



# Accelerating Agri-Food

**Opportunities from the Global  
Agrarian Revolution**

June 2019

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# CONTENTS

Transitioning from value chain to value web .....	4
Playing an infinite game...and thriving through wellness .....	8
Stocktaking the global mega-forces .....	12
Social platform .....	16
The Health and Wellness decade .....	20
Nature of a farm .....	24
How we farm .....	28
Products grown .....	32
Processing and distribution .....	37
Consumers and consumption .....	40
Directing actions – Articulating impact .....	44
Five impact opportunities for agri-food organisations .....	45
Sources .....	47

# Transitioning from value chain to value web



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**Our observation is that majority of people that make the choice to work in the agri-food industry chose to do so because they are passionate about creating safe, quality products for the people that eat, drink or use the food, fibre or timber products that they grow.**

They love the challenges that come hand in hand with a biological industry; balancing climate, water availability and labour with market prices and customer demand.

The problem that has emerged as global populations have become increasingly urbanised, is that many communities have considerably less knowledge about the complexities involved in running an agri-food businesses as they have lost direct connections to the land. In fact, as people find out about the processes that have historically been used to produce food, many are not liking what they learning. Practices the industry has used historically because the end justified the means are becoming socially and ethically unacceptable to many consumers, who want a higher bar in respect of how their food is grown.

Customers are rarely exposed to the passion of the people that grow the food that they eat, with the exception of those able to pay a high premium to source products directly from farmers markets. What they are regular exposed to around the world are bad news stories about the agri-food system; about animal welfare issues, environmental failings, price spikes or food safety scares.

This is reflected in the results of the 2019 Edelman Trust Barometer, which suggested that 65% of respondents across 27 countries agree that large-scale food and beverage production has harmed the environment and lowered nutritional standards.

With people holding these views it is not surprising that only 68% of people trust organisations in the food and beverage sector, although this is a positive score in comparison to general trust in business at 56%.

Regulators are focused on the details of the rules they administer and the extent of their jurisdiction. This means that they often miss change happening in the industry globally or focus on issues that suggest they are missing the bigger picture. The reality is that most governments develop policy to meet the needs of the majority of the population, who are increasingly urban. Policies that work effectively in urban areas are often ineffective or have perverse consequences in rural areas.

Around the world quality food, fibre and timber is being created by millions of farmers, growers and producers every single day and it is rarely, if ever, celebrated. The contributions that farmers make to their local communities go largely unnoticed or recognised. The investments that the industry has made to better manage its impact on our land and water are dismissed as being insufficient, rather than being acknowledged for the scale of what has been achieved to date.

The agri-food sector provides employment, supplies the nutrition and creates wealth for countries with the wide portfolio of products grown and sold around the world. The sector has the ability to underpin the transition to a low carbon future as the full capabilities of biologically sourced materials are understood and their ability to substitute many products we use in our day to day lives that are currently made from non-renewable resources is capitalised on.

### Perceptions shape consumer behaviours

It is not only the threat to the social license that is focusing organisation across the global agri-food sector the need to on take back the narrative surrounding the food system. It is also about how customers perceive their products in comparison to a competitor's offering. The provenance story that underlies a product contributes to how its value is assessed. The positive stories that can be told around a product can appear to be little more than spin, when the customer makes a Google check and discovers nothing but bad news about the industry. Customers question the integrity and the provenance of products and if they do buy, they pay a lower price. The predominant narrative around the sector is costing farmers, growers, processors and their supply chain partner's real money every single day.

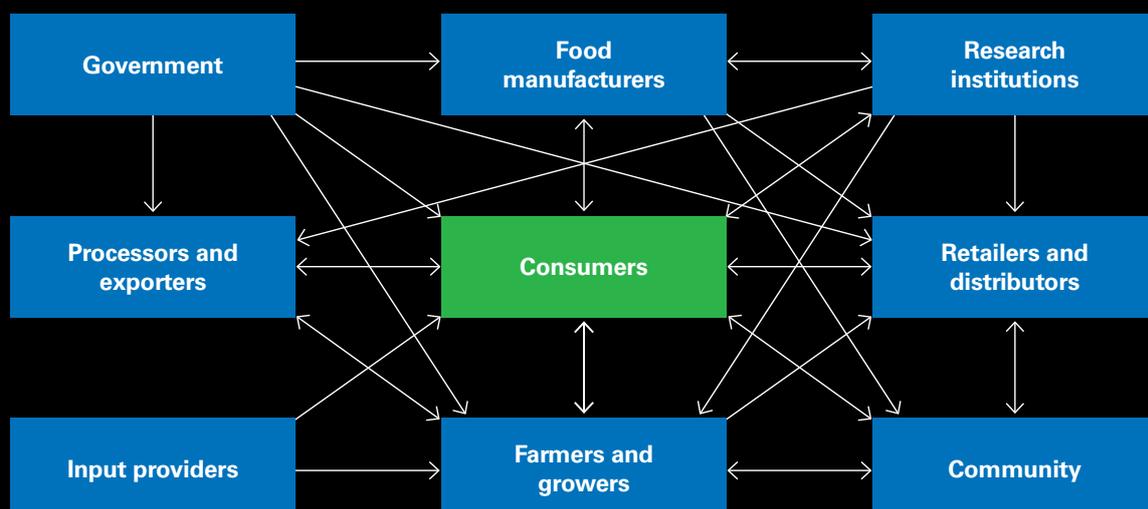
It has become clear that individual consumers are intuitively making decisions about a product based on their perceptions of its origin and provenance. Food is being categorised as good or bad based on the personal ethics of a consumer. If a consumer decides a product is bad, there is unlikely to be a low enough price point to encourage a consumer to buy the product because there is something inherent to the product that would make it unconscionable for them to eat it. If the conclusion is that the food is good, the consumer will not pay an excessive price (it still has to represent value to that consumer) but they will pay an appropriate price for the attributes inherent in the product.

The reality facing the industry is that the threat of eroded value, caused by negative narratives, is growing every single day. The traditional value chain has flowed linearly: from input suppliers,

through the farmer to the processors, and ultimately to the retailer and the end consumer of the product. The bricks-and-mortar controlled by the retailer was the only point that the consumer interacted with the product, and this experience was carefully managed by the retailer to ensure that they captured the largest share of margin available from the value chain. Much of the time, the consumer had limited knowledge about the original source of the product they were buying.

Given that, what happened on the farm, orchard or fishing boat had little impact on a consumers perception of a product or its value. However, it has become increasingly clear to us that the traditional concept of a lineal value chain is rapidly being replaced by a more complex series of networks and relationships, which form a consumer centric value web.

## Envisaging the future: a consumer-centric value web



Technology has eroded the previously-held power of the retailer. Now every participant within the value web is able to develop direct connection with any other participant, including the consumer. The consumer sits at the centre of the web, and every participant organisation needs to be focused on understanding the factors that consumers will consider in making a buy or no buy decision about a product.

Obtaining this understanding enables an organisation to maximise its contribution to delivering a product that consumers see as good and are prepared to pay a premium for. The web also enables organisations to be better rewarded for the attributes that they bring to the table, rather than simply for their position on the lineal value chain.

Meanwhile the consumer is also seeking information about the product they are being offered, and is seeking out a wide range of information before they make a buying decision. Uncertainty around the sustainability, efficacy, safety or quality of one product in comparison to another will make the buying decision easier for the consumer. In response, organisations need to raise their game and ensure that their stories are told in a way that satisfies the customer's requirements. This is more critical today than it has ever been in the past.

### Verifying attributes delivers fact based narratives

Articulating a series of verifiable attributes that can come from how a product is grown, processed, exported and ultimately distributed to the end consumer assists an organisation in capturing more value from the products they grow and handle. Every step in a production process has the potential to add attributes to a product that consumers may find valuable. For instance, the cultivar or genetics of a particular plant or animal could be an attribute. The soil it is grown in, the way water is utilised, or how the environment is managed can all be considered attributes. The employment conditions of people involved in the process can be attributes, as can the channels through which a product is exported, or the technology deployed to verify its provenance. The specific attributes that are important to a local community, an individual consumer or a specific market will vary; depending on their particular interests and values.

The reality is that many consumers are sceptical about claims producers make about their products and how they are produced. Claims that are able to be independently verified are more

valuable to all stakeholders if they can be verified. This puts truth at the heart of any story being told. When a local community can verify what is really happening within a farming system, it gives them confidence that the natural environment, water and animals are being used in an ethical and sustainable way. It will also assure a consumer that the provenance of a product is intact, and it has the attributes they would expect given its price point. Technologies such as blockchain and traceability services are underpinning these characteristics as a way to collate and present datasets to validate a product is what it says it is.

Ultimately, specific businesses will identify and develop a suite of attributes that best suit the needs of their product, based upon a deep understanding of their customers' needs. As more companies embrace the principles of integrated reporting (IR) – and consider their performance in a wider sense than just profitability – we expect the attributes that companies choose to focus on will increasingly align with a more comprehensive approach to business reporting. The inclusion of attributes within an IR framework enables companies to better articulate the total contribution they are making to their community, as well as being transparent about their opportunities to do better.

