MAP OF AG

HORIZON 2022

An outlook for the agrifood sector

CONNECTING AGRICULTURE

Our vision is to be the most trusted global data platform connecting farms and industry

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FOREWORD

Welcome to our new Horizon publication. As 2021 draws to a close and we find ourselves remaining in the grip of Covid-19, we thought we'd take a look ahead to 2022 with a focus on opportunities and some predictions for the agrifood sector.

It's easy to feel dragged down by the unrelenting challenges that the pandemic has brought, but there have been many examples of agile adaption to the rapidly changing circumstances that have inspired me and command my complete respect. In truth, the global agrifood sector has, for the most part, been incredibly resilient and resourceful, though we must not ignore the significant difficulties specific sectors have had to deal with over the course of the last two years some of which are dramatically ongoing.

The pandemic has forced society as a whole to view life through a different lens and in time it is possible the havoc it has wrought may also prove to have been the spark that initiated significant positive change, for example in areas such as climate change, or indeed social welfare.

This first issue of Horizon focuses unashamedly on data in the agrifood sector and the articles we have commissioned demonstrate the breadth of opportunity that a data-driven focus could deliver for the challenges our industry faces. Our business at Map of Ag is all about data and creating opportunities throughout the agrifood supply chain to do things better. In the past 12 months our technology teams have made huge progress on delivering our new data integration platform as a service (iPaaS), *Pure Farming*, and we are hugely excited by the potential this cutting-edge solution can bring to the sector in 2022.

The international nature of our business (we are operating in the UK, NZ and Australia) means we have access to some of the key market signals across a wide range of agrifood sector businesses, economies and climates enabling us to build solutions that we believe are truly fit for purpose in a scalable way.

Our role is all about connecting data in a secure and trusted way to enable businesses inside and outside the farm gate to thrive and adapt to ever-changing demands, both environmental and social. Horizon is another way in which we aim to fulfil that connection promise.

The opportunity is huge in agrifood and we look forward to working with you to achieve your goals and ambitions in 2022.

Richard Vecqueray, CEO

OUR STORY
... SO FAR

Our core focus is our *Pure Farming* data permissioning platform allowing farms and industry to find, access, interoperate, re-use and above all control how and where their data is used.

The platform underpins an ecosystem of innovative data-driven solutions – proprietary and many more third-party – that drive productivity, efficiency, transparency and Net Zero.

By 2050 there will be nearly 10 billion of us needing to be fed. But that food can no longer come at the expense of the planet. Our belief is that data is one of the keys to unlocking sustainable food production.

Our vision – to be the most trusted global data platform connecting farms and industry – is focused on making reliable, trusted and permissioned data available today for a better tomorrow.

HOW CAN WE HELP YOU?

DATA PLATFORM

Our industry leading *Pure Farming* platform connects farm and agrifood sector data using a highly secure permissioning and data management engine that puts the data originator in complete control of their data.

DATA PRODUCTS

The data platform provides the foundation for our own proprietary data products as well as those belonging to third parties. These are used by farmers and the agrifood sector to measure, monitor and manage their businesses.

DATA SERVICES

Our expert teams provide a range of services including bespoke software development & consultancy, data science, on-farm advice, precision farming, and agrifood market research.

Discover more at mapof.ag | info@mapof.ag

WHERE TO FROM HERE?

Map of Ag Chief Technical Officer **Andrew Cooke** looks into the coming technologies influencing agriculture.

The turn of the year is often a time when we consider what has happened and what might take place. It can even be a good time to look a bit further out and consider how the budding technology trends of today might influence our future livelihoods.

Studies of future technology forecasts show that we are all over-optimistic about what could happen in the short term, and hugely under-estimate the longer-term impact of technology changes.

The Gartner hype cycle graph demonstrates this. Starting from zero there can be a huge spike of hype about a new technology, but it is difficult to see what real-life adoption might be like on the other side of the hype.

In fact, the Gartner hype cycle is just that – a "spike" of hype and then disillusionment, superimposed on a traditional cumulative technology adoption curve. The challenge in reading technology trends is to understand which may be pure hype, which have potential long-term application, and what the underlying adoption curve might be.

While the spike of inflated expectations may make it hard to assess which technologies will be adopted, it can also serve to bring forward adoption that might otherwise take years. Expectations drive investment, and investment can speed technology development beyond the purely incremental.

So, what rising technology trends might impact agriculture in the coming years?

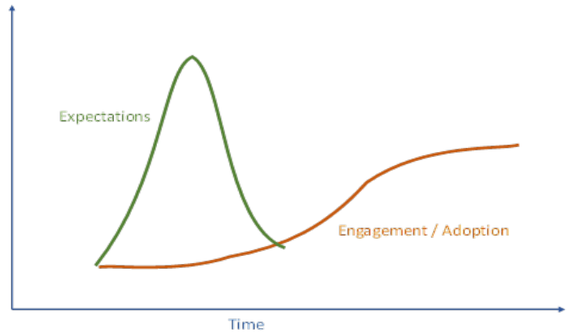
Three trends encapsulate several different technologies and their common opportunities and challenges:

1. **Augmented intelligence**
2. **Connected sensing and automation**
3. **Trust architecture**

AUGMENTED INTELLIGENCE

The typical phrase that is used is "artificial intelligence" (the type of "AI" that doesn't involve insemination!).

Figure 1: The Gartner Hype Cycle



But it's important to look a bit wider than just artificial intelligence and consider a set of related technology trends that revolve around "augmenting" or assisting our understanding and decision making.

Trends in this space include:

Digital Twins
Digital Twins are systems that take real-world data about farms, crops, and livestock, and place that data into mathematical models that help us with visualisation or prediction. The models themselves may include relationships discovered through machine learning analysis or more traditional scientific trials and human-developed algorithms – or even combinations of both.

Digital twins can provide early warning of infection or stress in livestock and crops. They can help us to visualise the nitrate or methane emissions of farm systems and undertake "what if" style analyses of different options.

Digital twins and connected data allow for predictive models and smart visualisations to be updated more frequently and analysed at greater scale than was previously possible.

