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Redefining excellence in agribusiness advisory: the role of the rural advisor in the modern world

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Executive Summary

The farming world is striving to feed an ever-increasing population from a declining land area whilst at the same time reducing its environmental footprint. As farmers evolve their practices to meet these challenges, the rural advisor working alongside the farmer must also evolve to meet the needs of the industry and the wider community – or run the risk of becoming obsolete. This Nuffield report explores the trends and issues facing the rural advisor and provides guidance for the future roles and necessary skillsets of the advisor so they can continue to add value to the primary sector.

The objectives of this Nuffield research report were:

1. To understand the trends in the use of technology in the agricultural sector, and how these trends will affect the role of the agricultural advisor.
2. To provide recommendations on the future role of the agricultural advisor, and to investigate optimal business models for the agricultural advisory sector.

The desired outcomes from this research are to redefine what excellence looks like in agribusiness consultancy, and as a result increasing productivity in the agricultural sector, whilst at the same time reducing the environmental footprint of the primary sector.

A rural advisor, also known as a farm advisor, farm consultant or rural professional, works within the agricultural sector to support farmers in the theory and practice of farming. The intention is to add value to the farming business, recognising that the definition of value will vary between clients.

To anticipate the future role of the rural advisor it was necessary to understand some of the key trends facing farmers:

- i) **Scale and complexity:** Farms continue to increase in size, and as a result complexity. The amount of information available to each farming business is increasing each year at a rapid rate, and this makes it more challenging to analyse and interpret the data.
- ii) **The commodity cost-price squeeze.** Farmers who are producing a commodity face the continual challenge of increasing input costs and a decreasing margin, whilst at the same time being scrutinised more closely.
- iii) **A declining (farm) labour force** is forcing farmers to adopt new technology that will reduce labour requirements, as well as altering the skill set requirements of farmers.
- iv) **Social licence to farm:** Farmers around the world are facing an increased level of scrutiny by the public and the consumer. This scrutiny includes the areas of animal welfare, environmental impacts and labour treatment.



- v) **Increasing use of technology on farm.** As farmers adopt new technologies, so too must the rural advisor become proficient with the technology in order to stay relevant.
- vi) **Land ownership versus management.** There is a worldwide trend towards a separation between the ownership of land and the management of land.

Developments in Agri-tech are impacting on both how farmers manage their farms, how rural advisors are interacting with their clients, and how they are managing their own businesses. However, for Agri-tech to have maximum impact, there are two fundamental issues that continually frustrate those working in the New Zealand primary sector:

- a) Lack of internet connectivity
- b) Lack of data sharing and interoperability

These issues are not new, but until they are resolved the ability for Agri-tech to influence farming in New Zealand will be constrained.

From an agri-tech perspective, the increasing use of artificial intelligence (AI) in agriculture has the potential to have a significant impact on the role of an advisor. Around the world there are already many instances where AI is replacing the traditional knowledge transfer role of the advisor. For example, Climate FieldView is auto-scripting corn sowing rates and fertiliser recommendations for US crop farmers. Farmer.Chat is an AI system providing agronomy advice for small scale cropping farmers in Ethiopia, Kenya and India. Closer to home, wearable technologies for cattle such as Halter are providing detailed farm management insights directly to the farmer.

The role of a farm advisor or rural professional varies widely throughout the world, between sectors and between organisations. **For those advisors whose role is purely focused on providing only technical advice, the impact of technology may be rapid and profound, to the point that their role may not exist in the future.**

This Nuffield research provides the following conclusions and recommendations for the future ahead:

Conclusion # 1: The farmer of the future will be:

- » Managing increasingly larger farming operations, which are more complex and have vastly more data points to manage;
- » Increasingly well qualified as their skills adapt to managing large and complex farm businesses;
- » Digital natives, adept and comfortable with using technology;
- » Addressing the issue of how to produce more product from less inputs (efficiency and scale), and/or adding more value to their product; and
- » Less likely to own the farm they manage, given the scale of many farm operations.



Conclusion # 2: The future role of Agri-tech and AI in farming has the potential to:

- » Improve decision making through better use of data - more data sources analysed by machine learning and AI to provide insights and ultimately recommendations;
- » Allow farmers to manage their properties more precisely: rather than managing farms at a paddock or mob scale, decisions are implemented by the square metre and individual animal;
- » Reduce inputs and increase farm yield, thus increasing farm productivity, and profitability, as well as reducing externality impacts on the environment; and
- » Provide real-time information and advice to farmers, thus reducing or even eliminating the need for technical support and advice by rural advisors.

Conclusion #3 The rural advisor of the future. The two conclusions above provide the context for the future of the rural advisor. The future state of the profession has been grouped into short term (Horizon One), medium term (Horizon Two) and Long term (Horizon three):

Horizon One: Embracing Change. The profession needs to understand and embrace the changes ahead. Responses should include:

1. **Utilising existing digital feeds**, even if they are disparate.
2. **Building a team of the best:** those providing advice to the rural sector will need to rethink what skillsets are required to deliver the best service.
3. **Identifying future trends and skillsets:** What are the likely skillsets required in five years' time, and where will they come from?
4. **Early adopters trialling AI:** Experimenting now will help guide future strategic direction.
5. **Providing a critical lens to new technologies** is an important role for a rural advisor. Ensuring that the technology for the farmer is fit for purpose, but equally may involve giving the farmer a 'nudge' to assist uptake.

Horizon Two: Integrated AI is the point where there is a hybrid blend between the traditional methods of providing advice and the use of AI for decision-making. AI may be used to analyse the majority of the data and provide recommendations, but the expert (farm advisor and farm manager) will employ their own expertise and real world understanding of the context in which decisions are to be made before making decisions.

Horizon Three: AI Farming. There are already examples of components of farming being completely automated, and it is not much more of a step to imagine a situation whereby the information necessary to optimise the management decisions behind these actions are also automated.



What hasn't changed?

Much of this report focuses on how farming and the farm advisory profession is being transformed by Agri-tech. However, what also became clear throughout this research is the importance of inter-personal relationships and communication. The importance of 'soft skills' has always been paramount to being a competent rural advisor: the ability to relate, challenge, motivate, coach, and inspire their clients.

As technology slowly takes over some of the basic (and then complex) tasks of the rural advisor the role of the advisor will naturally gravitate to the highly complex interpersonal skills that (at this stage) are beyond the realm of technology. Examples include strategic planning, succession planning, and managing teams. **Hence, the importance of the soft skills will become even more important.** This then begs the question of the candidate selection process for great rural advisors, and how they are trained.

The rural advisory profession needs to evolve as both farming and agri-tech evolve. The risk of not evolving is a loss of added value to the primary sector, and potentially a loss of business for the advisory firm.

The final section of this report provides twelve sets of actions and recommendations to ensure the primary sector continues to grow. These recommendations are grouped into the following areas:

- » Data ownership and management.
- » Simplification of complex farming businesses.
- » Evolution: overcoming farmer and adviser resistance to change.
- » Future skill requirements for advisers, and how we need to adapt our training and recruitment processes.
- » Smart use of technology to improve productivity of advisory firms.

Farmers, rural advisers and agri-tech need to work together to create a future that adds value for everyone.



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List of abbreviations

Most of us are newcomers to the field of machine learning and artificial intelligence, and the distinctions between the terminologies. To illustrate the potential for this technology I purposely asked ChatGPT for some definitions:

Machine Learning (ML):

Definition: Machine learning is a subset of artificial intelligence that focuses on the development of algorithms allowing computers to learn and make predictions or decisions based on data.

Key Concepts:

- » Data: ML algorithms learn from labelled or unlabelled data.
- » Training: Algorithms are trained on data to learn patterns and make predictions.
- » Types: Supervised learning, unsupervised learning, and reinforcement learning are common types.

Applications: ML is used in various fields like image recognition, natural language processing, recommendation systems, and more.

Artificial Intelligence (AI):

Definition: Artificial intelligence refers to the simulation of human intelligence processes by machines, especially computer systems.

Key Concepts:

- » Problem-solving: AI aims to mimic human intelligence in tasks like reasoning, learning, problem-solving, perception, and language understanding.
- » Narrow versus General AI: Narrow AI focuses on specific tasks, while general AI aims to perform any intellectual task that a human can do.
- » Ethical Considerations: Concerns about AI include job displacement, biases in algorithms, and ethical decision-making.

Applications: AI is used in various domains, including healthcare, finance, transportation, and entertainment.

Generative AI:

Definition: Generative AI is a subset of artificial intelligence focused on creating new content such as images, music, or text, that mimics human creativity.

Key Concepts:

- » Generative Models: These models learn the underlying structure of data to generate new content similar to the training data.
- » Variational Autoencoders (VAEs): A type of generative model that learns to encode and decode data, enabling the generation of new samples.
- » Generative Adversarial Networks (GANs): Another type of generative model where two neural networks, the generator and the discriminator, are trained adversarially to produce realistic data.

Applications: Generative AI is used in creating art, generating realistic images, synthesising music, and even in drug discovery and material design.



Each of these concepts plays a crucial role in the development and application of artificial intelligence technologies, with machine learning being a foundational component, artificial intelligence encompassing a broader scope, and generative AI focusing specifically on creative content generation.



Objectives

The Topic: Redefining excellence in agribusiness consultancy: the role of the rural advisor in the modern world

The objectives of my Nuffield research and this report are as follows:

1. To understand the trends in the use of technology in the agricultural sector.
2. To understand how these trends will affect the role of the agricultural advisor.
3. To provide recommendations on the future role of the agricultural sector advisor.
4. To investigate optimal business models for the agricultural advisory sector.

The desired outcomes from this research are to redefine what excellence looks like in agribusiness consultancy, and as a result increasing productivity in the agricultural sector, whilst reducing our environmental footprint.



Figure 1: Agriculture Research Trust farm, Zimbabwe, 2023



Chapter 1: Introduction

I have had the privilege of working as a farm advisor in New Zealand, and sometimes further afield, for well over 20 years. During this time I have seen significant change in the farming landscape. This includes the technologies used, regulatory pressures, societal expectations, climate challenges, labour pressures, and a continued challenge in farmer productivity and profitability. Likewise, for the rural advisor who works with the farmer, there has been a steady but significant change in the business landscape and the way we operate.

The majority of farmers are commodity producers. In simple terms, the only way for a commodity producer to remain profitable in the long term is to consistently increase in production, efficiency, or scale. In recent years New Zealand farmers have continued to increase in scale, but I am less convinced that they have continued to increase in productivity. The following chart, illustrating profit from productivity on New Zealand dairy farms, highlights that while there have certainly been productivity gains throughout the early 2000's, productivity gains in the last decade have been modest.