Given that the agri-food sector has faced a regular barrage of criticism in recent years, much of it unjustified, this represents a real opportunity. The great thing is that many in the industry are already doing what is needed to provide their products with a compelling attribute-based story. The industry now needs to front-foot this, obtain the necessary verification and take the lead in telling its stories in a factual way, but with the true passion that exists across the sector for growing safe, high quality food, fibre and timber products. Organisations need to take back the initiative and regain control of the narrative surrounding their products.

Articulating the attributes inherent within products will provide accurate stories to counter those based on half-truths and perceptions that have dominated social media conversations for far too long.



## Understanding consumer behaviour

With increasing consumer interest in and acceptance of new and novel foods, we explored with agri-food companies the factors they have detected underlying the consumer willingness to engage with these products despite many of them being highly processed and far from clean label.

**Animal welfare:** while enjoying animal sourced foods, many consumers are inherently uncomfortable with the processes that deliver these foods. Products delivering a similar experience that eliminate animal welfare risks appeal to many consumers.

**Incomplete understanding:** consumers are often not given a full picture of the impacts that a products supply chain has on health and environment. Stories told about novel foods focus on attributes where they out perform traditional foods but it is difficult to obtain a complete understanding of all the impacts a product has.

**Focus on health and wellness:** as consumers become more aware of the impacts that food can have on their health they are seeking out foods that have proven health benefits. Many novel foods are being designed to deliver specific health benefits which are appealing to consumers.

**Search for precise nutrition:** some consumers are looking to utilise technology solutions to secure better health outcomes. As a consequence products which have proven health benefits are easily incorporated into personalised nutrition systems and into consumer diets.

**Sustainable clean foods:** many novel foods are able to make claims about how they are produced in comparison to traditional foods which appeal to consumers; these include a smaller environmental footprint, use of less water, elimination of animal welfare issues and reducing unskilled jobs.

**Genetic manipulation:** consumers are becoming more attuned to the full range of issues associated with the use of genetic technologies (including

emerging gene editing technologies). As a consequence they are more open to the technologies being used in novel foods if the rest of the product attributes meet their needs.

**Inconsistent farming practices:** there are good and bad farmers all over the world. Ingredients used in food are grown by farmers that invest in their land and those that exploit it but as consumer can't tell whether they are buying good or bad food attracts them to novel foods that are clear about how they are grown.

**Organic content:** premium consumers are increasingly seeking out products that are grown in organic farming systems as they believe that these products are healthier and have greater nutritional density.

**Affordability:** the price of food is a bottom line for most customers around the world. If a novel alternative to an animal produced protein is cheaper than the traditional product yet delivers a similar experience this will attract many consumers to try the novel product.

**Ability to feed the world:** recognition that there are hundreds of millions of people that do not have access to the food and nutrition that they need attracts consumers to novel food products that have the potential to make a significant contribution to addressing malnutrition globally.

**Demographics:** groups within a community are more likely to explore novel products based on their willingness to explore new technologies. In respect of novel foods, millennial consumers are seeking to understand more about their food and are leading experimentation in this part of the economy.

**Food safety:** in some markets, consumers are inherently uncertain about the safety of the food that they eat for a wide range of reasons. Novel foods that come with assurances around their provenance and manufacturing process appeal to consumers that lack trust in the food system.

**Novel tastes and textures:** it should never be ignored that food must taste good and be pleasurable to eat to be attractive to consumers. Products that introduce appealing new tastes and textures are likely to attract consumers to try them. A great experience will encourage repeat purchases.



# Playing an infinite game...and thriving through wellness



Change is constant and it always will be. We instinctively search for new knowledge and use this information to look for better, more efficient ways to do things. The agri-food industry has constantly evolved; in what it produces, how it interacts with consumers and how it uses natural resources.

Industry leaders recognise that the pressure for change is unrelenting and likely to accelerate for the foreseeable future. As a consequence, the need to continue the transformation of organisations to become more collaborative, agile and resilient is an ongoing and significant focus for many organisations in the global agri-food sector.

## Recognising the extent of disruption

It is hard to comprehend the extent of disruption the agri-food system is facing globally. The reality is that much of what is considered usual agricultural practice today would not be that alien to the Vikings or the Romans. While we have introduced new equipment in some parts of the world, increased scale, and improved the genetic qualities of which has improved yield and raised production of the plants grown or animals raised, the fundamentals remain largely the same – tend the land, feed the animals, add sun and water and wait for a product to grow. As a consequence, the industry has been ripe for disruption for decades. Significant money is now

flowing into technologies that have the potential to reshape every aspect of the agri-food value chain, from what a farm is and how things are grown, through to new products, and to the way products are processed, distributed and ultimately consumed.

In our view, the world has not only entered the fourth industrial revolution, it has also entered the first global agrarian revolution. The basic premise of both revolutions is the same; the fusion of biological, digital and physical technologies to create exponential solutions that have the potential to transform industries and the way that we live our lives.

We see the agri-food sector as being at the centre of the fourth industrial revolution as combining the biological (a plant or animal), with the physical (a tractor or a spade) and digital (knowledge and insight) has been what the industry has always done to grow food and fibre products. We do, however, distinguish the revolution in the agri-food sector from the wider revolution because the sector effectively missed the first three industrial revolutions, and is consequently facing more significant disruption over the next decade or so than any other sector of the global economy.

## The agri-food market of the future

While food and fibre producers are facing dramatic change within their own farming operations, the wider transformation of society will have a material impact on the markets

producers ultimately sell their products into around the world. We often hear people talk about the market as if it is a single, uniform construction. Maybe in the past this was a reasonable approximation of reality, when channels to the consumer and the range of product options available were limited.

However, the technologies of the fourth industrial revolution are fragmenting markets into an infinite number of niches, aligned to the specific wants and needs of consumers around the world. As we note later in this report, the one size fits all solution has gone, to be replaced by a model that is trending towards mass personalisation and, eventually, solutions that deliver one size fits one products.

The global market in the next decade will be comprised of millions of niches. We expect that each of these niches will align with one of a number of key food system streams that reflect the ability of an individual consumer to make choices in respect of the food they eat and the way it is integrated into their daily lives. Given that markets are evolving rapidly it is hard to predict with accuracy what these food system streams will ultimately end up being, but we foresee seven primary streams which are likely to encompass the bulk of consumers around the world; subsistence, sustenance, first choice, flexible, integrated, ethical and premium. More details are provided on the following.

Recognising that the expectations on producers are different for consumers in each of these streams is critical to

determining where the products an organisation grows are targeted. It is important for producers to recognise that they are very unlikely to be able to feed the world, by developing markets across each of these seven streams, but in most cases maximising the value of their product will require them to target consumers in niches in more than one stream, recognising that each requires a tailored strategy and approach.

The challenge for organisations is that they are being required to make decisions on the niches they should target based on their expectations about how the system may evolve, and the assumptions they have formed about which of the 45 trends shaping the food system, discussed on the following pages, will have the most dominant impact on consumer behaviour and demand.

While we make predictions about the future of the food system, the speed and extent of disruption the sector is facing mean that the past does not provide a reliable predictor of what will happen in the future. The adoption of technology over the last decade has illustrated that the world is not linear, with many technologies following exponential adoption curves that start slowly. However, as adoption

accelerates it can't be overlooked that each doubling adds 100% more users. It is difficult to move beyond models that are built on historic data and trends, but it is critical that organisations do take this step to stand a better chance of capturing the opportunities in front of their organisation.

### Recognising that you are playing an infinite game

In an environment of dramatic and continuous disruption, the biggest risk facing organisations is maintaining relevance. In the past, organisations developed strategies which used language like winning, beating the competition or leaving nothing on the table. The focus today is on long term sustainability and earning the right to serve customers and partners. This change in language is reflective of a change in the ground rules surrounding markets that the pace of innovation and disruption is imposing.

Well known business commentator, Simon Sinek, suggests that what we are observing is a fundamental shift in how business works, from a finite game (with rules, a start, a finish and result) to an infinite game; a game with changeable rules, where players come and go and there is no endpoint. The

organisational objective is to build the capacity and resilience to stay in the game, and thrive in an ever-changing world while competitors fail or exit the market. The problem for many traditional businesses, is that if you try to play an infinite game with a finite mind set you will struggle to match your competitors for innovation, effort, morale and performance.

Surviving in an infinite game requires organisations to enhance existing, and develop new, capabilities to enable them to retain a sustainable and impactful position in the markets that they choose to play in.

Internationally, we observe many companies using the UN Sustainable Development Goals to define the impact they seek to have and reporting their progress.

Our conversations during the year have assisted us in identifying a range of organisational capabilities that have not always been a priority in agri-food companies, but which need to be developed in response to the substantive changes that are occurring in how markets are functioning. We have summarised the attributes we believe will help organisations to thrive in their infinite game on page 9.

## The seven primary food system streams

### SUBSISTENCE:

Food availability is not assured and consequently these consumers will eat whatever food is available when it becomes available, often as a result of their own farming activities, with little concern about the nutritional composition or safety of the product.

