultants when discussing innovation we need to take a three pronged approach:

What does Agriculture look like in the next 10 – 20 years?

What does the future look like for our Clients?

What are the challenges and opportunities for our businesses – servicing our clients and running our businesses?

What does Agriculture look like in the next 10 - 20 years?

Key words are Connectedness; Collaboration and Value, Industry Data Platforms, Opensource Hardware, Cooperatives, Big Data, Drones, Artificial Intelligence.

The last 20 years have seen an explosion in adoption of new technologies and the arrival of new industries, markets and customers.

What does that actually mean?

5 RIRDC trends (<http://www.rirdc.gov.au/news/2015/08/14/new-trends-research-predicts-mega-opportunities-for-australian-agriculture-as-world-grows-hungrier-wealthier-with-fussier-consumers-by-2035>)

A hungrier world: Demand for food products. By 2050 we are looking at 9.7 billion world population up from 7.3 billion in 2016 (2.4m increase). Food demand is expected to increase about 60-70%. We have competition for this market – Brazil has tripled its agricultural exports since 2000.

A wealthier world: Protein demand/Different product formulations/Value Chain Opportunities/Diversity of products

Fussier Customers: More Data means more educated consumers that will change target market/niche market/product specifications/traceability/ethical considerations.

Transformative Technologies: Digital disruption/improvements in genetics/new science technologies and data analytics will change how our clients work and how we work together.

Bumpier Road: climate/environment/global impacts and the growth of cross-sectoral integration will mean we need to have greater agility, greater resilience, greater understanding of the drivers of our risk profiles to respond to more shocks and more severe shocks across climate/financial markets/consumer trends.

Family Farming will remain the fundamental model of agriculture with a corporate approach to strategy and business structure. Corporates and family farmers will form collaborations to work together to benefit from the positives of each business model and learn from the weaknesses. (<http://www.agriculture.gov.au/abares/media-releases/2016/family-farms>)

Those family farms with gross revenues over \$500k will need to identify non-traditional paths of family succession planning to grow business to remain viable. There will be a whole segment of under performing small businesses that will need to change models or sell out.

50% of current jobs that exist in the world will be gone in 50 years. (<http://www.dailymail.co.uk/news/article-2826463/CBRE-report-warns-50-cent-occupations-redundant-20-years-time.html/>)

The tools that farms will have at their fingertips will be a growth in bioengineering, market segmentation, sensor technology, 3D printing, robotics, precision agriculture, artificial intelligence and big data.

Digital technology will have cross sectoral uses. It will be used as a vehicle of extension and communication. It will change the direction and rate of on-farm productivity changes.

The way in which we market agricultural products will need to evolve to meet the new consumer demands around welfare, integrity and value.

New technologies will continue to drive the large scale, low cost business model of ever more productive farming, processing, distribution and retailing with a growing market of smaller scale, consumer focused production that focus's on ethics, food miles, traceability and relationships. There will also be growth from the health conscious market segment where we will see the continued niche markets of ancient grains, heritage breed meats, heirloom fruits and vegetables, and craft beers and spirits.

The society in which agriculture will operate will be a platform of openness and collaboration. Social media will play a role for both participants in agriculture (twitter has become a platform for "I have a problem, can anyone help me with it" (This has the potential to affect demand for consultants) and consumers who want to know what's in my food, what does the brand stand for and I want it in 70 characters or less.

eXtension will play a role and we are already seeing GRDC and private sector play in this space where the use of communication technologies are reshaping the traditional means of extension (<http://www.extensionaus.com.au/>).

Cooee Collective is but one example where private sector have pulled together a collaborating cross sector of skills to offer mentoring and coaching to people living all over Australia and New Zealand (<http://coo-eecollective.com.au/>).

MLA have recently called for tenders to develop business requirements for an information exchange platform for the red meat industry.

Overlaying these fundamental industry trends, we have a vast array of innovation driving productivity and disrupting traditional production.

The traditional innovators will supply the new open source culture with open source hardware and schematics or mechanical drawings which are all released under free terms. The original sharer gains feedback and potential improvements on designs from the wider community. Such sharing can drive a high return on investment for investors.

This new baseline will drive useful farmer applications of new technologies. Private companies and farmer driven cooperatives will work together to utilise the industry data platforms to increase efficiencies and productivity within the sector supplied with some information from research networks but also contributing their own research. Where research has traditionally been technologically it now becomes focused on innovation.