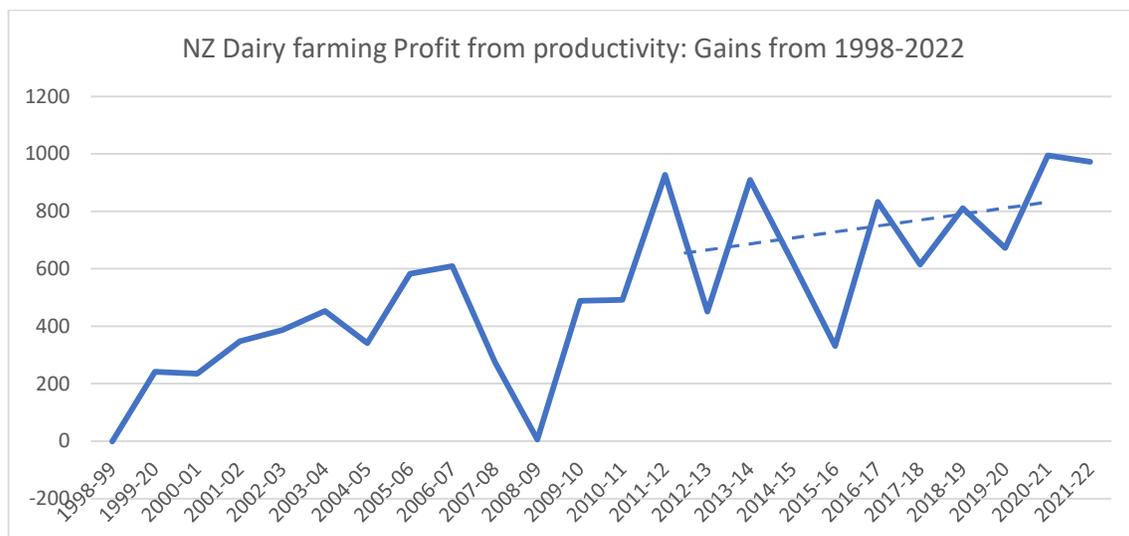


Figure 2: Profit from Productivity. Source: DairyNZ Economic Survey 2021-22

Figure 2¹ illustrates that although there has been a continued increase in profit from productivity gains over the past thirty years, the trendline over the last decade suggests recent gains in productivity have been modest. Similarly, Figure 3² demonstrates that lambing and calving performance on New Zealand farms has also remained static.

¹ DairyNZ (2023), New Zealand Dairy Statistics, 2022-23

² BLNZ economic reports, <https://beeflambnz.com/industry-data/economic-reports>

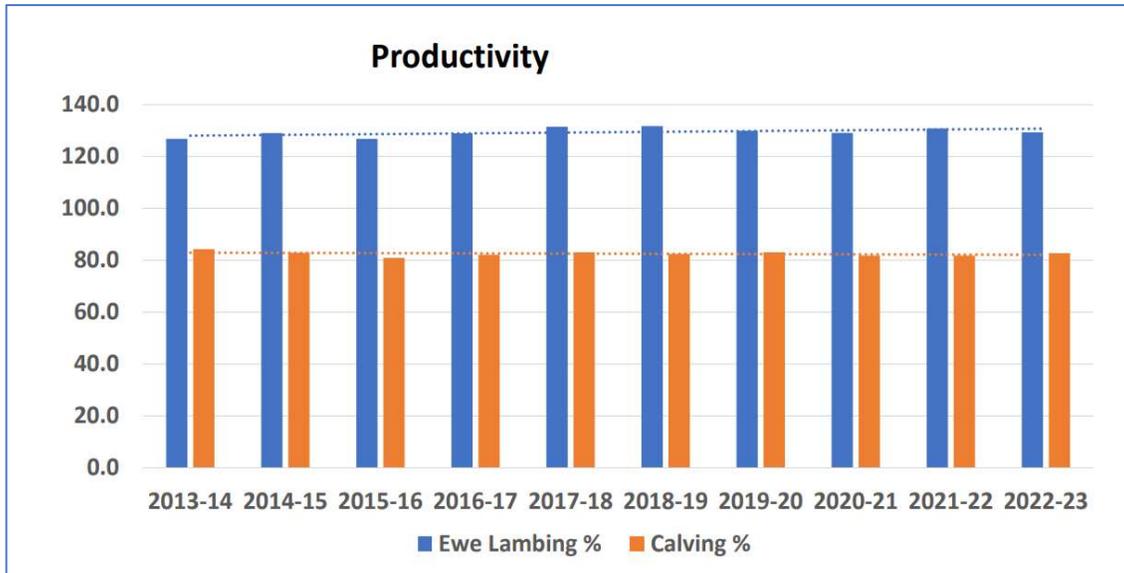


Figure 3: NZ Ewe lambing % & Beef Calving %. Source: BLNZ, via P Journeaux

In a similar fashion, information from Statistics NZ shown in Figure 4³ and Defra in Figure 5⁴ suggests the rate of productivity gains in agriculture have been steadily declining. There are many thoughts as to why this is occurring, but the fact is that we need a 'circuit-breaker' to quickly improve productivity whilst at the same time reducing our environmental footprint.

³ NZ Productivity commission, <https://figure.nz/chart/whhlfHYuekvFiX6L-fApkWeeLb7CJLTjw>

⁴ DEFRA, Government statistical service, Agriculture in the UK Evidence Pack, September 2022 update, <https://www.gov.uk/government/statistics/total-factor-productivity-of-the-agricultural-industry>

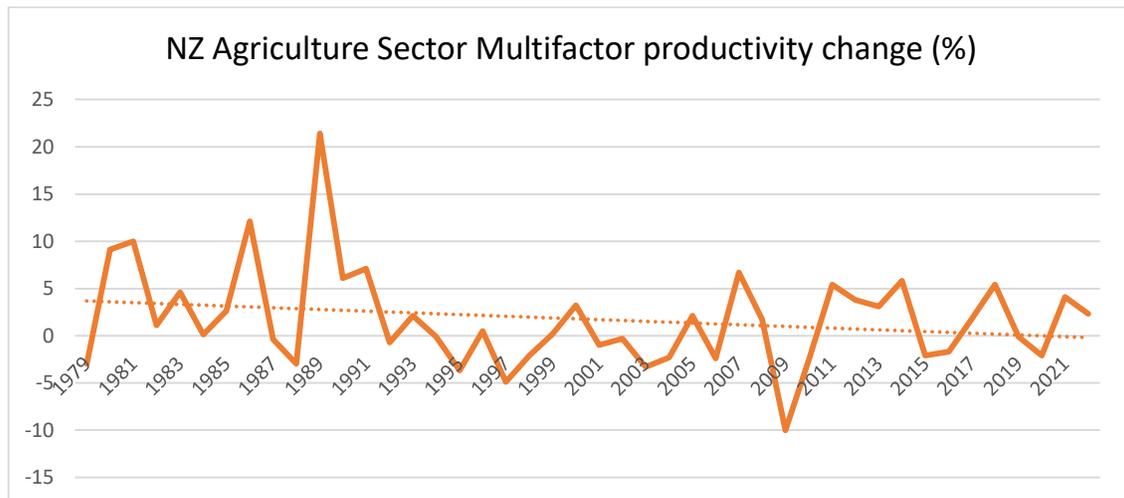


Figure 4: Agriculture Sector Multifactor Productivity Change (% per annum). Source: Statistics NZ, via Figure.nz

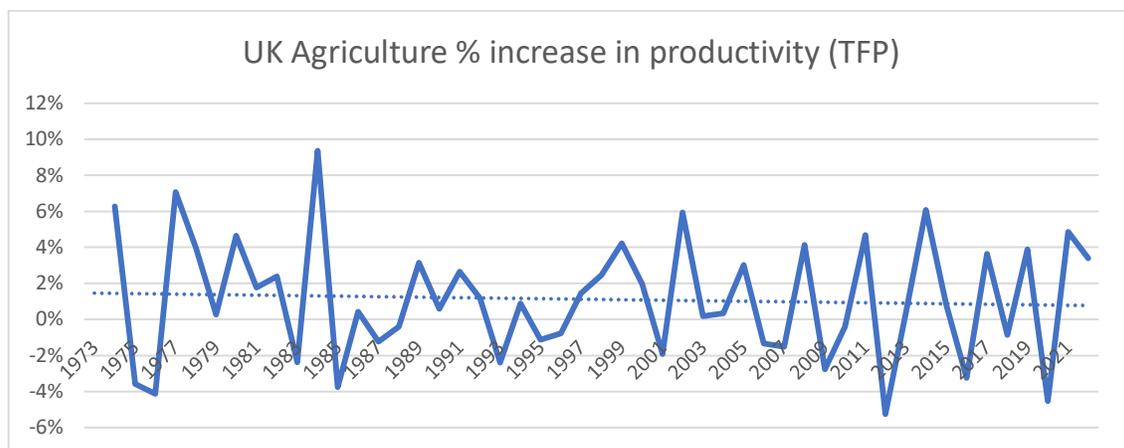


Figure 5: UK Agriculture: Annual % increase in Total factor productivity. Source: Defra

For the rural professional there are also challenges. Traditionally the service offered by the rural professional to the farmer is based on a deep understanding of the farmer's business, and by using decades of experience to quickly analyse complex problems, the advisor aims to quickly find solutions that will add value for the farmer. Herein lies a challenge for any business that sells time: in order to have the best people on your advisory team, providing the best advice, you need to pay the best. This exposes the rural advisory business to the trap of any professional services business that charges on an hourly basis. As the cost of labour rises, there is a constant cost-price squeeze on margins. Like the farmer, the rural advisor has also had to adapt to a far more complex farming and advisory environment, where the sole objective of increasing production has been replaced by a far more complex multifactorial set of objectives, broadly encompassed by the goals of financial, social and environmental sustainability. Once again, there is a productivity issue to address for both the farmer and the advisor.



However not all is lost. Technology is here to save the day, or at least that is what we have been told. Throughout history science has risen to the challenge to meet the needs of a growing and more demanding population. “Agriculture 4.0”, the fourth agricultural revolution, based on artificial intelligence and machine learning, is steadily making an impact on farming around the world. So, what are the impacts for the New Zealand farmer and farm advisor, and how do we ensure that this revolution will lift productivity for both? That is the purpose of this Nuffield research paper.



Chapter 2: Methodology: What did I do?

This Nuffield research is based on an 18 month exploration of the context and issues surrounding the rural advisor, and the farming world they operate in.

The Nuffield research allowed me the opportunity to explore the advice ecosystems in New Zealand, the United States and United Kingdom in particular. Insights from other countries were also examined along the way, although time did not permit visiting every single country in question. The methodology undertaken was an inductive approach. This involved starting out with a key question in mind, but keeping a wide lens on the issues at hand, and refining the problem/issue as time went on. This ultimately led to asking some key questions, such as:

- (a) What is the future of the agricultural advisor?
- (b) How will technology impact the role of the agricultural advisor?
- (c) What are the optimal business models that need to be considered in order to add value to both the farmer and the advisory organisation (public or private)?



Figure 6: FAO Headquarters, Rome



Chapter 3: What is a rural advisor?

Around the world there are many different terms used to describe those who assist farmers (and the wider agricultural sector) in making decisions. Such terms include agribusiness advisor, rural advisor, extension agent, farm consultant or rural professional. While the terms are largely interchangeable, there are certainly differences between individuals, organisations, sectors and countries around the scope and style of how the work is undertaken. In New Zealand there is a blend of advice provided by the private sector and by the state or levy body organisations (e.g. DairyNZ). In other countries the state or academic institutions have a much larger role to play in the provision of advice to farmers.

