



Agribusiness Agenda 2016

Volume 2:

Foresight to the future.



KPMG New Zealand

kpmg.com/nz





In New Zealand homes alone \$872 million dollars' worth of food is thrown away every year.

Globally, over a third of the food produced for human consumption gets lost or is wasted.

There is enough food wasted to feed the world's starving population. The world we live in has a massive disconnect with two major issues that can literally solve each other: hunger and food waste.

Globally, initiatives are being put in place to reduce food waste and end poverty. And New Zealand is playing its part, owing it to those who are starving and respecting the food that we have access to.

Kiwis with some true ingenuity have pieced together these critical issues and are starting to close that gap, one meal at a time.

A food rescue initiative has been set up as a distribution hub to connect the dots: KiwiHarvest.

KiwiHarvest, run out of Auckland (also associated with FoodShare in Dunedin), has been operating since 2015, collecting food from various sources (supermarkets, restaurants, wholesalers, farmers) and transporting it in their refrigerated van to charities and people in need. 100 percent of the food is distributed. KiwiHarvest aims to reduce the negative impacts of food waste on our environment by redistributing the excess food we have and helping to create lasting positive social change by nourishing those in need.

Every month KiwiHarvest delivers the equivalent of 20,000 meals to over 70 Auckland charities.

KiwiHarvest has a family of part and full time employees with very diverse backgrounds, sharing one passion, to feed the worlds starving population. They also need to rely heavily on the help of volunteers and donations, especially as they expand into more areas and experience growth.

Key partners include The Goodman Foundation and SKYCITY Auckland Community Trust. The largest food donors to KiwiHarvest are Countdown, Bidvest and Fonterra.

KPMG acts as a very proud in-kind partner. Suneil Connor, a KPMG Senior Manager, acts as a Director advising on finance, strategy and risk, and holds a position on the board, supporting KiwiHarvest with their exceptional growth and empowering efforts to give back to the community.



Welcome to life in the post-factual 21st century

By Ian Proudfoot
KPMG Global Head of Agribusiness

"We will tell you the truth, the whole truth and nothing but ... the part of the truth we agree with ... and if the truth is not to our liking, we will make something up we do like, and proclaim it as fact. It appears that nobody will ever hold us to account, so there is nothing to stop us."

I have found myself shouting at the television and radio more often in the last year than ever before. Firstly, I thought that this was just increasingly curmudgeonly behaviour as I move through my forties. However, it slowly dawned on me that, it was not me but them; the people – the politicians, analysts and experts – that were broadcasting at me that seemed to have detached themselves from reality and were, frankly, making things up to suit their arguments. Quoting facts seems to have become a creative pursuit for those that shape and lead societies most important conversations whether it be on the economy, the environment, immigration, international trade, security issues or any one of many other issues. Gossip and social media comments are reported as serious news, balance is out the window, and nobody is held to account for what they say.

The quest for a good sound bite is rapidly replacing substance in our world today. No longer do people spend hours working the statistics to suit their arguments. If they can't quickly Google up a piece of research that supports them, conventional wisdom appears to favour making something up (and eating humble pie later if you are fact-checked) over missing the opportunity to secure air time at six o'clock. Without the constraint of truth, we live in a more volatile, dangerous world. Incredibly complicated issues are simplified into 15 second stings or 140 character tweets; colouring people's opinions and, ultimately, shaping Government policy, investor behaviour and the consequences that follow.

Given the volatility and uncertainty surrounding our lives, we need deeper understanding and considered analysis more now than at any time in modern history. Inflammatory half-truths or fiction do not help the public see the whole story. Nor do they guide executives and directors to pursue optimal investments, or assist policymakers in reaching the right conclusions.



Why have we got to here?

It's illuminating to reflect back to November 2014, when we published the first globally focused *Agribusiness Agenda* titled '*Exploring our Global Future*'. This highlighted the major mega-forces that were accelerating the pace of change in our daily lives.

The slow recovery from the GFC had seen organisations in developed economies shy away from risk, impacting youth employment and leaving many people facing years of austerity. At the same time, emerging economies had achieved sustained strong growth, shifting the centre of economic power to the East; providing their populations with new freedoms and comparatively greater buying power than at any time in recent history. The income disparity between the most and least affluent people in the world continues to balloon; and with increased connectivity, this becomes more apparent to those at the lower end of the scale. We highlighted other megaforces such as rapid urbanisation, climate change, growing health issues linked to our modern lifestyles, and the emerging technologies that were reshaping how we lived; as well as the decreasing security we felt in our daily lives (from both physical and cyber threats).

We concluded that the level and speed of change was always going to challenge the foundations of our communities.

In late 2014, the 'post-factual response' to change was not as apparent from our leaders. Yet on reflecting on what has happened in the last two years, perhaps it is not surprising that 'hearing what you want to hear' has become so appealing.

ISIS had only appeared in our lexicon a month or so before we wrote the 2014 Agenda. We were in the midst of the West African Ebola epidemic, which was looking like it had the potential to become a global pandemic. We were still trying to understand the probable impacts on global financial systems and the Eurozone if Greece defaulted on its sovereign debt.

As the civil war intensified in Syria, we had yet to get our heads around the economic, political and social implications created by the scale of the migration towards Europe. We were yet to experience the emotional impacts of constant terror attacks being perpetrated in cities across the world by radicalised 'lone wolves'. The concept of Brexit and its resulting uncertainty, particularly on long-term investment plans, was still to come; as was the ongoing quantitative easing, negative interest rates and low inflation that stagnating economies

have become so reliant on. Nor could we predict the emergence of Donald Trump, as potentially the next US President, complete with his isolationist, wall-building rhetoric.

Much has happened over the last two years that leaves people feeling less certain about their future. It is little wonder they are looking for 'leaders' that profess to have the answers. Those who tell us what we want to hear – rather than what we need to hear – have been making political gains around the world, regardless of the substance underlying their arguments. The vote in favour of Brexit was a clear demonstration of this. The 'out' campaign promised a new panacea for the UK, yet the morning after the voters had empowered them to deliver the promised future, they had no idea of the first step to take.

There can be no complacency in the face of the first global agrarian revolution

Amid so much change, there does remain a single constant that the agri-food sector is hanging onto; the basic human need to source sustenance from an external source. I regularly hear arguments that there will always be a market for our food products because people will always need to eat. There's also the continuing need for other products fundamental to our daily lives (such as clothes, housing and fuel) that have been largely or partially sourced from biological products grown around the world.

While it is true that people will always need sustenance, this does not necessarily mean it will be gained through eating and drinking the foods and beverages we know today. In future there is no guarantees that the forms of food historically produced by the farmer, grower or fisherman will still be in demand. The same goes for how timber, cotton, wool or rubber will be used into the future. Industry leaders who rely on the past to provide their stakeholders with assurances about the future are doing them the same disservice as some politicians and opinion leaders are doing to the wider community. That is, they are both providing a selective and tailored truth.

The ability to fuse physical, digital and biological technologies is unlocking new solutions almost daily. The potential to disrupt the most fundamental building blocks of our everyday lives is real – and there's simply no reason why the agri-food sector would be immune from this.

The reality for the sector is that it has always fused physical technologies (such as ploughs or tractors), biological elements (the plants or animals raised), with information (the intuition of the farmer) to grow food, fibre and timber. Its historic location at the confluence of the three strands of the fourth industrial revolution mean the agri-food sector must realistically expect the disruption it faces to be as great, if not greater, than any other sector of our economy.

I would go so far as to suggest that we are on the cusp of a global agrarian revolution. We are about to see transformational change across every aspect of how the sector works and what it produces.

Yet the level of complacency remains high across the agri-food sector, as the industry 'truths' are regularly discussed and defended.

'People will never eat a plant based burger in preference to a beef one.' 'The decimation of the woollen carpet market by synthetic alternatives could not be repeated in our sector.' 'We are the best in the world at growing milk; nobody can compete with high-volume, low-cost production.'

These statements largely rely on yesterday's realities. When we widen the lens of 'truth', the comfort provided by these beliefs is quickly eroded. What if the plant-based burger is scientifically proven to materially reduce the risk of heart disease or cancer, while still tasting and eating the same? What if the synthetic product alternative eliminated animal welfare issues, was better for the environment, used less water and was also natural? What if dairy powders are substituted with protein sourced from an insect or are grown from cultured cells that provide a more consistent product, reduce food safety risks, and are available 365-days-a-year?





Taking a broad perspective to future opportunities

In times of change, the perspective that we take to an issue is critical. If the field of vision is limited to what we want to see (or the truth we are comfortable with), we not only risk being destroyed by the disruption that is coming towards the industry at speed. We also risk missing the opportunity to respond to, join or lead the impending revolution.

So, what are the attributes needed to identify and deliver on those opportunities most likely to create sustainable success? It will require informed perspectives, balanced analysis, and a willingness to respond and adapt.

For leaders in the agri-food sector facing the greatest changes their industry has experienced in generations, they will need open minds. In guiding their organisation towards a prosperous future, they must be prepared to 'pull up the anchors' that have tied them to the deep traditions inherent within a conservative industry.

This report explores some of the emerging trends that should be on the radar. We explore new forms of food (such as algae, printed, nutraceutical, cultured and plant-based products); and the different ways these products will be grown, processed, distributed and re-purposed post-use.

It highlights the seeds of disruption that are apparent in the sector today. These are evolving at speed so it is important to continuously scan the horizon as new ideas and business models emerge that present new opportunities. You can be certain that the future will emerge differently from the way we describe it in this report. Some ideas will never be commercialised successfully, while some will remain niche because they are not able to be effectively scaled. Others will emerge faster and more extensively than we can comprehend today.

How can we re-shape the agri-food sector to meet the new realities of the world we will be living in tomorrow? It will require us to embrace change, to acknowledge the whole truth, and to avoid building walls around a legacy industry to preserve the unpreservable. If we can do this, we will be ready to capitalise on the exhilarating future that lies ahead for the sector.



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Recapping the mega-forces shaping the 21st-century

The *Agenda* released in November 2014, titled *Exploring our Global Future*, explored the mega-forces shaping the future, and the impact these forces would have on the global agri-food system.

It is not surprising that the mega-forces identified two years ago remain broadly the same today, and our analysis of these factors remains relevant. (If you wish to view the November 2014 report, it can be accessed via the *Agribusiness Agenda* page on www.kpmg.com/nz).

In presenting this 2016 edition of the *Agenda*, our aim is to more clearly articulate how we expect to see the agri-food system evolve. We've set out to answer the question – how are these emerging global trends going to impact the value chain? How will they change: the nature of a farm, farming practices, the products grown, the processing technologies, the consumer interface, and the way products are used? Those questions comprise the main themes explored in this *Agenda*. We also discuss the social and regulatory trends that are shaping the value chain.

We start by briefly recapping the mega-forces.

Theme

1

Challenging the global status quo



Geopolitical instabilities



Economic re-balancing



Government 3.0

This megatrend is driven by the shifts in economic and political influence, and the impact these are having on the public's perception of its own safety and security.

In 2014, we highlighted the slow recovery from the Global Financial Crisis, the growing economic influence of emerging nations, the rise in religious fundamentalism, the destabilising impact of cyber terrorism, and the challenges that Governments face regulating against problems that no longer exist solely within their sovereign borders. These trends are creating a world that is less trusting and more uncertain. This is best illustrated by the various repercussions of the civil war in Syria. There is the failure of the UN to secure a ceasefire, given the deepening political divisions in the Security Council; as well as the growing fear of ethnic and religious difference. Most obviously, there are the major social and political impacts arising from the wave of refugees across the Middle East and Europe. We continue to see this uncertainty and lack of trust shaping the way communities and economies evolve and interact with each other.

Theme

2

Future world citizens



21st-century consumer



The ageing generation



Integrated urban living

In our 2014 report, we suggested the world will be shaped by three key emerging demographic groups. The first is the hyper-connected consumer who seeks instantaneous access to the latest solutions via various digital platforms. The second is the expanding cohort of senior citizens facing life managing chronic health issues, albeit equipped with financial resources. The third group is the rapidly-burgeoning urban population; swelled by rural people seeking a better life in the city but ultimately facing the reality of living in crowded, sprawling metropolitan regions. Companies are designing products to appeal to these core demographics; whether it's a digital platform aiming to provide millennials instant access to products and services, or solutions designed to complement the lifestyles of ageing consumers, or compact appliances and new forms of social interaction for urban communities. While the challenges of ageing populations are a particular focus for developed nation Governments, all three demographics are having a major impact on how societies are developing in emerging economies.

Theme

3

Empowering infrastructure



New wellness models



Lower energy intensity



Targeted education

The ability of a society to realise its potential is directly linked to the effectiveness of the social infrastructure it is built on. Under this theme we explored three significant infrastructure areas – healthcare, energy, education – and the impact they have in shaping our future communities. The spiralling cost of healthcare is driving the trend towards preventative health management; something which is becoming increasingly apparent as Governments seek policy responses to address lifestyle, health and obesity issues. The ratification of the Paris Climate Summit goals has set the world on an irreversible course to a low-carbon future, refocusing attention on the use of fossil fuels and accelerating the search for sustainable energy alternatives. A high-performing education system underpins a growing, vibrant economy; technology is unleashing the benefits of global education to a wider audience more now than at any time in history. Long-term growth will be underpinned by innovative delivery in meeting these key societal needs.

Theme

4

A connected and converging digital world



Fusion revolution



Realising value in data

In 2014, the *Agenda* reported experts suggesting the world was in the formative stages of a digital revolution. The internet of things had recently come into our lexicon, but what was less apparent was the exponential speed at which machine learning and artificial intelligence was developing. The speed of development has led the World Economic Forum to declare 2016 the start of the Fourth Industrial Revolution, a revolution based on the fusion of physical, digital and biological technologies. As change accelerates it has become clear that the impacts of diffused innovation, the wide application of digital technologies, are more fundamental and transformational in nature than we could have envisaged two years ago. We have consequently evolved the megaforce to reflect the transformational solutions the **Fusion Revolution** is delivering to the world. Realising the value of data grows in relevance as it has become easier to create and collect data. The challenge now facing organisations is securing the talent necessary to unlock the insights hidden in their data.

Theme

5

Enabling indefinite sustainable living



Climate changing



Facing resource scarcity



Social enterprise

Last year, the United Nations set 17 Sustainable Development Goals (SDGs) for the global community to collectively work towards in eliminating the poverty, malnutrition and neglect inherent in our society. Many of these goals revolve around using the planet's resources in a balanced, sustainable manner. Initiatives such as the SDGs and the Paris Climate Change Accord indicate an emerging awareness of the need to shift towards securing a more sustainable future for all. There is little doubt that the impact of the changing climate and the constraints of resource scarcity will significantly influence some of the more disruptive innovation in the coming years. It also appears likely that much of this innovation is going to be developed and commercialised by businesses that have a wider purpose than purely profit. We can expect to see significant growth in the scale and impact of social enterprises on all aspects of daily life, fuelled by entrepreneurs with a desire to not just make money but to make a difference.

The changing nature of a farm

For most people in the developed world, their minds image of a farm is the one they were exposed to as kids – the farmer in the farmyard (or driving his tractor), dogs in tow and a plethora of different animals living happily in harmony.

This stereotypical farm never really reflected the reality of most farms around the world; farms are generally small (less than 1 hectare), have been operated by a family largely to provide food for subsistence and have used minimal, primitive technologies.

With the world still struggling to feed itself, recent estimates suggest that 795 million people (11 percent of the global population¹) are chronically undernourished, it is no longer possible to rely on predominately subsistence agricultural practices to produce sufficient safe food to meet current food demands.

Farms are changing faster today than at any point in history, driven by the need to produce significantly more food to supply a growing and increasingly hungry global population. The challenge is not just producing more, but doing it in a sustainable and ethical way.

Conventional wisdom has been that more food is produced by increasing scale, consolidating family farms into broad-acre farms or large scale pastoral operations, or utilising feed-lots, or housing animals in barns. These intensive systems, which are very different to the stereotypical farm, have raised many concerns for consumers;

- they don't like their impact on the environment and water quality;
- they have concerns over the welfare of animals; and
- they have questioned the nutritional quality of the food being produced.

This is before they think about the impact these systems have on rural communities, the risks of consolidating production in a single geographical area or the environmental footprint associated with distributing the product.

As a consequence the search is on for new farming models, focused on meeting the nutritional needs of the population while better utilising natural resources and embedding food production closer to those that will ultimately eat the food.

¹ <http://www.worldhunger.org/2015-world-hunger-and-poverty-facts-and-statistics/>



570 million

Estimated total farms in the world²

4%

of these farms are in high income countries.

49%

of these farms are in lower middle income countries.

China has the largest agricultural area:

525 million

hectares

The next largest is:
Australia = 456m hectares
USA = 414m hectares

72%

of farms globally are less than 1 hectare.

6%

of farms globally are larger than 5 hectares.



201
million

or 35% of these farms are in China



138
million

or 24% of these farms are in India

There are
approximately:

25
million

farms in Indonesia

The next largest is:

Russia = 23 million farms

Bangladesh = 15 million farms

90%

of the world's farms
are estimated to be
operated by families.

75%

They are estimated
to farm 75% of
agricultural land globally.



(Graphic above) 2 <http://www.sciencedirect.com/science/article/pii/S0305750X15002703>



Cultured farming offers an opportunity for safer, more sustainable food

SHAPING MEGAFORCES



New wellness models



Lower energy intensity



Fusion revolution



Facing resource scarcity

The 'Maastricht Burger' grown and introduced to the world by Professor Mark Post and his team at the University of Maastricht in August 2013 gave the world a first indication of the opportunity inherent in cultured farming.

The first burger received mixed reviews, it was lacking the natural fat in beef which impacted the eating experience, but it was apparent that it was a step forward in the quest for sustainable meat.

Professor Post talks about a vision that within the next 20 years all the beef the world needs is grown from a small herd of cattle, utilising an embedded farming system that enables consumers to grow cellular fresh beef when they want a steak, burger or beef roast.

The rapidly evolving field of cultured farming may ultimately give the world the ability to grow as much animal protein as it wants to eat from cells rather than growing the whole animal. The process involves harvesting animal cells and placing them in a nutrient mixture that allows them to grow into pure muscle tissue. This is not mock meat, but real meat grown without the animals.

It is not just meat, innovators are working on, but also milk without cows and eggs without hens.

The not for profit research organisation, **New Harvest**, suggests cellular agriculture offers the potential to build a post-animal bioeconomy where we harvest animal products from cell cultures, not animals, to feed a growing global population sustainably and affordably.³

Think about growing all the meat, milk and eggs the world needs without animal welfare, effluent or environmental issues.

Think about growing these foods without by-products that contribute little or nothing to the economics of a farming system. Think about producing food in facilities where safety and security are more tightly managed than natural farming systems, delivering consumers more confidence over food quality.

Cultured farming may address many of the concerns that consumers have over higher intensity farming systems but it is by no means certain that they will quickly accept a product that many would see as being unnatural. The innovators recognise this and are focusing on the sustainable attributes of their products as they prepare for launch, for example:

– **Perfect Day Foods** is working towards launching animal free dairy products in 2017 and describes its mission as “empowering you to enjoy the dairy foods you love while making the world a kinder, greener place. Zero compromise required.”⁴

– **Memphis Meats** have grown and cooked a cultured meat meatball, are fusing Silicon Valley innovation with the culinary traditions of the America’s southern states, “to farm real meat cells—without the animals—in a process that is healthier, safer, and more sustainable than conventional animal agriculture.”⁵

There are already products in the market that have been developed using cultured solutions. **Soylent**, the new nutrition company claiming to make the world’s most nutritionally balanced food, notes all its products use “bioengineered algae as a source of lipids and essential omega fatty acids.”⁶ The algae is farmed in bioreactors, enabling the organisms to be grown using less resource than traditional farming methods.

Implication: When synthetic carpets were introduced many argued that consumers would never buy a nylon carpet in preference to a wool one. Today less than 5 percent of carpets sold worldwide are woollen. **Price, quality and ethics will ultimately drive demand for cultured food products.**

³ <http://www.new-harvest.org/about>

⁴ <http://www.perfectdayfoods.com/our-story/>

⁵ <http://www.memphismeats.com/about-us/>

⁶ <http://www.soylent.com/>

54%

of the global population currently lives in urban areas expected to grow to 70% by 2050.