Mobile applications and faster networks with improved coverage will allow us to access insights from augmented intelligence "as we need them" – either in real-time as decisions need to be made, or in the right context for our work. Experiments with virtual reality, augmented reality, speech recognition and related tools may also provide new ways to see, hear and interact with the outputs of augmented intelligence.

Pattern Recognition Technologies
These are tools and systems that train machines to recognise patterns in data. Depending on the types of data involved, this can include computer vision (various types of image processing), and natural language recognition and semantic analysis (understanding what people say). It can include the use of “deep learning” (training computers to recognise patterns, and then reusing that learning) and “machine learning” (automatically finding mathematical relationships between data). These technologies are often collectively called artificial intelligence.

A key use of pattern recognition is to collect data without human effort. Examples include monitoring milk to anticipate somatic cell count or using satellite images to monitor crop growth stages and disease or nutrient problems. Companies are using these technologies now, but the coming years will bring scale, reduced costs, and the ability to “connect things up” and use this “recognised” data for multiple purposes.

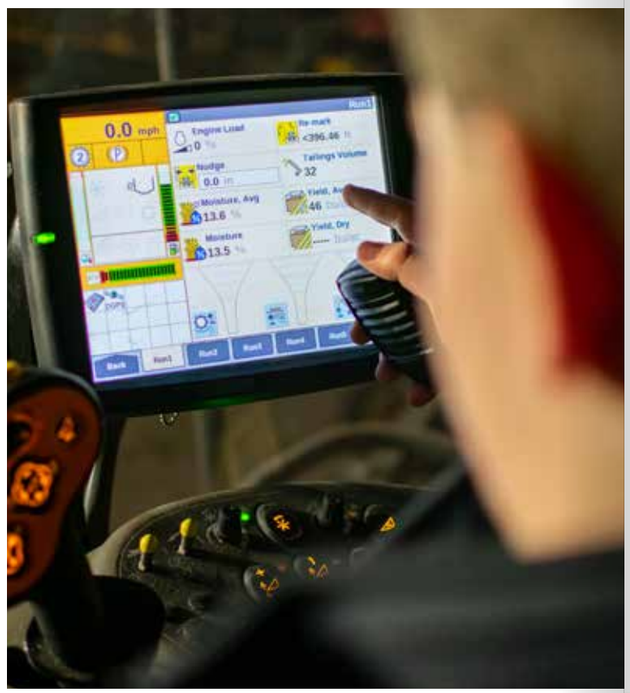
CONNECTED SENSING & AUTOMATION

One source of the data that will drive future decision technologies is the spread of affordable and connected sensors.

The “Internet of Things” (IoT) is the term used to describe a network of connected sensors and actuators used to gather data and control systems. IoT devices make use of a variety of modern networking technologies (short and long range) to deliver information to the cloud, and sometimes to take instructions from centralised servers.

Newer battery technologies, and at times use of solar energy, enable network connectivity and more frequent measurements than would have previously been possible. Modern IoT devices may receive updates to their embedded software over the network, allowing problems to be corrected and functionality to be improved.

Importantly, IoT devices are often (though not always) more affordable than previous generations of sensing and automation devices, and therefore can be deployed in greater quantities, giving a corresponding increase in



granularity or scale of monitoring. IoT and other connected devices and sensors are increasingly changing how we measure and manage in farming and environment systems.

For instance:

- Automating data collection tasks that farmers would have previously had to undertake manually (if they were undertaken at all). Examples include recording the activities involved with milking animals, including quantity and characteristics of milk. Lightweight sensor devices on animals collecting animal wellbeing, movement, and feeding information much more frequently than livestock keepers could otherwise hope to observe in their animals.

Movement and temperature sensor data – when combined with the augmented intelligence already discussed – can predict heats, infections, even stress and boredom. We have long been able to download yield information from combine harvesters, although the task of walking with a USB stick has sometimes stopped that data being used. An internet connected harvester, however, becomes a very large IoT device, collecting yield data and quality assessments in real-time. As the data can be collected without human intervention, it is more likely to be leveraged

with soil, satellite, and hydrology data to support future intelligent decisions.

- Catchment-scale monitoring of rivers for nutrient flows once occurred with monthly data collection visits from sensors. New floating IoT sensors will collect river metrics in real time.

The increased time-series granularity will allow us to understand whether we are seeing real improvements or declines in water quality, or merely the response to local rainfall events. In combination with farm activity data and intelligent models, farmers may even gain insights into the practical activities they can undertake to improve ecosystem health.