Bitcoin and Blockchain will impact agriculture just as the 1970's mainframe computer impacted agriculture; just as the 1980's PC helped influence agriculture; just as the 1990's internet has changed agriculture; just as the 2000's social/mobile paradigm shift has reduced the tyranny of distance in ag; the 2010's growth of blockchain/bitcoin technology will completely change the way in which we do business.

Quote from Melanie Swan: Blockchain: Blueprint for a New Economy: *We should think of blockchain as another class of thing like the internet. It is a new organising paradigm for the discovery, valuation and transfer of all discrete units of anything and potentially for the coordination of all human activity at a much larger scale than has ever been possible before.*

Agriculture is among our most technologically advanced industries, yet most Australians are largely unaware of the revolution that is occurring on our farms.

Of course, all these things we talk about cannot happen without good internet and communication infrastructure.

So what does all this really mean for our clients?

The clients we will be working more with will be millennials, Generation X and to a lesser extent the Baby Boomers. Millennials will display a tendency toward collaboration, interdisciplinary skill sets, and early adoption of new technologies compared to Generation X who need to actively develop technical skills and are less team oriented. Millennials entering the agriculture workforce will want to do business differently from the older generations. They will have a strong desire to work together as part of a global community and to address hot button issues like environmental policies, animal rights, controversial technologies, and GMOs. Many are more comfortable with nuanced positions on these issues and are more open to collaborating to find solutions.

<https://www.google.com.au/search?q=generational+differences&biw=1821&bih=829&tbm=isch&tbo=u&source=univ&sa=X&sqj=2&ved=0ahUKEwinpYCi2oXNAhVhPKYKHUBFAbEQsAQIKQ&dpr=0.75#imgrc=LqsnGvifvBhMNM%3A>

Our clients will be exposed to a rapid rate of change including the continual inflow of big data. The devices from which data can now be captured range from individual animal sensors, to soil, water and temperature monitors, imagery from drones, data from automatic stock weighing scales, data from sensors on tractors, seeders and harvesters, genomic and performance data for livestock.

The capacity to record, integrate and analyse all this data, and then to utilise the results as part of farm management decision-making, creates the undoubted potential to take farm productivity to new levels by enabling management at the individual animal or square metre scale, rather than at the herd or paddock scale.

There is already and will continue to be a rapid growth in the volume and velocity of unstructured data. Filtering it and deciding which of it is important and unimportant will be critical. Bites of data need to show value and growers willingness and ability to consume large research or technical papers decrease.

Did you know that there is now a Fitbit for Cows – a combination of sensors, machine learning and cloud that measures the activity of a cow in 3D space and using artificial intelligence algorithms can detect various behaviors such as eating, walking, ruminating. This information is then modelled to provide insights into animal health and Connecterra is predicting up to 20% increase in productivity per animal with direct on farm profit implications. <http://www.connecterra.io/connecterras-fitbit-for-cows-wins-2015-startup-of-the-year-at-web-summit-in-dublin/>

Swarmfarm Robotics have developed a smaller lightweight ride-on lawnmower robots that work together as a swarm that adapt to different crops and different tasks. They have the ability to slow down and stop at individual plants. New opportunities to grow crops in different ways, throw out the boundaries of CTF, Zero Till and how we harvest. <http://www.swarmfarm.com/>

Late last year, 6 teams of driverless trucks drove across Europe. The emergence of driverless trucks brings with it the promise of doubling the output of the transport network at 25% of the cost. There will be untold fuel efficiency and labour gains, lower goods prices and increased standards of living with a number of road safety benefits. In Australia, Rio Tinto operate 69 driverless trucks at its Western Australian operations saving 500 work hours a year by running them 24 hours a day. <http://time.com/4285093/driverless-trucks-europe/>

Prescription farming as an extension of precision farming will be the next big thing in cropping. Currently in the States, JD, Monsanto, Raven and DuPont Industries are collaborating to capture, quantify and analyse on-farm data which they deliver back to the client in a useable format in tailored field prescriptions for farmers. The use of multi-layered data to generate variable-rate planting and fertilizer application systems based on soil types, elevation and yield history has the ability to plant each paddock with different seed varieties, at different depths and spacings and vary it according to weather predictions. In the states, users of Prescriptive farming are reporting yield increases of 5% over 2 years. <https://www.no-tillfarmer.com/articles/65-writing-a-prescription-for-the-future-of-farming>