1900

London was the only city with a population over 5 million.

1950

New York was the only city with a population over 10 million.

37

urban regions with populations exceeding 10 million today. 700 million people live in these regions (10% of the global population).

Urban farming can reconnect cities to fresh, sustainable food

SHAPING MEGAFORCES



Economic rebalancing



Integrated urban living



New wellness models



Social enterprise

As more people live in cities every week the challenge of delivering sufficient safe, nutritious, sustainable food to urban populations continuously grows. Organisations are exploring opportunities to embed agricultural practices in urban areas with a goal of delivering local, sustainably produced food to consumers.

This could take the form of commercial production in sky farms on top of offices or supermarkets, communal allotment areas (which could be located on grass verges due to lack of space), edible borders in parks and gardens, living walls on buildings or social food projects set up to support disadvantaged communities.

Urban farming is about supplying fresh product, minimising environmental impacts, contributing to greener more sustainable cities, connecting people to their food and, for many urban farmers, providing access to food or opportunity to disadvantaged members of the community.

– Social farming organisations exist around the world; one example being **Soul Food Street Farms** in Vancouver which transforms vacant urban land into artisan fruit and vegetable farms. Soul Food describes its mission as “empower[ing] individuals with limited resources by providing jobs, agricultural training and inclusion in a supportive community of farmers and food lovers.”⁷

– Europe’s largest urban farm has been built on top of a building in The Hague by urban farming specialist, **UF**. The commercial farm, **UF de Schilde**, includes a 1,200 square meter rooftop glasshouse and a tilapia farm one floor below. The farm is expected to produce 45 tons of vegetables and 19 tons of fish annually which will be sold to the local community.⁸

– Another example is **LA Urban Farms**, which provides farmers with Garden Towers they can utilise to grow vegetables, fruits, herbs and edible plants. Their farmer partners include chefs that use the fresh local produce on their menus, commercial operators and residential developments.⁹

Vertical farming innovations

Urban farming systems are increasingly utilising new technologies to enhance both the yield and quality of the produce they can grow. Vertical farming systems use technology to tightly control environmental factors including pests, light, animals, disease, fungus, weather to enable all year production. This is achieved through fusing intensive digitally controlled indoor farming LED lighting systems with biological innovations in irrigation systems and growing media.

The farms are found in old high rise buildings (for instance **Green Sense Farms** in Illinois¹⁰) and disused bomb shelters underground in London (**Growing Underground**).¹¹ They can be in any space, anywhere consumers are looking for fresh, natural food.

– **AeroFarms** of New Jersey are building one of the largest vertical farms which will ultimately produce nearly a million kilos of leafy greens using aeroponic mist technologies that sprays nutrients onto crops being grown in vertical stacks without soil, sunlight or water.¹²

Implication: Farming is no longer confined to traditional farms but can be conducted anywhere. Urban farming businesses will be established with multiple social and commercial objectives, but **they will all be focused on delivering sustainable local food**, thus making them strong competitors for traditional producers.

⁷ <http://solefoodfarms.com/>

⁸ <http://www.ecowatch.com/inside-europes-largest-urban-farm-1891126795.html>

⁹ <http://laurbanfarms.com/>

¹⁰ <http://www.greensensefarms.com/>

¹¹ <http://growing-underground.com/>

¹² <http://aerofarms.com/>



Realising the potential of blue larder

SHAPING MEGAFORCES



Government 3.0



New wellness models



Climate changing



Facing resource scarcity

As urban populations grow, the pressure on land based farming systems to produce sufficient food to meet consumer demand increases, particularly as the most productive land is often the land most suited to intensive urban development. As a consequence, there will be a need to increasingly look to the ocean to provide a much greater proportion of the global food supply.

Historically, the blue larder has been used to provide fish and shellfish (caught wild or cultivated) and some plant products (like kelps and other types of seaweeds). Our utilisation of the ocean for food has been constrained to a fraction of its potential because of the ease of producing food on land and the practical challenges associated with working and farming at sea. In the future it will become a primary source of farmed food.

As a consequence greater investment will be made into understanding the nutrition and health properties inherent within more of the species that call the ocean home.

Many forms of micro-algae that thrive in the ocean have been identified in recent years and have been found to be rich sources of nutrients and antioxidants. One example which has migrated into mainstream diets in recent years is Spirulina (a blue green algae, cyanobacterium, produced from seaweed) which is being extensively used as a dietary supplement for both humans and animals.

Innovation will be required to enable the blue larder to be extensively farmed in a sustainable manner. As our diet becomes increasingly aquatic the chances of the farm being in middle of (or under) the ocean increases. For example, algaculture, or the farming of algae, is evolving around the world, producing not only nutrients for human consumption, but stock feed for animals and a potential input into biofuel production.

Growing on the sea with floating farms

Recognising constraints on premium agricultural land, floating farms, not just for aquaculture but dairy and other livestock farming, horticulture and cropping, are becoming a reality. Using the ocean to create space for the production of food is an obvious response to the loss of productive agricultural land. We expect the development of ocean farms will not be restricted to floating farms as innovation with underwater farming systems accelerates. One example being **Nemo's Garden**, an Italian company developing intelligent, undersea biospheres, in which they are currently growing herbs.¹³

Floating farms can be located close to many mega-cities or any populated area with access to water, enabling them to enhance locally grown food options. They provide food which can be grown without the impacts of many pollutants that are found in the land based environment around cities, creating the opportunity to deliver healthier food. The systems can also be designed to utilise easily available renewable energy sources (tidal, wind, solar) reducing the carbon footprint of the products.

Implication: The cost of securing cultivatable land will see farming activities move to offshore systems, as we learn how to capture the full nutritional potential of the blue larder.

¹³ <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-14-life-below-water.html>

Other emerging themes...

Social enterprise farming.

We are increasingly noting farming businesses being set up with a social purpose. In some cases these enterprises are created solely to address a social issue, be this feeding a specific community, addressing a health issue or making a contribution to feeding the 795 million undernourished people in the world. However, it is more common to find businesses being established with a dual lens, to both respond to a social issue and to make a commercial return. Social enterprise agri-food businesses will do things differently; they clearly understand their reason for being and are driven by a different set of metrics which will make them challenging competitors. They are also more likely to identify and adopt innovation and as a consequence disrupt the traditional way things have been done.

Crowd sourced farming.

Using technology to redesign commercial models is reshaping how organisations interact with each other and consumers around the world. Farming activities are not immune and producers around the world are looking for ways to use digital solutions to reengineer their farming operations to better tailor production to the needs and demands of the consumers of the products they produce. There are farmers that have established crowd sourced models where they seek consumers prepared to make financial commitments to buy the products they will produce in advance of the product being grown. Such approaches can enhance a farm's financial viability (payment can be received for stock in advance of production), minimise waste by aligning production to demand and more clearly connect the consumer with their food. An example is **True Grass Farms**, where consumers buy a part interest in an animal to be reared and receive their share of the food produced from that animal once it has been slaughtered.¹⁴

Sharing comes to farming.

Having redefined the taxi and accommodation sector it is not surprising that enterprising farmers are thinking about the potential to **Rent-a-Ruminant** (this company supply goats that provide eco-friendly vegetation management services)¹⁵ or a chicken, or a sheep, or some bees or (even) a bird of prey. Connecting people with their food, providing sustainable environmental management services (say weed control or pest eradication) or just enabling a farmer to economically manage a larger number of animals than is possible on their own land, we should not overlook the 'uberisation' of farming particularly in emerging markets.

The emergence of new financial investors.

Previous *Agenda* publications have highlighted the concerns that many professional, financial investors have historically had about investing into primary sector assets; the inherent volatility driven by commodity price shifts and weather does not deliver the consistent return patterns that financial investors seek. However, the global food story is attracting more non-traditional investors to the sector, with pension, private equity and sovereign wealth funds all seeking to take more active investment positions in primary sector assets. They are however bringing different expectations to farming businesses; around management practices, reporting, risk management and an investment time horizon that includes a clear intention to liquidate investments at a defined point in the future. As professional investors become more active in the sector, farm management practices will evolve to create a new category of farming business that meets the needs of the investment life-cycle.

¹⁴ <http://truegrassfarms.com/>

¹⁵ <http://www.rentaruminant.com/>

Changes in how we farm

Prehistoric people spent much of their lives hunting or gathering food. Over time, the human pursuit of food has shifted broadly from collection to the cultivation of food – yet the true essence of farming has not changed substantively for centuries.

Farmers have always cultivated plants, raised animals, planted trees or harvested the oceans; in order to provide food, fibre or fuel.

Farmers and producers are naturally innovative, and have always made enhancements that deliver year-on-year incremental improvements in yields. There is something very significant, however, about the level of investment currently being made into new agri-food technologies. We appear to be on the cusp of a major step change – not only in productivity; but in challenging the very fundamentals of how, where and when we sustainably grow food, fibre and timber.

This is best illustrated by the wave of investment into innovative agri-food businesses. Many organisations are looking to deliver a range of technological solutions to producers that:

- integrate digital solutions into farming systems to augment the intuition of the farmers and producers;
- increase the precision application of nutrients and other inputs into a farm to enhance yields, while minimising the environmental impact of farming;
- take advantage of developments occurring in unmanned vehicles, both on the land and in the air;
- enhance animal genetics, nutrition and health to improve productivity, while being alert to consumer concerns about the use of genetically modified organisms in food; and
- develop tools to enable previously unproductive regions to contribute more via water capture technologies, cultivars and evolved farming techniques.

The potential for disruptive change is best illustrated by the increase in investment in these technologies over the last 10 years. In 2005, it was estimated that agri-tech investments amounted to around US\$100 million. This figure had grown to US\$4.2 billion for the 2015 year. Clearly, the markets had recognised the opportunities available to disrupt traditional agri-food practices, and deliver solutions that address the issues facing the global food system.

Reports suggest the agricultural robotics industry is now serving a

US\$3 billion

market which will grow to
US\$10 billion by 2022¹⁶

Thousands of robotic milking parlours
have been installed worldwide, creating a

US\$1.9 billion

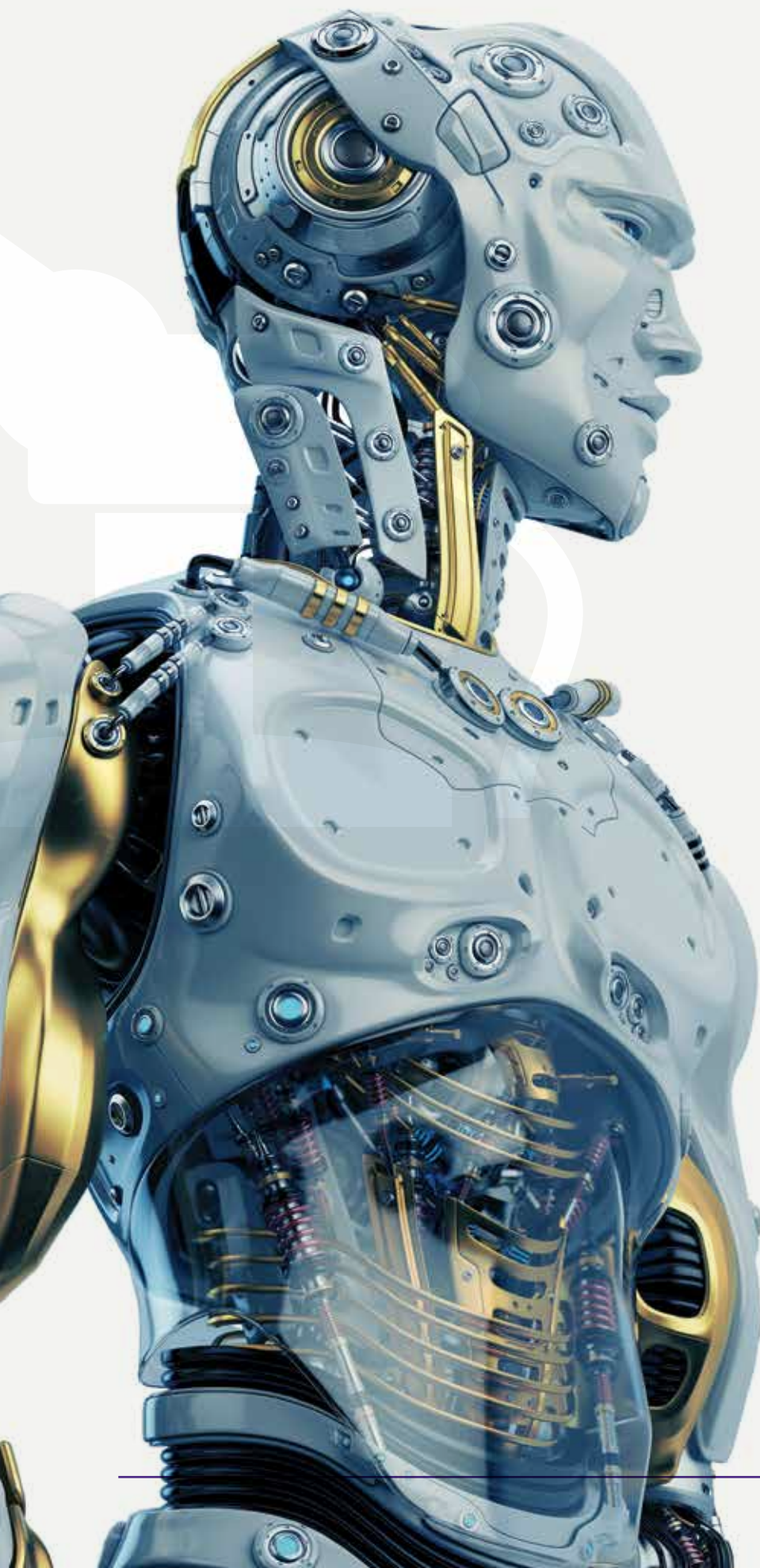
industry that is projected to
grow to US\$8.5 billion by 2026



Fresh fruit harvesting

A limited number of fresh strawberry harvesters are already being commercially trialled, while fresh apple and citrus harvesters have also reached the level of late stage prototyping. Market adoption will start from 2021 onwards, reaching US\$230 million by 2026.





US\$485
million

Autonomous drones have been providing detailed aerial maps of farms, enabling farmers to take data-driven, site-specific action. Agriculture will be a major market for drones, reaching US\$485 million in 2026.



300,000
tractors

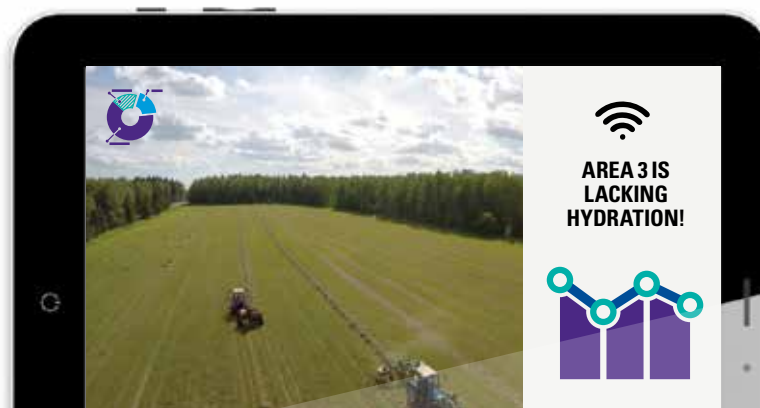
More than 300,000 autonomous tractors equipped with autosteer or tractor guidance will be sold in 2016.



Robotic
weeding

Vision-enabled robotic implements have been in commercial use for some years in organic farming. These implements follow the crop rows, identify the weeds, and aid with mechanical hoeing. This will become a US\$380 million market by 2026.¹⁵

(Graphic above) 16 Agricultural Robots and Drones 2016-2026: Technologies, Markets, Players, The future of farming; ultra precision farming; autonomous farming; future of agrochemicals, August 2016. <http://www.idtechex.com/research/reports/robotics-2016-2026-000458.asp?viewopt=contents>



Big data and analytics augment experience

SHAPING MEGAFORCES



Government
3.0



Realising
value in data



Climate
changing



Facing resource
scarcity

With the trend towards data-driven agriculture, farmers and producers are discovering innovative ways to be able to grow more with less.

Traditionally, the agri-food sector has been a slow adopter of digital technologies. Various reasons have been suggested for this, including challenges with connectivity in rural areas, the resistance of farmers to change, but also a lack of practical solutions being available. These barriers are now being overcome. Rural connectivity is being addressed in many countries as the economic and social potential of high-speed broadband is recognised. Resistance to change is reducing as the industry enters a period of generational change, but also as the

financial and environmental benefits of digitally-augmented farming become more apparent. The shortage of solutions diminishes as demand grows.

We're seeing rapid growth in the application of precision farming technologies. By enabling the precise quantification of an input (be that water, fertiliser or chemical) to be applied to specific areas, farmers can simultaneously reduce costs and enhance production yields. Data from various sources – including high-resolution satellite imagery, meteorological records, soil nutrient sensors, water flow gauges and production reports – can be integrated and analysed by algorithms to produce highly specific recommendations that not only enhance production but also improve environmental outcomes.

Embedding sensors across production systems – be they pastoral, horticultural, or any other form of biological production – will be a game-changer in capturing the production potential of land of any size. Delivering what is possible relies on recruiting highly-skilled people that can ask the questions that need answers, comb the terabytes of data to identify the gems of insights that can deliver the game-changer, and build the algorithms able to augment the intuition of those operating the system.

In California, **The Climate Corporation**¹⁷ has built a data analytics platform that utilises weather, soil and field data to provide farmers with recommendations tailored to their specific paddocks to improve yields. It is also creating a platform that can provide tailored weather insurance products to farmers. Companies like Canada's **Farmers Edge**¹⁸ or **ReGen**¹⁹ in New Zealand are also combining data to provide fully-integrated solutions that help improve sustainability, efficiency and productivity. **The Yield**²⁰ from Australia is utilising sensor technologies in oyster farming systems in Tasmania to improve production and manage risks that arise from contaminants in the water.

Unlocking such valuable insights is not easy and there are challenges to be overcome. Aside from connectivity, there are major issues to be addressed surrounding data ownership. The most significant benefits will be gained by integrating multiple data streams. However, this is only possible when individuals and groups are confident their data will not be used to disadvantage them economically. As the sheer volume of data grows exponentially, ethical principles surrounding data ownership urgently need clarification.

A 'rough measure approach' is no longer good enough in a world where agri-food producers are expected to produce ever-greater output while operating within the limits that communities and consumers impose on them. In order to demonstrate and verify the integrity and efficacy of their products, producers will increasingly embrace the integration of GPS technology, IoT sensor technologies, precision applicators, autonomous vehicles and other mainstream technology innovations to demonstrate their compliance with regulations.

Implications: Producers that are slow to utilise data to augment intuition will ultimately struggle to meet wider public expectation and deliver sufficient output to remain economically viable.

17 <https://www.climate.com/>

18 <http://www.farmersedge.ca/>

19 <http://www.regenerated.co.nz/>

20 <http://www.theyield.com/>



Organic and biological farming systems emerge into the agri-food mainstream

SHAPING MEGAFORCES



21st-century consumer



Integrated urban living



New wellness models



Climate changing

Throughout history, many dedicated producers have sought to adopt organic farming practices. These are broadly defined as systems that are managed to maximise soil fertility and minimise adverse impact on the local ecosystems.

Designing a farming system that effectively marries sustainability with productivity presents a range of challenges. The key skill in organic farming systems – which some, but not all practitioners achieve – is to make the land productive in an environmentally and economically sustainable way.

Organic farming tends to polarise thinking. One camp argues that widespread adoption of organic practices will starve half the world, while the other sees it as the track towards healthier, safer, more environmentally-sustainable food. The key question is whether organic produce represents a 'need to have' or a 'nice to have' for consumers. What is the elasticity of demand?