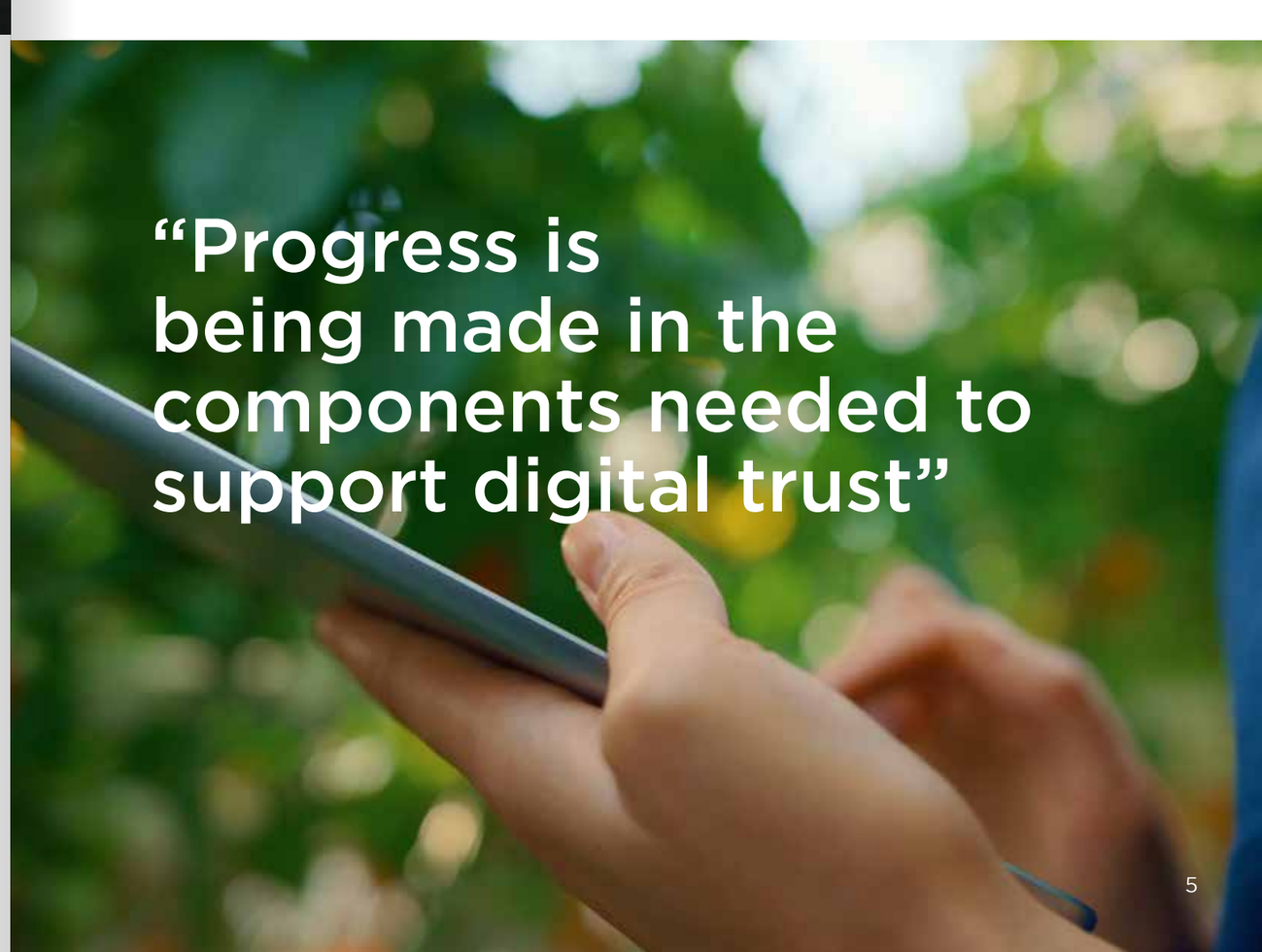
Connected sensors may soon support the logical next step in automation: responsive environments. Sensors, data networks, and digital twins combine to support machine-driven controls that operate within constraints that farmers define.

This is the agricultural equivalent of a car that uses radar to keep its distance from the car in front, or your phone which adjusts its screen brightness in response to the ambient light. We’re starting to see early examples of creating responsive environments in agriculture such as:

- Targeted application of nitrogen to crops based on their growth stage, farmer decisions, and real-time measurement with N sensors

- Irrigation systems that apply dairy shed effluent to fields taking into account soil moisture sensors, effluent pond levels, and forecast rainfall

- Greenhouse control systems that automatically adjust air flow, temperature, and irrigation based on plant growth stage, sensors, and rules the grower has set, rather than purely based on a pre-programmed recipe.



TRUST ARCHITECTURE

A common thread to these technology trends is substantially greater collection and use of data. Much of the processing will be carried out by sophisticated computer software operating in the cloud. For many farmers, this could sound like an Orwellian nightmare: their farm and activities under continuous observation, remote decision making, and the threat of a remote "big brother" making judgements.

It's fair to ask whether the benefits that technology promises are worth the loss of privacy and control. Farmers, their suppliers, and their downstream customers will not gain the full benefits of augmented intelligence, connected sensing and automation, and other technology trends unless the questions of trust, control, and security can be satisfied.

Fortunately, in the same way that technology is bringing us new solutions for collecting and interpreting data, progress is being made in the components needed to support digital trust across the industry.

One of the key needs is a coordinated model for data permissions. Those who create data in their business (or more precisely, about whose business the data is collected) need to control how that data is used. This is not just a case of restricting access. Indeed, it may be one of extending access – being able to give appropriate data access to staff and co-workers, or to vets and agronomists. Farmers and growers may want to provide subsets of data to supply chain partners, input suppliers, or software tools of their choice. They may need to control the types of data accessed, agree the purpose of access, and even change their mind and remove access.