Duker (2019) has a succinct description of a rural professional as someone who “works within the agricultural sector to support farmers in the theory and practice of farming. Rural professionals help farmers become better farmers.”⁵

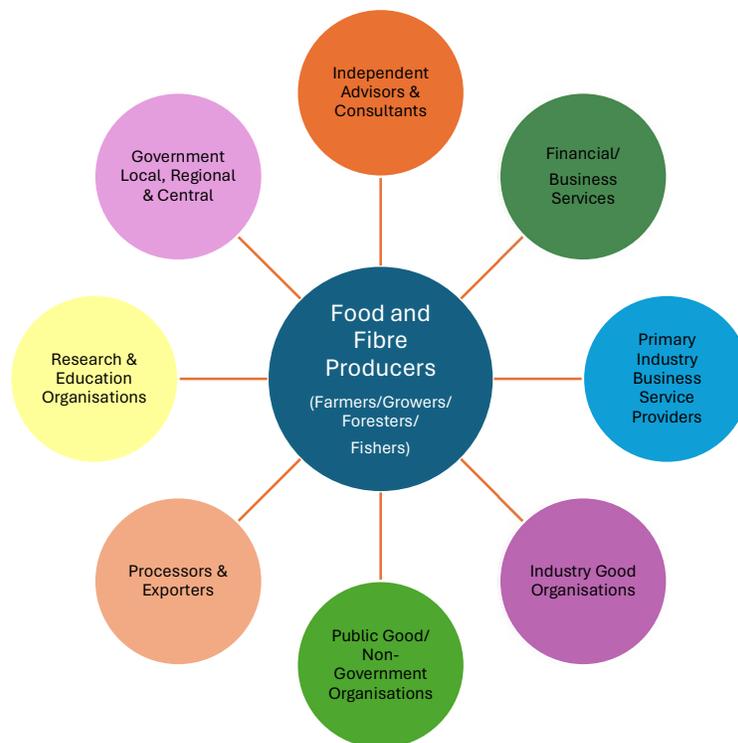


Figure 7: Rural professional roles within the rural sector, Duker, Kellogg report, p10

Duker also described the desired attributes of a rural professional in the following infographic.

⁵ Duker (2019), p10



Figure 8: Duker, Kellogg report

Nettle (2018) describes the private farm advisory sector as “commercial advisors offering advisory services as part of farm input sales; farm management consultants; veterinary surgeons and agronomists (providing fee-for-service advice on a unit or hourly basis; farm advisors within the supply-chain (e.g. milk, meat or grain-processing companies); and farm advisors employed by farmer-owned and operated groups, or employed in advisory or extension roles within sectoral or industry organisations.”⁶

Matheson (2019)⁷ provides a useful framework that examines the relationship between farmers, their advisors, and others who influence their decision-making. As seen in the following diagram, the systems advisors and process consultants typically have a close relationship with the farmer, and thus, potentially a high degree of influence. This highlights the importance of ensuring the rural advisor stays relevant and maximises value added in the future.

⁶ Nettle et al (2018), Journal of Rural Studies 58 (2018) 20–2

⁷ Matheson L, (2022) Redefining the future role and opportunities for rural professionals, NZIPIM journal, March 2022 edition p7-11

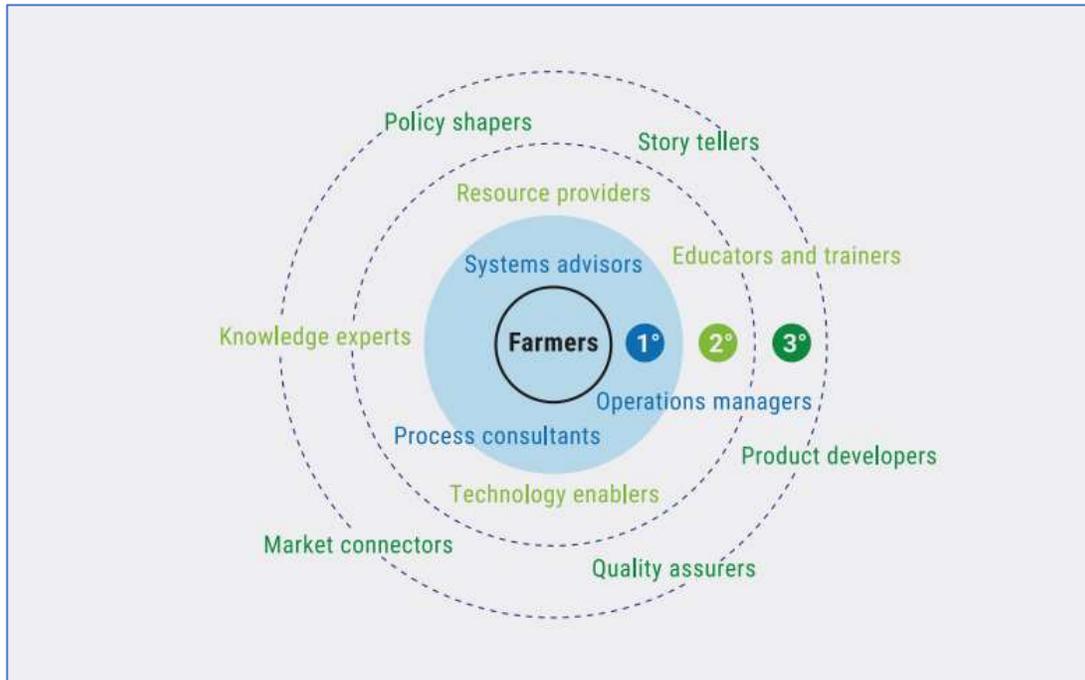


Figure 9: The rural professional system ecosystem. Source: Matheson 2021

I have chosen to use the term 'rural advisor' in this report as it is a term widely used around the world. This includes those that work in both the public and the private sector. This research is primarily focused on the changing nature of those providing independent advice, however the key messages will be applicable to all.

My Nuffield research allowed me the opportunity to gain an understanding of some of the rural advisory models throughout the world, which are described below.

3.1 United States

Agricultural advice and extension of information in the US has been built up through successive generations of extension transfer from land grant universities. The United States Land Grant University System was established in 1862 with the enactment of the Morrill Act. This federal legislation provided land and funding to states for the establishment of institutions that focused on practical education in agriculture, science, and engineering. The primary goal of these institutions, known as land grant universities, was to provide accessible education to a broader segment of the population, including practical skills that could improve agriculture and industry.

The land grant university system has played a crucial role in providing information and support to farmers and the agricultural community. This role is carried out through various avenues:



1. **Research:** Land grant universities conduct agricultural research to develop improved farming techniques, crop varieties, pest management strategies, and more. This research is often targeted at addressing real-world challenges faced by farmers, such as increasing yields, reducing environmental impact, and improving resilience to changing conditions.
2. **Extension Services:** One of the key components of the land grant university system is the Cooperative Extension Service. This service connects research-based knowledge generated by land grant universities to farmers, ranchers, and the general public. Extension agents, employed by the university, who are experts in agriculture and related fields, work directly with local communities to disseminate information, provide technical assistance, and offer workshops and training on topics ranging from crop management to livestock care.
3. **Education and Training:** Land grant universities offer agricultural education programs, including degree programs in fields such as agronomy, animal science, horticulture, and agricultural economics. These programs prepare students for careers in agriculture and related industries, ensuring a continuous supply of knowledgeable professionals who can contribute to the advancement of farming practices.
4. **Demonstration Farms and Experimental Stations:** Many land grant universities maintain demonstration farms and experimental stations where researchers and extension agents can test and showcase innovative agricultural practices. These sites serve as living laboratories to demonstrate the practical application of research findings.
5. **Publications and Outreach:** Land grant universities produce a wide range of freely available publications, fact sheets, online resources, and workshops that provide farmers with the latest information on best practices, emerging technologies, and industry trends. These resources are accessible to farmers, enabling them to make informed decisions for their operations.
6. **Collaboration and Partnerships:** Land grant universities collaborate with government agencies, industry organisations, and other stakeholders to address complex agricultural challenges collectively. This collaboration helps ensure that farmers receive a holistic and comprehensive approach to improving their operations.

Throughout my journey through the US it was apparent that the extension system still continues to play a vital role, however that role is changing. Whilst many of the smaller farmers used the advice of an extension agent, most of the commercial operators relied on advice provided by an agronomist or a nutritionist. There was a noticeable absence of the whole farm management consultant which is more common in New Zealand, Australia and the UK. This may be due to the combination of advisory support traditionally provided through the land grant university system, along with the rise of targeted advice provided with provision of farm inputs.



Figure 10: Soya crop, Iowa



Figure 11: Robotic milking farm, Illinois

3.2 United Kingdom

The UK advisory system is made up of a combination of private farm advisors, vets, product sellers, agronomists and industry good bodies. The extension service in the UK was privatised in the 1990's. Whilst there is an element of information provision from the Agriculture and Horticulture Development Board (AHDB), particularly in Scotland, advice is typically provided by private firms, whether they are independent or linked with selling a product such as agri-chemicals, animal health drugs or fertiliser. The need for advisory support is also driven by a complex reporting process associated with the receiving of subsidies. This requirement for compliance and subsidy reporting



has led to a relatively high uptake of advisory support. The BPS subsidy system in the UK is being replaced the sustainable farming initiative (STI) payment which is reportedly less complex. It is estimated that around half of farmers in the UK will seek advisory support, and in the dairy industry this could be as high as 95%.

3.3 New Zealand

The rural advisory structure in New Zealand is a combination of private, industry organisation, and some government advisory. In the 1980's the MAF farm advisory programme run by the government was privatised and sold off. This led to the evolution of the private farm advisory business, i.e. user pays. Alongside this has been the evolution of advice provided as part of selling a product or service. For example, agronomy advice for growing maize crops is provided by companies selling maize seed, and fertiliser recommendations are usually provided at no cost by those organisations selling fertiliser.

Industry good organisations also provide a level of advice and extension information. Such organisations include DairyNZ, Beef + Lamb New Zealand, Zespri, Horticulture New Zealand and Foundation for Arable Research (FAR). The level of farmer advice and support does vary between each organisation, nonetheless there is a significant amount of freely available information available to the farmer.

In the 1980's there a shift to privatisation of government assets and organisations. The MAF advisory service was no exception, and the advisory service was sold to Wrightsons. Over thirty years later, in 2022, the central government initiated the MPI Primary Industries Advisory Service.

3.4 Pros and cons of the various systems

It was well outside the scope of this report to provide a definitive view of the best approach to an advisory system. For example, is a government led advisory system the best approach, or should government get out of the way and let the private sector lead the way? My observation is that there was a role for a government presence to inform farmers around key compliance issues such as biosecurity. There is also without doubt a role for the private sector. However, for the private sector there is always a risk of advice being provided with a bias, e.g. a fertiliser rep providing a fertiliser recommendation who also sells fertiliser. However, the overriding observation was that **farmers will naturally gravitate towards where they feel they are getting the best advice**, no matter where the advice is coming from.



Chapter 4: What are the relevant trends in agriculture?

There is a plethora of information that is widely available as to where agriculture is heading across the globe. Some of this information is data driven and based on fact, other is futurist thinking based on trend data. I have focused on the key trends that are relevant to this line of research. These include:

(i) **Scale and complexity**

Farms are increasing in scale and complexity. For example, it was estimated by some US researchers that 80% of US agricultural output would be produced by 20% of producers by 2027. In New Zealand, the average dairy farm has more than doubled in size since the early nineties to 157 ha.