Market volatility, particularly as premium organic purchases are discretionary to most consumers, has meant demand has peaked and troughed with economic cycles. As we understand more about the toxins and carcinogens that permeate our daily lives, however, the commitment of many consumers to organic and biological products appears to be building. With the concerns that high-value customers have about the safety and nutritional quality of their food – together with innovation in how products are branded and marketed to consumers – evidence indicates this is creating a less elastic demand profile for these products.

The arguments around lower yield also appear to be reducing, as the organic sector increasingly benefits from digital and precision technologies benefiting mainstream farmers.

Organic farming is practised in more than 162 countries across the globe. In 2014, the global market for organic food was estimated at US\$80 billion. This compares with US\$17.9 billion in 2000. This suggests the industry has grown at a compound rate of approximately 11 percent per annum this century.²¹

Findings from the 2016 **Aotearoa NZ Organics Market Report**²¹ suggest the demand for certified organic produce represents a sustained global shift in consumer consciousness, particularly in premium markets. The key challenge facing organic and biological producers is developing systems capable of fulfilling the growing demand for their product, as mainstream supermarkets, restaurants and food service operators look to fulfil consumer requirements and incorporate organic products into their year-round offering.

Fighting 'bug with bug' to protect crops and control biosecurity

Concerns about the levels of chemicals and fertilisers being used to protect crops are encouraging many farmers to look for natural ways to raise crops, manage disease and respond to biosecurity incursions. Natural biological control agents include insects (such as wasps) that prey on disease carriers, or bacteria that counter an infestation or deliver disease immunity to a plant. Use of these agents will be prioritised around the world to provide protection more in tune with the preservation of biodiversity and production of safe food.

Implications: Farming systems producing organic and biological products become more common as these products move into the mainstream, driven by more stable demand and major retailers seeking to expand their range.



²¹ <http://www.oanz.org/publications/reports.html>



Valuing the scarcity of every last drop of water

SHAPING MEGAFORCES



Fusion
revolution



Climate
changing



Facing resource
scarcity



Social
enterprise

The planet's supply of fresh water is largely finite, yet the demand for water increases as society urbanises, wealth grows, and people look to eat different and more complex foods. The challenge facing the global community to provide a secure, safe water supply to every citizen is significant. Today, 2.3 billion people do not have access to adequate sanitation and more than 650 million have no access to safe drinking water.²²

The global agri-food system utilises 70 percent of the planet's fresh water. As a consequence, there is a growing focus on how it is using water and the production footprint it leaves. Producers are innovating with technologies used to manage water, grow crops and, in some cases, changing the crops they choose to grow. (This is explored further in the following section, *Changes in what we grow*).

For those of us living in temperate regions, it can be difficult to recognise the extent of water stress facing the world. Research suggests that 43 countries are currently experiencing severe water scarcity, and estimates that half the global population could be living in areas of high water stress by 2030.

Countries facing water stress have less than 1.7 million litres of fresh water per person per year; severe scarcity occurs in countries with less than 500,000 litres per person.²³

How many times have we heard arguments that the scarcity of water makes it the new oil? The sustained reduction in oil prices in recent years gives weight to the argument that the economic and political power afforded to oil producers is

diminishing. Major producers continuing to pump oil at depressed prices suggests they are cashing up reserves quickly as the world shifts into a post-fossil-fuel, low carbon environment.

If water does become the new oil, the focus on its use will only increase. The agri-food sector will need to ensure it makes every drop of water count. Designing systems and deploying digital and analytic technologies that allow farmers to understand their water availability, and utilise it with precision, is critical. Many technology companies are already focusing on delivering solutions in this area. For example, **Welintel** has developed sensing systems that show producers what is happening to their groundwater, and plan pumping and irrigation to maximise the benefits they derive from water.²⁴ Other systems support irrigation decision-making and enable the precision application of water.

Efforts need to extend beyond digital technology, however. Work will accelerate on the genetics of plants to help them to thrive in arid, hostile climates. There will also be significant developments in condensing technologies that are able to extract water from the atmosphere. Analysis indicates there could be 11.5 millilitres of water in each cubic meter of oxygen in a

desert environment, offering the potential to produce water out of thin air in the most hostile regions of the world.

The customer response is also apparent; **US clothing giant Levi's** has targeted water use as a critical issue for their businesses. Five years ago, the company initiated a drive to reduce water use in its supply chain without compromising quality. It is now using 96 percent less water in making a pair of jeans, far less than the industry average of 11,000 litres.²⁵ Achieving such results requires action throughout the value chain. Similarly, the agri-food sector needs to be able to demonstrate its actions and quantify the improvements it is delivering.

Implications: The agri-food sector will be made accountable for water resources as scarcity grows; forcing producers to innovate around how they source and apply water, and potentially the products they grow.

²² <https://assets.kpmg.com/content/dam/kpmg/nz/pdf/cyclewater-aug-kpmg-nz.pdf>

²³ <http://www.un.org/waterforlifedecade/scarcity.shtml>

²⁴ <http://www.welintel.com/>

²⁵ <http://www.bbc.com/news/business-35613148>

Other emerging themes...

UAV's or drones deliver aerial solutions.

Recognising the potential inherent within UAV technology requires a shift in thinking – from operating a single lightweight drone to envisaging the use of a swarm of 10 or 20 heavyweight UAV craft. They will have the capability to do tasks beyond the power of a single vehicle (e.g., lifting, spreading, mustering, pruning, spraying), and to do it faster, cheaper and more safely than traditional on-farm techniques. At the same time, they will be able to conduct aerial observations of the land and collect data from remote sensors, delivering more timely data to support other decision-making systems. The regulatory impediment that will exist on UAVs in cities is likely to be less burdensome in rural areas, making them a game-changer for farm operators. The cost and skills required to operate UAV technologies may remain a constraint, offering opportunities to develop new pay-for-access business models.

Robotics and other world class manufacturing practices.

Many of the issues facing growers of biological products are the same as those facing any production-focused business. They must attract and retain people to do sometimes repetitive work, improve productivity, deliver consistent quality, minimise wastage, and reduce working capital tied up in inventory, to name but a few. To address these issues, businesses have long been implementing continuous improvement practices like Six Sigma, adopting just-in-time manufacturing processes and other best-in-class practices. Increasingly, they are exploring the adoption of robotic technologies. The agri-food sector has been slow to see the opportunities inherent in these practices, but we expect them to become as common in agriculture as they are elsewhere in the economy, with transformational impacts on both the environment and productivity. Imagine a robot that can harvest fruit 24-hours-a-day, handle it carefully, integrate it with logistics and packing systems, and ultimately deliver greater volumes at a faster speed to market. Or a robot that is able to deliver ultra-targeted weed control while also identifying areas in the crop that are under-yielding, in order to prompt corrective action.

Farming without antibiotics.

Increasing resistance to antibiotics is one of the biggest threats faced by the human race today. Diseases and infections that have been easily treated in the past are starting to result in death and disability. This is having a huge impact on families, communities and Governments around the world, and it is not surprising that blame is being spread. One finger is pointed squarely at the agri-food system's use of antibiotics to manage animal health as a key contributor to growing resistance, despite the sector using less than 20 percent of all antibiotics consumed globally. Concerns around antimicrobial resistance are resulting in consumers and food retailers increasingly demanding antibiotic-free food. Eventually, farmers will need to learn to farm without antibiotics. This will influence stock levels, as well as where and what is grown, but in the short term at least, premiums may be available for certified antibiotic-free food. The need to remove antibiotics from farming systems will not only drive focus on animal management practices, but also on areas such as biosecurity, genetics and natural health remedies.

Now you can have another one just like that one.

Just over 20 years ago, the ability to exactly replicate an animal or any biological species through cloning was a scientific breakthrough. In 2016, it can be done on an industrial scale, with research indicating that cloned animals are not ageing any differently from traditionally conceived animals. Genetic diversity may be compromised, but speed and certainty are accelerating the uptake of cloning technologies. It is not only animals that will be cloned. The ability to engineer plants for phytoremediation or biofuel research often involves complex design and assembly of DNA elements that require advanced cloning tools. Cloning allows growers to mass-produce plants that may be difficult to grow from seed.

Changes in what we grow

As the world's population grows in size and wealth, producers will be required to continuously reassess the products that they grow, catch or harvest, and present to the market.

What we eat today differs significantly from the food that was eaten 50 years ago. The major fast-food operators – the likes of McDonalds (founded in 1955 and now has 36,000 stores in 119 countries), Pizza Hut (1958) and Starbucks (1971) – have been joined by numerous other quick-service food chains and multi-national retailers. These operators have fundamentally changed prevailing diets in some countries, and brought diversity to others. Suggesting that the UK's preferred national dish was a chicken tikka masala would have raised eyebrows in 1960s Britain, but by 2001 it was easily accepted as a reality in a more diverse, multi-cultural country.

Technological evolution also has a major impact in shaping demand for products. This is well-illustrated by the challenges faced by the coarse wool industry since the 1950s, when synthetic fibres were introduced into carpets.

Failure to acknowledge the implications of changing technologies can leave an industry with a stranded capacity and product in a declining industry.

In another 50 years time, we can expect the global population will be eating food that has evolved again in significant and dramatic ways. With forces shaping the global agri-food systems – including the practical implications of climate change, natural resource constraints, growing health concerns, new technologies, and the evolution of fashion and lifestyle trends – producers will need new strategies that allow them to remain relevant and prosperous. While you may be a world-class producer in your sector today, understanding how that product will be used into the future is critical to making long-term strategic planning and investment decisions.

For those currently invested in the sugar industry, for instance, recognising the implications of concerns around obesity and the resulting public policy positions should shape thinking around diversification. For those in the dairy sector, recognising that many countries face serious water stress should shape decisions whether to invest in a new powder dryer or a liquid processing plant.

Litres of water
used to provide....

1kg of beef:

15,000 
Litres

1kg of chicken:

4,325 
Litres

1kg of tomato's:

215 
Litres

x1 250ml glass of milk:

225 
Litres



x1 egg:

196

Litres



x1 250ml glass of wine:

109

Litres



x1 250ml glass of beer:

74

Litres



1kg of cheese:

3,178

Litres



1kg of apples:

822

Litres



1kg of cabbage:

237

Litres





Dietary diversity expands around the world

SHAPING MEGAFORCES



Geopolitical instabilities



Economic rebalancing



21st-century consumer



Integrated urban living

Over the next 20-30 years, billions of consumers will have the opportunity to develop a palate that is more eclectic and cosmopolitan than at any time in recorded history.

As these consumers grow their personal wealth, they will seek to experience new tastes and greater ethnic diversity in the foods they choose to enjoy. It is likely there will always be a place on the menu for a storied, grass-fed, hormone-free, GE-free, antibiotic-free steak; or a world renowned glass of red wine. However the expectation held by many Western food producers that growing wealth would equate with a desire to transition to a Western-style diet – heavy in dairy, red meat and sugar – is

starting to look increasingly erroneous. Evidence suggests emerging consumers are steering away from Western food trends and augmenting their traditional diet with carefully selected premium products offering new tastes and experiences.

Emerging markets are not necessarily adopting a Western diet. This is probably best illustrated by the Japanese diet, which retains its unique traits despite Japan's emergence as a global economic powerhouse.

Meanwhile there is a 'culinary diaspora' of Chinese, Indian, Vietnamese, Middle Eastern, Mexican and African cuisines spreading across the globe; gaining popularity not only for their taste but also the cultural experiences they deliver to diners.

Bernard Salt of KPMG Australia calls it 'the Bok Choy Effect'; the growing ethnic diversity in our daily diet as the population globalises and gains the confidence to experiment with different styles of food. This is shifting the global demand for food and creating new market opportunities for producers. Consumers in the West continue to seek fashionable new products; while consumers in emerging markets look for authentic, storied proteins to add to their diets to demonstrate their growing wealth, influence and sophistication. Both groups will be willing to pay

a premium to secure authentic experiences.

A good example of this is the growth in demand for Asian-influenced foods in the United States – a sector which has grown at faster rates than more traditional American fare. The shift towards Asian-based cuisine aligns with the growing demand for healthy, fresh alternatives that are also fast and portable (such as the fresh sushi available in many cafés and supermarkets). The Chinese American Restaurant Association notes there are over 45,000 Chinese restaurants across the US; a number that exceeds all the McDonald's, KFCs, Pizza Huts, Taco Bells and Wendy's in the country.²⁷

However, while our diets will diversify and evolve, there will also be 'safe harbours' that remain. In a world that is changing and disrupting, many consumers will seek comfort from the foods they knew as children. It would be foolish to overlook the value consumers will attach to those foods they have known and enjoyed their whole life.

There are other implications arising from the significant influx of refugees many countries are currently responding to. One of the few things many migrants have been able to bring with them is their food culture. With support from social entrepreneurs, food businesses are being

established to leverage this experience; adding further diversity to the diet of host countries, and enabling migrant groups to preserve at least one element of the lifestyle they have been forced to leave behind. A good example is **Eat Offbeat**, a food delivery company based in New York City.²⁸

Implications: Consumer demand will mean what is grown today will not necessarily be sought out by consumers in the future; being close to ethnographic trends will increase the likelihood of the right products being grown.

²⁷ <http://time.com/4211871/chinese-food-history/>
²⁸ <http://eatoffbeat.com/>



Alternative plant-based proteins replicate daily diet

SHAPING MEGAFORCES



Economic rebalancing



21st-century consumer



Climate changing



Social enterprise

The global population is expected to grow to more than 9 billion people by 2050. With the population being wealthier than ever before, the growth in food demand will be particularly focused on animal proteins. In fact, some experts suggest that production of animal proteins will need to double to maintain sufficient supply.

This presents a number of challenges; including the availability of land, stock feed and water, as well as the environmental impacts of animals.

While there will always be a place for natural proteins, it is likely that the majority of the growth in demand for animal proteins will be satisfied through alternative forms. Cultured farming systems will provide part of the answer, as will textured plant proteins.

These products are not new; textured plant proteins have existed for decades. The likes of tofu and quorn are well known meat alternatives, and have been available in international markets for many years. Their potential has been constrained as they haven't sufficiently replicated the experience of mainstream foods and flavours that consumers are accustomed to.

Backed by major equity investors and with a sharp focus on innovation, organisations like **Impossible Foods**,²⁹ **WhiteWave**,³⁰ **Beyond Meat**³¹ and **Hampton Creek**³² are developing alternative foods that closely replicate the experiences of meat, dairy and egg products. Made from plants, these products offer more sustainable, ethical, and healthy forms of proteins to consumers. The argument for these products is strong, given that:

- they remove the animal welfare issues that concern many people;
- they are better for the environment (reducing the contribution that animal based farming makes to climate change);
- they can be designed to include desired nutrients while excluding the attributes of natural food that contribute to health issues;
- they can be organic; and
- they can be manufactured in environments that make it easier to guarantee the products safety to consumers.

Danone,³³ a large French global dairy and nutrition company, is currently planning the purchase of **WhiteWave Foods**. The latter is a US business that specialises in plant-based milks and related products. The deal was sought as Danone has set a goal to 'help and support people in adopting healthier and more sustainable eating and drinking practices and constantly evolve their portfolio of brands and products to achieve this objective'.

Impossible Foods has engaged a team of scientists, farmers, and chefs that has spent years striving to develop the technology to naturally replicate a burger meat patty. From taste to texture and sight, the burger is made from 100 percent natural ingredients – minus the cow – and has recently been launched commercially in major US markets.

Implications: We face a future where alternative plant-based products will no longer be reserved only for the dedicated vegan; but will provide healthy, sustainable, ethical affordable food experiences to the mainstream population.

²⁹ <http://www.impossiblefoods.com/>

³⁰ <http://www.whitewave.com/investors/press-releases>

³¹ <http://beyondmeat.com/>

³² <https://www.hamptoncreek.com/>

³³ <http://www.danone.com/en/>



The miracle berry
Synsepalum which is
found in West Africa

Exploring the potential of natives

SHAPING MEGAFORCES



New wellness
models



Fusion
revolution



Facing resource
scarcity



Social
enterprise

It is estimated that we lack detailed knowledge of 70 percent of the flora and fauna species native to New Zealand, yet alone understand their nutritional and pharmacological potential inherent in these species.

The statistics for the number of species in Amazon rainforest are unknown, but the biological potential sitting in this region is considered to be almost infinite. It is estimated that only between 5 percent and 15 percent of the region's plant species which have the potential to become therapeutic drugs have been screened for bioactive compounds.³⁴

It is worth noting that over 7,000 medical compounds are already prescribed by Western doctors that are derived from plants.

The undiscovered natural possibilities that exist in the world today will transform how we eat and administer medical care in the future. Yet the speed at which natural ecosystems are being destroyed in the name of development increases the risk that truly game-changing food and medicinal products will be lost before they are identified and their potential recognised. It is critical that we enter a new period of biological exploration to identify the solutions inherent in the natural environment that have yet to be discovered, cultivated and commercialised.

There are many examples of unique products that have already been discovered in our natural environment in recent years. These include;

- the miracle berry **Synsepalum** which is found in West Africa. The berry suppresses sourness to draw out a sweet flavour if it is eaten before food (imagine its potential to remove sugar from food while still delivering a sweet taste to the palate); and

- the **Korolex**³⁵ range of products developed from the horopito herb, native to New Zealand, which the company has commercially cultivated successfully for the first time. The herb has anti-fungal properties and is used to make products that are effective in managing long-term Candida.

The natural environment not only has pharmacological potential, but also the opportunity for plants to aid research. Certain plant compounds enable scientists to understand how cancer cells grow, while others can serve as testing agents for potentially harmful food and drug products.

Of course, some natural products have been illegally cultivated for centuries as illicit narcotics. However the recognition of the spectrum of uses available for some of these products is driving change in regulatory environments and creating new, legal opportunities for growers. The decriminalisation of marijuana in some countries and, more particularly, the rapid growth in its acceptance as a form of medicinal pain management has made the sector one of the fastest-growing primary sectors in some parts of the world in recent years.

Another emerging trend is the role of floral flavours in enhancing the experience that food delivers. Flowers are increasingly being used as a flavour component in unconventional foods and drink products.³⁶

Implications: The natural environment offers almost unlimited potential to identify new sources of nutrition, healthcare and scientific resource; however we run the risk of missing this potential by underinvesting in building our knowledge in this critically important sector.

³⁴ <http://latinamericanscience.org/2013/11/why-its-worth-saving-the-amazon-rainforest-a-market-based-solution/>

³⁵ <http://www.korolex.com/>

³⁶ [http://www.foodnavigator.com/Market-Trends/Flavour-in-focus-Natural-and-sophisticated-florals-on-trend-in-Europe/\(page\)/1](http://www.foodnavigator.com/Market-Trends/Flavour-in-focus-Natural-and-sophisticated-florals-on-trend-in-Europe/(page)/1)

Other emerging themes...

Ancient and heritage foods revived as monocultures are increasingly challenged.

The global food system has scaled production by reducing the number of varieties produced in favour of high-yielding and uniform production. As a result, the majority of the global food supply comes from only 12 plant and five animal species.³⁷ Some 75 percent of genetic plant diversity has been lost since 1900, as farmers worldwide have transitioned from local varieties towards these high-yielding cultivars. This quest towards monocultures has raised concerns around the quality of nutrition, biosecurity exposures, and lack of choice for the consumer. These concerns will see a demand shift towards premium, more storied foods. Ancient grains and seeds like chia, millet, flax and quinoa are being integrated into all aspects of our diet. Demand will grow for the superior flavours and denser nutrition of heirloom and heritage fruit and vegetables, as greater value is placed in the diversity in our diets.

Insect proteins become a part of the daily diet.

Arguments surrounding the role insects will play in the global food system into the future have been rehearsed many times over the last couple of years. They are highly efficient protein converters; taking waste biomass and efficiently turning it into consumable, high-protein foods for humans and animals with limited effluent and (to date) no concerns surrounding animal welfare. They are also a regular part of the diet for billions of people around the world (from snails in France, to grilled crickets and grasshoppers in Asia). The beauty of insects is that we have yet to have any clear idea on the number of species that currently exist, and what their protein potential could be. This means we have probably yet to uncover the real game-changers. Recent research into cockroach milk indicates the mind-blowing scope of the opportunities inherent in the insect kingdom. Despite the cringe factor, it will not be too long before eating insects becomes mainstream. They will become an ingredient in the same way as whey protein concentrate or palm oil (and the reality is that we will be eating insects without even realising we are doing so).