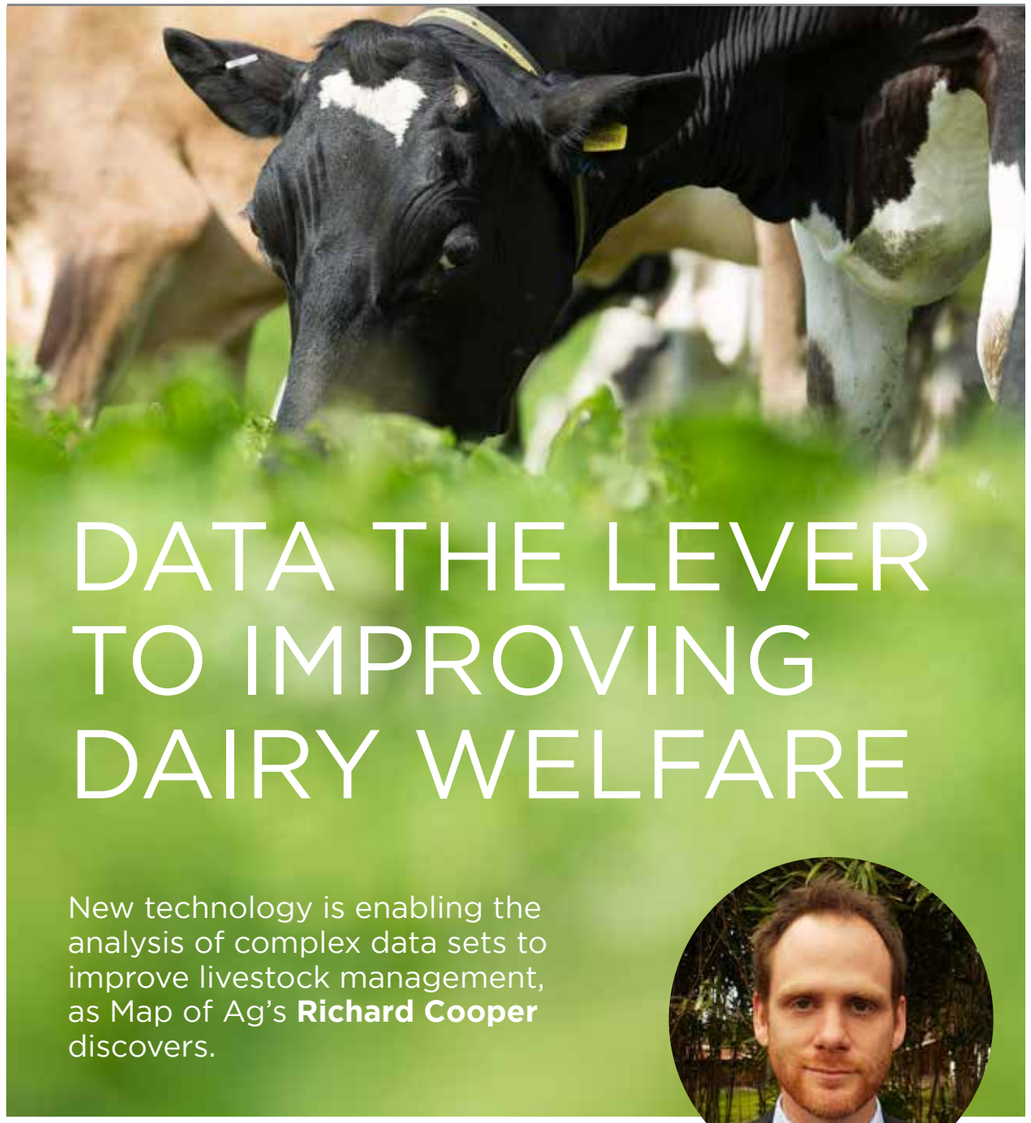
Frameworks in this space are still evolving and it's an area that is full of acronyms. The most widely used framework is a specification called OAUTH 2.0 (Open Authentication). This provides a secure way of granting data access to software systems but doesn't facilitate agreements between people or organisations. An in-development extension to OAUTH 2.0, UMA or User-Managed Authentication provides a centralised way to control data from multiple sources but is also focused on software access only.

Distributed ledgers may offer some long-term solutions in this space. Distributed ledger technology is the cryptographic engine that underpins blockchain and crypto currencies, but you can use distributed ledgers without speculating on digital coins. This technology might allow digital signing of structured data access agreements – in a way that the signatures can't be lost or fraudulently generated, and all changes and approvals recorded over time.

Data access agreements in this form could be used hand-in-glove with digital identity (a trustworthy way of linking an online identity to the real person or company that controls it) that is still under development. While the underpinning technologies are still evolving, trusted industry data hubs and controls are starting to provide farmers with the control and delegation they need.

Our *Pure Farming* platform is among them. It allows farmers to define data access permissions at a variety of scales, to other software systems, organisations, and individuals.

There is much still to be done around trust and security of farm data. Initiatives such as the NZ and UK Farm Data Codes of Practice, or the USA Farm Bureau Federation's privacy and security principles help to establish the mandate for farmer and grower control of their data and to provide the principles that will underpin future data access agreements. ■



DATA THE LEVER TO IMPROVING DAIRY WELFARE

New technology is enabling the analysis of complex data sets to improve livestock management, as Map of Ag's **Richard Cooper** discovers.

Modern dairy herd managers are having to rise to the challenge of not only producing milk with greater efficiency but achieving it in a way that satisfies customers' demands for excellent animal welfare and environmental sensitivity.

Agricultural technology, and the data it generates, can be an invaluable tool to achieve these objectives and provide some robust evidence that withstands consumer scrutiny. Meeting that scrutiny is often answered through greater compliance, in turn requiring auditable proof of practice for operators to continue supplying some processors.

In the past decade the scrutiny has ratcheted up, in part driven by social media's ability to disperse images quickly and widely of farm practices often taken out of context.

Out of context or not, perception becomes reality, and it can make the managing herds in a way that is welfare conscious and economic, a dual challenge.

In the United Kingdom consumers are now consistently claiming animal welfare is a key influence upon consumption decisions.

An IGD survey conducted last year revealed 89% of consumers placed “animal welfare” as being of key importance to them, a proportion that has changed little in the past decade.

Alongside that, environmental concerns have risen to be rated by 81% of shoppers as “important to fairly important” to them.

More than 50% of consumers surveyed also cited “animal welfare” as a reason for reducing their dairy consumption and opting for veganism in their food preferences.

Fortunately for UK farmers, consumers generally regard their practices positively with 78% considering animal welfare standards on farms as “generally high to very high”. Farmers are still seen as the most trusted group in the food supply chain, driven largely by consumers’ respect for their expertise.

However, it is also recognised that negative news on the sector can be damaging, with 44% of consumers reporting lower meat purchases on grounds of such reporting. That figure is likely to be similar for dairy given its equivalence to meat in many consumers’ diets.

Despite the differences and distances between their farms, the issue of welfare management is shared by farmers in the UK and most post-industrial economies of the West.

While UK farmers may grapple with welfare issues around lameness and calf euthanasia, Kiwi farmers for example have faced challenges on practices including winter grazing and de-horning.

In responding to consumer demands and resulting compliance requests to show they are being met, farmers are increasingly looking to technology and the data it can gather to help them respond better to welfare issues, on both a herd and an individual animal basis.

Neither the UK nor New Zealand are short on agritech to monitor animal welfare. The UK’s agritech sector is now valued at £14billion, and NZ’s agritech export earnings now top NZ$1.5 billion, almost exceeding its wine revenue. Estimates are that 22% of all tech activity is committed to animal and crop welfare.

Lameness is a common condition and welfare issue in both hemispheres. It is also a key production limiting disease where integrating technology can help manage a problem that can cost the manager of an average sized Kiwi herd NZ$20,000 a year, and in the UK £6,400.

In the UK the integration of tech to help manage lameness is now at a commercialised level. Edinburgh-based IceRobotics’ CowAlert monitors as an example, combine highly accurate data analysis software with wireless sensors to collect data on cow movement and behaviour.

Lying time, walking, movement, and overall activity levels are interpreted and can generate early warning of impending lameness issues before they become debilitating.