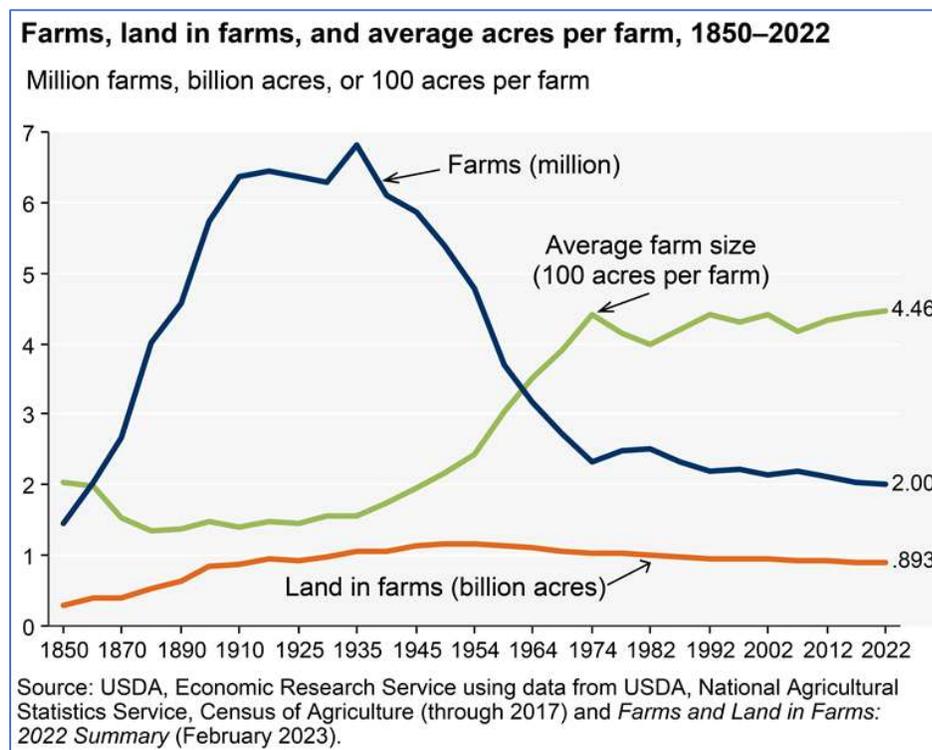


Figure 12: US Farmland and farm size. Source: USDA⁸

A comment by futurist thinker Aidan Connolly provides some perspective on the challenge of how larger famers with fewer workers means a growing disconnect with the consumer.

"Fewer than 2 million farms feed America, and only 2% of its population works to produce food and agricultural products for export. Brazil's agricultural juggernaut is driven by 4.4 million farms, while in the UK agriculture has a mere

⁸ USDA <https://www.ers.usda.gov/data-products/data-visualizations/other-visualizations/visualizing-u-s-farmland-ownership-tenure-and-transition/>



140,000 farms, employing less than 0.8% of its population. Agriculture may be producing more than ever but, as a percentage, agriculture contributes less than it ever has to world Gross Domestic Product (GDP). As a result, an increasingly urban population is completely disconnected from the realities of how food is produced" (Aidan Connolly).

The gradual but consistent increase in farm size is also evident in New Zealand, as shown in the following graph⁹.

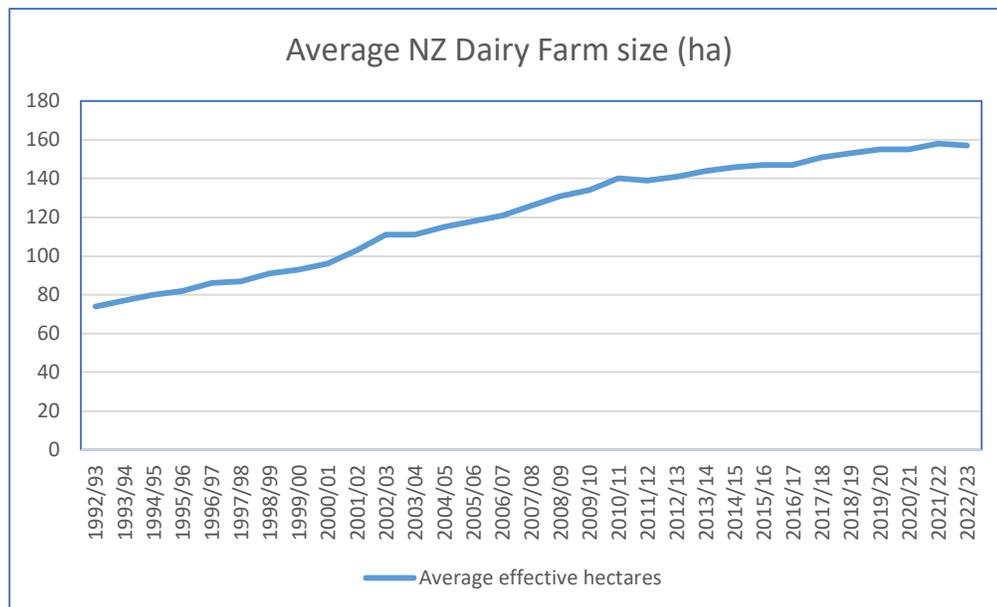


Figure 13: NZ Dairy Farm size. Source: Dairy NZ

Adding to the issue of complexity is the challenge of diversification. Diversification of farm production systems is commonly cited as a solution to the risks of reliance on one income stream, as well as way of matching the land use to the class of land available. However, a key factor in the success of the primary sector in New Zealand, and particularly in dairy, is the simplification of farming systems by focusing on one or two products. Perhaps clever use of technology can reduce the complexity of diversified farming systems?

(ii) **Commodity production**

The commodity cost-price squeeze. Across the globe, farmers who are producing a commodity (e.g. corn, soya, wheat, milk powder) face the continual challenge of increasing input costs and potentially a decreasing margin. The typical solution to this is increasing farm efficiency and productivity. This has become more challenging in recent years as the externalities of farming are being scrutinised more closely and environmental pressure is increasing. The

⁹ DairyNZ (2023), New Zealand Dairy Statistics, 2022-23



following chart illustrates how the cost of dairy farm expenses has been rising at a faster rate than income, decreasing the margin for the farmer.

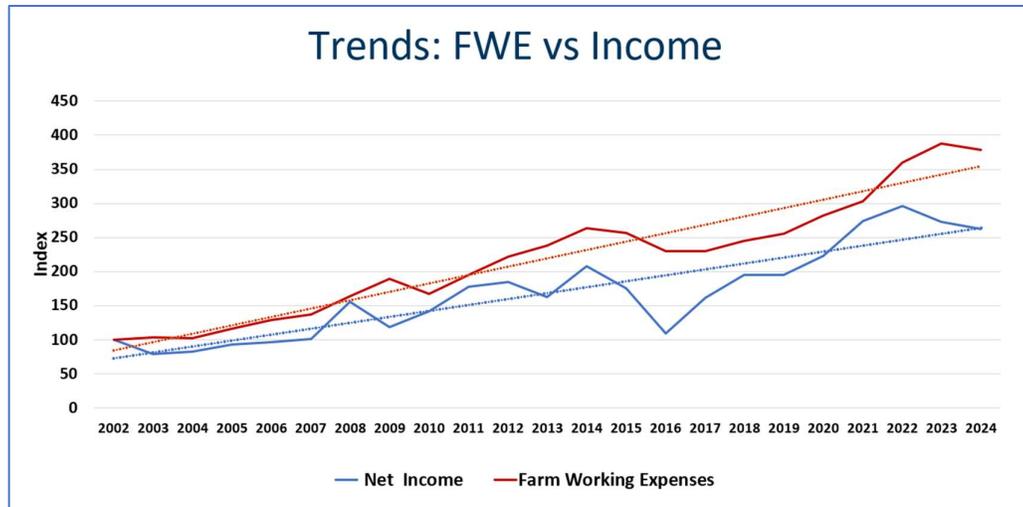


Figure 14: Waikato dairy farm expenses vs income. Source: AgFirst

The alternative to increasing scale and efficiency is to add value to the farm product, in an effort to break the commodity cycle trap. Rural advisors potentially have a role to play here also, through working with farmers to achieve closer market linkages and thus a greater margin.

(iii) **Lack of labour**

Without question every country visited and every farm visited highlighted challenges with recruiting and maintaining a stable labour force. A common cause of this challenge was cited as the urban drift, with workers favouring employment in urban areas. When examining the increase in labour productivity in agriculture in New Zealand (Figure 15), there has been a noticeable improvement in labour productivity, raising the question that has the lack of labour availability forced an increased use of technology to improve labour productivity?

There is no evidence to suggest that pressure of labour availability in the agricultural sector across the world will abate. Will technology save the day? The lack of labour availability may have forced an increase in agricultural labour productivity as shown in Figure 15.

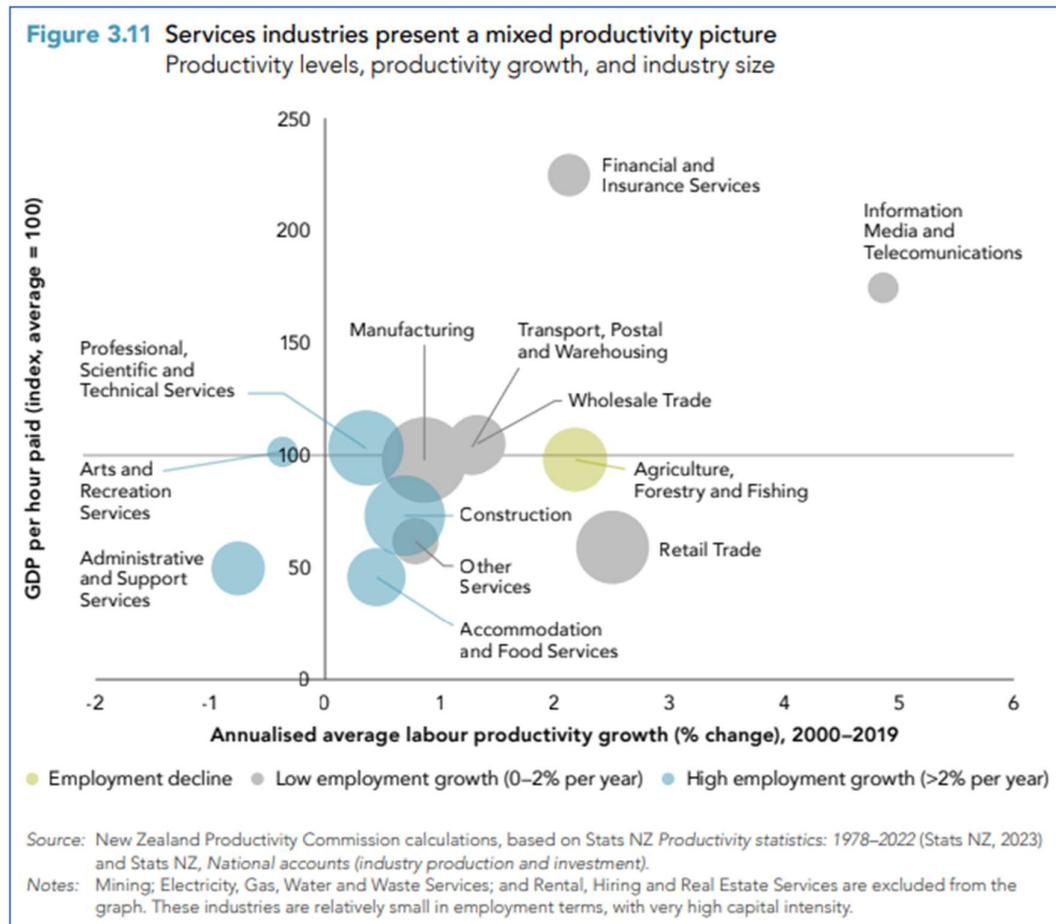


Figure 15: Labour Productivity. Source: NZ Productivity Commission

(iv) **Social licence to farm**

Farmers around the world are facing an increased level of scrutiny by the public and the consumer. This scrutiny includes the areas of animal welfare, environmental impacts and labour treatment. The speed and ease of communication through social media channels means it is much easier for issues to be reported and circulated – whether the issues are real or perceived.