There may be a role for scavenged food in the diet of the future.

In the natural food chain, larger animals prey on smaller animals until a primary predator that has no natural threats is reached at the top of the chain. When these animals die, they are eaten by scavengers that survive on the scraps they can find in the environment. The developed human food system has cut across natural food chains by growing food specifically for consumption; however as demand exceeds supply, it will be necessary to consider any source of protein. One argument occasionally raised is whether there is a role for scavenged foods in future of human nutrition. This may include commercially collecting and processing feral animals (such as goats or horses), linking pest eradication programmes to the food supply, and even collecting road-kill as a source of cheaper base protein for consumers. While none of these 'wild' food sources are highly palatable given traditional expectations around food, management of pest species could directly benefit the environment and boost the supply of natural animal protein in a world that is seeking more food.

Artisan, storied foods will always preserve a high value niche in global markets.

More and more of our food is now being sourced in non-traditional ways (such as cultured foods, insects, plant based proteins, wild foods etc). Given this, will traditional farmers still have a place in the global food system? The answer is yes, but that place will only be preserved for those farmers who produce authentic natural protein from a farming system that is excellent in all respects. Artisan, storied foods will come from farmers that focus on: restoring the biodiversity in their farming system, valuing every last drop of water, reducing their carbon footprint, treating their staff with respect, and contributing substantively to their communities. These 'model farmers' will produce food they are proud and passionate about providing to the world.

37 <http://www.fao.org/docrep/007/y5609e/y5609e02.htm>

Processing innovation

Instant access to information is creating the most informed consumer base in history.

Their purchasing decisions are driven by information; technical material on product functionality and authenticity provided by the product manufacturer, reviews written by other users and general social media commentary on the product and its competitors. The emergence of highly informed consumers will continue to drive innovation in how food, fibre and timber products are processed, to ensure that products meet their expectations and fit within their lifestyles.

Processors are facing many challenges. Consumers that want products with high end functionality at discount price points. Other consumers that are looking for unique and highly curated experiences that are highly tailored to their personal needs. While others are more focused on their environmental footprint and will seek products that have been created through value chains designed to maximise sustainability. A group of consumers are more interested in the story and branding that underlines a product because of the status and prestige using the product conveys on them.

It is critical that processors understand the consumers their products are intended for; this enables them to incorporate features that consumers will value and pay a premium for, while excluding features that delivers no value.

Design capability driven by consumer insight needs to become a core competency for every entity. Consumers will quickly adopt products that solve their day-to-day challenges while ignoring products that are unable to deliver on their expectations.

This trend will be pronounced when attributes are personal to consumers. For instance the design of a product will be critical when it comes to attracting customers looking to source tailored nutrition that assists them in managing complex or chronic health issues. Thinking about how a product targeted at a person that may have arthritis in their wrists is packaged, to make access as simple and pain free as possible, is critical to creating a consumption experience that will attract repeat purchases.

We expect that how a product is processed will become as important to its overall story as the way it is grown and distributed.

Trees provide us with more than 5,000 everyday uses...







Tailored, genetically guided nutrition

SHAPING MEGAFORCES



Government 3.0



21st-century consumer



New wellness models



Fusion revolution

Nutritional experts have long been intrigued by the fact a diet that works for one person, fails another. As a consequence, there is increasing focus on how genomes effect an individual person's mental and physical health and fitness.

Food plays a significant part in shaping who we are as people and how we function, yet within a geographic region we all largely eat the same types of food with little or no reference to the physical differences that exist between us.

With the challenges of fast paced modern life, it is becoming increasingly difficult to eat in a nutritionally balanced manner. As a consequence, many consumers are looking to functional foods to fill the dietary gap in their diets. More consumers are becoming health conscious eaters and looking to the foods they select to reduce the risks that their lifestyle choices give rise to.

Functional foods and beverages incorporate nutrients with specifically identified health benefits. The category also includes dietary or nutraceutical supplements and other personal care products with specific health benefits. The products, which are sold as ready to consume foods, products that can be reconstituted and supplements, represent a rapidly growing segment of the global nutrition market. Recent market research suggests that the nutraceuticals market is expected to grow at a compound rate of 7.3 percent over the next 5 years to achieve annual sales exceeding US\$279 billion.³⁸

Soylent, the world's most nutritionally balanced food³⁹ (discussed earlier in the report), and another product, **Huel**, that has been designed to deliver all the protein, carbohydrate, fat and 26 vitamins and minerals⁴⁰ that the body needs to avoid being deficient in all essential nutrients, demonstrate that it is likely to be theoretically possible to live only on nutraceutical products.

With the global rise in chronic illness (diabetes, obesity, allergies and cardiovascular disease) traditional dietary guidance is being constantly reviewed. There is a growing focus on developing diet guidelines that consider the genetic makeup of an individual and the impact of their environment and lifestyle on health.

This trend is emerging rapidly in pet food category; you can now purchase highly tailored food for your dog addressing myriad factors from genetic make-up, to health issues the canine may have. **Just Right by Purina**⁴¹ allows a consumer to create a profile for their dog, entering unique details, and Purina will recommend and supply a personalised dietary plan to help the dog achieve its health goals.

While personalised, tailored food has yet to gain the same traction in human diets, it is only a matter of time until similar technology interfaces are developed and solutions

offered to human consumers. Currently, there are nutritional supplements available that have been designed to meet the needs of a demographic group. As food becomes a major tool to manage chronic health issues, we expect to see human supplements following those for our pets and becoming far more tailored to the needs of an individual.

Implications: As more consumers use food to manage and sustain their health, nutraceuticals are becoming an ever more important segment of the global food system, with an expectation that products will become more tailored to the individual.

³⁸ <https://globenewswire.com/news-release/2016/05/18/841073/0/en/Global-Nutraceuticals-Market-Research-Review-2015-2016-Outlook-to-2021-TMR.html>

³⁹ <https://www.soylent.com/>

⁴⁰ <https://huel.com/>

⁴¹ <https://www.justrightpetfood.com/>



Replicating the sensory perceptions of food via a printer

SHAPING MEGAFORCES



Integrated urban living



Fusion revolution



Realising value in data



Facing resource scarcity

One of the biggest disruptions to the global food sector will come from the ability to print food that not only looks like the food we know and trust but has similar sensory perceptions – the smell, crunch, chew, texture and consistency that makes us love the foods we love.

Food printing will change the food vending sector forever. The afternoon office snack will be unleashed by the potential of food printing. The vending machine could perform a non-invasive scan of your current state of health to identify the nutrients you need now to get you through to your next meal. It could then print off your tailored afternoon snack that looks and tastes like your favourite chocolate bar or piece of fruit, but in reality is a perfectly nutritionally balanced snack that will see you through to dinner without wasted calories and with all the nutrients needed.

The combination of innovative ingredients able to be used as printing materials, software and printing technology is opening up a world of possibilities in the form of digital food printing.

An example of the potential inherent in food printing was demonstrated by Food Ink, a pop-restaurant that opened over the summer in London. Food Ink created a one-of-a-kind experience in the form of a restaurant, where all the food, all the utensils and all the furniture were produced through 3D-printing, creating an immersive futuristic space. The restaurant was described as place where fine cuisine met art, philosophy and tomorrow's technologies, leading the way in being able to replicate sensory perceptions of food.⁴²

Food printing is currently a novel technology but many novel applications are already appearing for the technology. The development of 4D technologies offers the potential to create deeper experiences; products that more accurately represent all the sensory experiences that we seek in food or that have dynamic capabilities, such as the ability to self-transform over time. It is likely that we will ultimately be able to print food that is alive. For instance printing products that mature in the same way that a natural product does or that incorporates live cultures, such as probiotics.

Printing technologies also offer the potential to produce food that responds to some of the challenges we face with natural food products. Products can be printed in such a way that only the elements of a product that we want to eat are printed, for instance it may become possible to print an 'apple' without a core, helping consumers solve the problem of what to do with the core when they have finished.

It will also become possible to print food that has a large environmental footprint; one of the early uses of the technology has been printing 'beef' steaks that enable people to enjoy a steak without the concern over the impact its growth has on the environment.

Implications: Food printing offers the potential to deliver highly tailored food that will replicate the natural experiences consumers are seeking while addressing the inherent issues that exist with growing and using these foods.

⁴² <http://foodink.io/>



Extracting full value from molecular structures of the products we grow

SHAPING MEGAFORCES



21st-century consumer



Fusion revolution



Facing resource scarcity



Social enterprise

We are increasingly recognising not only the obvious potential in the products that are grown but the inherent potential in their constituent parts.

Extracting all the available value from production is not a new trend, it has been a goal for most primary sector businesses for decades. In the future producers and processors will not just be looking for the obvious value in co-products (for instance the opportunities to create new markets and grow incremental value from offal, blood, bones and skins in a meat processing business) but the hidden value that can be extracted from exploring the molecular structures of a product.

As a consequence more research effort is being directed towards the molecular properties of plants and animals. A good example of the number of uses of a commercially grown product is the range of applications that can be extracted from the forested radiata pine tree. The tree, which is often used for framing buildings with waste biomass being turned into paper pulp, presents researchers with a raw material to work with that can be turned into a spectrum of high value products.

New Zealand Crown Research Institute, **Scion**, is conducting a wide range of research into alternative uses for forested timber⁴³. The research at Scion has not only sought ways that timber can be used in construction for more than just framing, developing load bearing structural timber products that can be used in large commercial buildings, developing innovative bio-adhesives and new bio-plastics from forest biomass as well as looking at ways waste biomass can be used as an environmentally friendly fuel source. The work conducted by Scion highlights the significant hidden value within a day to day product, such as timber, as our understanding of its molecular structure increases.

Innovation however goes well beyond timber; work is progressing on the proteins that exist in wool and what their potential uses maybe. Other researchers are looking at how they can produce sustainable food wrappings from the waste streams coming out of the food production. A further example is **Brewtroleum**, an initiative by Gull Fuels and DB Breweries in New Zealand, which saw waste streams from beer production being used to produce a commercially distributed biofuel.

Chefs around the world are creating gastronomic experiences by breaking down food into its constituent parts, creating entirely new molecular ways for consumers to enjoy food. Molecular gastronomy has been pioneered by high profile chefs like Heston Blumenthal, who has developed a scientific approach to cuisine that he refers to as multi-sensory cooking.

Other chefs are taking up the challenge of creating new ways to experience food, one example being **Café Art Science** in Cambridge, Massachusetts. The business is run by academics from Harvard University, is described as a café for the sensorium... where culinary art, science and design meet the sustainable future of food.⁴⁴

Implications: Research is unlocking the financial opportunities inherent in the molecular structures of plants and animals we grow by creating sustainable products and new consumer experiences.

⁴³ <http://www.scionresearch.com/>

⁴⁴ <http://www.cafeartscience.com/>

Other emerging themes...

Ultra-raw foods can generate significant price premiums.

The value of a product is sometimes maximised by doing absolutely nothing to it other than moving it from where it is caught or harvested to where it will be consumed. Fresh fish caught alive is probably the best example of the potential inherent in ultra-raw foods; its value is multiplied many times over if it can be delivered alive from the ocean to a tank in a restaurant in Asia enabling it to be sold alive and cooked to order. While it may sound simple, doing nothing to a product other than transporting it in peak condition to a market that could be thousands of kilometres away, is often very challenging. It requires complex supply chain solutions to get food products in their raw form to their consumers in condition to attract the price premiums necessary to underwrite the cost. The price premiums for ultra-raw products reflect growing consumer concern increases about the impact that processing has on many of the beneficial enzymes and the nutrients in the raw food.

The high protein revolution accelerates.

Protein used to be a word exclusively reserved for scientists and nutritionists, however it is as likely to pop up today in a challenge on **Masterchef** as it is in a scientific journal. As consumer awareness of the constituents of good nutrition build, the central role of protein in our diet is more understood and consumers are paying premiums for healthy, innovative, high protein foods. A glass of milk is no longer a glass of milk but a protein beverage, and its value grows as the amount of protein it delivers increases – so much so dairy companies are refocusing their business towards high health opportunities, like sports nutrition. The role that protein rich diets plays in maintaining general health and well-being is attracting a new wave of health conscious consumers, particularly amongst millennials, who are prepared to pay a premium for innovative high protein foods.

There will always be a place for something just a little bit naughty.

In world where more consumers are becoming health conscious and eating for identified health benefits of food, their undoubtedly remains a place in the diet of the vast majority of consumers for the treat food experience. Whether this is an extravagant meal out, a take away of choice or a favourite dessert, consumers will continue to crave these treats every now and then. The treat maybe smaller and consumed less frequently, but consumers will be seeking better quality products and bigger experiences, to ensure that they get the best return from their financial and dietary investment in the treat. **Lewis Road Creamery**⁴⁵ have demonstrated that when you do provide differentiated treat experiences, and back it with a well-planned marketing strategy, it is more than possible to get consumers in the best suburbs out of their yoga studios and into the supermarket aisles to fight over a highly priced treat.

Returning craft to mainstream consumers.

A trend currently driving growth in the beer sector provides an indication of the desire consumers have to seek out storied products. The proliferation in the number of craft brewers globally, offering regionally, distinct handmade products is driving growth in the beer segment in many countries, as brewers look to create differentiated products that provide a journey of exploration for connoisseurs. The craft beer sector in the US reported its eight consecutive year of double digit growth in 2015; the sector's volume growth of 13 percent compared with a decrease in the total volume of beer sold over the same period of 0.2 percent.⁴⁶ We expect the craft trend to spread; craft cider will take off globally but also in further processed categories like confectionery, cheeses, ice creams, sorbets as well as ready to eat processed meals are all expected to enjoy a craft benefit. An uncertain world encourages consumers to hark back to the food and drink that their grandparents used to enjoy, with craft offerings being well positioned to satiate these desires.

⁴⁵ <http://www.lewisroadcreamery.co.nz/>

⁴⁶ <http://fortune.com/2016/03/22/craft-beer-sales-rise-2015/>

Changes in how food is distributed

There is much discussion in this report about disruptive technologies and the impact that they will have on how we grow, process, distribute and experience food in the future.

When it comes to distribution, the primary tool that will drive disruption has been with us for almost a decade. We are only now recognising its potential to totally transform how we live our day to day lives.

The technology is the smart mobile device that billions of us now carry around. It offers the ability to create completely new distribution models for food products that can connect a consumer more directly to the producer and, as a consequence, shift where margin is captured along the value chain.

The idea of the weekly shop being completed under one roof has shaped the evolution of modern retail channels over the last 50 years or so. Yet the reality is most people around the world do not buy food from a supermarket, they still use traditional markets, family and friends to source the food they need. This creates opportunities for disruptive food retail business models to crystallise

in emerging economies, where the incumbent strength of the major food retailers will not be trying to slow the shift away from the bricks and mortar stores that they have invested billions of dollars into.

Models will develop that disaggregate the western shopping experience, taking it back to the future in many ways. The models will reflect the time pressures consumers are under, a desire to select from products that have important attributes (be that price, nutrition, provenance, origin, reviews or any other criteria) and a wish to make life a bit easier.

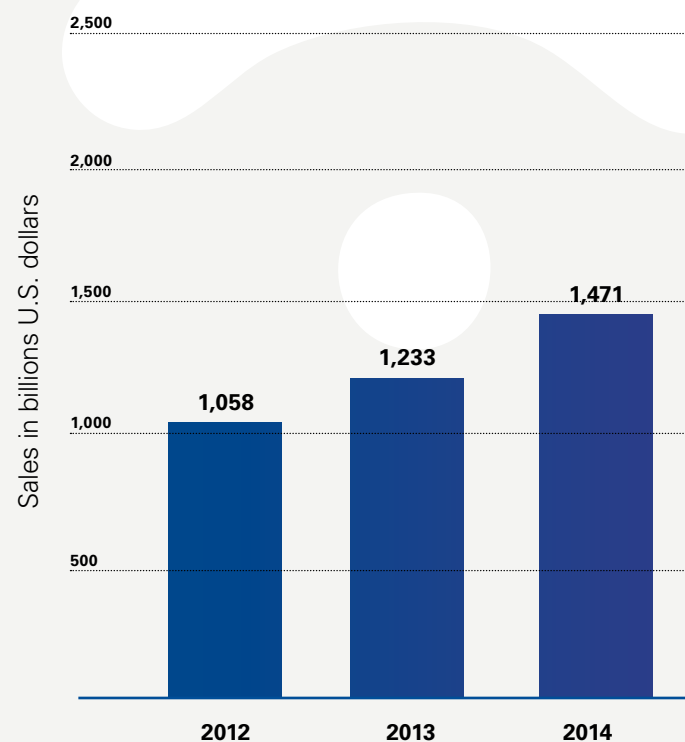
We foresee a situation where the weekly shop is replaced by a series of apps that connect a consumer to their greengrocer, butcher, fishmonger, baker, delicatessen, wine merchant and pharmacist to complete on demand sourcing.

The challenge for retailers is how they remain relevant in a world of unlimited choice online and delivery moves closer to instantaneous. How do they deliver a curated experience to consumers that will keep them coming into stores to maintain a viable business? The battle ground in food distribution over the next decade is for the control of the customer relationship; it is the step on the value chain that unlocks the greatest share of the value within a product to the owner of that relationship.

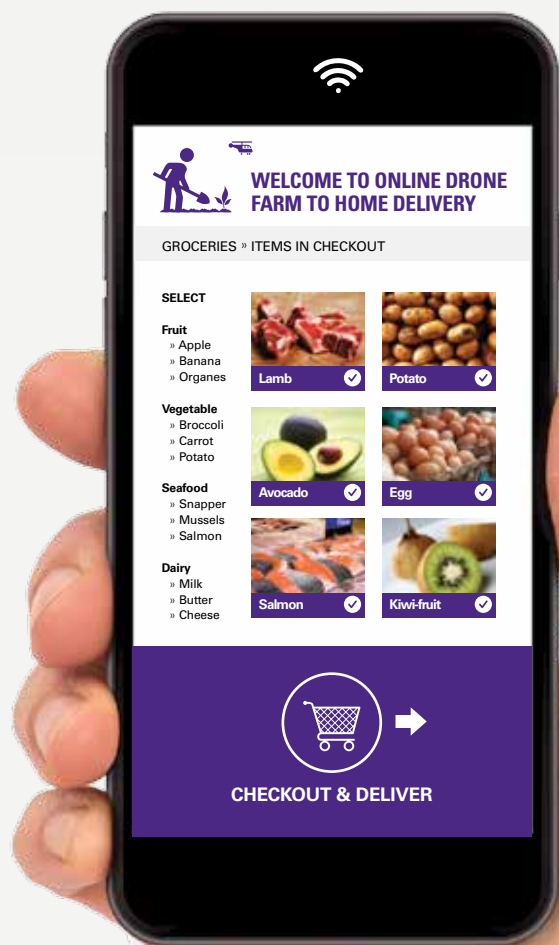
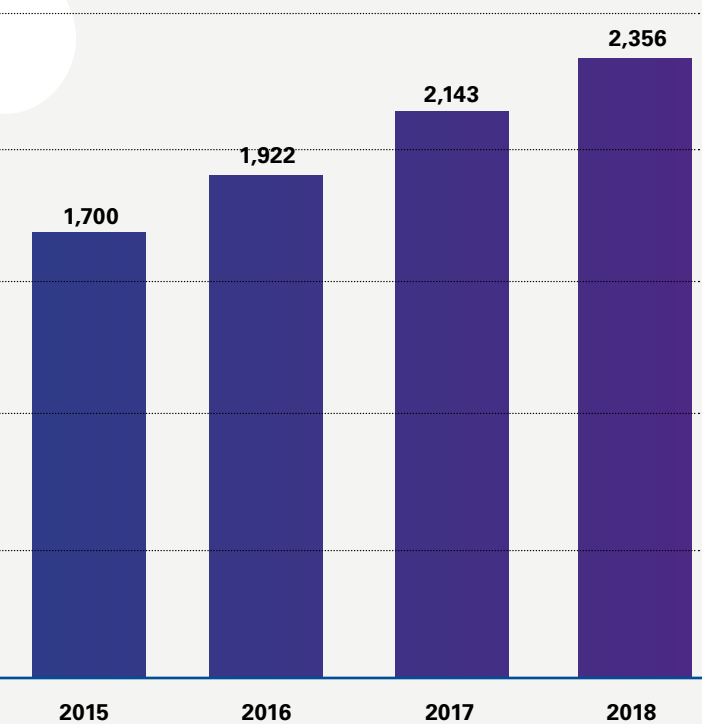
FUTURE DELIVERY



US Dollars spent each year via online shopping⁴⁷



⁴⁷ <https://www.statista.com/statistics/261245/b2c-e-commerce-sales-worldwide/>





Local food is all about provenance

SHAPING MEGAFORCES



Geopolitical instabilities



Government 3.0



21st-century consumer



Climate changing

The local food movement has become a notable component of the premium food sector that has emerged globally in recent years.