### SUSTENANCE:

This consumer has sufficient economic capability to buy the food they need for them and their family. Their focus is on sourcing enough nutrients to enable them to function in daily life and continue to generate income to buy more food in future.

### FIRST CHOICE:

Greater economic capacity provides some ability to make choices about the food eaten which sees consumers start to seek out animal proteins (or equivalents) as an alternative to plant based foods. Priority is given to providing safe, nutritious food to children.

### FLEXIBLE:

Consumer has the financial capability to choose from a wider range of food options and the attributes of the product start to inform the choices that are made. There is the capability to eat out on occasion and to invest in more expensive foods for special events.

### INTEGRATED:

Food is fully integrated into lifestyle, the consumer can afford foods that provide functional and nutraceutical properties when necessary and regularly invest in premium food products and eating at 'experience' restaurants when they are spending time with family and friends.

### ETHICAL:

Consumers which put the provenance of the product central to their buying decisions. They generally do not have financial constraints on their purchasing decisions, likely to be open to purchasing organic products, novel foods and experimenting with vegan and flexitarian diets.

### PREMIUM:

Consumers where the cost of food presents no financial constraint and their focus is entirely on the experience that a product delivers. They wish to engage in novel food trends quickly. They focus on the attributes of a product and how expensive it is in making purchasing decisions.



### The bottom lines in a fragmented, disrupted agri-food sector

Having explained why we believe the agri-food sector is now experiencing the first global agrarian revolution, our view that markets are fragmenting into millions of niches, highlighted that there are 45 identifiable global disruption trends, and explained that the fundamental rules underpinning markets have shifted. **We only see opportunity in the agri-food sector if you are prepared to approach your future with the right mind-set.**

The speed and extent of change can be viewed as a challenge or an opportunity. The only person that is able to determine the lens you choose to use is you. We believe that the only practical choice is to view disruption as an opportunity, to understand the key bottom-lines shaping the industry and then to buckle in for what will be an exhilarating ride.

We believe there are three bottom-lines shaping the future of the agri-food sector:

#### 1 Sustainability is a non-negotiable:

To maintain social license the reality is that it is no longer appropriate to just do enough; there is a need to listen to all relevant voices, including those from minority communities, and do the right things for the organisation, stakeholders and the wider community. While conversations often focus on climate, land and water, achieving true sustainability requires an organisation to think far more holistically about the systems they interact with. This requires thinking beyond financial metrics and environmental consequences to include analysis of human, social, intellectual and technological dimensions in decision frameworks. It is becoming apparent, that as more organisations think about the wider impact they have on a value chain, circular thinking is being designed into business models, with greater effort being made to find partners to extend the life of non-renewable resources.

#### 2 Food is central to future of the health system:

The connection between what people eat and health outcomes is irrefutable. As the social impact and costs of curative healthcare systems place an increasing burden on government and society, there is no doubt that policy settings will shift towards preventative care models. This places food at the centre of the health system of the future and increases focus on a food's nutritional density, functionality and impacts on health outcomes (both positive and negative). Recognising this shift presents a myriad new opportunities for food producers able to verify the therapeutic outcomes their products contribute to, but also flags risk for products that contain ingredients that are perceived to be bad for health. It also suggests the space that has traditionally existed between the food and pharmaceutical sectors will become increasingly blurred, as businesses from both sectors explore opportunities in functional and nutraceutical foods.

#### 3 Diets will transition as consumers personalise experiences:

The last decade has seen the protein wave wash through the food system, with consumers placing significant focus on the protein they eat. However, we believe this central focus will evolve in the coming decade. We expect a second wave to come through the sector, shifting the focus of consumers from purely protein towards the complete nutritional density of their food as recognition grows that there are many other nutrients, oils, fats and minerals that are important to health. Secondly, consumers are thinking far more about the foods they eat and where they come from; we have heard many times in recent months that there is place for 'good food', whether it is produced from plants or animals, but no place for 'bad food', any food produced without awareness of the impact it has on health and the environment. We also believe consumers are taking more control of their diet. In seeking personalised experiences, they are transitioning from conventional food to nutrition arrangements that align with their lifestyle, world view and ethics.

#### Volume to...value, values or wellness?

The mantra over the last five years for many agri-food organisations as markets have become more complex and disrupted, has been that we need to accelerate the shift of our products from 'volume to value'. While this is easy to say it is not nearly as easy to deliver on, as many organisations have found. As a consequence, some organisations have started to talk about making a shift from 'volume to values' which makes a lot of sense. While activities adding value to a product can be replicated or superseded by a competitor, underpinning a product with a set of values that reflect an organisation's ethics and morals is significantly harder for a competitor to replicate or displace.

We think that there is an opportunity to take this position one further step.

#### We suggest that organisations should aspire to transition from 'volume to wellness'.

We believe 'volume to wellness' encapsulates growing products that have attributes consumers aspire to inherent within them, and that are unpinned by a clearly articulated set of ethics and morals. However it goes further, and says our focus is on producing products that promote wellness; wellness for the consumer that eats the product and also wellness for our community and wellness for our environment.

Thriving in the infinite games requires organisations to make bold commitments to secure a sustainable place in the game and derive fair value from what they create. We believe as we move into the 2020s, a decade that will be dominated by health and wellness themes, now is the time to place wellness front and centre in our agri-food story if we really want to secure our share of the value we grow.

# Organisational capabilities to thrive in the infinite game

## Long term focus

A goal for any organisation playing an infinite game is to earn the right to continue to play. Looking to extract the last dollar at the expense of a relationship does not make sense if you are wanting to continue playing. Balancing an immediate return with the need to leave something on the table to build trust requires continuous and careful focus.

## Own your own problems

When faced with challenges, too many organisations look to a third party, often the government, to provide solutions to their problems. The reality is nobody else has an incentive to solve a problem as quickly the organisation itself. Owning your own problems and actively seeking to find solutions is critical if you want to secure your position in an infinite game.

## Hire ahead of the curve

The quality of people that an organisation employs shapes its culture. People are critical to creating successful businesses that can thrive and grow in disruptive environments. Organisations should make every effort to over-hire in advance of growth to provide the capacity to innovate faster and respond to unexpected disruption.

## Seek good advice

In a sector that is experiencing significant change, such as agri-food, there will be a wide spectrum of opinions about how any market is likely to evolve. Being open to a range of opinions by encouraging internal discourse and seeking external advice will build a better understanding of the opportunities in front of an organisation and provide it with the courage to do the right thing.

## Ensure financial resilience

Playing an infinite game requires ongoing investment in innovation to respond to threats as they arise. Organisations need to have the capability to make investments when required. This means they have to balance a desire for growth with prudent financial management to guarantee their balance sheet has the resilience to withstand an unexpected shock or support an opportunity to be grasped.

## Address points of friction first

Too often organisations seek to build consensus around the points of agreement and in doing so overlook the (often critical) matter over which there is no agreement. While it is uncomfortable to focus on the points of friction, ultimately addressing these issues will drive better outcomes and enhance the likelihood of building long term, sustainable relationships.

## Report on the right metrics

Historically the only metrics that mattered were those calculated from the profit and loss account. If you are looking to make a sustainable contribution to an industry this will require an organisation to report on a wider range of metrics which reflect the impact that the organisation has on its customers, business partners, community and environment. Using the UN SDG's as a framework to achieve this is an option for every organisation.

## Keep an eye on the extremities

A business looking to survive in the infinite game should not ignore what is happening on the extremities of their organisation. If a small fraction of customers are unhappy and the organisation is not listening, there are now channels for the marginalised to be heard and this can quickly undermine an organisation. There can be no tolerance for non-performance.

## Innovation comes from anywhere

We have learnt over recent decades that innovation does not come from boardrooms or brainstorming sessions. It comes from somebody saying "what if we did this?" Organisations need mechanisms that encourage their teams to bring forward innovative ideas. They also need to sense global business model innovation to identify seeds of ideas that could deliver a step forward if applied to the agri-food sector.

# Stocktaking the global mega-forces

The mega-forces shaping the world's future are evolving as scientific discovery and knowledge become available.

The Agenda in 2014 highlighted 14 trends across economics, politics, demographics, social infrastructure, technology and the environment that our research suggested were shaping the multipolar world in which we live; a world where a disruptive externality can come from anywhere at anytime. The report highlighted the rapid impact that the Ebola outbreak in West Africa had on people all over the world during 2014.

We reviewed the mega-forces in 2016 and unsurprisingly concluded there was little change. We did highlight that given the breadth of applications being developed using fusion technologies, that it had become clear these products are going to have a more fundamental and transformational impact on society than we had previously envisaged. Rolling forward to 2019, we have identified the fusion revolution as one of two mega mega-forces, the other being the transition to a net zero carbon position given the consequences of doing nothing.

In addition to identifying these two overarching themes, we concluded three new mega-forces need to be incorporated into the analysis based on our research. Awareness of the fundamental impacts these new forces (Generation Voice will fight for its future, inequality can no longer be overlooked and we must be able to do that with plants) are having has become apparent recently in response to concerns over climate change and the political consequences of large groups in communities feeling excluded or left behind by economic growth. Some of the other forces have been renamed to sharpen their focus but the overall conclusion is that our world has only become more complex, or more multipolar, in the last five years.