There will be issues around who owns the data and farmers will have to develop new levels of trust with their service providers and be more accepting of this new data-sharing world. There will be the emergence of shared value data platforms such as Grower Information Services Cooperative in Texas. The GISC is a grower-owned cooperative based on ensuring growers have the ability to control their own farm data and ensuring grower ownership of that data. GiSC brings growers together – from across the country, with different operations, commodities, and farming practices – and provides its members a FREE platform that facilitates their ownership rights and allows them to realize the value of the data produced on their farms. <https://www.gisc.coop/>

Recently NFF with funding from the Government announced new software platforms, and I make note of the Digital Ag Service which will provide data collection and storage. <http://adf.farmonline.com.au/news/nationalrural/agribusiness/general-news/pm-backs-nffs-digital-revolution/2749593.aspx>

Picture the day when you, or your client, can print your own field sensors on an inkjet printer complete with an inbuilt battery, and then peg it down in your crop to monitor pest, disease, or canopy cover. Printable electronics, printable batteries and even printable LCD screen technology is available now, it won't take long to turn up on farm.

Artificial Intelligence is the study of creating computers and software capable of intelligent

behaviour. Linked to this is the concept of machine learning, which allows computers to learn from vast amounts of data and calculations, and then make decisions. There will be a range of agricultural applications for the technology.

I apologise for the blatant JD advertising but this You Tube video is a good example of what the future may look like. <https://www.youtube.com/watch?v=jEh5-zZ9jUg>

The technology is such that Researchers analyzing electronic health records are using artificial intelligence to show that they can predict heart failure as much as nine months before doctors can now deliver the diagnosis.

<https://blogs.nvidia.com/blog/2016/04/11/predict-heart-failure/>

There are so many more influences: Autonomous tractors, crowdfunding platforms such as AgFunder that specialise in funding ag-startups. Australian research such as AgAlytics where soil and tissue testing can be performed infield on a mobile device, virtual fencing, mothering ewes and lambs in the paddock using RFID. And we haven't talked about Drones yet....

Combining the increase in the use and capability of drones and the growth in agri-robotics will disrupt agriculture as we know it and challenge the way we currently farm.

All told, the agricultural robot market is expected to grow to \$16.3 billion by 2020 from \$817 million in 2013, according to the latest Bank of America Merrill Lynch Global Research report.

And, the report says, one large segment of that market will be drones.

The agricultural drone market has the potential to generate an additional 100,000 jobs in the U.S. and \$82 billion in economic activity between 2015 and 2025, according to the report.

<http://www.marketwatch.com/story/how-drones-will-drastically-transform-us-agriculture-in-one-chart-2015-11-17>

Challenge: What role will consulting/extension and adoption services have in this new world?

Where research has traditionally been technologically it now becomes focus on innovation – an opportunity for consultants to participate in R&D where traditionally we have worked in the fields of adoption.

There is a great movement in the R&D and Industry sector to change the traditional pipeline approach and renew the industry to mirror the collaborative, collective open data platforms that are active in agriculture. We need to encourage a new system of transformational research to translate into on farm gains.

The Autumn Quarter of the Farm Policy Journal had a contribution from Robertson et al which contained some amazing figures about Australian R&D. In 2015, Australia ranked 10th in the world for innovation inputs, 72nd for innovation efficiency and last for research-business collaboration. Clearly, there are greater returns on investment to be gained by improving the relevance of the model. Robertson et al: Five Ways to Improve the (Agricultural Innovation System in Australia: Farm Policy Journal, AFI I Vol. 13 No.)

How do we play a role in speeding this up?

The opportunities will lie in driving research and innovation relevant to a range of sectors and applying it to agriculture. There will be obvious benefits from cross sectoral research in climate change, robotics, soils, sensors, water, and processing data. Research will have to move to a cluster based cross sectoral collaborative model where relationships are long term and create value for the end user. **Our opportunities may be to provide a partnership between growers, service providers, industry and government where there is a shift towards a user pays model based on a value proposition and a focus on working with business and providing returns on investment to all parties based on a co-investment model.** It's about having skin in the game to get the best outcomes. These shared income streams will recognise the value of private sector involvement.

The private sector is well placed to be an active participant in the development of tools to support better use of data in industry which when interpreted either through AI or professionals will add greater value to research investments and deliver greater practice change. **There may be a role utilising our extension and facilitation skills by pulling the collaborative team of researchers, farmers, venture capitalists and entrepreneurs together develop systems of regional consultation that allows for the utilisation of individual data with maximum productivity gains.** Some industry groups do this already, but some need reinventing.