Consumers have flocked to farmers markets and bought local in their stores as they have sought to understand who is growing their food, to build relationships with them and to connect with the story behind the food they purchase. The ability to make an assessment of the integrity of the person that has grown your food and the alignment of their ethics with yours has seen the local food movement become defined by geographical proximity. If something is grown more than 50 miles away many consumers would not consider it to be local food.

The more we have explored the concept of local food, it has become apparent that being able to understand the authenticity and provenance of the food and who has produced it is far more important than being geographically close to its source for many local food consumers.

As a consequence, technology will enable any farmer, anywhere in the world, to become a local food supplier to consumers across the planet. The Internet becomes their virtual farmers market; they can use video (and in the near future virtual reality) to tell their story and provide evidence to support product authenticity, use social media to have real time conversations with consumers and use an e-commerce platform to supply food on a timely basis.

Research suggests around 50 percent of consumers are willing to pay up to 10 percent more for locally grown or produced foods, and almost one in three are willing to pay up to 25 percent more.⁴⁸

Verifiable provenance is a bottom line for storied food

Any producer wanting to be a local farmer to the world must be able to verify the safety of the products they produce. The emergence of social media means a contamination incident can go viral within minutes. This is challenging as stewardship responsibilities increasingly encompass the whole time that your brand is associated with the product, even if that extends beyond when you control the product. The reputational and financial implications of a failure can be catastrophic to a business.

As supply chains extend and become more complex, the risks associated with food fraud and corruption are on the increase, further reducing the trust consumers have in the product in the package being the product described on the package. There are solutions being developed that apply digital and chemical technologies to verify the safety and integrity of products, by they

food, fibre or timber. These technologies include digital printing solutions that print a unique, traceable label for each unit produced and chemical foot printing of a product so it is possible to categorically state whether the content has been tampered with. As these technologies become more accessible and cheaper, their use will increase, bridging the gap of trust with consumers.

Implications: Any producer can become a local producer to the world if they can build connections with consumers and authenticate product provenance, providing an opportunity to secure price premiums.

48 <http://fortune.com/2015/08/21/local-food-movement-business/>



Digitally enabled direct to consumer channels reshape food retail

SHAPING MEGAFORCES



Government
3.0



21st-century
consumer



Fusion
revolution



Realising
value in data

Many food retailers appear to be on a journey to irrelevance as their focus on low pricing impacts the experience that they deliver to consumers. The most innovative food producers are seeking alternative channels to market. Premium consumers wanting choice seek out niche retailers or explore opportunities to source food directly from the producer through online channels.

Without reinvention, it is unlikely the supermarket experience that dominates modern retail around the world will survive. Conventional supermarkets need to find ways to stay relevant.

Entirely new business models have emerged in recent years (like Uber and Airbnb) demonstrating consumers, particularly millennials, place greater value on instantaneous access to products and services than in the past. Access rather than ownership allows greater lifestyle flexibility. The access principle will shape food retail; the idea of buying a week's groceries at one time will become redundant as consumers demand fresh produce and want it delivered now in the format that they wish to use the product. Access models mean fresher food, enhanced nutrition, less wastage, more flexible lifestyles – wins for the community and the consumer.

Digital distribution models for food represent one of the most significant areas of new investment into the agri-food sector. The initial models were online versions of the supermarket experience with fulfilment being completed via delivery or click and collect models. Specialist online retailers have entered the food market; **Amazon Fresh**,⁴⁹ offers consumers a

fresh food selection which can be delivered within an hour for subscribers to the prime service.

Other organisations are offering richer experiences to the consumer. Businesses like **Blue Apron**⁵⁰ and **My Food Bag**⁵¹ that provide the ingredients and recipes for consumers to cook their own meals at home have emerged around the world. The challenge to these businesses is that they have to place rules around ordering for their logistics to work, which reduces how flexible the service is for a consumer.

Platforms have also been created that directly connect the consumer to producer, often with a specific product category focus, such as organics. Examples include **Aussie Farmers Direct**,⁵² which provides farm fresh food to a consumer's front door, and **Oooby**,⁵³ a service that specialises in delivering local and organic food.

Ultimately, consumers will disaggregate their weekly shop, buying from the best butcher, dairy, greengrocer, fishmonger, baker, vintner, pharmacist, general merchant and will make their purchases using their smart device. The future of food retail is effectively back to the future with the addition of to-the-door-delivery.

Virtual reality technologies present an opportunity to take consumer connection to the next level. They can place a potential consumer into a farming system, immerse them in the value chain, create interactions with the people producing the product (and provide samples if connected with a food printer). VR has the potential to take engagement to a level well beyond the farmers market or the supermarket for those producers looking to develop deeper relationships directly with their consumers.

Implications: Food retail models are evolving as consumers seek access to innovative, new products and services through a channel that fits best with their lifestyle.

49 <https://www.amazon.com/b?node=10329849011>

50 <https://www.blueapron.com/>

51 <https://www.myfoodbag.co.nz/>

52 <https://www.aussiefarmers.com.au/>

53 <https://www.ooooby.org/>



Made from
mushroom pulp

Supply chain innovation increase food availability

SHAPING MEGAFORCES



Geopolitical
instabilities



Government
3.0



New wellness
models



Social
enterprise

A key to eliminating under-nutrition globally lies in transforming the supply chains that move food from the producer to the consumer. The estimates surrounding the amount of food wasted globally are well known; much of the approximately 40 percent of food that is never eaten is lost through spoilage in the supply chain.

A large percentage of this spoilage occurs in emerging markets as food handling, packaging, storage and transport standards allow for products to become damaged or contaminated.

Ensuring the food grown around the world actually reaches the intended consumer in an edible state is critical to growing the volume of food available globally. This is driving deep innovation in global supply chains. This could be as simple as changing the handling, packaging and storage techniques for grains, fruit and vegetables to minimise the risk of the product spoiling.

Simple solutions can deliver remarkable results. Changing the type of sack farmers use to transport their rice and grain, to ones which work effectively in the ambient conditions and can be sealed, as well as raising the store off the ground helps keep vermin out of a product, it reduces the risk of contamination.

Supply chain technologies widely adopted in developed markets, to reduce the amount of food that spoils in transit, need to be evolved to enable them to bring benefits to the remote regions of the planet. We expect to see social enterprises introducing not just innovative packaging solutions but looking at cost effective refrigeration solutions, upskilling communities in the safe handling and grading of food (so that high quality products are not packed with rotten ones) and the development of cultivars that are better able to handle transit in challenging conditions.

It should not be overlooked that part of the solution will also come from investment into physical infrastructure (particular roads in the remote regions of the world, opening up more efficient and fast routes to market) and reengineering of global logistics (air freight may become more viable for fresh product with large premiums, something we are currently observing with the transport of fresh liquid milk into high value markets like China).

Packaging Innovation will be part of the solution


As the desire to create sustainable, eco-friendly products increases, the way we package consumer goods is also being re-engineered. For many consumers plastic is no longer acceptable. Companies such as New York's **Ecovative** are using biomaterials to create high performing, premium products that are safe, healthy and certified sustainable. They work alongside industry and consumers to eliminate toxic, unsustainable materials without having to sacrifice on cost or performance.⁵⁴ An example of their product is Myco packaging made from mushrooms. **IKEA** announced earlier this year they are planning to swap their packaging to this material, as part of a wider sustainability strategy.⁵⁵

Implications: Supply chain innovation will play a material part in delivering a more sustainable agri-food system better positioned to meet the growing demands of consumers



⁵⁴ <http://www.ecovative.design.com/>

⁵⁵ <http://www.telegraph.co.uk/news/earth/businessandecology/recycling/12172439/ikea-plans-mushroom-based-packaging-as-eco-friendly-replacement-for-polystyrene.html>



Other emerging themes...

Reinvention of traditional supermarket experiences to make them relevant to the consumer.

Major global supermarket chains are not taking the threat of digital disruption lying down. Initial strategies have included the development of multi-channel business models (shift stores on line and into mobile formats), introducing delivery and click and collect services, loyalty programmes tied to powerful analytic tools and redesigning the in store experience and range to make it a more attractive to premium consumers. Some retailers have followed the Whole Food Stores model and created food Disneyland's for adults, providing wide choice and details on product provenance.

Others have diversified their range into new categories, introduced organics or developed sustainable sourcing models with their farmers. Physical stores may progressively become showrooms, more about experiencing new things than actually buying the groceries (similar to what is happening in fashion apparel), the only thing being certain is that they, like everybody else, will need to change to survive. In recent examples, **Amazon** has formed a partnership with e-commerce firm Fresh Nation to deliver fresh produce from farmers' markets to homes. In Australia, **David Jones** is reinventing some of its stores to specifically target the ready to eat food market.

Austerity accelerates collaborative, co-operative buying projects.

The period since the Global Financial Crisis has been the longest period of economic austerity experienced by the developed world since the Great Depression of the 1930's. Financial pressures have forced many people to change their diets, simplifying the food they eat in favour of cheaper forms of protein, while still trying to ensure that healthy, safe food is put on their family's table each and every day.

To counter these pressures, groups of consumers have started to club together and form purchasing co-operatives. Consumers pool their volumes to provide them with sufficient scale to go and seek out farmers and food suppliers that they can enter into direct bulk buying deals, accessing fresh food while avoiding margins collected along the value chain and as a consequence securing better prices. In some ways buying co-operatives represent a step backwards to the co-op's of old, however there is a significant difference as these groups are often enabled by technology to attract members, facilitate ordering and aid fulfilment.

Changes in how we eat

Lifestyles are accelerating. Smart devices have made it almost impossible to escape the reality of the day to day grind; just think about the panic that sets in when we realise we have left our device at home. It illustrates how central this single piece of technology has become to our lives.

To cope with modern life we constantly seek out tools that enable us to manage the volumes of data we are expected to process on a daily basis (wearable technologies, artificial intelligence and computer learning tools, self-driving vehicles, personalised operating systems). Tools that can also help us ensure that we do not forget about the basic necessities of life; the food, sleep and human interactions we need to function optimally.

A good example of the challenges modern life presents is becoming apparent in rapidly growing cities around the world. The distance that individuals are having to travel to work on a daily basis is a major contributor to busier lifestyles many are people dealing with. With no option but to live further from their place of work, commute times grow for many meaning that traditional meal times, particularly breakfast, are

being spent by hundreds of millions of people travelling, on the train, bus or in the car. This means that the way food is taken is evolving by necessity.

This is one example of why the way food is designed and packaged will need to evolve to fit more effectively into a commuter's daily life than it has ever done before. In a time poor world stopping for a meal is becoming a luxury few can afford, an ever increasing percentage of the food consumed will be taken on the go.

However, when we do stop for food it will be an event to be shared with family, friends or colleagues and, as a consequence, it will take on greater importance. It will be one of the few times we have face to face social interactions, thus we will expect more experience and innovation in our food.

Faster lives are also putting greater pressure on our bodies, placing them under more stress, providing less time for exercise, recovery and sleep and, as consequence, contributing to a wide range of emerging modern health conditions. In a world where the cost of curative healthcare systems are spiralling rapidly out of control, we expect that food will become an integral part of healthcare regimes designed to prevent certain diseases occurring, while also becoming a key tool used in managing the effects of existing health issues and the stresses associated with modern life.



795 million

people in the world do not have enough food⁵⁶



12.9%

of the population is undernourished



3.1 million

children die a year from poor nutrition





The world
now has more

overweight
and obese
people than
underweight



Obesity has
doubled

since 1980



1.9 billion
overweight
people

600 million of
these being obese
(in 2014)

87%

of deaths in high
income countries
are due to chronic
disease vs. 43%
in low income.

48%

of deaths in low
income countries
due to nutritional
deficiencies vs. 7%
in high income.

(Graphic above) 56 <http://www.fao.org/statistics/en/>



Eating to manage health becomes enshrined into society

SHAPING MEGAFORCES



Government 3.0



The ageing generation



New wellness models



Targeted education

With the majority of baby boomers due to hit retirement age over the next 15 years, Governments around the world are bracing for further pressure to come onto already strained health care systems. By necessity the way our health care services are delivered will have to fundamentally change to avoid the systems breaking down entirely.

It is a financial reality for Governments around the world that the cost of the traditional curative model of healthcare systems they operate is rapidly becoming unsustainable. Advances in medical science enable us to keep people alive for longer. The ageing population is the largest user of these technologies, while their contribution to funding the services reduces as they reduce their economic contribution to society as they retire.

The most obvious model to be explored is the redirection of investment towards models designed to prevent people getting sick in the first place. Preventative healthcare models invest proactively in programmes to enable very early detection and treatment of illness, along with education around healthy living (including eating practices) to minimise the number of people that become ill, particularly as they age.

By 2043 it is estimated that in New Zealand over 70 percent of the population will be over 65. Currently, it is estimated that around 85 percent of people aged 60 and over are managing at least one chronic health condition.

A combination of Government programmes and personal lifestyle goals will result in more individuals seeking to gain any advantage available to prevent illness and maintain health. Many will increase the focus they place on food as a key tool for managing health outcomes. Ageing consumers, particularly in the developed world, have often spent much of their working lives providing for their retirement, thus they have the capacity to buy premium products that deliver the nutrition they are seeking together with a more tailored experience.

Many global food companies are investing heavily in nutrition strategies and products that have demonstrable health benefits. **Fonterra Co-operative Group**⁵⁷ are using Anlene, a dairy product with proven benefits for bone health, as a key driver of their growth in emerging consumer markets in Asia.

Nestle⁵⁸ have created a platform to educate people on healthy aging and the importance of nutrition and supplementation. They have developed a range of nutritional solutions to sit alongside the platform, which are tailored to older consumers, incorporating not just nutritional features but also packaging innovations such as bigger fonts and easy-to-open formats.

Considering the format of a product and the experience that it delivers will help to create value for ageing consumers; getting the texture, taste profile and packaging right is critical.

The reality that you are what you eat will increasingly shape what people eat, either by choice or, ultimately, as the result of regulation that defines what should be eaten and what should be avoided.

Implications: Agri-food companies will benefit from new market opportunities emerging as population's age, however investment will be needed to verify health benefits and deliver products in appropriately tailored formats.

⁵⁷ <https://www2.fonterra.com>

⁵⁸ <http://www.nestle.com/>



Quality of Life Index: Slowest Commute Times (Avg)⁵⁹

Rank	Country	Minutes
1st	Egypt	51.02
4th	Russia	48.41
8th	Brazil	47.17
11th	China	44.73
15th	South Africa	43.35
24th	Canada	37.25
55th	New Zealand	28.51
60th	Switzerland	27.37

Fitting food into modern urban lifestyles

SHAPING MEGAFORCES



Economic
rebalancing



21st-century
consumer



Integrated
urban living



New wellness
models

Today's fast paced lifestyle, means that consumers are seeking solutions that enable them to minimise the time that they have to spend doing the routine things that need to be done, maximising the time available to do the things they value.

As urbanisation surges around the world the separation between home and work is growing. New lifestyle rules are evolving, changing how we eat and how food fits into our lives on a daily basis.

As average commute times extend in major cities to three to four hours a day, more meals are being taken in transit or eaten away from the home. There are significant opportunities for producers that are able to design products that are able to better fit into the day to day lives of their consumers; this could include reinventing the packaging formats to make the product easy to use, reconstituting products to meet the nutritional and practical needs of the commuter travelling over traditional mealtimes or introducing new and differentiated flavour options. Significant value is available to those that make it easier for commuters to fit food into their lifestyles.

It is not just the amount of time spent travelling which is reshaping how people engage with food. The costs of property in urban centres mean people are living in smaller spaces, often without full cooking facilities. This naturally means that people will spend less time planning and preparing meals looking instead for more convenient ways to access food.

For some convenience means ready to eat meals that can be put in the microwave (a good example being the extensive range of premium heat and eat products that **Marks & Spencer** in the UK provide, often through outlets located in key transport hubs), for other it is easy-to-prepare meals (the combine with boiling water and eat type products) while for some it is takeaway products.⁶⁰

Other consumers are looking for on the go convenience, with a fresh, healthy edge. Companies such as **Jess's Under Ground Kitchen** in New Zealand offer consumers (who are often urban based, young professionals) a gourmet, freshly cooked meal that can be collected from a convenient point near their office and eaten on the go without missing out on nutritional benefits.⁶¹

Many millennials appear to be shying away from the fast food eating habits that their parents pioneered and actively seeking out food products and services that will aid in their wellbeing journey.

Ultimately, we think that millennial behaviours will shape the future of the food industry as their desire for healthy, affordable, tailored and flexible eating experiences drives innovation into new formats and products. A good example of this innovation are social food businesses like **Eat My Lunch**. A company that will prepare and provide a free lunch to a child in a socially deprived area when somebody orders their lunch from the company (a buy one, give one model).⁶²

Implications: Our lifestyles are getting in the way of traditional dining practices; people want products that fit around their job to maximise the time available for them to do the things they want to do.

⁵⁹ https://www.numbeo.com/quality-of-life/rankings_by_country.jsp

⁶⁰ <http://www.marksandspencer.com/>

⁶¹ <http://www.myundergroundkitchen.com/>

⁶² <http://www.eatmylunch.nz/>



Kombucha – the superfood probiotic beverage.

Fermenting food reshapes western diets

SHAPING MEGAFORCES



21st-century consumer



The ageing generation



New wellness models



Fusion revolution

We often talk about a “gut feeling” or “trusting our gut instinct” and it turns out, research is suggesting that this mind-gut connection is not just metaphorical.

As the pace of life increases, many people are focused on maintaining body function at optimal performance levels to maximise their lifestyles. More consumers are taking the time to select food that is healthy, while some are looking for foods that are capable of preventing illnesses occurring.

Many nutritionists consider the effective operation of the gut to be so critical to maintaining effective health that they refer to the gut as the body’s second brain. This increased awareness has in turn generated a wealth of research into the gut-brain connection.

There are an increasing number of claims being made by food producers around direct links between gut health and improved cognitive and brain health. Some also suggest that maintaining a healthy gut also decreases the risk of neurodegenerative and some autoimmune diseases. Expect to see continued headlines about eating food that protects, boosts, and supports your gut, as our understanding of how the body interacts with food and nutrition.

Fermented foods such as kimchi, sauerkraut, kombucha, kefir, yogurts and cultured cheeses are amongst those that have appeared in the market, many of which are being sold with claims about positive impacts on gut health. Fermentation found in food is the process of converting carbohydrates to alcohol or organic acids using microorganisms; they are believed to have impacts on altering the chemical balance of the body. The ability for these foods to rebalance brain chemistry or change mood will result in these foods becoming more widely adopted in western diets to counter stress and anxiety.

It is anticipated that by 2021, the **Kombucha**⁶³ market (a fermented, lightly effervescent green or black tea beverage) will reach US\$2.1 billion alone, while traditionally ethnic foods, like kimchi and kefir, are now being sold in markets around the world, driven by consumer interest in their active properties.


Active foods – probiotics and algae to the fore

As people increase focus on the nutrient content of their food and what it delivers beyond taste, texture and experience, the demand for foods that have the capability to make a contribution to health long after they have been eaten will continue to grow.