## The 'mega' mega-forces



### Transitioning to a low carbon future is unstoppable

Higher incidences of extreme weather events together with increasing scientific consensus that human activity is contributing to an increase in global temperatures has resulted in governments, companies and civil society all making commitments to take actions to transition to a lower carbon future in an attempt to restrict the increase in temperatures to as close to 1.5 degrees celsius as possible.



### Fusion technologies accelerate exponential change in daily lives

The increasing ability to fuse biological, digital and physical technologies reshapes all aspects of day to day life, creates opportunities for new business models that redefine how businesses work across many sectors of the economy and delivers the ability to transform agriculture given that fusing a biological product with knowledge and physical tools is the fundamental core of the sector's activities.



## Challenging the global status quo



### Geopolitical instability is a fact of life

The increased ability to consume and share information using digital channels creates an environment that can rapidly accelerate groundswell political movements. This is seeing unexpected political leaders coming into power, often based on the positions that they take on a single critical issue for disenfranchised groups with the community.



### Economic influence will continue to shift as wealth grows in emerging economies

For most of recorded time, the world's largest economies were Asian. The shift of the balance of wealth to Europe and, ultimately, North America is a relatively recent phenomenon driven by the rapid industrialisation of these countries from the late 1700s. The first three industrial revolutions largely bypassed other economies and their influence declined. The growth emerging economies delivered as the west struggled to recover from the GFC demonstrated the wealth pendulum is swinging towards emerging economies and returning east towards Asia, disrupting the perspectives we have held for centuries on economic influence.



### Leading in a integrated and instantly informed world requires new capabilities

While physical distances remain the same and national borders rarely move, technology has eliminated the time delays that were inherent in most cross border transactions 25 years ago. A faster, technology enabled world is highlighting the constraints of government, legacy international institutions and treaties and the challenges of regulating in a connected world. A new approach to government is required based on greater responsiveness and more collaborative approaches to regulation.



### Inequality can no longer be overlooked

The gap between the haves and have nots has grown around the world, largely out of sight of those with influence and power in our communities. The benefits of economic growth have not been shared evenly, with many in the community believing they have received no benefits. Technology gives marginalised communities a voice. There is a need to listen to concerns being expressed and take action to ensure the benefits of growth are shared more evenly, to ensure the long term stability of society.

# 17 GLOBAL MEGATRENDS



LOW CARBON



FUSION TECH



GEOPOLITICS



ECONOMIC BALANCE



NEW GOVERNMENT



INEQUALITY



MILLENNIALS



AGEING POPULATION



URBAN DWELLERS



VOICE FIGHTS



FUTURE HEALTH



EDUCATION



DATA PLATFORMS



ENERGY SECURITY



MORE WITH LESS



IMPACT WHY



BIOECONOMY

## Future world citizens



### Millennials facilitate the connected, instant access economy

Millennial consumers are leading the adoption of digital solutions that provide instant access to the products and services that they require without the constraints of long term asset ownership. New solutions that increase lifestyle flexibility are rapidly replicated and adopted, globally accelerating the development and growth of increasingly innovative business models. The use of digital solutions means that millennial consumers are no longer confined to the choices available in their physical location.



### Anything but 'generation done' exerts their economic muscle

People aged over 65 represent the fastest growing segment of the global population, driven by increased life expectancy and falling birth rates around the world. As the population ages, the proportion of the population available to support the associated health and welfare costs of declines putting pressure on core social services. However, the ageing population are also consumers and in many parts of the world they have spent a lifetime generating wealth which they will use to secure products and experiences that enhance their lives.



### Urban survivors are empowered to become urban thrivers

The growth of cities and urban areas around the world continues to accelerate, driven by migration from rural areas and natural growth in the population. The evolution of smart technologies to integrate work, mobility, nutrition and lifestyle elements into day to day life, changing the nature of urban living from one of battling the system to survive to one where life is enhanced by cities that are designed to work with and for their residents.



### Generation Voice fights for its future

Generation Voice, those members of the community born after 2000, complete their schooling and enter into full productive economic and political life. This generation, and their children, will live with the consequences of climate change and they are not about to sit back and let their future be sacrificed without a fight. Generation Voice will be the most activist generation the world has seen, using the power of digital technology, to protect what is left of planetary resources for future generations.

## Empowering infrastructure



### Preventative medical systems enhance human health outcomes

Innovation drives the discovery of new solutions to a growing range of healthcare challenges facing society, however the cost of these solutions make it challenging to provide access to all but the most affluent members of our society. As a consequence, governments around the world focus attention on developing new primary care models that reshape lifestyle fundamentals, with the objective of preventing the illness and creating a fundamentally more healthy society.



### Education delivered beyond the classroom multiplies impact

A high performing education system underpins aspirations for growth and development in any society. The impact of an education system depends heavily on the quality of its teachers and the effectiveness of the channels used to deliver knowledge and enhance learning. As technology evolves the constraints of traditional educational relationships built in a classroom dissolve, enabling the best educators to have an amplified impact on global society than has not been possible in the past.



### Democratising data unleashes its potential for all of society

A world with billions of connected devices will see data lakes continuing to grow exponentially. Data is only valuable if insights can be extracted from the lake that create benefits for organisations or for society in general. The more relevant data that can be targeted towards answering a question, the better the quality of the answer. This is best achieved if organisations recognising the value of data is maximised, by sharing it with others to help find the solutions to the biggest questions facing society.

## Seeking indefinite sustainable living



### Energy security is now everybody's responsibility

Concern society is consuming finite energy resources too quickly, at the expense of the environment, has driven investment into renewable energy technologies but has also made it economic to recover fossil fuel reserves that were uneconomical to utilise. The need to transition to a lower carbon future while meeting increased energy needs, driven by economic growth, will require individuals to take ownership for their energy security in respect of both generation and usage, through solutions scaled to be embedded into day to day lifestyles.



### Infinite search for ways to do substantially more with a declining resource base

A larger population and the emerging wealth of communities globally is fuelling a growth in demand for consumers products. These goods utilise natural resources in their production. The wave of demand is increasing stress on already limited resources, increasing prices and putting more focus on how products are used. Sustainable resource management becomes an increasing focus for governments and societies who will seek to influence how resources are utilised to generate more output from less input.



### Impact rather than profit becomes the core of many organisations' why

Historically, the profit motive has been the primary driver underlying business. While some businesses, particularly co-operatives and mutual societies, have operated for the benefit of their members, the majority have measured their success based solely on the profit they create. Driven by the challenges facing society, a new breed of businesses are emerging that have a primary focus on addressing a social failing that too many in society overlook rather than reporting a profit. Having a positive impact increasingly dominates the why in society.



### We must be able to do that with plants

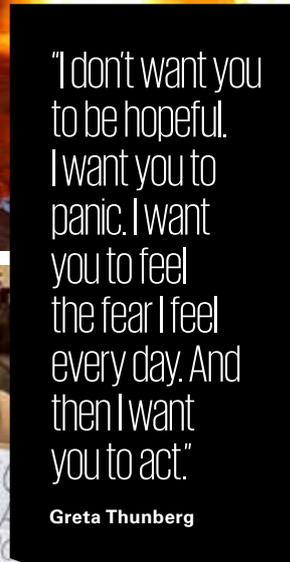
Modern lifestyles rely on access to a vast array of consumer products many of which are made from non-renewable resources. As their availability becomes tighter and costs increase the search for alternative, more sustainable alternatives accelerates. Utilising the properties inherent within plants through the application of modern bio-technologies will unlock sustainable solutions that will supersede products made from plastics, metals and other non-renewable sources.

Alexandros Michailidis © Shutterstock



"I don't want you to be hopeful. I want you to panic. I want you to feel the fear I feel every day. And then I want you to act."

Greta Thunberg



Liv Oelan © Shutterstock

# Social platform

Global population growth is predominately occurring in some of the poorest, most environmentally-challenged, water-stressed regions of the world; areas where sufficient nutritious food is often difficult to find. With over 800 million of the world's population regularly malnourished, the food system is clearly not delivering effectively for everybody. The UN has sought to highlight the scale of the challenge through the Sustainable Development Goals (SDG's).