In NZ Livestock Improvement Corporation is using driverless car AI, coupled with advanced imaging technology to track cows’ gait on a daily basis. It is a case of the machine ‘eye’ being more accurate and consistent than the human.

University of Nottingham research has demonstrated early detection and treatment is vital to achieve long lasting recovery in dairy cows. But a cow’s lameness is often not identified until she is severely advanced, and her accompanying loss of body condition and appetite have started to impact her production and possibly reproduction ability.

The use of technology also brings other benefits to herd owners and farmers. Dealing with lameness is a time-consuming job and stressful for both animal and farmer, and early elimination can significantly reduce farm work loads.

The sector is also witnessing the convergence of multiple technologies to better monitor overall cow health and welfare and is generating vast data sets capable of delivering deep, interpretative understandings on cow behaviour.

New Zealand company Halter has developed remote cow monitoring collars containing GPS positioning tech, solar powered batteries, and advanced monitoring software capable of gathering up to 3,000 data points a minute. This includes behaviour variables such as social grouping, position, movement, and rumination.

As the technology advances, increasing data helps formulate algorithms. Halter’s technology is also helping with early identification of a range of individual cow health issues, and on a herd basis helping to paint a picture of the overall health profile.

The technology on hand can be dizzying for farm managers, and at this stage no “silver bullet” software addresses all issues. But as herd sizes grow, technology to help vets, farmers and advisors take a big-picture view of whole herd performance is essential.

Technology that gives the herd an identity in its own right, benchmarking performance against other farming systems, and farms at a regional and national level is vital.

There is also greater need for farmers to have access to more technology capable of being integrated, pulling in data sourced from production, fertility and health records for example, enabling more predictive, insightful reports to be generated.

Map of Ag’s *FarmMetrics* solution in the UK (part of its *Pure Farming* Integration Platform-as-a-Service suite), for example, uses data from multiple sources including processors, the national cattle tracing system, farm sourced data and herd electronic medical records that is configured to final user requirements, whether for farmers, advisors or retailers and processors.

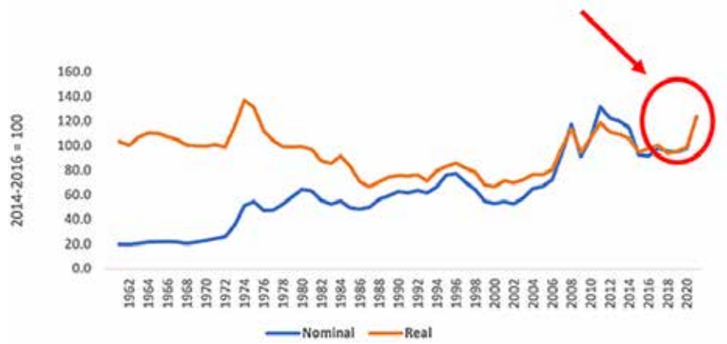
We are advancing the inter-connectiveness of farms to processors and ultimately consumers through *Pure Farming*. Our technology incorporates within-gate-generated farm data with genetics, compliance, system and even research data combined to enable consultants and vets to move from a reactive relationship with farmer clients to a proactive, strategic role. A qualified team of vets and consultants backs the reports with advice that can ensure early, effective, corrective action is taken.

Ultimately pressure on farmers to meet consumer demands on welfare and environment will not diminish. Thankfully, data-driven technology is rapidly improving to provide them the ability to better interpret the performance of their herds by providing a clearer understanding of individual animal performance and health, enabling care to be more proactive and preventative. ■

POLITICAL POPULISM A KEY DRIVER OF INFLATION

Until we find a constituency for sound money we will experience inflation, Map of Ag founder **Forbes Elworthy** argues.

Figure 1: FAO Food Price Index 1961-2021



Source: FAO; Map of Ag

US dollar food commodity prices have risen 40% since the onset of Covid-19 in March 2020.

This sharp price jump has reversed a period of farm produce deflation over the previous seven years.

In fact, farm gate prices have returned to almost the levels of the food economy spike of 2009-13.

Globally prices of many goods and services continue to rise. At the time of writing (December 2021) US inflation is running at over 6%; the UK at 5.1%; and New Zealand at 4.9%.

Shortages in blue-collar labour, fuel energy commodities, logistics capacity and food commodities drove inflation during the Covid period. Some believe this inflation will now moderate: as Covid recedes, entrepreneurs, including farmers, will be motivated by higher prices to invest to supply more goods and services to bring prices down, or at least to stop them rising further.

Those arguments assume other things remain equal. They would probably be correct if we were still in a globalised, well-financed yet fiscally disciplined world of 2000-2019. After all unemployment and deflation followed the boom of the 1920s and also the expansion ending in 2008.

However, I believe other things are not equal. As a result of likely further policy responses – fiscal largess – the 2022 global economy is unlikely to resemble 1929 or 2009. Instead, it may be more like that of 1974.

Why am I so confident that governments and central banks will err toward inflationary policies?

The rise of populism – witness Brexit and Trump – has seen political leaders focus on the common man or woman rather than previous policies of support solely on asset markets (which led to widening inequality). The result: large unfunded fiscal deficits to pay for these political programmes. The US, for example has boosted expenditure to 192% of receipts to address Covid-19 compared with 167% to address the 2008/9 credit crisis.

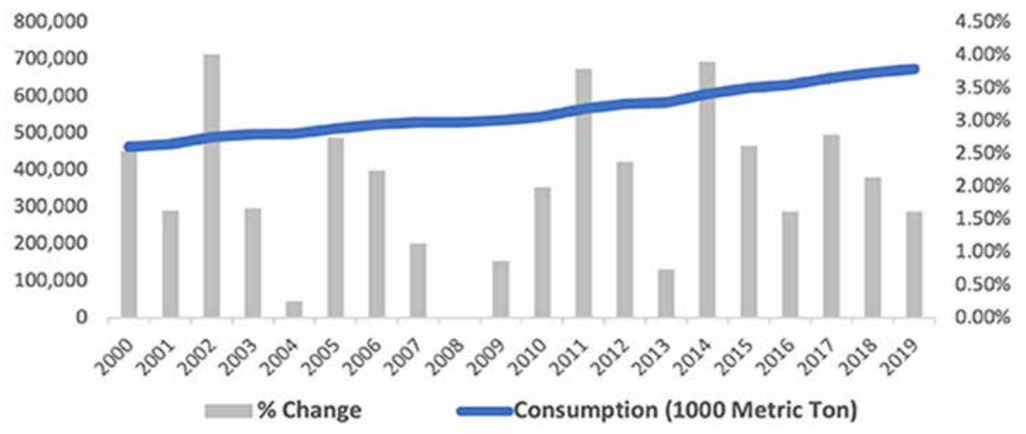
Ordinary people have a higher propensity to consume than the rich. As a result, the more populist current policy environment is leading to increased consumption, helping to tighten markets and lift prices.