Probiotics in dairy products, fermented foods, algae and sea plants, as well as the antibacterial properties of Manuka honey are creating high value markets targeted at those taking a holistic view of their health. We expect this sector will increasingly become the domain of pharmaceutical companies, businesses experienced in proving the health impacts of their products in a scientifically robust manner.

Implications: Consumers increasingly expect the food they consume to not only be healthy but capable of taking a role in enabling them to achieve lifestyle goals, creating opportunities for producers of active foods.

⁶³ <http://www.researchnester.com/reports/global-kombucha-market-analysis-opportunity-outlook-2021/66>



Other emerging themes...

Foods role as social connector evolves in a digitally connected society.

While we have never been more connected, the reality is we increasingly spend less time physically face to face with family, friends and colleagues than in the past. The art of conversation is being replaced with text messages and emojis, screens dominate day to day life and traditional sit down family meals are ever harder to lock into schedules. When people do come together it is often around a meal giving food a key role in connecting people and maintaining social bonds. The food that is served takes on more importance; consumers will seek out food that aligns with their values and ethics, that illustrates their affluence and success and, most importantly, indicates how much they value their family, friends or guests. Producers that are able to build a story around their produce that supports the messaging a consumer is wishing to communicate will be able to capture a premium.

Restaurateurs offer new dining paradigms to the market.

Television has created global megastars of chefs like Jamie Oliver, Gordon Ramsey, Wolfgang Puck and many others. It has provided these chefs, who have previously plied their trade in small kitchens outside the limelight feeding small groups of very affluent consumers, vast name recognition and more importantly potentially millions of consumers looking to try their food due to their personal brand. As a consequence, many of them are diversifying their businesses away from purely delivering Michelin starred food to white table clothed dining rooms and are creating new concepts designed to deliver high quality yet affordable food to the mass market. A good example of this is Gordon Ramsey's Plane Food, an outlet at Heathrow that provides an affordable picnic option to travellers departing on flights, as well as an experience of Gordon Ramsey's food. At the same time, fast food operators that have traditionally operated in the affordable food segment are looking to increase their average ticket value, using technology to enable consumers to design their own burger at the point of sale or through introducing gourmet ingredients and menu extensions.

There will be more passionate foodies in the future prepared to explore innovative food and beverage.

In addition to creating a plethora of celebrity chefs, food television has raised the understanding of the diversity of tastes, flavours and textures available across the world. It has created the first true generation of global foodies, people that are passionate about eating interesting, storied food and are prepared to explore and experiment to find new and unique food and beverage sectors. Sectors like wine, craft beer and delicatessen products demonstrate that a multi-billion dollar industries can be built on the back of producers that wish to experiment and consumers that wish to explore and make discoveries they can then share with friends (virtually or physically). The quest to discover new ethnic cuisines, unique flavours and innovative products will increasingly shape how people travel for holidays, the restaurants they choose to frequent and the retailers they purchase from.

Social issues re-shape the industry

The pressures on the agri-food system are increasing at the same time as almost 800 million people are under-nourished on a daily basis.

It cannot be overlooked that global population growth is predominately occurring in some of the poorest, most water-stressed, food-constrained regions of the world. The system is not delivering today; and yet it is expected to deliver more each and every day. This raises issues that will need to be analysed and addressed by communities around the world, if we are to produce the food the world wants in a sustainable way in the long term.

These are big issues that should not be left entirely to Governments to address. They require broad community responses. There are no quick or easy answers to many of these questions, but they cannot be ignored:

- How do we produce enough food while retaining the productivity capacity of our environment, our water and our oceans for generations to come?
- How do we help the 800 million under-nourished and hungry people on the planet to feed themselves on a sustainable basis?

- How far do we go in using emerging technologies such as genetic modification and cloning to produce the food the world needs (given that many of the technologies have been developed in recent years and their long-term effects are not yet fully understood)?
- How does the global agri-food system evolve against the background of uncertainty and suspicion arising from Brexit, terrorism, immigration concerns and a shift towards protectionism?
- How do Governments develop food systems that extend beyond their borders to achieve the food security they seek.
- How do we take steps to prevent people from eating and drinking themselves to death through over-consumption of unhealthy products (particularly from the most disadvantaged parts of our communities)?

It is unlikely we will ever have a truly sustainable food system unless we answer these questions, and collectively take responsibility to implement substantive solutions. Leaving these issues unaddressed will increase social imbalances across society, and all that comes with that. Growing food inequality will increase the risk of social unrest, economic migration and, ultimately, could lead to the threat of war and increased levels of terrorism.



People

To ensure healthy lives, knowledge and the inclusion of women and children.



Planet

To protect our ecosystems for all societies and our children.



Partnership

To catalyse global solidarity for sustainable development.



Zero Hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

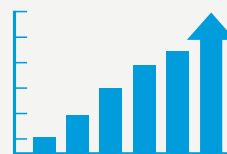


The Sustainable development goals include:



Dignity

To end poverty and fight inequality.



Prosperity

To grow a strong, inclusive, and transformative economy.



Justice

To promote safe and peaceful societies, and strong institutions.



Clean Water

Ensure availability and sustainable management of water and sanitation for all.



Unbundling GMO technologies

SHAPING MEGAFORCES



Government 3.0



Targeted education



Fusion revolution



Facing resource scarcity

Scientific development in the area of genetics has been dramatic in recent years. The ability to manipulate an organism's genome using biotechnologies that can reorder or change the genetic makeup of cells has made clear headway.

It is potentially creating game-changing solutions for many of the fundamental challenges facing the global agri-food system. It is now possible, or will soon become so, to engineer plants that have the ability to withstand drought, crops that are higher in beneficial nutrients and protein, and animals that deliver more food for the feed they consume.

Significant controversy still surrounds these technologies. However, a range of 'genetically modified' cultivars are now in wide use in some countries around the world (estimates suggest that there is currently around 180 million hectares of GM cultivars planted). Concerns are often expressed over the possible impact these technologies could have on human health and the environment in the long term. In response to consumer concerns, many countries continue to ban or heavily restrict the use of these technologies in the agri-food sector.

Those in favour of the technologies suggest consumer concern arises from a lack of education and understanding. Given that the science is highly complex, it is discussed in a highly simplified manner when addressed by the mainstream media. The term 'genetic modification' is a simplistic way to group a spectrum

of technologies that vary dramatically, both in what they do and how they do it.

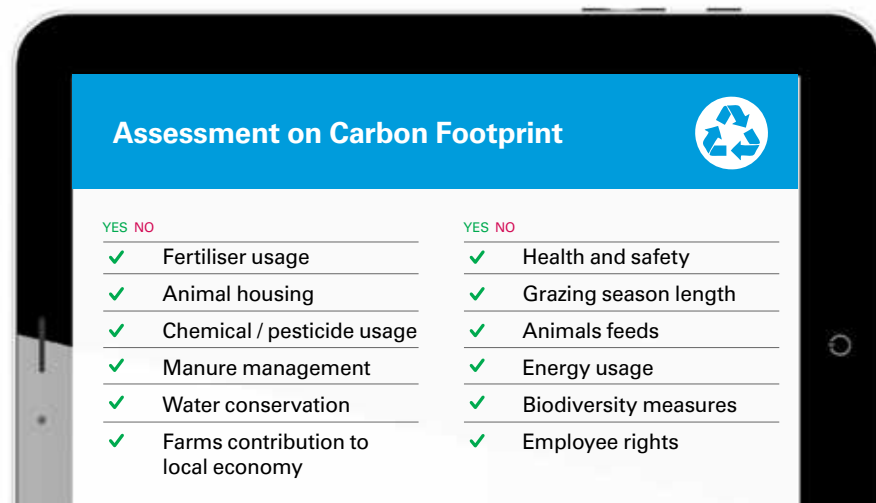
Some technologies are increasingly accepted around the world. Examples include marker-assisted breeding technologies such as **CRISPR-Cas9** (which simplifies and accelerates editing parts of the genome). Other technologies that have been developed are considered unacceptable and unnecessary by most people (transgenic animal species, for example and are yet to be widely commercialised).

We have become so used to grouping these technologies under the GM banner that any attempt to address them individually attracts suspicion that something is being hidden. In order to achieve a balance between community concern, consumer acceptance and economic wellbeing; perhaps we need to unbundle these technologies. That will allow us to better understand each technology, its individual potential and the associated risks.

A blanket restriction on using these technologies is unlikely to be sustainable in a world where scientific innovation progresses at speed. There is also an ethical issue; given the positive impacts the technologies can have on addressing food shortages in some of the world's most remote, unproductive regions. It is also fair to say

that a carte blanche acceptance would concern all but the most rationale, informed members of the science community. A balanced approach to assessing these technologies is required. The goal is to fully understand the tangible benefits and risks of individual technologies, while leaving individual countries to design a regulatory environment that respects the concerns of their own community.

Implications: Developments of genetic technologies offers the potential to address many issues facing the global agri-food system; but we require informed debate and better understanding of their long-term impacts.



Developing multi-dimensional ethical farming systems

SHAPING MEGAFORCES



Geopolitical instabilities



21st-century consumer



Climate changing



Social enterprise

Given that the agri-food sector uses so much of the available land and fresh water on the planet, it's not surprising that society wishes to hold it to account. The way in which producers manage these critical assets attracts greater focus than many other sectors of the economy.

Discussions occur on a regular basis around what an individual farmer or an industry sector must do to secure and retain their ticket to play in high value markets. The standards that have to be met to supply the highest value markets are continuously rising. It is no longer considered appropriate to waste natural resources, and those that do will lose their ticket. Consideration of what is and is not acceptable now extends across many areas of operation. Among other things, it includes an organisation's commitment to mitigate its carbon footprint, treat employees ethically, restore the native biodiversity of its land, and minimise antibiotic use for animal health maintenance.

These are not simply 'nice-to-haves'. Organisations that fail to meet expectations are actively being excluded from markets. In the past year, a number of palm oil producers that have continued to clear native forest have lost export market contracts; while seafood companies that have been identified as using slave labour have been excluded from markets.

Maintaining market access requires organisations to firstly define the standards they will meet; and then set mechanisms they will use to monitor and report their performance. The framework needs to be aligned to consumer expectations.

Origin Green, run by Bord Bia in Ireland, has created a programme that sees every farm and food manufacturing business setting clear targets around sustainability, energy, waste, biodiversity and social sustainability. The Irish approach has placed sustainability in its broadest sense at the core of their agri-food sector.

Supporting gender equality in the global food system

The traditional image of a farmer is the burly, rugged outdoorsman. The reality is different. More women work in farming than men; they number in the hundreds of millions. UN Food and Agriculture data suggests that more than half of all women of working age are engaged in agriculture in Southern Asia and Sub-Saharan Africa. Women play a critical role in sustainably growing food around the world – whether tending small holdings, producing food to meet their family's needs, and often producing additional supply that can be sold for an income. Growing global production relies on enhancing the working lives of women in agri-food.

Empowering women will materially increase the sustainability of the global food system. This requires tailored education in best practices delivered directly into local communities, micro financing structures to support investment in new technologies, and the enhancement of local enterprises that connect communities to a value chain.

Implications: To secure and retain access to high-value markets, there is a need to clearly demonstrate the steps being taken to continuously improve the efficacy of production systems.



The cost implications of poor diets are unsustainable

SHAPING MEGAFORCES



Government 3.0



The ageing generation



New wellness models



Targeted education

As healthcare costs spiral, Governments around the world are finding it increasingly difficult to continue to fund leading-edge treatments; while insurance premiums continue to rise due to insurers' rising costs. The consequence of this inflation is forcing some Governments to look at alternative approaches to funding healthcare.

We expect the focus of public healthcare investment will rebalance – moving away from a predominantly curative approach towards preventative care. The logic of such an approach is clear. It reduces the investment needed in expensive social infrastructure such as hospitals; as well as reducing the impact on productivity, and the social cost of illness.

The investment into preventative healthcare will include programmes to educate people about healthy living – the importance of good nutrition, the role of exercise, and the need to minimise inherently unhealthy products in their lifestyle (like alcohol, tobacco, sugars and fats).

We are already seeing initiatives to reduce the profile of unhealthy foods; such as advertising restrictions, sponsorship bans, and advisories on portion sizing. For those consumers who are not taking the carrot, there will also be a stick. Sugar, fat and other tax regimes will be implemented to impose a cost on those who are not prepared to change their habits around unhealthy food consumption.

France was the first to introduce a sugar tax in 2012. Other countries have followed suit, with the UK jumping on the bandwagon earlier this year, and the momentum for these taxes is accelerating rapidly.

This follows the approach many Governments have taken to minimising the use of alcohol and tobacco in recent years. With the rise of obesity and other preventable eating-related illnesses, many countries will adopt taxes and similar measures.

However it remains important the objectives for the tax are carefully thought through. The impacts on food producers – and not just those that grow the directly-taxed product – could be significant. Business models may need reassessment, and innovative product solutions developed. Ultimately, farmers may need to change what they grow or invest in programmes to reposition their products in the market.

The Lifestyle Wines

Research⁶⁵ programme in New Zealand is a good example of this, with the industry investing collectively to creating better low alcohol wines.

Implications: As Governments refocus on preventing illness, taxes and other measures will have material consequences on the producers of certain staple food products.

65 <http://www.nzwine.com/research/research-programme-1/major-programmes-1/pgp-lifestyle-wines-research-programme/>

Other emerging themes...

Waste minimisation and food recovery programmes will be driven by legislation and social enterprise.

The incremental demand for food over the next 30 years is well understood, as is the amount of food that is wasted. Around 70 percent more food is required, while around 40 percent of what is grown globally is wasted. Fulfilling demand without proactive steps to manage and reduce waste will place significant, and potentially unmanageable, strain on the global agri-food system. Reducing food waste is not rocket science, there are many low hanging opportunities; only buying and cooking what we need to eat, using apps that create menu's from what is left in their fridge, re-purposing close to expired food into recovery programmes, utilising ugly (or not perfect) fruit and vegetables and, potentially most significant, improving handling and logistics practices in emerging markets.

Governments are recognising the benefits inherent in reducing waste, with countries like France and Italy taking a lead in introducing legislation designed to reduce food waste by requiring excess food to be provided to community food programmes. However, the real drivers of waste reduction will be social enterprises, looking for ways to feed the 800 million that are hungry every night and minimise mortality from malnutrition. These enterprises (some with a solely social purpose and others a dual social/profit lens) are working with Governments, companies, community groups and others to design better ways to direct the food we grow into people's mouths rather than to landfill or compost heaps. KiwiHarvest (case studied at the front of this Agenda) being an example of a distribution initiative taking excess food to charities.

Sustainability of often poor and disadvantaged rural communities.

The economic prospects for urban and rural communities are often markedly different. Wages, living standards and access to social infrastructure usually being significantly greater in cities. The world is experiencing the largest rural/urban migration in history with no signs of it slowing down for the next 30 years. Consequently, talented young people are leaving rural areas to seek their fortune in the city. We should be concerned about the sustainability of rural communities; our food is grown in these regions and as the previous sections have illustrated food production is getting more complex and specialised every day. Without talented people in rural areas the chances of producing the necessary food becomes ever more remote. Priority needs to be placed on maintaining the sustainability of rural communities; ensuring they have the infrastructure (education, healthcare, connectivity, water) to retain (or attract) the necessary talent away from cities.

Protection of ecosystems is a given; restoration of biodiversity is being sought.

Farmers will regularly claim they are the world's best environmentalists, they argue they have no choice but to use their land sustainably as their future is dependent on being able to generate a living from it. The problem they face is that urban communities around the world are increasingly questioning their stewardship of the environment. Stories of water and riverbed degradation, excessive soil erosion, unwarranted use of fertilisers, antibiotics and chemicals and the adoption of monoculture reliant production systems have all raised deep concerns around whether farmers are the guardians of the land they claim to be. As a consequence the expectations being placed on farmers are becoming more explicit. It is no longer enough just to demonstrate a holding pattern in respect of the environment. Buyers want to know what is being done to enhance ecosystems, preserve natural biodiversity, minimise non-organic inputs, plant riparian strips. They are increasingly looking to understand the practical steps being taken to restore the native characteristics of the land.

More emerging themes...

Fair trade becomes a norm rather than a differentiator.

FMCG companies have built brands on the back of coffee, chocolate, cotton and similar commodities sourced through fair trade channels. Paying a fair price to the grower for a base commodity has secured a premium price at retail for the finished product. Consumers have been prepared to pay a bit more to a company doing the right thing. The question for many consumers has become why should some producers be paid more than others, through luck of geography, for doing the same job; is it morally robust for companies to under pay the majority of their suppliers because a fair price is being paid to a few. As this ethical dilemma bites, fair trade will progressively become the norm. The challenge for companies will be how they effectively differentiate their premium products. Maybe one clue to this is the farmers milk initiative in the UK, where consumers have the option of paying a bit more for the farmers milk, the premium being paid directly to the farmer to lift their earnings.

Reducing energy intensity of farming takes farmers off the grid.

For many farmers around the world, three cost items dominate farm working expenses: water, feed and energy. Generating a profit relies on each of these costs being tightly managed, driving innovation in each area. Much is being done to minimise the energy intensity of farming systems; both through reducing the amount of power utilised, as well as seeking ways to capture the sustainable, renewable power inherent in the farming system. The opportunities to utilise effluent, waste biomass, the sun, geothermal and growing plants to produce energy is enabling more farmers to move off the grid and make themselves energy self-sufficient. With oil supplies mired in political instability, the shift towards a low carbon economy is accelerating; producers around the world are starting to recognise the economic and environmental benefits of leading this shift.

Giving people trust the food is what it says it is.

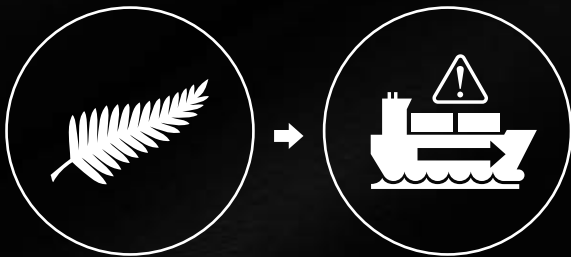
Most people in the developed world have grown up with certainty that the food inside the packet is the same as that described on the wrapper. Issues such as the horse meat/ beef scare in Europe, the blending of melamine into infant milk powder or, more recently, confirmation that much Manuka honey is not real Manuka honey, have highlighted what the emerging world has known for a while; there is money to be made passing cheaper product off as a high value food. The forgeries often go too far and people become ill (or die) from unsafe food. As trust in the authenticity of food declines, consumers will pay a premium for certainty over a product's integrity. Technologies including Blockchain (the digital tracing technique underlying Bitcoin), chemical fingerprinting of products and digitally unique labelling systems, as well as enhanced physical security of products as they move through a value chain, are being implemented to ensure the customer gets the experience they have paid for when they come to enjoy the product.



It's not about ideas.
It's about making
ideas happen.

– Scott Brinker, Author

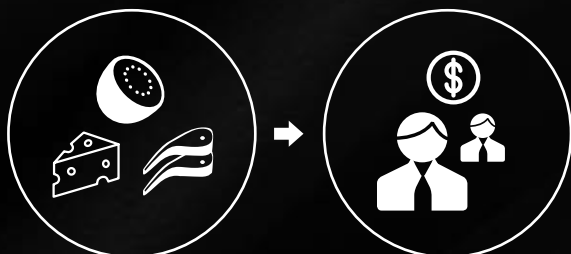
Where are our products going?



In 2015 New Zealand exported a total of:

\$37 billion

worth of agri-food products.



Most of our products are sold to middlemen and distributors.

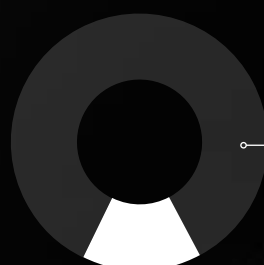




KPMG estimate our products generated more than:

\$250 billion

(\$0.25 trillion) of retail sales when on-sold to their ultimate consumer.



Potential to capture more value

This means the New Zealand primary sector captures less than 15% of the value we grow.

Something must change!