Yet the food system is expected to deliver more every day. Food issues however are not confined to emerging economies, many developed countries have significant levels of nutritional deficiency across their populations which is creating significant social and economic costs that governments are having to deal with. These are big issues that impact every member of society and as a consequence they should not be left entirely to governments to resolve; as they require broad community responses. Sustainability, in its widest sense, lies at the core of the food system. Communities need to produce sufficient food within the confines of the productivity capacity of the environment. Technologies such as genetic modification need to be explored, even though the long-term effects are not fully understood. Governments need to develop food systems that extend beyond their borders to achieve food security, and ensure their communities are responsibly educated on what constitutes healthy food. It is unlikely we will ever have a truly sustainable food system unless we collectively take responsibility to implement substantive solutions. **Leaving food issues unaddressed increases the risk of social imbalances destabilising society. In history, food inequality has resulted in social unrest, economic migration, war and terrorism.**

## Modern slavery becomes a growing issue in the agri-food sector

Society expects all employers to treat their employees fairly. This includes factors such as paying a fair wage, providing safe and sanitary conditions for workers and families to live and work and providing them with opportunities to develop useful skills and experience. The agri-food sector globally has often been viewed as a poor employer, providing

tough, unskilled physical work, often in harsh weather conditions, with anti-social hours and low pay; hardly a great story to tell the world. The reality has generally not been so bleak and employment across the sector is increasingly demanding more skills to respond to new technology and consumer expectations. If producers fail to meet employment standards that are acceptable to consumers, they may find themselves being considered modern slave masters and having the market access of their products restricted, as more countries introduce Modern Slavery legislation. The ability for stories to go viral through digital platforms shows the power of society setting standards, and amplifies the impact for those that chose to ignore the rules. There is a threat to the image of an organisation and its ability to recruit and retain top employees, as well as to the sustainability of their supply chain, if employees are reported to be mistreated in any form. **Corporate responsibility groups are calling on organisations to imbed transparent reporting into their strategy. In 2017 Nestle and Unilever implemented best practice on slavery reporting, with Nestle reporting on 11 key human rights risks relating to its businesses as a way to increase transparency.**

## Governments pivot towards preventative healthcare to address fundamental health issues

The World Health Organization has reported that non-communicable diseases (NCDs) cause more than 70% of deaths worldwide every year - with food being strongly connected to these illnesses as one of the top four behaviour risks. NCDs include lifestyle illnesses such as diabetes, metabolic syndromes and heart disease. The cost of treating these diseases is unsustainable for many governments, resulting in them adopting

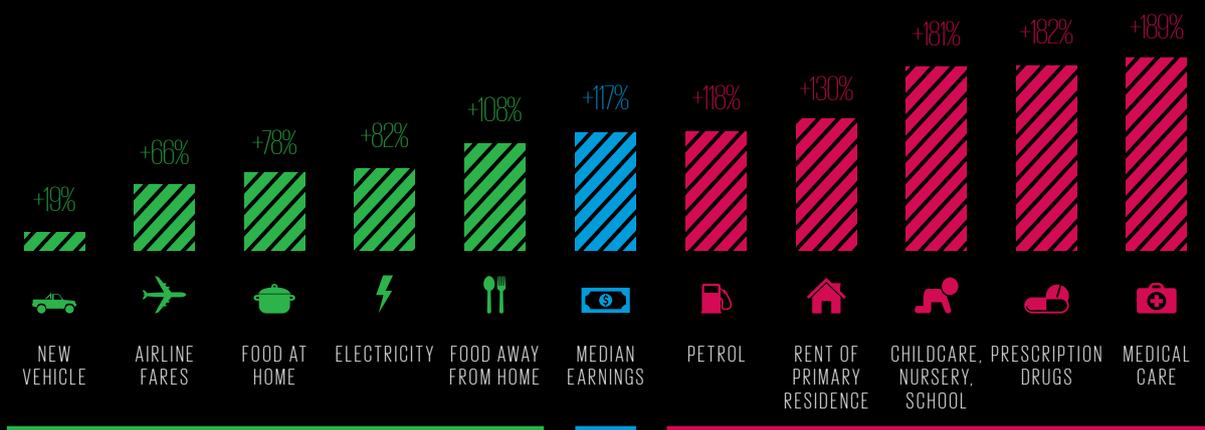
preventative healthcare strategies which have a strong focus on educating communities on dietary matters. The role that 'food as medicine' will play in the future of the healthcare system as well as the agri-food system should not be underestimated. The impact that health and wellness will have on the global agri-food system in the coming decade is explored in more detail from page 18. **Several countries are implementing legislation to combat food-related illnesses; with the UK, Ireland and Spain introducing sugar taxes. In the US, the 2018 Farm Bill proposes a Produce Prescription Program, to encourage the prescription of food as medicine.**

## Food production costs will increasingly reflect the true costs of consuming natural capital

Food spend as a percentage of income has consistently fallen in recent decades (the analysis on page 15 comparing the increase in median income in the US to movements in the prices of a range of products and services over the last 30 years, demonstrates this clearly). At the same time production costs have reduced, due to productivity improvements and an increase in the scale of many producers, however the reduction in cost has not been sufficient to enable producers to hold their margins. Some argue that the costs of producing food are currently materially understated as farmers, growers and fisherman have historically not paid for the natural capital they have consumed in growing products; most producers do not pay for the soil nutrients or ecosystem benefits that the plants they grow utilise, some are charged for water but for many this remains an asset that they can access freely. An analysis performed by KPMG in 2010 suggested that charging the food production sector for the natural



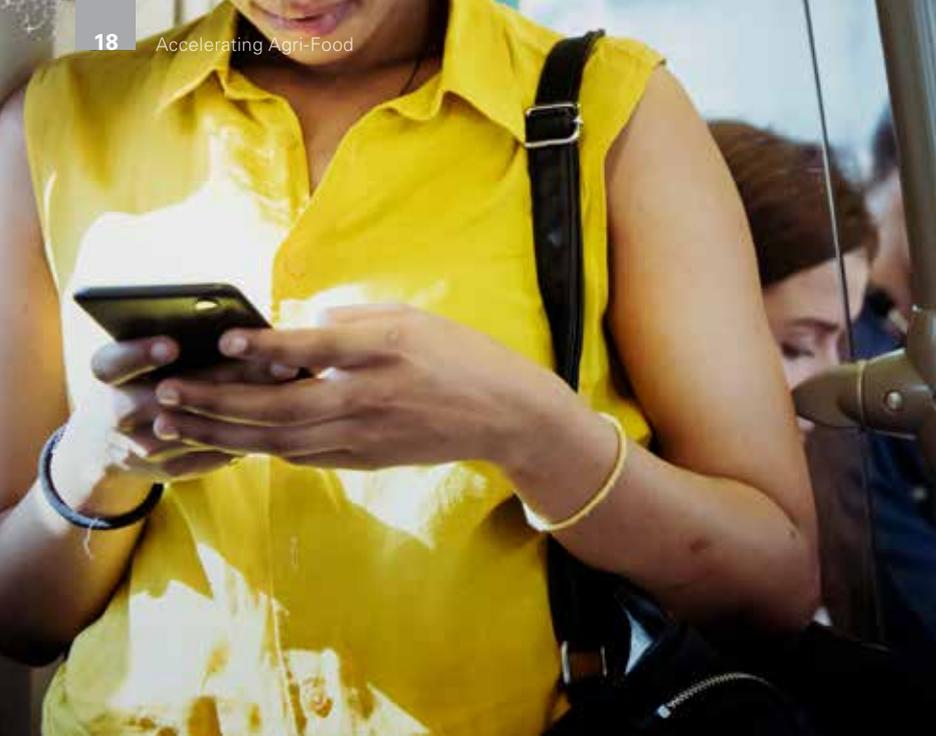
## GROWTH IN PRICES COMPARED WITH EARNINGS (USA) 1990-2018



Prices grew slower than earnings

Prices grew faster than earnings





assets it consumes directly and indirectly would result in a charge that amount to 224% of the industry's EBITDA. Given the focus from retailers to keep prices down, it is clear that food prices around the world currently do not reflect the true costs of production, in particular the costs of natural capital consumed. **We expect there will be moves made by governments around the world, as part of the response of individual countries to climate change, to charge farmers for the natural capital they consume. This would overtime result in food prices increasing to better reflect the true costs of the inputs into the food production process.**



#### Philanthropy and social impact-centred business models to proliferate

With over 800 million people being failed by the global agri-food system, the industry offers huge scope for entrepreneurs and philanthropists to have life-changing impacts on the global community. Many start-up businesses are being formed with either a dual purpose (profit and impact) or a purpose beyond profit, particularly to reduce the number of people suffering from under-nutrition. We have observed that many of these start-up enterprises are receiving funding from a range of high net wealth individuals as they direct their philanthropic activities towards some of the biggest challenges facing the global community. For example the Bill and Melinda Gates Foundation is collaborating with private sector enterprises, NGOs and governments with the goal of preventing 1.8 million malnourishment related deaths by 2020. Corporate social responsibility (CSR) is also evolving. It is no longer sufficient to sponsor the local football team, organisations are investing in impact projects that align with an articulated purpose that they have adopted (be that empowering women in rural communities, investing in skills for young people or promoting nutritional improvement). Consumers are expecting companies to be taking an active role in supporting the vulnerable in the global community. Demonstrating a strong commitment to purpose is a also key platform for attracting the best talent to an organisation. **The social enterprise One Acre Fund supports over 135,000 farmers in East Africa through a market bundle approach; providing local farmer groups with agricultural education, loans for planting materials, market training and crop insurance.**