In agriculture, I expect ongoing elevated prices of many goods driven by supply disruptions and ongoing demand stimulation. Dairy for example, as well as many horticultural crops, are seeing demand growing faster than supply (Figure 2 illustrates steadily increasing global demand for dairy).

Cheese and yoghurt are convenient, low-carbon intensity contributors to vegetarian diets. This has been a key driver of the steady increases in demand for these food ingredients.

Meanwhile, in contrast to its earlier growth, the dairy sector is experiencing tightening supply. For example, between 2002 and 2017 in NZ – the world's largest dairy exporter – the area of land used for dairy production doubled to more than two million hectares, putting a cap on global price rises. Yet this area has fallen during the past four years in the face of a land use change to higher and better uses (fruit crops) and environmental restrictions.

Figure 2: Global dairy consumption 2000 - 2019



Source: Labor Department

It is not only NZ that has reached "peak cow". Other dairy exporting regions such as Europe are now forecasting declining production in the face of similar restrictions.

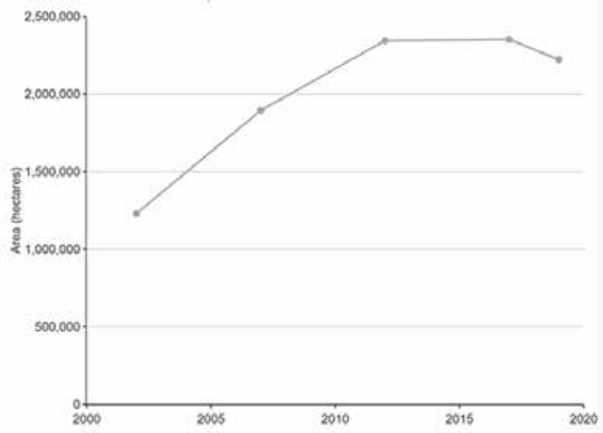
As a result, global dairy prices have already risen 38% since Covid-19 broke out.

Supply side pressures are not coming only from capacity restrictions. Ninety percent of global dairy production is grain fed (NZ and Ireland are exceptions to this). Therefore, for most producers around the world the main cost of production is inputs such as corn and soy. Since these prices are up 56% and 44% respectively in the past 18 months this is hardly leading managers of confined herds to want to increase production. Lack of cross-border labour (also a populist measure) is further constraining production.

The mix of supply side frictions and populist demand stimulation suggest inflation is unlikely to be transitory, in dairy as well as other key sectors of the economy.

This re-emergence of inflation is a radical change in the business environments we face. We have not seen sustained, widespread

Figure 3: Dairy Production New Zealand

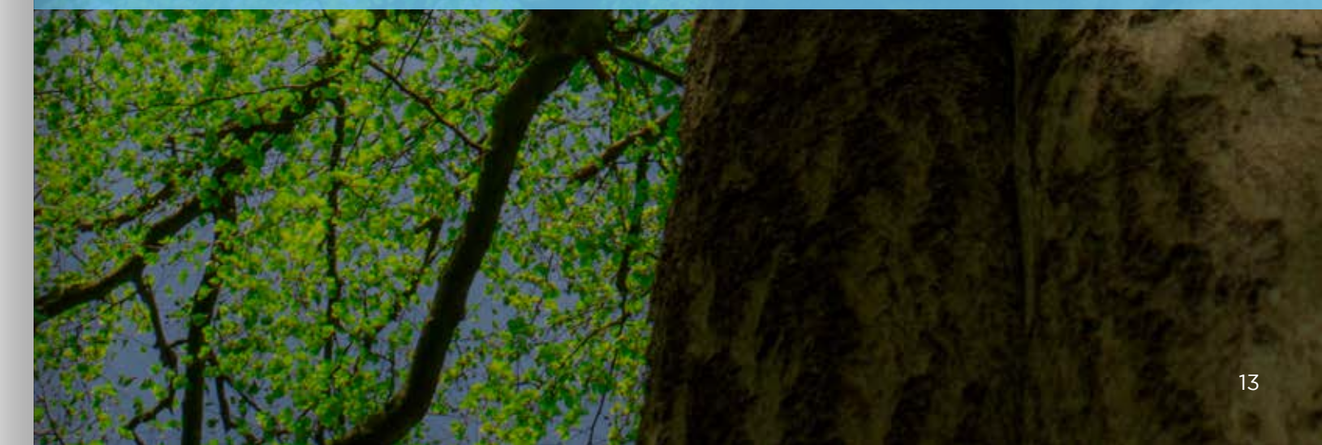


prices rises of this magnitude, in developed countries, for 40 years.

As ever business managers will need good data to help their businesses measure, respond to and thrive in these circumstances. ■

WHAT NEXT FOR CLIMATE ACTION IN AGRICULTURE?

While COP 26 was always going to be about implementation, wranglings over finance and commitments, Map of Ag's **Hugh Martineau** takes a look at the implications for farming.



Much was made of whether or not the deals struck at COP 26 would go far enough to limit global warming to less than two degrees Celsius (preferably one-and-a-half degrees) above pre-industrial levels.

But it was harder to cut through the noise and determine what some of the rhetoric could mean for the ag sector. Indeed, there weren't too many specifics but some sense can be made by focusing on the two key greenhouse gasses in agriculture.

Nitrous Oxide emissions are created from the application of organic and inorganic fertilisers and the resulting nitrification and denitrification in soils – an essential biological process in growing plants.