New Zealand today: a snapshot

(as at 30 June
2016 unless
stated otherwise)

Our population of 4.69 million
is growing at 2.1%⁶⁶



\$54,177 GDP
per capita



\$248
billion

Gross Domestic Product
of \$248.7 billion is
growing at 2.1%.⁶⁷



131,000
unemployed

131,000 people are
unemployed (5.1% of
labour force) and 342,000
people were under-utilised.



1.8%
wages

Average wages
increases are 1.8%
per annum.⁶⁸



\$258.4
billion debt

The total external debt of
New Zealand is \$258.4
billion, an all-time high.⁷⁰



AA+
rating

Standard & Poor's
has given New Zealand
an AA+ rating.

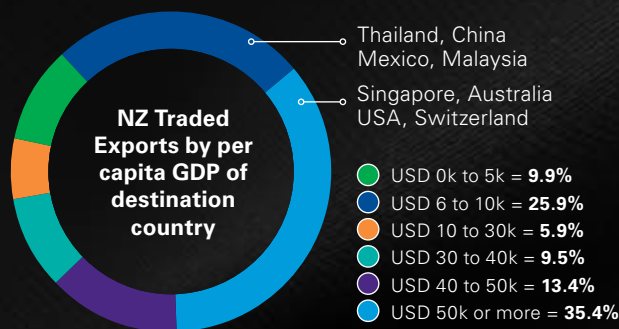
⁶⁶ http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/NationalPopulationEstimates_HOTPA30Jun16.aspx

⁶⁷ http://www.stats.govt.nz/browse_for_stats/economic_indicators/GDP/GrossDomesticProduct_HOTPJun16qtr.aspx

⁶⁸ http://www.stats.govt.nz/browse_for_stats/income-and-work/employment_and_unemployment/LabourMarketStatistics_HOTPJun16qtr-incl-HLFS.aspx

⁶⁹ KPMG analysis of Statistics NZ and World Bank data

⁷⁰ <http://www.tradingeconomics.com/new-zealand/external-debt>



More than half of our tradeable exports are sold to countries with GDP per capita below US\$40k, and 36% to countries with this measure below US\$10k.⁶⁹

60% with FTA deals

Almost 60% of tradeable exports are sold to countries we hold FTA's with.

42,000 homeless

Average house prices have increased by 13.5% in the last year to an average of \$591,000.⁷¹ We have around 42,000 homeless people.



Heart disease

Every 90 minutes, one New Zealander dies from heart disease.⁷² We have the third highest rate of obesity in the world, with 27% of adult population defined as obese.



Ranked 17th in technology

The World Economic Forum ranks New Zealand 17th in the world in preparedness to reap the benefits of emerging technologies and digital transformation.⁷³



Goodest Country

New Zealand is the 12th Goodest Country for the World⁷⁴ and ranks 4th in terms of transparency perceptions.⁷⁵

⁷¹ <https://www.qv.co.nz/resources/monthly-residential-value-index>

⁷² <http://www.heartfoundation.org.nz/know-the-facts/statistics>

⁷³ http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

⁷⁴ <https://goodcountry.org/index/overall-rankings#>

⁷⁵ <http://www.transparency.org/cpi2015>

The future is not pre-determined

Most people don't agree with everything we have written in the *Agribusiness Agenda* since 2010. Yet, like us, most people do recognise the potential inherent in New Zealand's primary sector. Most people also recognise that our sectors are not capturing as much of the value they grow as they should.

One of the most common questions we are challenged on is that it while it is useful to write the reports, what do they actually achieve in making substantive changes? How do they increase the share of the value that we capture? Are they not just further contributions to the well-meaning but ultimately ignored dusty piles of reports that have argued for change over the decades.

Put simply, people are asking how we overcome the inertia and get the important stuff done before it is too late.

The first section of this Agenda has articulated a global future of the agri-food system that is very different to the reality we have been comfortable with for many decades. It presents a series of opportunities to the New Zealand primary sector that are unique to this point in time.

We have built the primary sector on a platform that is starting to smoulder as change globally accelerates. Fuelled by innovative people, new money and a wealth of opportunity; the platform is on its way to bursting into flames. Change is not a nice-to-have, or something that is turned to once business-as-usual has been seen to.

It must become business as usual.

However, we face the triple challenges of **comfort** with the status quo, **complacency** over the speed of change, and **concern** over taking a different course to our competitors. This may mean that we don't make the changes necessary to future-proof the primary sector, or capture our share of the value that we grow. The risk is that we fail to create an economy that enables our children and generations to come to live secure, prosperous lives here in New Zealand.

The only thing certain about the future is that it will reflect the actions and decisions we each make.

The future is not pre-determined. Everybody has a role to play in shaping how it plays out for their country, their communities, their organisations and themselves. As the platform the primary sector has been built on over the last 150 years gets warmer under our feet, now is the time to stand up and take the brave, bold actions that will shape the kind of New Zealand we want to leave to the coming generations.





Introducing our possible futures

This section of the *Agenda* presents three views of the future, and uses the 'pre-mortem' approach introduced to the Te Hono Movement at Stanford University to explore what the future could look like. Pre-mortem involves the creation of short stories that provide an articulation of what needed to happen for the inevitable outcome (the defined scenario) to occur.

The scenarios all describe a possible future for New Zealand in 2036. They all assume:

- that the exponential speed of **technological innovation** we currently see continues throughout this period;
- that **climate change** develops in accordance with IPCC expectations and the consequent transition to a global low carbon economy accelerates;
- that concerns about **immigration and globalisation** slow the speed of global integration but despite this we avoid the outbreak of a global war; and

- that the **volatility in day to day to life** that has become so pronounced in the last few years (the terrorist incidents, disease epidemics, cyber uncertainties and economic insecurities) continues to provide an unstable platform for investment but will reward those prepared to take on some risk.

All the scenarios are also built from the reality of where New Zealand sits today; as a small developed country that it doing well but not brilliantly, as the statistics on the previous pages illustrate.

We are a country that has always had greater global impact than our size would suggest and is generally seen as being good for the world. Yet in a fast-moving, rapidly changing world, it becomes ever-harder for a small country at the bottom of the world to retain its relevance; particularly as other countries emerge with the scale and connectivity to take our seat at the most important tables.

Overview of the future scenarios



Future Scenario 1:

Complacency reigns

New Zealand continues to grow and export agri-food commodities, but each year, more family farmers leave the industry as the returns they make fall short of providing a livelihood.

There are still some good years – when supply fails elsewhere in the world – but these don't seem as regular as they used to be. Most years are hard...yield growth has not kept pace with global competitors, wetter weather adversely impacts production, and more customers choose not to buy New Zealand products because of the environmental and ethical tainting that many now associate with them.

The years of 100% Pure New Zealand driving growth in both tourism and agri-food demand are long gone. The future of New Zealand's primary sector largely seems to be as a land bank for a series of absentee landlords (some of the largest global investment funds). They recognise the long-term value inherent in good quality land with reliable water supply (and the hedge it provides to some of their more risky investments in high-growth markets around the world). The New Zealand economy is under increasing pressure from a growing aged population and high youth employment. Young people are packing up and seeking their fortune overseas; and there is no incentive to seek a career in the primary sector.

Future Scenario 2:

Traction for change comes...for some

After years of hard effort, the New Zealand primary sector recently came together to celebrate the 25th anniversary of the first Primary Industries Boot Camp (Te Hono Movement) at Stanford University.

Focus is placed on the outstanding successes that have been achieved by certain industries – those that left their differences behind, and worked collaboratively to capture the opportunities the agrarian revolution offered ambitious companies. This growth was not reflected across all sectors, however. While it was left unsaid on the evening, everybody knew that only around 30 percent of farmers have benefited from these collaborative initiatives.

Too many organisations have failed to recognise the market transformations happening around them, and simply stuck with the status quo. Many of these businesses have subsequently found themselves in foreign ownership, and are again suffering from a sharp downturn in prices. The global uptake of emerging agri-technologies, means international yield growth continues to outpace the yields available to New Zealand farmers given the climate instabilities they have to deal. The Minister also noted in her speech that the industry had recently reached the aspirational double exports target of \$68 billion set in 2011, successfully creating 35,000 jobs. She failed to acknowledge in her comments that achieving these targets had taken ten years longer than intended.



Future Scenario 3:

We must be on the leading edge of change

The turning point was the Great Muster of 2017. The vision adopted and the commitments made that week triggered a huge collective effort, and built the platform for massive growth in the value of agri-food exports from New Zealand.

Industry leaders had agreed to target an ambitious goal: to secure 45 percent of the value that a product grown in New Zealand creates through its value chain. This has been surpassed as smart technologies, deep collaborations, ambitious talented people and deep market insights have transformed the DNA of the sector.

The industry's right to exist is no longer called into question. It is seen as the best in the world at balancing the needs of the community, and the environment, delivering a sustainable economic return. The sector is the first-choice employer for students as they leave education, with more than half of those graduates taking science-based roles. It has fostered an innovation ecosystem that is attracting major international companies to site research centres in this country, and it provides significant growth capital for start-up businesses. Exports have recently exceeded \$100 billion and it is estimated 250,000 high-paying jobs have been created in 20 years.



Unpicking Future Scenario 1:

Complacency reigns

Quick recap

The primary sector remains focused on commodity products, but is finding it increasingly difficult to make a return as a result of competition and climate change.

Reputational damage means New Zealand is no longer seen as a leading producer of sustainable food.

Poor returns are forcing family farmers out the industry with more land being banked by absent, overseas investors.

The sector's challenges are impacting the performance of the domestic economy, and forcing young people to leave to seek employment overseas.

The pre-mortem – how did we get here?

The export statistics for the year to June 2036 provided little relief to farmers. They had seen their incomes decline over the last decade, despite global food prices again reaching record levels. Exports were up, a little bit, but the industry had been stuck around the \$45 billion level for years. There was one boom year in 2031, when dairy and beef prices had peaked in the aftermath of the great Asian drought. The windfall gains earned that year had fuelled a short-lived confidence that finally things were turning.

In fact, life had not been good for more than 20 years. The downward trend line can be extended back to the dairy price crash between 2013 and 2016, and the response of organisations to this event. Given the political and social turmoil that was unfolding around the world at that time, many organisations stepped back from higher-risk market growth initiatives as they sought to stabilise their finances during this period. They chose the lower-risk path of working the land harder and maximising production. While this recovered earnings in the short-term, it meant our companies reduced their customer-facing investment at a critical time.

The consequences of this understandable reaction to the crisis were significant. The industry was less

connected to customers when competitors were introducing new products and service innovations faster than at any time in history. The rapid evolution of alternative proteins from plants, insects and cultured cells disrupted traditional sources of protein far faster than anybody expected; creating real questions about the efficacy of the naturally-grown products New Zealand continued to sell to the world. These questions became increasingly harder to answer, as the industry continued to focus on maximising production.

Political pressure had been building for some time about the lack of stewardship farmers and growers were demonstrating over the natural environment. The quest for ever-greater production by financially stressed farmers brought these concerns into greater focus. In response to community pressure, the popular Farming Reform Act 2021 placed a new regulatory framework around land use and farming activities, as well as introducing farmer licensing and an onerous reporting framework. These measures effectively wiped billions from land values. The rules also prevented any further irrigation and aquaculture development, and restricted most Government R&D investment, except for that related to climate change.

In effect, the community had made a decision to withdraw the sector's license to operate. As a result, production began to fall and incomes began their inexorable run downwards. Declining profitability made it difficult for companies to pay competitive wages to retain good people, or invest in developing and marketing innovative products. Rather than continuing to struggle to make a living, an increasing number of farmers made the decision to seek the best available price for their land instead.

While popular support for the reform bill had been significant, it quickly became apparent that the contribution the primary sector had made to the overall economic wellbeing of New Zealand was much greater than anyone in urban regions had understood. The reduced production resulted in a drop-off in economic activity that was estimated to reduce GDP by around 2 percent. This meant the country spent much of the decade battling recessionary pressures, instead of benefiting from the global growth driven by the 'agri-food decade'. This had flow-on impacts throughout the economy; as unemployment costs grew, our young people left to seek work offshore, and the ageing population suffered huge losses to their retirement savings.

The learnings



1.

We cannot afford to become disconnected from our markets.

While markets have never been static, they are changing at a faster pace today than at any point in history. Investment in initiatives that enable organisations to deeply understand and interact with customers are critical; and building deep relationships requires commitment through both the good and bad times. Walking away when things get tough may make recovering the relationship in the future impossible. The reality for most exporting organisations is that investment in key relationships is a fixed rather than variable cost.



2.

New Zealand agriculture relies on sustaining the support of the whole community.

Preserving the license to operate is critical to maintaining a viable productive sector in this country. Reaching out to the wider community to help them understand more about the industry, and the contribution it makes to New Zealand, is also important in shaping their perspectives of the agri-food sector. Understanding the perspectives of the wider community in key areas – such as water quality, animal welfare and production intensity – is critical to ensuring our land is used in an optimal, sustainable manner. Sharing our views will ensure a more balanced assessment of the care and responsibility that producers take in preserving the productive capacity of their land.



3.

We cannot put our heads in the sand in the face of emerging technologies.

History shows us that New Zealand farmers have failed to recognise the disruptive potential of a new technology to the long-term viability of their business in the past. ("Exhibit A" is the threat of synthetic carpets to the coarse wool industry). We are entering an era when technologies that appear synthetic and unnatural in comparison to their traditional equivalents are emerging into the market (such as animal proteins from plants, insects, and cultured cells). Yet these products are addressing many of the concerns consumers have about natural foods. Industry organisations simply cannot assume these technologies will fail and not disrupt traditional markets. Instead, their plans and strategies should look at the opportunities these products present; both to lead the disruption, and differentiate the products we have traditionally sold into export markets.



4.

One good year does not make a trend.

There has been much talk in recent years about the need for the industry to disconnect from commodity product streams and do more to create value-add products. This has been largely driven by low commodity prices for key export products like dairy and lamb. The reality, though, is that when prices recover (as commodity prices inevitably do), the driver for change often falls away and nothing happens. The changes required to create value-added products are difficult, and they can take years to complete. Decoupling organisations from commodity value chains to the necessary extent requires deep commitment. It is important that the momentum for change is not lost, once again, in the temporary excitement of an improved dairy pay-out.

Traction for change comes...for some

Quick recap

A group of foresighted organisations collaborated extensively to take advantage of market opportunities created by rapid changes in technology. They have grown a significant value for all their stakeholders.

Many other organisations have tried but failed to collaborate effectively, and are relying on their existing business models. They continued to generate results reflecting the peaks and troughs of the commodity cycle. Some companies have ended up in foreign control.

Aspirational targets for the growth in the value of exports and the addition of new jobs to the sector were achieved, but it took 10 years longer than planned.

Climate change and the uptake (or lack thereof) of agri-technology will have a material impact on whether New Zealand farmers secure the same yield benefits as competitors around the world.

The pre-mortem – how did we get here?

The rush of the season launch was as spectacular as ever for the team at Fresh Fruit New Zealand. This is the collaborative marketing entity connecting consumers around the world to the compelling story of New Zealand's artisan-grown fresh fruit bowl. It was the fifth consecutive season that unique cultivars had been introduced, and once again, global media had come to Hawke's Bay to report on proceedings. The event has become the horticulture equivalent of the Cannes Film Festival; with growers, the world's media, and celebrity brand ambassadors all mixing comfortably. The industry was on track to achieve \$20 billion of exports for the 2036/37 season, leaving no question it had become the biggest agri-food sector in the country.

Twenty years earlier, the fruit sector had benefited from having a group of far sighted leaders that recognised the benefits of pooling their consumer insight and market development efforts. Such a strategy would amplify the number of consumers they could tell their story to. As consumer preferences have evolved, the way the sector grows and shapes its product portfolio have changed markedly. Collaboration has extended beyond marketing; as organisations have looked across their value chains and sought to collaborate

wherever it would increase the value captured for their stakeholders.

The fruit sector's journey to global supremacy was in stark contrast to many other sectors. Deep collaboration has given the fruit sector the requisite scale to move with speed and take large risks; the kind of risks that would have been passed up had companies been left to do the project themselves. While many other sectors had talked about collaborating, it has rarely been more than conversations and meetings. There has been no driving desire to do things differently. The leadership needed to cut through the practical and political challenges of true collaboration has often been missing across much of the industry.

These other sectors remain plagued by the two-steps-forward-three-steps-backwards approach; as commodity markets turn against them, or a breakthrough innovation is introduced to the market by a competitor. While these organisations have taken similar actions to companies in the fruit sector, they have been unable to achieve comparable success. Despite investing in market insights and introducing innovation, they have never been able to 'get all their stars to align', leaving them to compete in volatile

commoditised markets. The inconsistent returns have further slowed progress; as farmers became cautious about investment, and organisations reduced their commitment to innovation and consumer connectivity.

Many of these companies have gone into global markets under their own steam. They have lacked the scale to get noticed by premium consumers, despite often having well-designed, ethical and sustainable products. Over the last ten years, many of these organisations have been approached by overseas buyers that saw more value in what they were doing than the company could ever hope to realise for its stakeholders; and the businesses have been sold.

In some circumstances, the new owners were better positioned to connect the product to high-value market opportunities and had driven sustained growth in exports. The major honey sector investments by global pharmaceutical companies were a good example of this. Other foreign owners have focused on product offtake to address domestic food security issues, leaving some sectors largely stuck in a commodity supply cycle, with little prospect of change in the foreseeable future.

The learnings



1.

Pivotal leadership that sets the beat of an organisation.

A pivotal leader defines an organisation's strategy, articulates its culture and leads its team towards their goals. This leader sets the rhythm of the organisation, its focus on core purpose, and the speed at which it advances new opportunities. During periods of significant change, such leaders are willing put personal interests to one side and do what is best for the organisation. For some leaders, this may mean accepting there are others better-placed to lead the organisation through the change (due to capability, commitment to the change, dogmatic relationships with stakeholders, or expectations over their remaining tenure). They are prepared to step aside to let someone better equipped take the reins.



2.

Deep substantive collaboration is difficult, and requires buy-in across the organisation.

Many New Zealand businesses talk about their collaborative activities, but these are rarely in areas that are core to the business or its success. Collaboration has been used to extend ranges, access new markets or outsource non-core activities; generally parts of the business with limited impact if something fails. Many organisations lack the scale to maintain world class capability in all areas that are critical to meeting and exceeding their customers' expectations that well selected collaborative partners could provide. Recognition is necessary that deep collaboration involves taking risks with a partner in core areas of their business; and accept it has a fundamental role in creating innovative and competitive products and services.



3.

Foreign ownership creates value (when the investor's objectives are aligned with producers and the wider community).

The dialogue in New Zealand surrounding foreign investment is largely driven by fear; fear of what is being 'lost to' or 'taken' by the international investor. There has always been a reliance on offshore investment in this country. With the extent of the opportunities available to the agri-food sector today, significant value can be created from partnering with an aligned international investor; one that brings not only equity, but access to innovation, brands, consumers and even regulatory reform. We need to acknowledge that owning part of something successful and growing is preferable to owning 100 percent of an organisation unable to take advantage of the global opportunities.



4.

Agri-food products can also be global brand success stories.

As we have noted in previous *Agendas*, we need to make our food, fibre and timber products the agri-food equivalents of the Apple iPhone, the Louis Vuitton handbag, or the Rolex watch. New Zealand companies have historically been good at investing in tangible assets, such as processing equipment, but have under-invested in the intangible areas, such as brand-experience to secure price premiums. Future investment must be directed into delivering branded consumer experiences around the world. Imagine if the global launch of our new season products engendered the same excitement and celebration that New Zealanders currently experience at the start of the Bluff Oyster season.

Unpicking Future Scenario 3:

We must be on the leading edge of change

Quick recap

The industry took responsibility for developing a compelling and engaging vision of its future, and articulated how it will contribute to a more prosperous future for all New Zealanders.

Organisations have focused on their value chain and thought about what could be possible. Analysis of where returns fall led to business models being redesigned so our organisations could own more of the steps that generate value.

The primary sector is seen as a positive contributor to the wellbeing of New Zealand, and is a trusted steward of our natural environment.