As an industry, consultants have the opportunity to drive farmer interfaces, useability of new technologies, system integration between paddock and value chains. **We are perfectly placed as an independent, third party to scan for opportunities.**

Perhaps there is an opportunity as a networked and connected industry group, resourced to help businesses that want to change could be the best investment of funds or to package the information outputs from RDCS/CRCs and develop easily consumable information packages of high value.

The challenge for us as an industry is that there is likely to be a certain level of producer price resistance given the historical structure of extension and will result in a paradigm shift from subsidised R&D/innovation to commercial rates. As consultants we already play a role in this shift.

There is additional challenge of a fundamental lack of understanding in the value proposition and this will increase as appetites for information increase but the appetite for how it is delivered changes.

In terms of our **internal businesses**, our greatest challenge is to move with the (rapid) times.

Know 4 things: your customer, where the market is moving; the nuances of the technology and its applications and what our competitors are up to.

As consultants, we can summarise what the innovative future looks like in terms of service delivery for our clients.

We can provide new solutions that are new either to the market or our consulting business.

We can adapt solutions by modifying existing products, processes and services for entry into new clients or markets. This is possibly the most common form of innovation for us.

We can provide thought leadership that delivers cutting edge insights or advice to market off the back of practical innovations.

We can solve problems that overcome issues for clients.

I guess the question is as consultants, which of these four services do we undertake and how does the changing agricultural space affect how well we do this.

The challenge will be identifying the skill sets that we are going to need but perhaps don't currently have.

Are our businesses agile enough to handle a fragmented knowledge system and translate that knowledge in new formats to add value to our clients? **Is a new role for ag consultants really as data consultants?**

A key consideration must be the change in social dynamics (how our clients want to receive information, how our clients process information, how the older generation deals with changes in information delivery). How do we tailor our service delivery? The obvious options are:

- Increase value from the use of social media. This will drive the delivery of information in 70 characters or less. This will also train a generation to know a little bit of a lot of things and be less patient to learn the intricacies of new research or innovations. **Is there a role there for us to be the font's of all knowledge and tweet/facebook/instagram or linked in the critical information?**
- How will tools such as video conferencing and improved data systems affect our business? What does a world of electronic advisory services look like? I look forward to the day where we have a lower travel cost component to my business and I have real time access to all relevant data that I need. We need to recognise that these tools have a great potential to change our businesses.
- To find efficiency gains, is market segmentation to a greater degree that we do it now going to be easier or harder in the future? As new generations work in agriculture, digital technology will be the norm. What opportunity is that for our business? Will the old chestnut that everyone learns differently still be relevant as more people are educated, tech savvy and progressive? Will workshops still be relevant or will their format and fluidity change. How do we tailor what we do to the 6 segments the Ag Institute identified in their submission to the Fed Government Agricultural Competitiveness White Paper.
- Our clients will have greater individual choice and empowerment with connectivity proving a new form of globalisation that will break down borders, barriers and boundaries in consulting. The 2PS platform uses AI algorithms to match client need with a team of independent consultants to provide the best outcomes for the client. Once competing consultants working together referring clients to each other. <http://2ps.com/>

Bitcoin, crowd funding and peer to peer lending are changing traditional banking systems. **Is there a role that agricultural consultants can play to assist in the management of capital, the writing of the marketing plans, the structure and monitoring of the returns on investment?**

Some of the challenges we face will be how we manage a growing lack of privacy of data, lack of standardisation limiting farmers' ability to integrate information from different sources, a potential for a loss of basic skills as automation progressively takes over, and increased franchising as farmers become locked in to participation in specific production

systems as a consequence of their technology choices.

So the things for us to think about as a sector are:

How do you anticipate and plan for change. How do we help our clients anticipate and plan for change? How do we help them get the right information? How do we help them identify and invest in the right innovations? How do we help them manage productive profitable businesses in this new operating environment?

How do we keep abreast of all the data? How do we evaluate what is the most important data? How do we actively be a part of the collaborative society but protect our clients and our IP?

The innovation is in how we play together and interact as an industry. It's where the opportunities are but it is also where the challenge lies.

The most important thing to remember is that whilst technology and innovation changes. Good management and good advice doesn't.

To summarise:

Top 3 Challenges	Top 3 Opportunities
1. Recognition from industry of the value proposition that the private sector contributes	1. Work with researchers in research design to ensure effective outcomes
2. Keeping abreast of all relevant data. Technical papers need to be prioritised beneath on ground change.	2. Innovative online extension services
3. Managing data ownership and use	3. Active role in the collaboration of the industry to provide higher returns on investment for farmers, researchers and investors.