(v) **Increasing use of technology on farm**

Those from a non-agricultural background often view the agricultural sector as low tech. The reality is that this is far from the case. Many of the farmers I work with and have met are world class in the use of technology. However, it could be considered there is a bimodal distribution of technology uptake in the farming sector. In other words, there are extremely complex and large-scale commercial operations that are heavy users of technology, alongside individual operators who have embraced technology to reduce labour costs, improve productivity or reduce environmental impacts. At the other extreme there are a large number of typically smaller operators who operate in a more traditional sense and may



not be utilising technology to its full potential. This bimodal distribution may have impacts on where agri-tech investment is focused in the future. As farmers adopt new technologies, so too must the rural advisor become proficient with the technology in order to stay relevant.

(vi) **Land ownership versus management**

Although somewhat difficult to quantify, there appears to be a worldwide trend, at least in the more developed countries, towards a separation between the ownership of land and the management of land. In the United States, USDA statistics report that “*nearly 40 percent of all US farmland is rented or leased, and 80 percent of all rented farmland is owned by non-farming landlords*”¹⁰. One could argue that this allows for a separation and (specialisation) between the employment of capital towards land or the management thereof, thus allowing a smart young farm manager to progress quickly in the agricultural sector. Others would argue that this trend is leading a loss of the ‘family farm’ structure and the associated cultural and community values associated with that. This report does not aim to delve into this complicated topic, merely to highlight this trend, and to reflect on the potential impact on how we manage these farming enterprises.

¹⁰

<https://www.ers.usda.gov/data-products/data-visualizations/other-visualizations/visualizing-u-s-farmland-ownership-tenure-and-transition/>



Chapter 5: The trends in Agri-tech

Farming Goes Digital

Aidan Connolly, a futurist thinker in agriculture made the following comment in his book titled The Future of Agriculture:

"Digital technologies are also a feature of indoor farming and their growing usage will continue to be a story for 2020, but most aren't ready for 'prime time' commercialization. Technologies coming to traditional outdoor agriculture in 2020 include robots and sensors, while blockchain appears to be closer to fulfilling the promise of traceability we haven't yet seen in food or farming. Rural connectivity can be a limitation to adoption. The silent drivers of change are the increasing use of artificial intelligence and machine learning, combined with the 'Internet of Things'. Many of the innovations we see gaining the most traction in farming are not those that replace human labour and human cognitive function, but those that enhance traditional jobs and allow greater efficiencies to be achieved."¹¹

Across the world there is massive investment in agricultural technology as countries and companies across the globe grapple with the question of how to feed an ever-increasing population with a reducing land resource, all the time managing environmental issues such as greenhouse gas emissions, water scarcity and water quality. The advent of precision agriculture has allowed management of farms to move from management at a farm level to a paddock/field level, then to management at the square metre and individual animal level. These technology enhancements do allow us to produce more from less, but the challenge is quickly becoming in managing the scale of data and information at our disposal, how to interpret this information rapidly and accurately, and then how to execute decisions based on this information in real time. The farmer is grappling with this, and so is the rural advisor. The role of machine learning and AI is rapidly evolving to a point where this is adding true value to farming operations. This is best illustrated by the following case studies that highlight how the primary sector is embracing Agri-tech.

The aim of this research report was to examine how the role of the rural advisor is changing in the modern world, and how that advisor must adapt to stay relevant and to add value. To reiterate, the desired outcome of the research was to **"redefine excellence in the role of the agribusiness advisor, with a particular focus on how the role of technology is going to change the role in the future, ultimately adding more value to the farmer"**.

5.1 Does Agri-tech add value?

In theory the use of technology should add value to the farm, the farmer, and also to those providing advice to the farmer. There are numerous examples where technology has added value, however there are also plenty of examples where this has not been

¹¹ A. Connolly, The Future of Agriculture, 2022, p12



the case. Duker (2019)¹² states *“The use of technology on the one hand is very effective to reach farmers with information, however without appropriate support it was not seen as a sole catalyst for change. Delivering information through digital platforms can easily be “glossed over” by the farmer and end up adding to the current situation of information overload. It was deemed necessary to ensure any technology is supported with follow-up and discussion to embed the information and activate change.*

Technology was highly valued when used well to support and empower farmers decision making. Continued development of tools and platforms which empower farmers and facilitate efficient discussion was encouraged”.

Technology must be seen as a tool to increase productivity or performance, no matter how that is measured. Farmers are generally astute business managers and will rapidly adopt good technology. Equally they will dismiss poor technology very quickly. Good technology will enhance a good farm manager, however it will be less effective at turning a poor manager into a good one.

There are some fundamentals that cannot be ignored when the role of technology is discussed:

- » Internet accessibility is fundamental. This includes both connectivity and speed. Policy makers around the world are aware of this issue, but the issue is still present, and will become a limiting factor in maximising the benefits of technology for both the farmer and the rural advisor.
- » Data sharing to achieve data interoperability is also fundamental. This is an issue worldwide and there is numerous literature on this issue. Nuffield scholar Lucie Douma (2023) has covered this issue extensively. Douma states¹³:

“We live in a world where it is becoming increasingly important to provide transparency on the activities within farms. Consumers want information, customers want to know what the processes are so they can start to capture their scope three emissions within their own value chains, and farmers need to know what is happening on their farm so they optimise the management and inputs into the farm. The common thread through these goals is data.

Data is king and it is critical to find a way to capture, manage and share data seamlessly.”

¹² Duker A, How Can Rural Professionals Be More Effective in This Time of Transformational Change? Report for the Kellogg Rural Leadership Programme. Course 40, 2019, p23

¹³ Douma L, Data sharing to achieve data interoperability, 2022, p8



5.2 How will technology influence the role of the rural advisor?

Unconscious technology adoption

Technology adoption in the primary sector often happens without a conscious decision. A simple example has been the adoption of the use of smart phones by almost every farmer and farm advisor. This has allowed real time access to market information, production records and weather forecasts. However it is unlikely that this was the reason for initially purchasing a smartphone. Now we are seeing examples of farmers moving their livestock with their phone. In a similar fashion the rural advisory sector has gradually embraced technology. Some examples include decision support models, increased use of video conferencing technology (to improve efficiency),

- » Douma (2022) advocates the employment of a data manager for farm businesses but recognises that most farms will not have the scale to manage this efficiently. This task could easily fit within the role of the advisory firms.

5.3 Agri-tech in advisory: examples

The best way to illustrate how agri-tech is changing, or about to change the role of the rural advisor is to provide some case studies that transform the way we handle information in the primary sector.

5.3.1 Climate FieldView

An insight into how technology is transforming the provision of advice in the primary sector is Climate FieldView. Climate FieldView, owned by Bayer, provides data-driven insights for cropping farmers. It is reported there are over 200 million acres already using Climate FieldView in over 23 countries. Climate Field View can provide auto scripted sowing recommendations, fertiliser rate and crop health recommendations.

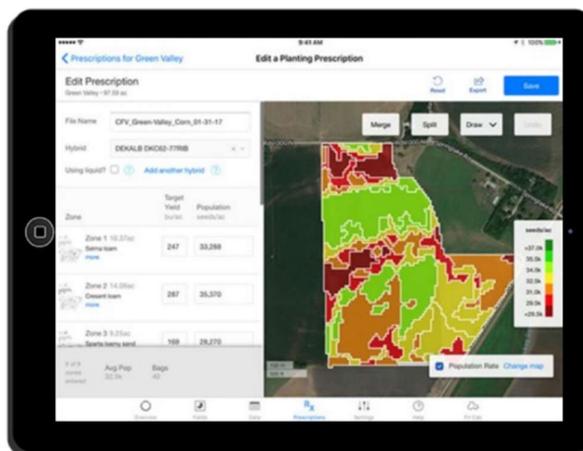
The system combines weather data provided by satellite imagery, with precision yield information from GPS information provided through harvesting of previous crops. Three years of crop harvest data are required to optimise accuracy of results.

Utilising this level of information, at a detailed scale, and over multiple years highlights the ability of machine learning systems to analyse vast amounts of data to provide detailed recommendations. This allows optimisation of crop yield, while ensuring inputs such as seed and fertiliser are also optimised. At an advisory level, whether or not the service was provided on a user pays basis or as part of the process for purchasing seed, the task of recommending seed sowing rates and fertiliser inputs is now automated and no longer requires the input of an agronomist or fertiliser expert.

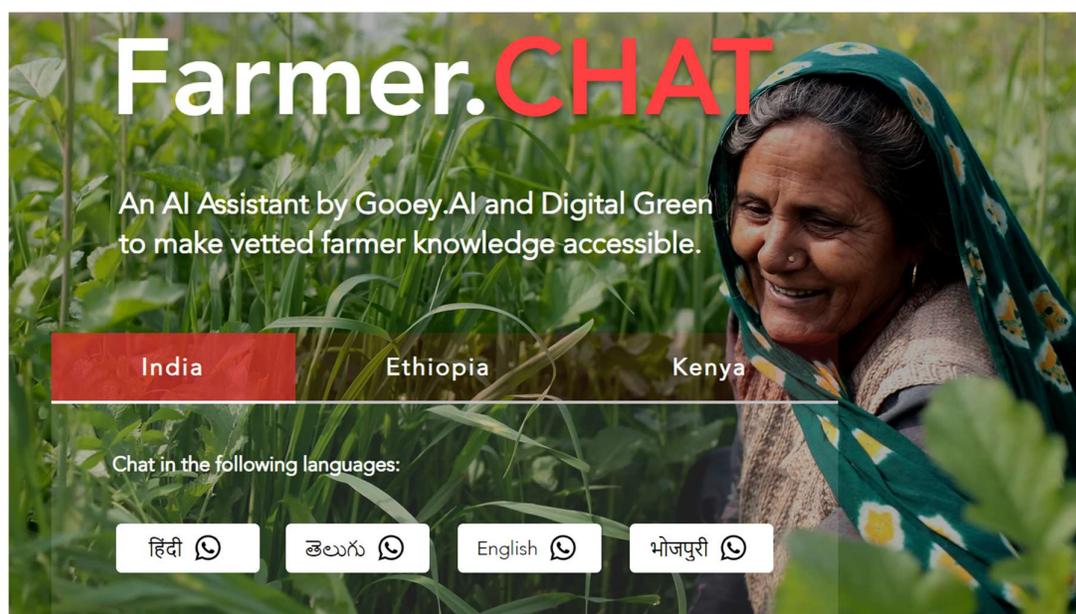


Variable Rate Prescriptions

- FieldView Planting, Fertility, and Crop Protection Prescriptions
- Create custom prescriptions from satellite imagery or historical yield data



5.3.2 Farmer.Chat



Similar to ChatGPT, Farmer.Chat is a generated AI system designed to provide advice to smallholder farmers in India, Kenya and Ethiopia. The transcript shown below is an example of how Farmer.Chat can be used by a smallholder farmer on their smart phone to obtain localised agronomy advice.