According to the United Nations Framework Convention on Climate Change (UNFCCC), "at COP26, governments recognised that soil and nutrient management practices and the optimal use of nutrients lie at the core of climate-resilient, sustainable food production systems and can contribute to global food security".

It is encouraging to see this focus on nutrients and in particular the use of reactive nitrogen. The movement focusing on #nitrogen4netzero has been gaining traction, not only due to the impact on GHG emissions but also the co-benefits for water and air quality and reducing the impacts of nitrogen deposition on biodiversity.

Map of Ag has focused heavily on nitrogen use efficiency in the past two years with pioneering work with Kellogg's Origins growers in the UK. The work has provided evidence of the opportunities to reduce environmental impacts and improving margins in the process.

Methane emissions continue to be a focus due to its potency as a GHG (~85 times CO2 over a 20-year time frame) and due to its short-lived status in the atmosphere (average 11.8 years). This short-lived nature means it does not have the same cumulative effect as carbon dioxide so while some argue that it is less of a priority, policy makers now view this as an opportunity to accelerate action on global temperature rises.

This is reflected in the Global Methane Pledge agreed at COP26 which aims to reduce global methane emissions by at least 30% from 2020 levels by 2030. While this pledge is centred on waste, oil and gas industries, the scrutiny of ruminant livestock methane emissions will continue. There are already calls for the pledge to include agriculture which accounts for approximately 50% of global methane emissions.

Although there is an awareness in certain quarters that livestock are an essential part of our agricultural production system, as an industry we need to provide a better narrative to support this and demonstrate this through data-driven evidence.

For example, emissions from cropland which amount to 11m tonnes of CO2 and measured in a separate inventory to agriculture (Land use, Land use Change and Forestry), are being partially offset by approximately 8m tonnes of removals by grassland.

So how do we create the positive narrative?

1. By generating an evidence base that helps us relay the story

2. Accepting the challenge and acting on opportunities for emissions reductions

3. Demonstrating how to generate carbon dioxide removals

4. Enhancing biodiversity gain in our agricultural systems

Data led approach
There are still many gains to be made in improving production efficiency to meet targets and improve emissions intensity (CO2e/Kg product). Efficiency should not be confused with intensification as efficiencies can be found in all production systems. These efficiencies must focus on the key resources we use on farm – land, livestock, feed and fertiliser. We need integrated data management systems to inform management decisions which apply to every farming system.

The other side of the net zero balance is creating removals of carbon dioxide. Creating a baseline of carbon stock in soil and above ground woody biomass (trees, hedges etc) is essential and the data that feeds this must be accurate and gathered in an appropriate way.

Improvements will be driven by improving the methods for data collection, organisation, and use. Specifically, to GHG emissions, the approaches we are adopting for collecting data reduce administrative burdens on farmers by minimising duplication in accessing data, but the most valuable benefit that I have found has been in improving the accuracy of the data collected, which has considerably improved the level of analysis, insights and recommendations that are made as a result.

GHG tools
There are continuing discussions around which tool should be used. This is understandable as farmers are looking for appropriate means to measure the baseline. But really, this is a moot point. Map of Ag is agnostic about tools as long as they meet standards for scientific rigour and transparency. We are working with partners to streamline data collection to inform third-party models.

Emissions calculations and models are continuously being updated as scientific evidence evolves. We need to make sure we have the right data to inform these models, as well as ensuring that data is owned

and held by farmers so they can adapt and not be beholden to a single tool provider.

The most important element of GHG measurement is the data that feeds the models. This is the area where most models presently fail - their ability to process high resolution activity data means that accuracy or results is diluted along with the useful insights that can be generated – resulting in generic recommendations for GHG emissions reductions.

We have been working on data collection to improve GHG emissions calculation and are finding that we can get far more value from the assessments than simply a GHG emissions figure.

We are generating Key Performance Indicators from automated data sources that can help identify efficiency gains that can be achieved on farm. This has both a GHG benefit and a positive impact on profitability through resource efficiency.

This is an area that will continue to evolve but as farmers, we need to ensure we maintain control and ownership of our data and hold it in a form that can inform the most relevant and up-to-date models. ■

SOYA NEEDS DATA-DRIVEN TRANSPARENCY

The use of soya in animal feed should be a legitimate option for farmers. But as Map of Ag's **James Husband** explains, consumers will need to be reassured by its provenance

The need for increased transparency surrounding the provenance of soya is resulting in a growing number of UK feed companies joining the Round Table on Responsible Soya (RTRS) association.

Soya has become something of a pariah crop in recent years with consumers increasingly linking its use in animal production with deforestation of the Amazon forest and other unsustainable land-use change (LUC) in South America.

Global soya production has increased eight-fold in the past 50 years with 77% of production finding its way into animal feed rations – the majority in poultry and pigs and then aquaculture. China is the largest importer of soya followed by the EU which imports an average of 60kg of soya per adult and child.

A recent 3-Keel report assessing soya usage across 11 retailers in the UK and the EU concluded that the majority of declared soya volumes, particularly in non-aligned supply chains, did not have an associated origin disclosed.

On the face of it, some of the figures surrounding soya use in the UK are alarming. EFECA (a UK-based consultancy focused on natural resources management) estimates that only 32% of soya imported into the country was covered by a deforestation and conversion-free soya standard.

But probe a little further and the situation may not be quite as bad as it seems. If soya sourced from territories considered at low risk of deforestation (North America and Canada), and soya covered by an Amazon Soy Moratorium (ASM) contract are added to this figure, the total proportion of soya imported considered to be from sources of low risk or covered by a deforestation and conversion-free certified soya standard amounts to 62%.

Recent Agricultural Industries Confederation published data attempted to quantify the risk of this remaining, approximately 40%, of unaccounted soya, and estimated that as little as 5.9% of total soya imported into the UK was potentially linked to LUC.

But perception is perhaps more important than reality and that's why the retailer sector is acting: Both Waitrose and Marks & Spencer have already banned the use of soya in dairy cow rations and many others are looking at its provenance and ways to reduce its use.