#### Environmental regulation crystallises a step change in agri-food technology and investment

Governments have committed to address levels of greenhouse gas emissions from

economic activities in their respective countries. The Paris Agreement saw most countries commit to keeping the increase in global temperatures well below 2°C with an ambition to keep it close to 1.5°C. Delivering on the commitments that have been made is likely to result in most governments introducing regulations that target activities that generate emissions. Given that the farming of livestock is a significant creator of methane gas, one of the key greenhouse gas, we expect these regulations will ultimately have impact across the agri-food value web. Responding to new regulatory requirements will likely attract ethical investors to the industry, will spark innovation that will benefit all farming systems, and increases the amount of technology being deployed across the industry. Companies are already taking matters into their own hands in line with consumer expectations, proactively implementing systems to ensure carbon use is captured and actionable steps are taken to reduce emissions. We expect to see companies and regions pushing hard to achieve zero carbon status for their products as this is an attribute that ethical consumers are prepared to pay a premium for. **Arla Foods, a Danish dairy co-operative announced in March 2019 that it will target a 30% reduction of greenhouse gas emissions by 2030 and will work towards zero carbon by 2050, noting that setting the target focuses each of the co-op's dairy farmers on what they can do to improve their businesses.**



### Food security and affordability remain a key priority for almost every government in the world

For many governments the availability and affordability of food is a top priority, as failures to deliver sufficient food to their population can lead to social unrest and ultimately could result in leaders being changed (via the ballot box or other means). Governments are taking different approaches to setting up resilient and secure national food systems. Some countries lack the ability to produce all the food they need to feed their populations and as a consequence governments, either directly or through sovereign wealth funds, are making international investments designed to secure access to sufficient supplies of product to meet domestic demand. Other countries are making significant investments to develop domestic production, including securing access to novel growing practices and new technologies. There are also initiatives to diversify diets to reduce reliance on products that are more susceptible to supply issues. Enhancing food handling practices and encouraging agri-food companies to minimise waste are also a

focus in an attempt to ensure that more of the national food supply is eaten. **The World Economic Forum initiated a five action initiative bringing together farmers, government, civil society and the private sector, facilitating partnerships at regional and country levels, and encouraging the exchange of knowledge around food security.**



### The challenge of feeding the world attracts talented young people into the agri-food sector

The young people that are now coming into the workforce have grown up in a technology-enabled world; they expect instant access to knowledge and insight, they have a strong value system and a voice that they are willing to use when they see activity that is not aligned to their values. It is predicted that Millennials will comprise 75% of the workforce by 2025, and they will likely have the greatest spending power of any generation in history. Evidence indicates that the millennial generation reacts positively to companies and organisations that can clearly articulate their purpose and values and is prepared to take steps to bring these commitments to life. This means that they are attracted to a workplace or industry that is contributing to society, rather than operating solely for financial benefits. Roles that enable them to use skills to improve society are of particular interest – and opportunities in the agri-food sector to mitigate malnutrition and environmental degradation will be appealing to many. **We consequently expect to see companies across the agri-food sector recruiting employees into a wide range of roles with a commitment to let them use the skills and experience that they develop during a sabbatical period to make a contribution to helping the world to feed itself.**



### Finance arrangements increasingly take account of how a borrower manages ESG in their organisation

To date, the investment that organisations have made into addressing environmental and social risks they face have predominately been seen as a cost. However, this is changing rapidly as investors and lenders around the world start to place more focus on the activities of the companies they are providing capital to and the impact that these activities have on the environment and the wider community. The consequence of this is a growing amount of green financing arrangements being entered into around the world, which is forcing those raising capital to link their Environmental, Social and Governance (ESG) performance

to the cost of the capital to they are able to secure. To secure green funding arrangements there are expectations being placed on organisations to report on their ESG performance using a recognised framework, such as Integrated Reporting, and provide an assessment of the impact they are having on society. As a consequence, there are opportunities for organisations that have adopted clear strategies to manage and reduce their impact on the environment and to actively support their community, to translate their actions into cost reductions. Lenders are finding creative ways to reward those that are proactive in addressing critical issues. In addition, the growing power of the consumer voice on social and ethical issues is benefiting the financial performance of organisations that have taken steps to enhance the sustainability of their business practices. The Financial Times reported an analysis of more than 300 of the world's largest companies across a range of sectors found that those with more ethical operations make bigger profits.



### Bringing activist campaigners to the table to become part of the solution

The agri-food sector has always been subject to challenge by activists; perhaps more so than any other sector of the global economy (with the possible exception of the energy sector at certain points in history). However there is a unique paradox involved in the nature of the challenge that is placed on the sector. Organisations are coming under scrutiny as one of the largest users of natural and human resources (be that land, water, the oceans or soil or as a major employer globally of people) which has a range of positive and negative benefits on the community and society. It cannot be overlooked that the collective purpose in using these resources, to provide people with sufficient food, is undeniably positive. The very reason the sector exists is to feed the world. This provides a solid framework for working with those who may oppose various activities within the sector. When setting policies and operating practices, more organisations are inviting a diverse range of perspectives to the table. This helps them to design robust frameworks that enhance rather than detract from their social license to operate. Companies need to ensure they listen to every voice so communities are assured the sector is working with them, not against them, to maintain their social licence to operate.

# The Health and Wellness decade

Like all other industries, the agri-food sector is being disrupted through innovation and technological transformation, with consumer needs and demands underpinning the pace of change.



**Emma Wheeler**  
Senior Manager, Agri-food  
Co-Author, KPMG

The growing focus on food-as-medicine is driving massive change within the agri-food industry. Traditional big food companies, agricultural producers, pharmaceutical businesses and start-ups are all being attracted to opportunities in food for health and wellness purposes. For agri-food companies, this means a shift away from commodity models where producers decided what to produce and what would be offered to consumers, towards the creation of highly specialised and enabled food that is designed with specific nutritional profiles.

As consumers become more educated about what they eat and attentive to the impact that food and lifestyle has on health, this is resulting in a health and wellness trend sweeping across parts of the community. This trend is shaping an evolution of not just food products, but the way in which we grow, consume and market our food. **The health and wellness food market was valued at USD769 billion for 2019.**

Our view, however, is that consumer focus on the impact that food has on health is still nascent and we will see the trend accelerate exponentially in the coming decade. As a result we consider it is likely that the 2020s will be a decade where health and wellness dominates the food system. This will drive change across the entire supply chain. From ensuring soil health is optimal to focusing on the growth of nutrient dense produce, through to the how food is presented to consumers (such as composition of the packaging used) and the way food is cooked and waste products re-purposed.

We have all been told many times that **prevention is better than cure**. In a traditionally reactive environment, or cure focused approach to health, consumers are awakening to the power of a proactive, preventative approach, with food as medicine as a core foundation.

It is notable that it is not just consumers awakening to the power of a preventative system; governments across the world are constantly challenged to meet the spiralling costs of curative care systems and are prepared to explore preventative care models with the expectation that a healthier population will reduce the long term costs of health.

It is significant that millennials, who have now taken on the role as the largest consumer group, are the biggest supporters of the health and wellness ideal. **It was reported that 53% of millennials place health and wellness as the most valued area of their life.**



## The problem

Health researchers have long been aware of the far-reaching consequences of poor diet and lifestyle. The rapid expansion of non-communicable diseases (NCDs) is due largely to lifestyle-related illnesses; including obesity, cardiovascular diseases and diabetes. Over time, the burden of these diseases is rising disproportionately among lower-income countries and populations. **The World Health Organisation reported that of the 56.9 million global deaths in 2016, 71% were due to non-communicable diseases (NCDs).**

**One in five adults in OECD countries, and one in six children, are obese. The global paradox, however, is that one in five children under the age of five exhibit stunted growth due to malnourishment.**

Many of the risk factors associated with NCDs are modifiable with behavioural change associated with diet. The cost of the global healthcare system is no longer attainable – 64% of Americans want to lower their healthcare costs, but don't know how to. It is estimated that malnutrition in all its forms could cost society up to USD3.5 trillion per year, with overweight and obesity alone costing USD500 billion per year. The global economic impact from obesity is roughly USD2 trillion, or 2.8% of global GDP.

There is a direct correlation between diet and health outcomes. The impact of people not having access to enough food, the right nutrients or eating too much of the wrong types of food are massive on the health of the global community. The direct financial costs of this trend are significant but the social and emotional toll that the impacts of inadequate nutrition have on our community should not be underestimated.



## The potential cure

Many consumers have become aware of the strong link between diet and health and are now seeking out options that support their personal health requirements and provide broad-spectrum nutritional density. To date much of the education has come through public health campaigns and



\$769 Billion 

USD BILLION 2019  
Health and Wellness food market value

\$3.5 trillion

USD TRILLION ESTIMATE  
Malnutrition could cost society up to USD3.5 trillion/year, with overweight and obesity alone costing USD500 billion/year

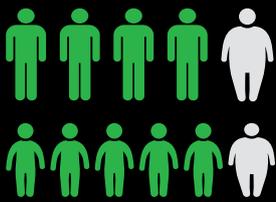


PEOPLE  
One in five children are stunted

\$2 trillion 

USD TRILLION ESTIMATE  
Global economic impact from obesity is roughly USD2 trillion, or 2.8% of global GDP

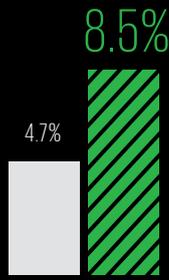




PEOPLE  
One in five adults, and one in six children, are obese in OECD countries



GLOBAL PEOPLE 2016  
WHO estimate 56.9m deaths, 40.5m (71%) due to non communicable diseases (NCDs)



PEOPLE, 18 YEARS +  
Global prevalence of diabetes in adults rose from 4.7% in 1980 to 8.5% in 2014, with a major contributor being diet



% HEALTHCARE SPENDING  
Between 2-7% of all healthcare spending in developed economies is on obesity





**Health is no longer just the absence of disease, but the focus on wellness.**

individual consumers doing their own research to understand more about their diet. There is a need to amplify the availability of easily accessible, reliable and unbiased information to enable people to make the best dietary choices for their specific lifestyle and economic circumstances.