Farmer.Chat was developed as an initiative to improve the transfer of information to a much wider range of farmers who would not normally be able to access this information, and at a significantly lower cost. The slide below illustrates the point that a traditional methodology of extension, i.e. person-to-person would cost US\$35 per



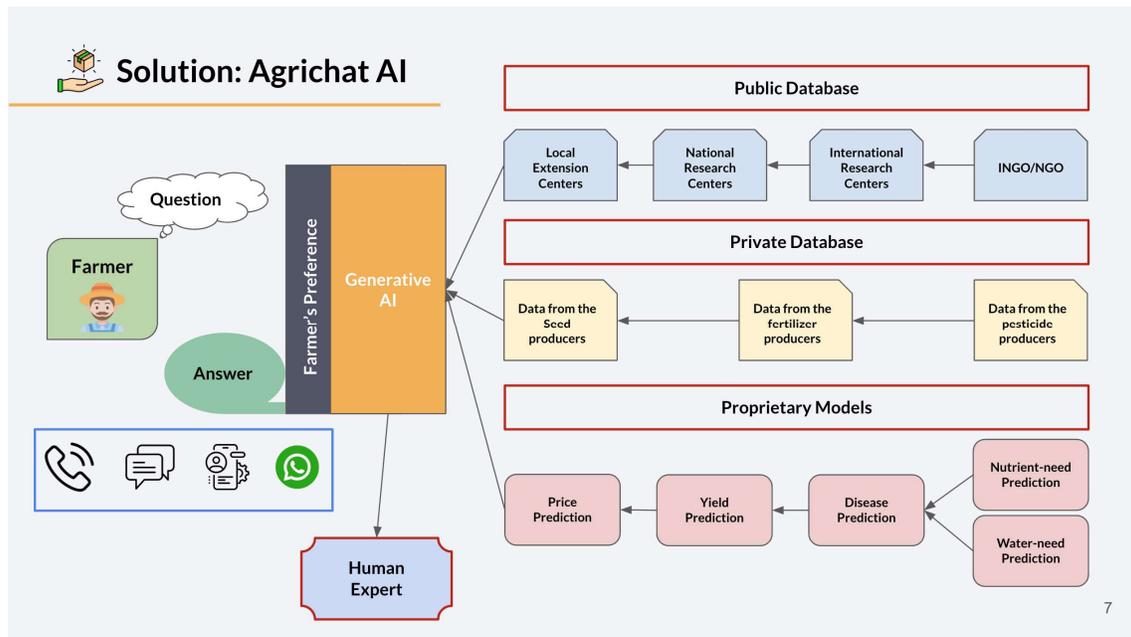
interaction, use of recorded videos and other internet systems costs \$3.50 per interaction and Farmer.Chat was 35 cents per interaction. Whilst there are some obvious limitations to such systems around the personalisation of the advice and understanding some local context, nonetheless it is a cost effective and practical method of mass extension of information.



5.4 Agrichat



Agrichat is a similar system to Farmer.Chat, but focused on farmers in the United States. Originally developed by MIT Agrichat aims to provide customised advice to US farmers. Agrichat also provides links to relevant information. The schema below describes the architecture of a system such as Agrichat. Notably, the system relies on accessing information only from reliable data sources in order to increase the chance of providing accurate information and advice.



Shown below is a transcript of an interaction with Agrichat, using the example of a grain farmer in Ohio asking for agronomy advice.



Hello! I'm ready to assist with your agricultural queries from University of Kentucky Database. What are you looking for today?

how should i decide when to plant my corn? i am in Ohio

AU



Deciding when to plant your corn involves understanding the growth stages of the corn plant. Corn, or maize, is a member of the grass family. When properly managed, a single corn plant can reach 7 to 9 feet tall and produce a single ear with 450 to 600 kernels. Corn grown in Kentucky, for example, normally produces over 11,000 pounds of seed and 11,000 pounds of fodder per acre, which is nearly 200 bushels per acre. Understanding how a corn plant develops and understanding key development stages will help you better manage your corn. For corn to produce a plant and kernels, it must conduct both photosynthesis and respiration. Photosynthesis uses sunlight to convert water and carbon dioxide into glucose sugar. Respiration uses sugar to build structures such as the plant itself.

As for your location in Ohio, the planting time may vary slightly due to differences in climate and soil conditions compared to Kentucky. It's important to monitor your local weather conditions and soil temperature. Corn typically requires a soil temperature of 50°F for germination. You may also want to consult with local agricultural extension services or experienced farmers in your area for more specific advice tailored to your local conditions.

Sources:

ID-139: A Comprehensive Guide to Corn Management in Kentucky

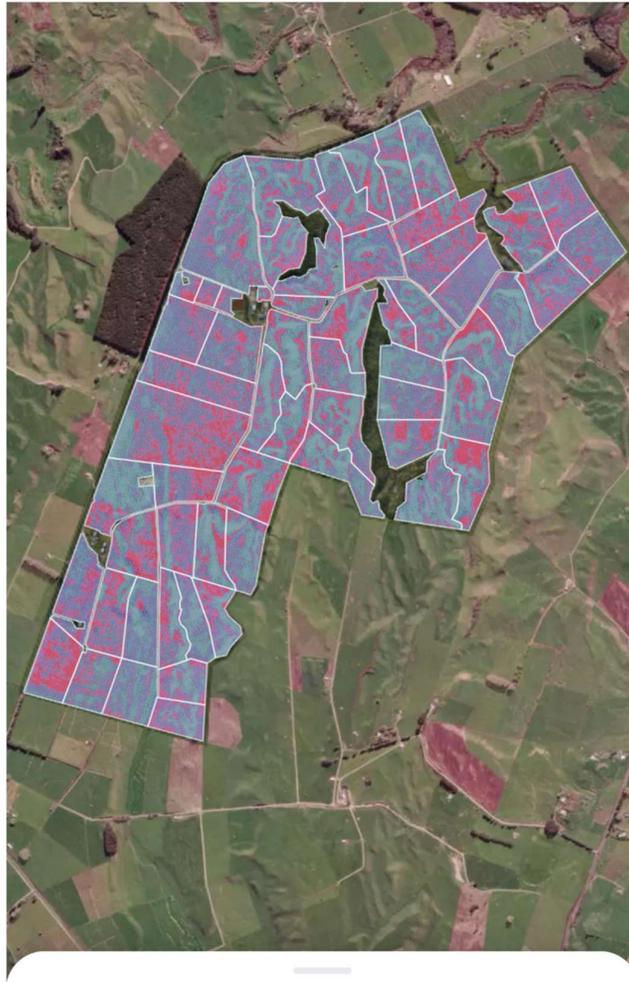


Send a message.



5.5 Halter

Halter is a good example of a local initiative using a combination of smart agri-tech combined with machine learning. Halter is a cow wearable (collar) utilising GPS location information along with motion sensors, allowing the user to geofence cattle, as well as providing a wide range of animal information including heat detection, lameness, rumination, and indications of animal health. Recently Halter have also introduced pasture grazing information, such as growth rates, estimated pasture cover, cow intake, grazing area and rotation length. The level of detail provided to the farmer is at a level that was hitherto unavailable. For example, the diagram below is a heat map of grazing intensity by livestock over a 12 month period. This level of data then allows the user to start questioning growth rates and performance of their farm at a granular level that was not previously available.



Herd heatmap

Where cows spend the most time.

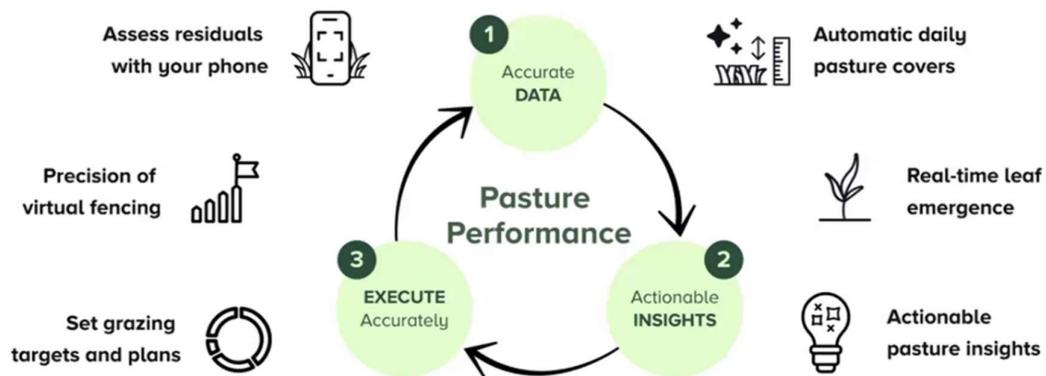
Systems such as Halter have the potential to transform pastoral management systems in New Zealand. It will also have implications for the advisory field. In the first instance advisors need to understand the potential and the limitations of this type of technology in order to be able to provide meaningful advice on whether or not to adopt such technology for their particular property. From a data management viewpoint, systems such as Halter provide a high level of analytical data, both per animal and per paddock/square metre. For the advisor who used to spend time analysing mating performance, animal health trends and pasture growth data, all of this information is now being provided instantly to the farmer. Hence the data analysis component of an advisor's job has now been automated. For some advisors this will be welcomed, others may view this as a threat.

Halter is also an interesting case study of the complex issue of cost vs value. To develop world class agri-tech requires significant investment. Naturally, to obtain a return on investment will typically require those who derive value from the technology to pay for



the use of that technology. In the case of Halter, that is the farmer, and the investment cost can range from tens of thousands into the hundreds of thousands. The perception of the value derived will vary between farmer, depending on their level of use and experience. For what is perceived to be too expensive for one farmer may in fact be a satisfactory return for the next. There is a role here for an independent advisor to provide an objective viewpoint on value derived, and whether the technology is fit for purpose for that particular farmer.

Pasture Pro introduces...





5.6 Aimer

Aimer is another example of technology developed in New Zealand. Aimer has a goal of providing intelligent pasture management information to the farmer. Whilst still at an early stage of development, similar to the previous examples, Aimer has the potential to provide highly detailed information based on analysing large quantities of data to provide detailed recommendations to the farmer.





Chapter 6: Analysis

6.1 What am I thinking?

Before discussing the potential changes to the profession of the rural advisor, it is important to remind ourselves why the profession exists in the first place – **that is to support farmers managing their businesses**. Or, put another way, if farmers could find that support through other means, would the profession exist at all, and does this improve the efficiency of managing a farm business? This thought could be confronting to a rural advisor whose business and identity is associated with providing advice to the farmer, but it is important to keep focused on why the profession exists in the first place.

The role of a farm advisor or rural professional varies widely throughout world, between sectors and between organisations. For some, the role is 'narrow and deep', for example the provision of technical advice on which herbicide or insecticide to use. For others the focus may be much broader, focusing on the business itself – farm systems, governance, and strategy (Figure 16). The impact of agri-tech on the role of the advisor will thus differ depending on the role being played. **For those whose role is purely focused on providing only technical advice, the impact may be rapid and profound, to the point that their role may not exist in the future.** For example, the provision of advice around fertilisers, agronomy and financial analysis can be automated. This would reduce or even eliminate the roles of nutrient management advisors, agronomists, bank managers, accountants, and some aspects of farm advisory.