Organisations in the sector are viewed as the employer of choice, particularly in science and technology areas. This has created an ecosystem that is attracting global organisations to invest in research facilities here, supporting a rapidly-growing a disruptive technology eco-system.

The pre-mortem – how did we get here?

The year 2035 was a landmark year for New Zealand's agri-food sector – when it broke the \$100 billion export barrier, creating over 18,000 jobs in the year, and adding more than \$4 billion to GDP. It was the latest in a hot streak of positive years. It was the result of two decades of ongoing hard work and sustained efforts to differentiate New Zealand-grown products on the world stage.

The pain farmers had suffered during the 2013 to 2016 dairy crisis set the industry on a course that delivered these achievements. A strong message was sent to industry leaders during that period: farmers never again wanted to be left facing financial ruin as commodity markets collapsed. This was the catalyst for a culture change initiative that has progressively transformed every aspect of the primary sector's ecosystem. It brought a common focus and dynamism to the actions of the majority of participants right across the industry.

The mood for change saw all stakeholders – from farmers to company leaders, suppliers to regulators, politicians, financiers, iwi and community groups – come together at a pan-industry forum (later dubbed the Great Muster). The Muster sought common ground between these diverse groups. By the end of the week, delegates were working to articulate how the primary industries would have to fit within a long-term vision for a more prosperous New Zealand.

The most durable common ground identified was the universal willingness to build a country that would enable our children, grandchildren and subsequent generations to build successful, sustainable and fulfilling livelihoods in New Zealand. As the massive opportunities for New Zealand's food, fibre and timber industries became apparent over the course of the week, so did the impediments to realising their potential.

To avoid the Muster being another talkfest, it ended with a pledge day. This saw Government, companies, political parties, Māori organisations, community groups and individuals commit to take actions within the next 100 days to address impediments, and start working towards the future.



The passion generated at the Muster meant that people delivered on their pledges. Within six months, major initiatives had progressed meaningfully. In many cases, these initiatives had been talked around for some years, but had been tied up in politics and bound in red tape. They included:

- restructuring education to incorporate agri-food into school curriculum's; as well as create a world-class, multi-campus agri-food tertiary education system with a footprint in all main centres, including Auckland;
- development of a national master brand ('The source of wellbeing'), built on deep consumer insight and incorporating world-leading ethical production values and authenticity tracking systems;
- initiatives to position New Zealand as a good country for the world, including a programme empowering young people to solve some of the major malnutrition problems inherent in the global food system; and
- establishment of an investment fund, which ultimately raised \$1 billion, for investments here and around the world in early-stage technologies that provide our companies with first access to game-changing innovations.

As of 2035, the journey is just 20 years in. There is still much to be done – there is scope to delink more products from commodity markets, get even closer to consumers, find new collaborators and evolve the products offered to the market. Not every person or organisation got on board straight away, but as the transformation has progressed, the coalition has widened and expectations for growth are robust.



The learnings



1. Everybody has the ability to shape their future by the actions that they choose to take.

Ambitious people, organisations and countries do not leave their future success to chance. They articulate their vision and determine the actions that they need to take to realise it. For the primary sector, this means all stakeholders in an industry can help shape its future. Complaining about prices from behind the farm gate must be replaced by proactively participating in industry initiatives which increase connectivity with consumers and create greater value for all. The more people that align to a common vision and take ownership of the future, the more transformational the outcomes will be achieved.



2. The Government is not responsible for driving change but can enable organisations to shape their own future.

We regularly hear people suggest the Government should do this or fix that and everything will be perfect. Government can only ever be an enabler of change through the policies it chooses to adopt. The Government does not decide what to grow, but it can encourage high value development through its positions on land use, water, market access, employment and many other issues. We are lucky to have open channels to government, where issues can be raised and resolved in a constructive manner. As a consequence it can be easy to see the Government as the answer to every problem. Realising the opportunities inherent in global markets lies within the people and organisations in the industry, Government can facilitate the journey but should never be expected to lead.



3. Old world institutions need to evolve in order to create future success.

We created our schools, universities, research institutes, co-operatives, and industry good organisations over time; in response to market needs and opportunities. As these institutions develop their own traditions, they can become inflexible and continue to solve the problems they were created to address, rather than the challenges facing us in a disrupting world. Moving into the new world, it is important we learn from the past while recognising it may no longer be a reliable indicator of the future. Being prepared to challenge sacred cows and do things differently – whether in the way we structure tertiary education, or collectively invest in research – will be important to maintaining fit-for-purpose institutions.



4. We rely on everybody doing the right thing (thus we must define what the right thing is).

The more product we sell through premium channels, the greater focus that falls on producers, processors and supply chain partners to 'do the right thing' across the supply chain. The challenge lies in defining what this is – given that it is not static, and evolves consistently. The ability to capture a premium relies on everybody being clear on what is expected of them, and being able to demonstrate that they meet these expectations. The Irish food sector has developed Origin Green to link the expectations of consumers to their producers, and provide a mechanism to constantly lift standards and verify compliance. Ensuring our industry has a tailored framework that provides clear definitions, and certifies compliance, increases the chance of success.



5.

Access to game-changing technology is critical to securing market leadership.

The only certainty for the agri-food sector is that humans will always need sustenance. However the form this could take may bear no resemblance to food we have traditionally eaten – meaning the biggest disruptions could come from outside our traditional markets. Maintaining wide foresight of new innovation is critical; as is the need to gain early access to game-changing solutions. To maintain or develop market-leading access for our products, we need a collaborative investment vehicle that can secure first-mover access to the most promising transformational technologies.



6.

Being perceived as a good country will create long-term benefits for New Zealand.

The global agri-food system faces significant challenges providing a growing population with the nutrition it needs, let alone the nutrition consumers demand. New Zealand will never be able to feed the world, but we have to have to play a role in helping the world to feed itself. The industry needs to work collaboratively to identify ways it can deploy its intellectual property, talented people, supply chain relationships and passion for food to create substantive solutions that benefit the world. Such actions add further depth to the authentic stories that underlie our products and help position our industry as a supplier of choice and an employer of choice.



7.

Rather than wait to get everybody on board, move forward with those who are committed to change.

History suggests that New Zealand's agri-food industry is comprised of a very broad church. Different groups and individuals view the opportunities available in very different ways. While it would be powerful to have wide consensus over the future, and the resulting strategies that should be prioritised, the likelihood of achieving this is remote. Yet disruption is continuing at pace – and every day a change is deferred, it reduces the potential impact that change will have. The time to act is now, working with 'coalitions of the willing' who can find common ground and are prepared to back an initiative and move forward. If it works, others may be able to join over time. If it fails, we need to capitalise on the learnings it provides to inform future initiatives and try again.



8.

We need governors connected to the future who are able to balance risk with the need for growth.

The current environment challenges governors to remain relevant, despite being called consider issues that are not necessarily within their sphere of experience and knowledge. The reality for many is that they honed their skills in an analogue world, but are now being asked to lead in a very different digital environment. While their critical leadership skills are still relevant, they may require additional support in some aspects of decision-making. For instance, organisations may need to access specialist knowledge to assist in the consideration of specific proposals. Future governors will also need to be clear around their highest priority risks, in order to pursue growth initiatives at the speed necessary to secure an advantage.

Making things happen relies on all of us

Reaching \$100 billion of exports in 20 years is undoubtedly the proverbial BHAG (big, hairy, audacious goal). But when we break it down into annual packets of 4.85 percent of growth, the target does not seem so dramatic.

While it is a significant challenge to sustain such rapid growth, year on year, for two decades; it is achievable in the context of the global market. Premium consumers are valuing provenance, safety and innovation over mass-produced food every day of the week.

The key to unlocking this kind of sustained growth is simple; it relies on every single person in the industry. It lies in the passion they have for the food, fibre and timber products that they grow, process or sell to the world.

It is their desire to be part of building an industry that is good for New Zealand, and good for the world.

New Zealand already grows some of the world's finest produce. However this inherent value will only be fully realised when the quality is backed by a powerful provenance story.

Deep in the waters of the South Pacific, there is a natural, beautiful land. Rich in natural resources, its producers balance this sustainable abundance with the use of innovative technologies.

A country that is prepared to stand out, that will zig while others zag. This small nation is a respected global citizen, making a contribution to securing a more equitable world for all. Always the first country to see tomorrow, it welcomes visitors with open hearts and open minds.

The future lives in the hearts and minds of each and every one of us. The only thing preventing New Zealand from realising a bold vision for its future is complacency.

Tomorrow will likely look very different from today. Let's not wait to find out how different before we act.

Achieving **\$100 billion** of exports requires **4.85%** compound annual growth for the next **20 years**.

This will not be delivered by the status quo.

Where might growth come from?



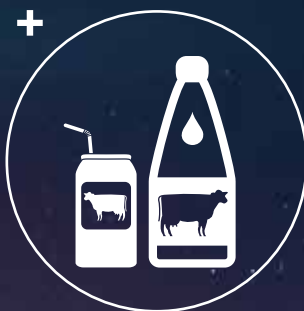
Advanced **bio-engineered** products derived from timber and other biomass



Alternative forms of animal dairy **protein** (particularly sheep and goats)



Storied, chilled, 'free from' **beef and lamb** cuts



Liquid **dairy** nutrition solutions



An expanded and more diverse **aquaculture** sector



Pharmaceutical and nutraceutical foods produced from **native flora** and fauna



Poultry products – eggs and meat leveraging NZ's **disease free** status



New varieties of fresh fruit and vegetables



Medicinal **plants**



Artisan and craft products, such as hops, cider, cheeses and pork products

Realising opportunities in a disrupted world

Our disrupted world requires every business to think differently. At KPMG we recognise our clients are looking for more than our traditional services. We are investing heavily in bringing experts into our business with the skills to help our clients prosper into the future.

Our clients are looking for different perspectives and insights to help them understand the opportunities ahead, while bringing fresh approaches to working through challenges. We then help put this thinking into action – whether that's refining the infrastructure to deliver or mapping the flight path for a changing world.



Trevor Newland
Partner
Audit



Riria Te Kanawa
Director
Performance



Joe Hanita
Associate Director
Performance

Māori Business Team



We are committed to helping businesses like yours fulfil their potential. Our Enterprise DNA programme is based on 8 traits that high performing businesses share, over the course of the programme we work with you to build these traits into your business and enable your high performance. If you are enthusiastic and open to change in order to get to the next step on your journey, we can help.



Paul McPadden
National Managing Partner
KPMG Enterprise

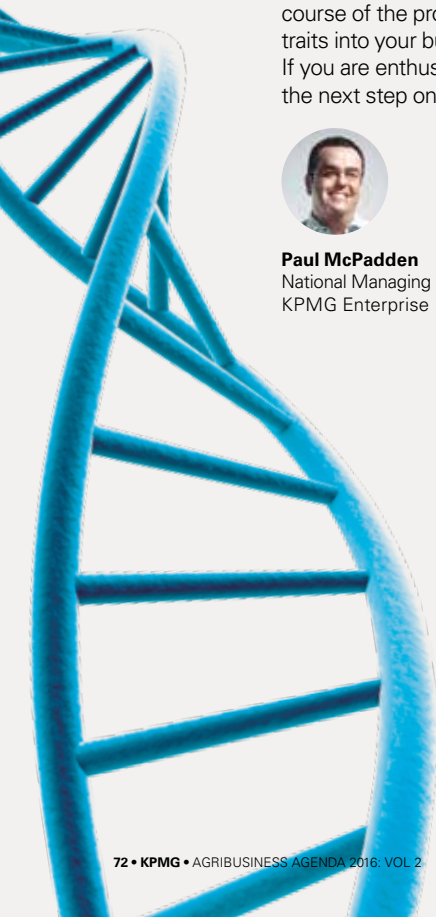


Andrew Hawkes
Partner
KPMG Enterprise



Richard Campbell
Director
KPMG Enterprise

Enterprise DNA



The NZ Innovation Council is a national innovation and business growth community that helps provide a supportive eco-system for Kiwi companies to connect, innovate & grow. Programmes include forums, nationwide access to experts, investor introductions, online business resources and events; the NZ Innovation Awards and Innovation Heroes series, that celebrate and profile kiwi innovators. For more see innovationcouncil.org.nz



Louise Webster
Founder & CEO
NZ Innovation Council



Andy Blackburn
Director
NZ Innovation Council



Digital futures and foresight

Traditional and proven approaches are falling short in the face of disruptive technologies and new business models. The digital foresight approach provides the foundation to achieve innovation, agility and readiness for emergent change. It enables leaders to explore future worlds and develop a collective understanding of preferred scenarios. Only by continuing to engage in such future-focused thinking can leaders ensure they take advantage of emerging technologies and avoid being surprised by underlying trends, uncertainties and disruptors.



Stephen Graham
Director
Digital Strategy

estute+

Estute+ believes in New Zealand as a world leader in developing and exporting exceptional products to consumer markets. Being results focused we assist you to identify, qualify and quantify your customers, markets, channels, segments and product plans to drive profitable growth.



Vanessa O'Neil
Director
Estute



Patrice Feary
Director
Estute

Cognitive and Analytic Platforms

The future will belong to those who harness data and use it to fuel innovation. Bring this to life with rapid time-to-value by leveraging Cloud Cognitive platforms. By combining the data from all kinds of sensors (Internet of Things) with cognitive technologies such as machine learning will result in new insights and possibilities.



Andrew Tubb
Partner
Advisory



Mike Clarke
Partner
Advisory

KPMG

Farm Enterprise

Farm Enterprise combines a practical knowledge of farming with a real passion for helping farming businesses evolve and thrive in the fast changing world of food and Agribusiness. We work alongside farmers tailoring practical solutions that inspire them to find opportunity in challenge and set themselves up to succeed.



Roger Wilson
Partner
Farm Enterprise



Brent Love
Director
Farm Enterprise



Julia Jones
Specialist
Farm Enterprise

Strategy and Performance

Growth is usually one of the top agenda items for CEOs. Companies are targeting aggressive growth strategies in response to structural shifts caused by new technologies, changing regulations, evolving customer needs and sector convergence. However, realising growth is extremely challenging – with the majority of organisations unable to achieve and/or sustain their growth ambitions.



Simon Hunter
Partner
Performance



Tuhi Isaachsen
Director
Performance



KPMG growth solutions

Growth is usually one of the top agenda items for CEOs. Companies are targeting aggressive growth strategies in response to structural shifts caused by new technologies, changing regulations, evolving customer needs and sector convergence. However, realising growth is extremely challenging – with the majority of organisations unable to achieve and/or sustain their growth ambitions.

KPMG's growth solutions allow organisation to create memorable customer experiences, foresee disruptors, deliver innovation and design and implement strategy in order to drive and sustain growth ambitions.

Customer experience insights, strategic foresight and innovation are all required for a robust approach to growth strategy.



Achieving and sustaining growth ambitions is a challenge for businesses across industries and sectors.

KPMG's growth solutions can drive your organisation to achieve its growth goals.



Customer Experience – understand what creates positive and memorable experiences to make customers return again and again.

KPMG's Customer Experience Excellence Centre is the world's largest customer experience think tank. Through an ongoing research programme across three continents over seven years, over 1.4 million consumer evaluations have been gathered.

The Centre's research demonstrates that a universal set of emotional qualities defines an outstanding customer experience – these are The Six Pillars, which are essential goals to master for a leading customer experience. Organisations that deliver across The Six Pillars demonstrate the enhanced commercial outcomes that are achievable, as The Six Pillars have a clear link to loyalty and advocacy.



Foresight – anticipate the future in an increasingly disruptive environment.

KPMG's strategic foresight approach provides the foundation for considering alternative future scenarios as a tool to build a robust strategy.

The strategic foresight approach enables leaders to explore future worlds and develop a collective understanding of preferred scenarios.

Developing future state scenarios enables executive to bring disruption to the executive table and begin having conversations that address the questions that are vital to the future of your business.

Foresight thinking provides a well-proven approach to facilitate organisational leadership to work together toward an innovative future.



Innovation – harness the collective ideation strength in your organisation to respond to challenges.

Power Ideas Together (PIT)® is KPMG's award-winning idea management software. It enables you to share, enrich and grow ideas. Its intuitive use makes sure everybody likes to use it. The built-in social intelligence ensures that all relevant knowledge within your organisation is captured to create great ideas.

In our view ideation is not just about ideas. It's about tapping the tacit knowledge that's hidden in the back of the minds of employees. Capturing this knowledge is key to success in collaborative ideation because it makes small ideas bigger, or even makes impossible ideas easy to implement!

Our innovation management software automatically builds up a knowledge base of everything that's posted. It creates a single brain for your organisation that everybody can use.



Strategy – design and implement effective strategy to take your organisation from its current state to a desired future state.

KPMG's Global Strategy Group (GSG) helps clients to drive innovation to results.

Our approach to growth strategy is underpinned by our 9 Levers of Value framework, 9 Levers of Value core principles, the benefit of our One Firm approach, which leverages capabilities across KPMG and a collaborative method that includes various constituents across a client's business.

KPMG's 9 Levers of Value framework can be used to deconstruct, analyse and re-orient strategy.

The benefit of our approach to growth strategy is that it enables implementation, creates momentum, aligns stakeholders and focuses on value.

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KPMG agri-food foresight solutions

Empowering agri-food enterprises to utilise foresights to bridge the gap between their conventional practices and methods to the future of agribusiness.

To stay connected to a consistently accelerating industry, KPMG have launched a new platform dedicated to global trends and predictions in agribusiness and food. With the pace of change in industry, businesses will become less relevant in the global arena if they are not habitually refreshed with new market content.

Time is money, and hours, if not days, can be spent researching market trends to understand how markets are evolving today and the seeds of future disruption being sown to reshape the market tomorrow.

KPMG's Agri-Food Foresights team have spent the last four years watching and commenting on these trends. With the launch of KPMG Agri-Food Foresight Solutions we are making it easier for businesses of all sizes to gain access into our insights.

We challenge traditional assumptions around market trends and appreciates that disruption is already upon the agri-food sector. As part of our suite of growth solutions it provides access to information, tools and experts that can help governors, managers and teams interpret and respond to change as they are identified.

The service provides scaled subscription levels to enable organisations to gain the depth of insight appropriate to their requirements.

Given the volatility and uncertainty inherent in the industry today, external perspectives and independent analysis can assist you in deciphering the key strategies that will contribute to success.

1



The Connector

- + Quarterly insights on the developments surrounding the seven trend themes
- + Delivered in a concise slide pack
- + Backed by references to source information
- + Open eyes and ears to a rapidly developing world
- + Perfect for individuals, farming businesses and early stage companies wanting to understand the business ecosystem

2



Insights Plus

- + Deeper insights on disruption relevant to your business and the markets you operate in
- + We will sit down with you to select the relevant areas of interest from our menu of options and provide these insights to you in a Board ready package bimonthly
- + Designed for small to medium sized companies

3



The Deep Dive

- + Highly tailored analysis of trends relevant to your specific business
- + Presented in packages ready for presentation to Board and Senior Executive teams at an agreed frequency
- + Relevant insights from and connecting to the wider KPMG team
- + Includes attendance by KPMG experts at workshop sessions during the year
- + Geared towards large export businesses

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We trust that we have again created a useful narrative to move the conversation forward on how the industry creates the value for its participants and the wider New Zealand economy. We would like to thank each and every one of our contributors who gave their time and their opinions so freely – without your input we would be unable to produce the *Agenda*.

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Growing the next generation of primary sector leaders.



The Experience Centre proposed for the ASB Farm at Mount Albert Grammar School creates the opportunity to educate young people in Auckland about the contribution the primary sector makes to New Zealand, the innovative practices the industry employs and the world class career opportunities that are available in many different disciplines.

The Centre will support the teaching of Agricultural and Horticulture programmes at Mount Albert Grammar School as well as providing an agricultural experience to over 20,000 Auckland school children a year, when fully operational. By engaging our youth we have the potential to embed our most productive industry into the prosperity of New Zealand.

The plans for the centre have advanced, with preliminary designs now complete and consents close to being applied for. There are many opportunities to get involved in the development and we need your help to enable the centre to be up and running for the 2018 school year.

Artist impression drawings above of the new building being constructed at Mt Albert



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