Many of the risk factors associated with NCDs can be mitigated with dietary behavioural changes. At a broader level, consumers are increasingly turning to food – rather than a pill – as a longer-term health solution. They are actively seeking out options that support their personal health requirements, and this has spawned a growing market for food-as-medicine. We have noted that some food companies are now viewing the Business to Doctor channel (B2D) as a key channel for them to support doctors in learning about how food can be used as an effective non-pharmaceutical prescription.

**Health is no longer just the absence of disease, but the focus on wellness.**

An eruption of products that have functional ingredients have reinforced the role of food as medicine, which has been around for centuries. Foods that specifically address personal health concerns have skyrocketed in popularity as have foods that contain specific functions; anti-inflammatory properties, or potent nutrient dense ingredients that support immune function, or improve gut health. Whole foods, in their most natural state with wide spectrum of nutrients, are recognised as premium products, and consumers are willing to pay more for them.

**The organic food segment alone is worth EUR85b and is growing at 10.5% a year.**

**Less is more**, with free-from foods gaining popularity, with products that are as close to their natural state as possible.



**And the market impact**

Agri-food organisations around the world are aligning themselves with health and wellness trends. They are looking for ways to leverage the opportunities through product re-formulation, new product streams, or partnering with smaller agile innovators.

**Agri-technology** is helping facilitate the food-as-medicine movement in a number of ways. **Technology** is assisting right from the seed, with the ability to implement plant genetics, and tools to assist with cultivars. It is facilitating the expression of certain features of a product, over less desirable attributes, such as specific nutrient content, flavours or texture, colour and shape or elements such as higher yield, pest and disease resistance, seasonality and storage potential. For example the use of **CRISPR-cas-9** to edit the genome of a banana when a virus was discovered that threatened food security in Africa. Or to edit crops, inserting omega-3s to promote anti-inflammatory responses.

With a massive 75% reduction in kitchen-prepared food between 1985 and 2015, **convenience foods** are being re-invented for the health-based era meaning there is a need for **convenient, on-the-go** options. The next generation of modern convenience food is emerging as a response to the rise in health eating.

Convenience in terms of packaging such as edible packaging from **water.io**, or single serving size ready-made salads from **Whole Foods**, and the ability to have personal vitamin delivery through **Vitality**.

Traditional big food companies are also alive to the potential of the health and wellness trend. It has been a key driver of acquisitions and partnerships activity across the sector in recent years: recent examples include **PepsiCo** acquiring **HealthWarrior** and **KeVita**; **General Mills** investing in **Purely Elizabeth**, **No Cow**, **Farmhouse Culture** and **Kite Hill**; **Mars** investing in **Kind**, the list goes on.

The food giants are not only bringing in smaller more agile start-ups under their umbrella; they are also tweaking their own ingredients to align with consumer demands. **Nestle** has set out to cut sugar in its confectionery by 40 per cent; while **Kraft** is reducing artificial preservatives and colours in favour of natural spices like turmeric.

As health and wellness increasingly becomes a driving factor for consumer purchasing choices, all those in the agri-food ecosystem must consider product attributes and adjust systems and formulations accordingly to position themselves for the decade of health and wellness.

# Nature of a farm

Many in the developed world still imagine 'the farm' as the stereotype they knew from childhood; a farmer driving his tractor with dogs in tow, and a plethora of different animals living happily in harmony. This has never reflected the reality of the majority of farms around the world; which largely exist to provide subsistence living for a family unit or small communities.

Yet even those with a more sophisticated understanding of modern agriculture are needing to review their definition of a farm. Agriculture is undergoing massive transformation, driven by the need to produce significantly more food to supply a growing and increasingly hungry global population. The challenge is not just in producing more, but doing so in a sustainable and ethical way that provides nutrient-dense foods to support health for all populations. The sustainability of intensive farming systems is increasingly being challenged by consumers and regulators from a variety of perspectives – environmental impact and water quality, through the welfare of animals and people to the quality and nutritional density of the food being produced. To meet the demand for food, 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 the ultimate consumers.



## Cellular farming sees more food being grown from cells rather than growing an animal

The ability to create food that replicates meat, fish and dairy products – with a lower greenhouse gas footprint and without the need to slaughter animals – is likely to become a commercially-viable option in the next decade. Products are now being grown in controlled environments using cell cultures, rather than growing the entire animal. Techniques will be developed and scaled so this becomes a cost-effective way of supplying 'real' animal protein to consumers around the world. Consumers are already being educated on the techniques of cellular

agriculture; and the lower impact on land, water and the atmosphere means the products are being described by their developers as 'clean food'.

**Organisations such as Perfect Day, Memphis Meats and Finless Fish are high-profile alternative food brands leading the way in this space. Perfect Day use microflora and fermentation to replicate the protein found in cow's milk.**



## Optimising the contribution of the 'blue larder' to global food and fibre resources

With greater volumes of food being required for both human consumption and animal feed, access to prime agricultural land will become increasingly competitive. The ocean represents a viable and productive option; not only in creating more aquaculture farmed seafood, but also in providing space for innovative farming systems. While we may eat more seafood protein in future (much of which is likely to be grown in aquaculture farming systems rather than being wild caught), ocean farming will be increasingly focused on plants that can grow in and around the ocean, and that can make a significant contribution to global protein and nutrient supplies. Algae, seaweed, and water lentils are rich in nutrients and provide plant-based marine food options that will enable us to better utilise the 'blue larder' on a global basis. Organisations are quick to understand the potent power of bioactive marine-derived sources, and pharmaceutical companies are creating supplements harnessing these. **Parabel have created a protein rich plant protein from water lentils, with the protein structure similar to that of animal proteins; containing levels of essential amino acids and**

**branched chain amino acids (BCAAs) that are comparable to whey, higher than other plant proteins including soy and has a protein digestibility-corrected amino acid score.**



## Vertical farming and covered cropping innovation redefines economics for plant-based agriculture

With consumers being willing to pay a premium for fresh and local produce, producers are incentivised to explore different systems to provide this. Businesses are creating closed loop systems (sometimes referred to as 'plant factories') that utilise resources in a circular fashion through the application vertical farming and covered cropping technologies around the world. Core to these technologies is innovation in the use of lighting systems which enable plants to grow quickly and with enhanced nutritional properties. Vertical farming is especially valuable in urban areas where land is scarce and expensive. The range of crops that can be economically grown in these systems is increasing, while the costs associated with developing a facility are decreasing – making them increasingly commonplace in many cities around the world. **In Shanghai, the district of Sunqiao represents a new urban approach to agriculture, showcasing what can be achieved with vertical food factories. VertiCrop and Plantagon are space-saving vertical farming systems designed to promote the farming of healthy crops in controlled and closed-loop environments. Emirates, the airline of Dubai, has recently announced an investment in covered cropping systems to enhance the supply chain for its flight catering business.**







### Regenerative farming systems support a drive to achieve zero-carbon food

The quest for increased agricultural production, and the use of intensive farming practices, has over time depleted the natural capacity of land in many parts of the world and in some of the more extreme cases has left the land unable to be farmed. Regenerative agriculture recognises that agricultural land is part of a larger ecosystem, and that it is no longer acceptable for farming activities to simply make withdrawals from this system. They must also invest in the soil management techniques they use, the approach to cropping the land and activities undertaken to support the redevelopment of the natural ecosystem (including the setting aside of land from production, the promotion of native flora and fauna and the protection of wetlands). The ability to capture carbon in soil and aboveground biomass will contribute to reversing current global trends of atmospheric accumulation of carbon. As more producers aspire to grow zero carbon food, starting with a reduction in their carbon footprint, regenerative agricultural practices will help to not only ensure no more damage is done to the land but to restore its natural capacity. Institutes are forming to educate farmers and help subsidise their shift to regenerative practices. **For example, the Rodale Institute offers research, education and outreach; and is home to the longest-running comparative study of organic and chemical agriculture.**