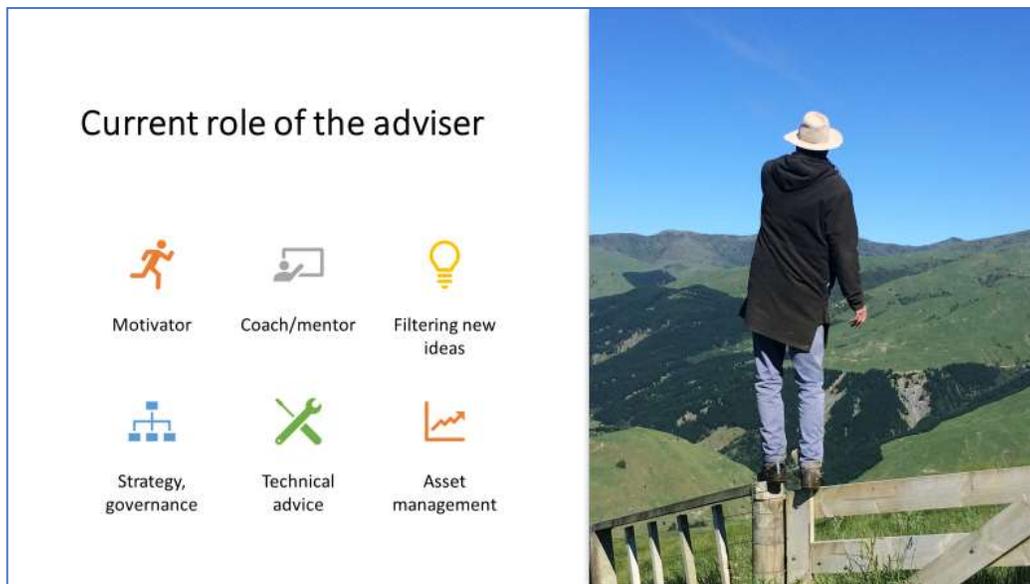


Figure 16: Current roles of the farm advisor

Eastwood et. al (2019) examined this issue from an academic viewpoint and came to similar conclusions. Eastwood identified the advisor's role in "acting as a sense maker



in the smart farming innovation system, rather than a promoter or barrier to technology uptake. Further adaptation of advisory practices is required to enable greater value from data-driven smart farming to be captured by farmers.” Eastwood also went on to suggest that the “main implications for advisor capability, roles, and service models were related to i) tools replacing some of the roles of advisors; and ii) supporting farmers through uncertainty associated with the implementation, and ongoing use, of smart farming.

Eastwood 2021

“Our contribution is in considering the interaction and balance of weight of the past and push of the present, relative to the pull of the future. Previous works exploring the future of Agriculture 4.0 have favoured pull of the future factors (techno-optimists) or weight of the past (techno-pessimists). We suggest that the weight of the past will continue to have a large influence on technological futures, thereby dampening the hype associated with these technologies. The techno-optimist's vision of the future will also be hamstrung by current limitations around data connectivity/integration, limiting the value proposition for farmers.

There is a risk that with a focus on pull (future) factors, technology development is focused on livestock production in corporate, large-scale, industrial production, and so does not address factors that hinder development of, and access to, integrated digital solutions for small-scale farmers. If this is the case, Agriculture 4.0 will have a more limited role in enabling sustainable food systems.”

Eastwood also raises valid concerns around the adoption of agri-tech being hindered by a lack of connectivity, and the risk that agri-tech solutions are more focused on the corporate or large scale industrial farm operations. I agree with those comments, and the issue of connectivity in New Zealand remains a critical limiting factor.

For those of us who consider this all a bit far fetched, it is useful to reflect on how quickly society is evolving, and how technology has already fundamentally disrupted certain industries. For example, Airbnb is now the world's largest accommodation provider but owns no real estate. Uber is the world's largest taxi company but owns no taxis. And the pace of change is increasing. For example, it took 3.5 years for Netflix to reach one million users, but it took ChatGPT only five days to achieve the same outcome.

There has also been debate and some concern around how AI might stray outside the intended boundaries, and/or create bias in it's decision-making. The regulatory framework for using AI is under-developed, and policy makers and technology firms around the world are taking steps to create a policy framework and regulation before it is too late. With regard to the issue of decision-making bias, consider the example of an Agri-tech AI system that aims to optimize crop yields and farm profitability. Has this system considered the environmental and social impacts of its decisions? Until we can be supremely confident that all factors have been taken into account, there remains a vital role for human oversight to ensure decisions are made in a 'whole-farm' context.



6.2 What is the farmer thinking?

As highlighted in the previous section, the role of the rural adviser to support and add value to the farmer. Throughout the Nuffield journey farmer perspectives on the role of the adviser were gathered.

The value derived from involving an adviser in a farmer's business will vary greatly depending on their perception of what value means and how it is measured. For some farmers the definition of adding value will be as simple as increasing farm profitability. For other farmers value may be derived from resolving a conflict with the worker or business partners. Thus, the benefit of introducing new technology into the system will vary greatly on the issue at hand.

The farmer feedback was less around the technology itself – that is simply seen as a 'tool of the trade'. But what came through very strongly was the importance of the adviser as a mentor, a coach, a motivator, a challenger of ideas, and a person of trust. Once again, this highlights the value of the 'soft skills', the interpersonal skills that create change.



Chapter 7: Conclusions: so what does this mean?

7.1 Key conclusions

For ease of reference, the objectives of my Nuffield are repeated below:

1. To understand the trends in the use of technology in the agricultural sector.
2. To understand how these trends will affect the role of the agricultural advisor.
3. To provide recommendations on the future role of the agricultural sector advisor.
4. To investigate optimal business models for the agricultural advisory sector.

Chapter 5 looked at the trends, and Chapter 6 analysed the impact of these trends. This section aims to tie these threads into thoughts for the future ahead.

Conclusion # 1: The future role of Agri-tech and AI in farming

Agri-tech and AI has the potential to:

- » Improve decision making through better use of data - more data sources analysed by machine learning and AI to provide insights and ultimately recommendations;
- » Allow farmers to manage their properties more precisely: rather than managing farms at a paddock or mob scale, decisions are implemented by the square metre and individual animal;
- » Integrated data systems reduce time and cost of data input, as well as giving the market and the consumer greater assurance of the quality of the information.
- » Reduce inputs and increase farm yield, thus increasing farm productivity, and profitability, as well as reducing externality impacts on the environment; and
- » Provide real-time information and advice to farmers, thus reducing or even eliminating the need for technical support and advice by rural advisors.

Limitations to the achieving the possibilities noted above include:

- » Lack of connectivity (internet speed)
- » Lack of applicability
- » Slow uptake (due to lack of perceived value, cost, awareness, trust etc.)
- » Lack of digital integration (data interoperability)

Conclusion # 2: The farmer of the future

The farm manager of the future will be:

- » Managing increasingly larger farming operations, which are more complex and have vastly more data points to manage;



- » Increasingly well qualified as their skills adapt to managing large and complex farm businesses;
- » Digital natives, adept and comfortable with using technology;
- » Addressing the issue of how to produce more product from less inputs (efficiency and scale), and/or adding more value to their product; and
- » Less likely to own the farm they manage, given the scale of many farm operations.

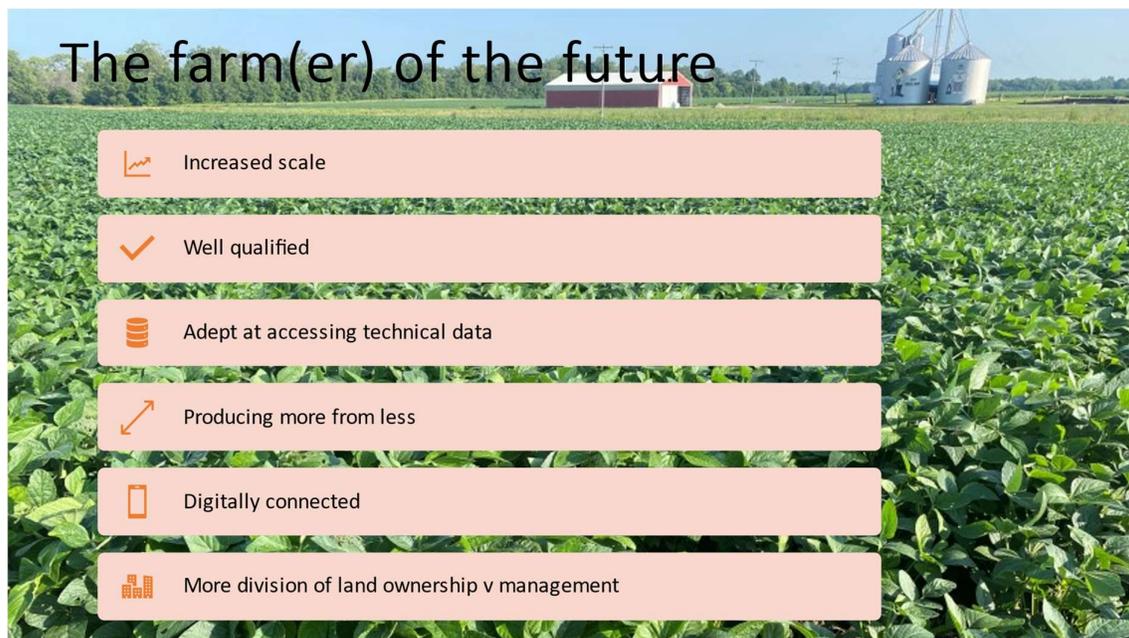


Figure 17: The farm(er) of the future

This framework provided, by conclusions one and two, then help to guide how the rural advisor will adapt to this future ecosystem.

Conclusion #3 The rural advisor of the future

The 'professions' (e.g. health, finance, legal) are all set to be impacted by technology, and in particular AI, and the rural professional sector is no exception. Figure 18, utilising the three horizons model for strategic planning, illustrates the current and future states of the profession. Whilst I have taken the approach that the primary sector in New Zealand is currently in Horizon One, it can equally be argued we are already in Horizon Two.

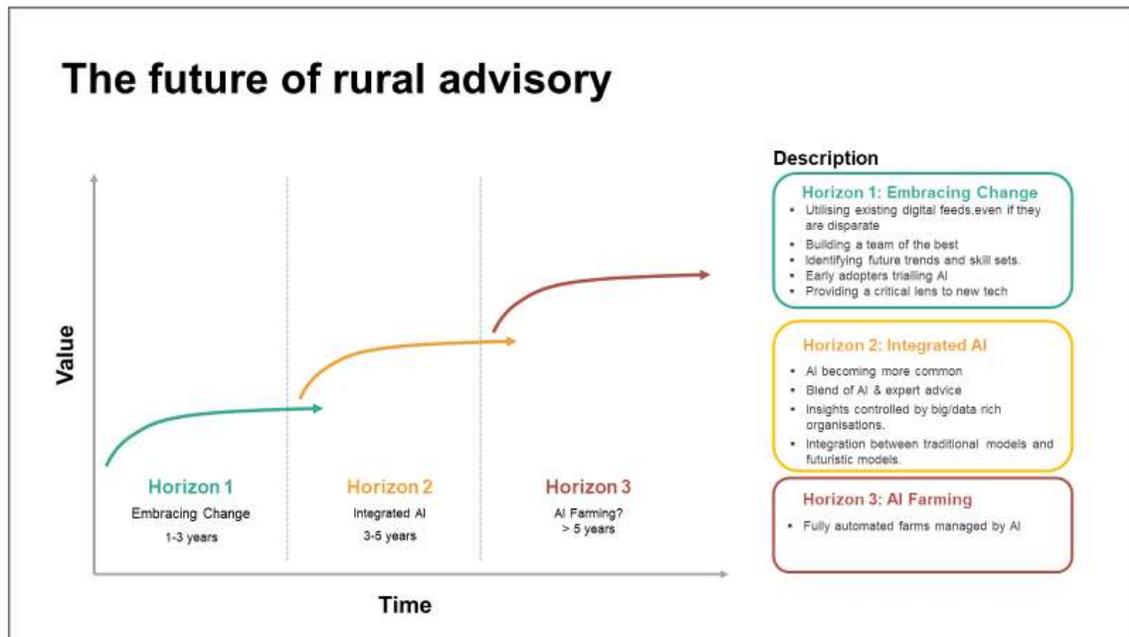


Figure 18: The future of rural advisory

Horizon One: Embracing Change

While the pace of change may vary, the trends are very apparent. The rural advisory sector needs to embrace these changes, albeit with a critical lens over the technologies being promoted. The Ag-tech arena is littered with failed ventures. Embracing change looks like:

1. **Utilising existing digital feeds**, even if they are disparate. There is already a wealth of analytical data available to farmers and farm advisors. There is opportunity to utilise this data more effectively. Douma (2022) cites the need to employ data managers on farm to manage data better, and also highlights that rural professionals could provide this service to those farms with insufficient scale to do so in their own right.
2. **Building a team of the best**: those providing advice to the rural sector will need to rethink what skillsets are required to deliver the best service. For example, additional skillsets in an advisory firm may include data analysts, GIS specialists, and AI experts.
3. **Identifying future trends and skillsets**: the previous point highlights the change in skillset for firms currently. What are the likely skillsets required in five years' time, and where will they come from?
4. **Early adopters trialling AI**: the ability to experiment with the use of AI in farming is available right now. Experimenting now will help guide future strategic direction.