Creating reassurance and transparency with respect to the sourcing of soya is hugely important. Soya is the most productive of the protein crops, which on face value should make it the most sustainable, as less land is required to meet demand. A lot of work has already been done to address the deforestation risks and in fact most of the deforestation in Brazil is not due to soya production but cattle ranching.

The ASM was signed by 90% of companies sourcing soya from the Brazilian market in 2006 to ensure that soya production in the Amazon region only occurs on existing converted agricultural land and not through deforestation of native vegetation. Since its implementation, soya-related deforestation has decreased while Amazonian soya production has increased by 400%, showing that agricultural output can be increased while protecting tropical forests.

Retailers, understandably, need to have confidence in the sourcing of soya in their supply chains to ensure there is no risk of soya being used that can be associated with LUC. The actions of Waitrose, M&S and others are completely understandable while provenance uncertainty remains. But if this uncertainty could be removed this would provide farmers with more choice, particularly at a time when the market for inputs is overheated - soya has at times been comparatively cheaper than rape meal when accounting for their respective protein contents and its use could potentially cheapen rations.

All this points to an increasing need for transparency, much of which will be driven by access to – and use of – good data. Already, a number of certification schemes exist to cover areas such as environmental responsibility, workers' rights, respect for communities and the legal use of land (see panel). Many of the UK feed companies that have signed up to RTRS are buying 'book and claim' credits for the soya tonnage they use which adds 0.5-1% to the cost. This is a positive step and shows that there is demand for more transparency in supply chains

which will only grow. However, there is already criticism that this is not going far enough because the credits do not relate to the physical flow of materials, and this is unlikely to allay consumer fears in a sufficiently robust way.

What retailers, processors and consumers need is a clearly understood and robustly audited system which moves in the direction of 'mass balance' and 'identity preserved' soya assurance. Such a system should be welcomed by the sector to enable soya to remain a legitimate (but sustainable) option for livestock producers around the world. ■

Certification schemes

'Book and Claim' Credits - credits are bought which relate to sustainable soya having been grown but the origins and destination are unknown. The lowest tier.

'Area Mass Balance' Credits - These cover regionalised origin and shipping points so sustainable soya has been grown in a defined region and it has been shipped into a defined region.

'Mass Balance' - The origin can be traced until blending where sustainable and conventional soya is blended at a known %. Shipping is traceable to farm.

'Identity Preserved' - Full traceability from growing to farm. The soya that is sustainably grown can be traced back to the farm that it was.

JOIN THE DATA JOURNEY...OR BE LEFT BEHIND

The future of farming needs access to and effective use of good data, argues UK farmer **Peter Kendall**

Agriculture is going through a data revolution – not just here in the UK but globally. If we're really going to understand the impact farming businesses are having on the environment, or if we want to produce more in an increasingly sustainable way, then data will be at the heart of our collective future.

It's been a long-held view that if you can't measure it then you can't manage it. And that's true for every farm business no matter what sector it operates in or how big or small.

But the use of data on many farms is very much in its infancy and I know from my own experience it's a journey and there's still much to learn.

If you agree with the "measure it to manage it" premise, then the use and sharing of farm data needs to be not only central to your business strategy it also needs to occupy the minds of policy makers and representative organisations alike.

The ag sector needs as much incentivising as possible to collect (firstly) and then make good use of data. Incentives come in a number of forms – ranging from government grants and subsidies through to private sector initiatives that stimulate farmer engagement through effective rewards.

In my view we have not got serious enough about data and we need to. In my own farm business where we have expanded beyond our 1,300ha arable operation to develop a substantial poultry business, data is becoming a key tool for effective decision making. It is true that poultry is an enterprise that lends itself to "contained" environments and thus potentially easier to measure, but we have been benchmarking our arable operation for many years.

The poultry enterprise has been a real eye-opener. There are so many interacting variables in broiler production that require careful monitoring. When we installed our sheds we gained an unbelievable ability to measure and analyse data in ways that we simply hadn't imagined before helping us make simple management changes such as adjusting ventilation regimes, as well as altering dark periods to reduce electricity use during peak times.

What's more, by sharing our data with our processor we have identified wider opportunities to push for greater efficiencies in the business.

Our experience is just one example of what can and could be achieved more widely across our amazing industry. But there are barriers to making this happen.

On the one hand, not all data is good – or clean – data. Rubbish in means rubbish out. But the pace of technological change in dealing with this is breathtaking.

On the other, significant challenges exist with respect to capability, and of course trust in who's doing what with the data. These are not technology issues really. They are ones of culture and mindset. But we need to start somewhere and it is true that many businesses are simply not collecting any (or hardly any) data. This needs to change.

If we are to ensure that our businesses can truly be sustainable in the long term and deliver the metrics and evidence the consumer is demanding, then we cannot turn our back on the data opportunity. Our dependency on global markets is greater than ever, the policy framework is changing in the UK (albeit too slowly), and climate change is having an impact on what we do.

To encourage a culture of performance measurement, the collection and analysis of data has to be made as simple as possible. This should include creating standardised metrics we as farmers can buy into and creating incentives, an opportunity that is being missed here in the UK in the post-Brexit reforms of agricultural policy.

The change the industry is seeing is so great that we have to make sure that data management is second nature, and for the next generation it has to be an everyday thing. Whether it's apps on phones, or an ability for equipment to interact with the office computer, farmers have to be able to see trends and the results of their decisions easily.

So where to start?

Our experience has been to begin by looking at separate elements of the business that can be benchmarked easily, and thinking about aiming for small, incremental gains that add up to big improvements. A mistake in farming is thinking your business is unique and you can't compare yourself to someone else. You can. If you look at your fuel usage or your staffing requirements, no matter your size you can look at where your competitors sit.

That's why I am such a strong advocate for a data-driven future in our sector. Up- and down-stream of the farm gate, agribusiness is becoming increasingly focused on provenance, traceability and above all net zero. This all needs data. And for the most part, those agribusinesses want to work with farmers, not against them. Data should help create more integrated supply chains where rewards can be shared, not monopolised.

It won't be long before a divide opens up between the data-enabled businesses and those that aren't. And I know which side of that I'd rather be, despite the uncertainty and the journey we need to go on. ■

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