5. **Providing a critical lens to new technologies** is an important role for a rural advisor. As a trusted partner of a farming operation there is an ethical responsibility to ensure that the advisor is acting in the best interest of the farmer. This may mean ensuring that the technology is fit for purpose, but equally may involve giving the farmer a 'nudge' to assist uptake.

There is also a vital role to play in correcting any bias by AI systems who might be designed to optimise one aspect of the farm business (e.g profit or production) without sufficient consideration to other aspects such as social or environmental outcomes.

There may also be a role for advisors to consider with regard to influencing policy development for new agri-tech, particularly AI, as well as being the interface between farmers and regulation. Whilst the easy answer may be to leave this task to others, this creates the risk of poor policy development.

6. **Adding value or cost?** As with any technology adoption, it is important to ensure the technology is adding value to the end user, i.e. the farmer. If we think specifically about new technology in the rural advisory field, will this technology benefit the farmer, the adviser, or the developer of the technology? If there is a one-sided answer here this may hinder the uptake of the technology.

Horizon Two: Integrated AI

Horizon two, Integrated AI, is the point where there is a hybrid blend between the traditional methods of providing advice and the use of AI for decision-making. In some cases we are already at Horizon two. AI may be used to analyse the majority of the data and provide recommendations, but the expert (farm advisor and farm manager) will employ their own expertise and real world understanding of the context in which decisions are to be made before making decisions.

There is a risk (and opportunity) that the data sets and decision making technologies will be owned and controlled by large corporates. Risks include data ownership/privacy, and the cost/benefit of the technology to the farmer. The counterfactual to this issue is that for the benefits of data mining and analysis to be maximised it is important to have scale in both data sets and software development.

Horizon Three: AI Farming

While not without challenges, it is feasible to imagine a future where an entire farm is managed by an AI system. For example, futuristic dairy farms in the Netherlands include robotic milkers, automated feeding and effluent systems, and robotic pasture harvesters. Large scale arable farms are already using robotic cultivators, sprayers and harvesters. It is not much more of a step to imagine a situation whereby the information necessary to optimise the management decisions behind these actions are also automated.



7.2 What hasn't changed?

Much of this report has discussed how farming and the farm advisory profession is slowly but surely being transformed by agri-tech. However, what also became patently clear throughout this research is the importance of inter-personal relationships and communication. The importance of 'soft skills' has always been paramount to being a competent rural advisor. In fact several of those interviewed as part of the research suggested that **the difference between a good and a great rural advisor is their level of interpersonal skills**. In other words, the ability to relate, challenge, motivate, coach, and inspire their clients.

As technology slowly takes over some of the basic (and then complex) tasks of the rural advisor the role of the advisor will naturally gravitate to the highly complex interpersonal skills that (at this stage) are beyond the realm of technology. Examples include strategic planning, succession planning, and managing teams. Hence, the importance of the soft skills will become even more important. This then begs the question of the candidate selection process for great rural advisors, and how they are trained.



Figure 19: UK farmer Jimmy Stobart, discussing pasture management

7.3 Implications for the rural advisor

The implications for the rural advisory sector are wide ranging and significant. However the impact of these implications will vary considerably, dependant on the local situation and the desire (by both farmer and advisor) to change. For those at a later stage in their career there may be less motivation to change, and a lesser need. With that point in mind, shown below are some thoughts on the implications for rural advisors and rural advisory firms. Whilst some of these points have already been covered, for completeness they are listed again below.

Some advisors will view the automation of advice as a threat, others will view it as an opportunity. For a rural professional whose cost of services are covered by the sale of a product (e.g. fertiliser recommendations provided by a fertiliser sales representative, or sowing rate recommendations provided by an agronomist), the automation of advice may disrupt their business model. For a farm systems advisor who relies on a wide variety of analysis tools to make good decisions they may view this as an opportunity to automate the data analysis, freeing up their time to focus on their interpersonal relationships and decisions that cannot be automated.



Issue	Implications
Automation of basic tasks, e.g. body condition scoring, automated heat detection and thus analysis of livestock mating performance.	<ol style="list-style-type: none"> 1. Loss of task for the advisor 2. Faster and more accurate data collection and analysis, enabling handling of bigger data sets
Automation of report writing Automation of complex tasks, e.g. analysis of financial reports, recommending seed sowing rates, provision of technical advice.	<p>Increased efficiency for the advisor</p> <ol style="list-style-type: none"> 1. Loss of task/role for the advisor 2. Frees up time for the advisor for other tasks and interpersonal issues. 3. If the basic and complex tasks are automated, what is the training pathway for a young consultant who would traditionally do these tasks?
Ownership of analysis tools owned and managed by large corporates.	Potential for an advisor to be excluded from data sets and analysis tools, i.e. a barrier to entry.



Chapter 8: Call to action (recommendations & next steps)

The rural advisory profession needs to evolve as both farming and agri-tech evolve. The risk of not evolving is a loss of added value to the primary sector, and potentially a loss of business for the advisory firm. The following points are a series of recommendations for those in the rural advisory sector to consider.

Where does the advisory industry need to head?

- Digital natives, embracing AI
- Part of a team, users of big data
- Assisting farmers in with the transition
- “Soft skills” become even more critical!
- How can tech, advisory, R&D & farmers work together, to reach more farmers, with greater impact, for less cost?
- Working together to break the productivity barrier!

	Issue	Recommendation	Desired outcome
Data ownership & management			
1.	Farmers struggling to manage and analyse data.	Advisory firms to employ data managers on behalf of the farm businesses to manage data better.	Improved farm productivity and profitability.
2.	Rural advisory firms struggling to manage and analyse data	Advisory firms to employ their own tech specialists to support their own team.	Accelerated use of smart Agri-tech by advisors
3.	Access to data/data analytics may become restricted by large corporates who have developed the necessary systems to manage the data. This could hinder the success of an independent consultant.	Establishment of partnerships with data analytic businesses will ensure that rural advisors are not 'locked out' of access to data. It also provides software developers access to real world expertise.	Improved industry collaboration leads to improved farmer outcomes.



4.	Connectivity: in NZ internet connectivity remains a major barrier to implementation of new technology.	<ol style="list-style-type: none"> 1. NZ government and industry to accelerate efforts to improve rural internet connectivity. 2. Rural advisors to be proactive with farmer clients in seeking out cost effective internet solutions. 	Improved farmer profitability with a reduced footprint.
5.	Data sharing to achieve data interoperability	NZ government and industry to accelerate efforts to improve data sharing and data interoperability.	Improved efficiency
6.	AI Strategy	Advisory firms to develop an AI strategy for their business, to ensure information and recommendations are handled correctly.	Business compliance, data protection, avoidance of AI bias in recommendations
Complexity of farm businesses			
7.	Farm businesses, and the role of the farm advisor is becoming more complex.	<ol style="list-style-type: none"> 1. Advisory firms offering a team approach, with consultants offering specialist advice, will be better placed to service the needs of their clients. If not working internally as a part of a team, there needs to be much stronger levels of collaboration between advisory firms. 2. Aggregation of advisory firms (nationally and internationally) will assist in managing the complexity of farm businesses and also the creation of scale necessary to develop new data management systems 3. Smart use of technology at the farm level to aggregate and synthesise large amounts of data. 	<ol style="list-style-type: none"> 1. Better advice provided to the farmer, along with improved advisor efficiency. 2. Make complex farming systems easier to understand and manage.



Evolution			
8.	Farmer and advisor resistance to change	<p>1. Advisors can play a pivotal role in evaluating and filtering new Agri-tech opportunities. To do this advisors will need to be familiar with the latest Agri-tech opportunities relevant to their field of expertise.</p> <p>2. Ensure that any new technology is adding value to the farmer, not just cost. This needs to be a key check and balance in any new technology adoption.</p>	Improved uptake of Agri-tech that adds value.
9.	Are the next generation of rural advisors going to be 'fit for purpose'?	<p>1. Review the education and development requirements for new rural advisors, addressing the need for additional skills such as GIS, data mining, and use of AI.</p> <p>2. Review the personality styles that are required for advisors of the future. There is likely to be an increased emphasis on interpersonal skills over the traditional knowledge and analytical skillset.</p>	New advisors are 'fit for purpose' and fully efficient within a shorter timeframe.
10.	If AI is automating many of the basic tasks that a young advisor would undertake as part of their development programme, how do we train new advisors?	With reference to the previous recommendation, there may need to be a complete rethink of requisite skill sets and personality traits to ensure new advisors can become proficient in a much shorter timeframe.	
11.	Developing tools for the future	1. Farm advisory firms have an opportunity to lead the development of farmer friendly AI software. This will likely require collaboration with software development firms and policy	<p>1. New business opportunities for advisory firms.</p> <p>2. Reduced cost of advice for farmers.</p> <p>3. 'Fit-for-purpose' regulation and policy.</p>



		<p>developers of AI regulation.</p> <p>2. Advisory and agri-tech firms need to be involved with policy development and regulatory frameworks.</p>	
Rural Advisory business			
12.	Rural advisory businesses need to increase their productivity/efficiency.	<p>1. Embrace the automation of certain tasks (e.g. pasture assessment, livestock condition scoring), and focus on using the information provided to add value to the farmer.</p> <p>2. Utilise AI to auto generate recommendations and reports, or parts thereof.</p> <p>3. Clever use of AI will enable rural advisory businesses to 'scale-up', reaching a wider audience and having a greater impact.</p>	Improved efficiency and reduced cost for advisory firms.

The recommendations provided above are intended to add value to both the farm and the farm advisor. The farm advisor can become more efficient with their time, which then allows them to make better use of data to provide more valuable insights for the farmer. The advisor will transition from a role of analysing data to encouraging behaviour change, and in some cases the advisor may not be required at all – which should be viewed as a measure of success in itself. Farmers, rural advisers and agri-tech need to work together to create the future.

What does it mean for the adviser?

- Reduced data collection time = increased efficiency
- Use of big data sets to gain (automated) deeper insights
- Our role evolves from data analysis to recommendations and encouraging behaviour change





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