### Competition for prime agricultural land intensifies placing greater focus on returns being generated

Land is always in demand, however supply is largely fixed. Globally 40% of the usable land area is currently being farmed, with much of the land being used to grow commodity food products and stock feed for animals. Historically, food and fibre production has utilised prime land because there was no

alternative uses for this land, however as cities, energy and resource demand has grown viable alternative uses for the land have emerged. Prime agricultural land has often surrounded cities thus as urban regions grow it is not surprising that farmers are being approached to sell their land to developers to allow for further urban expansion. In mineral rich regions, such as the east coast of Australia, there has always been a tension between farmers and mining companies over how competing land uses can effectively co-exist. While the production of food is critical to the long term health and prosperity of our society the quest for low price food has meant the return farmers have generated on their investment has often been significantly below other land use options. **It is likely governments with a focus on food security will protect some high attribute agricultural land for continued food production, however for farming to be able to continue to utilise all its current space, farmers will need to place much greater focus on the returns their farming system is generating.**



### Production of insects expands exponentially to deliver sustainable animal feed solutions

Insects are a natural diet for many animals, offering high levels of protein to promote growth. The United Nations Food and Agriculture Organisation (FAO) estimates that commercial animal feed production will need to increase by 70% by 2050. At the same time, the use of productive land to grow feed for animals will come under increasing pressure, as more focus is placed on the carbon footprint of food production. The opportunity for insects to convert waste biomass into protein and other important nutrients is second to none – making them a viable and valuable future source of stock feed. As a consequence, we expect to see the farming of insects at scale becoming increasingly common around the world in the next decade. Insects already

form part of the diet for many people around the world. We do expect to see more insect products finding their way into the human food chain, particularly as a replacement for commodity uses of some animal proteins, but do not envisage a time where they will become a preferred alternative to traditional animal based meat proteins in the foreseeable future. **Companies such as Ynsect and Enterra Feed are emerging as processors of insects into protein-rich food for animals.**



### Circular production systems are developed to utilise co-products and by-products created by agricultural production

As part of their social license to operate, producers will need to demonstrate they are effectively managing inputs – and utilising outputs – from their production systems. A 'circular production system' is aimed at minimising waste and emissions, and making the most of any resources present in the system. Organisations will increasingly look for creative ways to build circular production systems; with the ultimate goal of using all by-products and co-products in a productive or socially relevant manner. For the agri-food system this includes looking at alternative packaging models and specifically designing uses for waste streams that are generated from the production of food and fibre products, including effluent, excess bio-matter and under grade production. The reliance placed on imports and exports across the global food system does challenge how effectively a circular system can be implemented as exports, for example, represent an inherent leakage from a circular system. **Research from Europe shows that applying a circular solution could reduce fertiliser, pesticide and water use by 45–50% in 2050; while at the same time lowering land-use, greenhouse gas emissions, fuel and electricity by 10–20%.**

# How we farm

For centuries, the essence of farming has not changed substantively. Producers have always cultivated plants, raised animals, planted trees or harvested the oceans; in order to provide food, fibre or fuel. Being naturally innovative, they have always made enhancements that deliver year-on-year incremental improvements in yields. Recently, however, the level of investment made into new agri-food technologies has sky-rocketed.

The fundamentals of 'how, where and when' we grow food are changing; and waves of investment are sweeping into innovative agri-food organisations. The sector is alive to the many opportunities available to disrupt traditional industry practices. We're seeing integrated digital solutions that augment the intuition of farmers and producers; precision agriculture tools that increase output while minimising the environmental impact of farming; and water capture technologies that enable unproductive regions to contribute more. Technology like robotics and animal and plant genetics are delivering solutions that address issues facing farmers, growers and fishermen.



## Communication technologies enable data-augmented activity across the agri-food value web

The uptake of digital technologies and the IoT (Internet of Things) has been constrained by inadequate access to connectivity, especially in rural areas. However with investment in many countries into rural communication networks and the transformational potential of 5G technologies and other low-powered network solutions, digitalisation of the sector is becoming more feasible for many producers in remote rural areas. Having access to multiple data sets enables aggregation of data; which can enhance productivity, minimise waste, and improve traceability and product quality. New communication networks unlock the ability to collect, analyse and utilise data across the complete agri-food web. Adopting data-based farming solutions will become the norm on farms, as farmers understand the technologies available and experience the benefits

to productivity, sustainability and accountability that data augmented farming can provide. Ultimately, the technologies will deliver improved financial and social outcomes for rural communities. **Leading the way in data utilisation, the Netherlands was the first country in the world to have a national low-power, long-range, wide-area network (LoRa Network). Dutch telecommunications giant KPN implemented LoRa Network ensuring the Internet of Things applications were available across the Netherlands.**



## Robots and drones reshape labour requirements for many aspects of farming

As the amount of food required to feed a growing and more prosperous population continues to increase, production systems are becoming increasingly complex, with the breadth of skills needed to operate a farming business continuing to expand. The skills, experience, education and business acumen required to undertake jobs within the agricultural sector extends not only to on-farm workers, but to rural support businesses, processors and the entire value web. With a shortfall of skilled labour in the industry already, and continued migration of young and skilled people from rural to urban regions across the world, the agri-food sector is facing a workforce crisis. The application of technologies, such as drones and robots, provides the ability to monitor farm production remotely, safely and cheaply, and enables available people to be deployed to roles that enable them to develop and utilise a wider range of skills and add more value. As the adoption of these technologies grows, it supports agri-

food businesses in producing more while using less resource as they also enable precision farming techniques to be applied in respecting of pollinating, spraying and harvesting. **Farmbot is being promoted as the world's first open-source CNC (computer numeric control) farming machine. Farmbot uses hardware that can move with precision to do activities such as plant seeds, water crops, measure the moisture content of the soil, and destroy weeds.**



## Satellite-enabled systems improve farming practice, environmental management, resource allocation

Precision agriculture utilising satellite enabled farming is becoming more available as the cost and capability to regularly collect large-scale imagery of land areas from orbits of small and relatively low cost satellite systems increases. This imagery is then analysed using analytical tools, including biological algorithms, to observe, measure, understand and respond to inter and intra-field variability in crops. The emergence of these big data lakes being sourced from satellite imaging has the potential to transform farm production and risk management, in turn assisting governments and insurers to also understand farm dynamics for the purpose of better regulating environmental management practices and underwriting agricultural risks respectively. As the uptake of technology increases, the cost of implementing satellite-based technologies will make it feasible for smaller producers to utilise these tools on smaller parcels of land. Regular imaging will allow them to assess the effectiveness of production systems





and enhance environmental decision-making. **Aggregated images can create contour maps that allow the user to see where water flows, create yield maps of productive land areas, or determine variable-rate seeding. Use of this technology will also inform regulatory decision-making, including decisions around optimal land use for particular tracts of land.**



#### Digital agri-marketplaces evolve to facilitate transactions across the value web

Agri-food slowly morphs into a fully-digitised industry, online marketplaces are enabling the exchange of goods, services and capital equipment. Digital exchange services are common across the global economy but are only starting to emerge in the agri-food sector (with the exception of food delivery services which have grown significantly over the last five years). The challenge historically for many producers has been finding information on products and services relevant to their specific needs in an environment where there is a plethora of solutions from suppliers all claiming to deliver significant production benefits, but no tools to enable an easy comparison of attributes being claimed. Digital marketplace platforms facilitate the easy comparison of products and then make it simple for direct lines of communication to be opened up. Connecting producers to the suppliers of technology and farm system inputs, food companies to producers, and, in some cases, consumers directly with the producers of their food will assist in ensuring value is spread across the value web based on the attributes an organisation brings to a product. **Indigo Marketplace is an example of an organisation that has built a more transparent and efficient supply chain, by directly connecting buyers and growers through their digital platform.**



#### Water scarcity promotes farming systems that maximise the benefit of every last drop

In the many agricultural regions facing water scarcity, access to water and rights to draw water from bores or aquifers are often the most valuable asset of a farming business. Currently 70% of the world's population experience water scarcity for at least one month a year and it is forecast to get worse over the next decade. Agriculture is the largest user of water worldwide, with the United Nations reporting it consumes nearly 70% of the world's fresh water. Water scarcity affects social and economic stability as well undermining the sustainability of natural environments and ecosystems. For the agri-food sector, enhancing

water productivity is critical, if the industry is to make a significant contribution to alleviating water scarcity. The mechanisms used to allocate water rights contribute significantly to land values and focus producers on farming systems that maximise the value extracted from all water available to a particular land holding. However, reducing the footprint will need innovation in water forecasting and precision irrigation technologies as well as serious consideration of using cultivars which have been modified to enhance their resistance to drought. **Digital solutions and innovative irrigation technology on farm offer techniques that can monitor water usage and encourage precision agriculture so no drop of water goes wasted.**



#### Bio-control technologies become prevalent as focus placed on minimising food residues

The emergence of analytical tools that enable laboratories to measure the constituent parts of a food product to the nearest part per billion means that it is now easier than ever to identify unwanted chemical residues in food products. Although the majority of these trace elements present no risk to human health they do create concern for consumers about the safety of their food and as a consequence they attract regulatory response. The impact of these analytical technologies mean that on farm practices that have been widely adopted in the past, for instance spray protocols, become commercially unacceptable as they create the risk that the resulting product could be rejected by customers or fail a phytosanitary inspection at a border. The focus has consequently moved to finding alternatives to traditional chemical pesticides, animal health remedies and crop protection products that have more natural composition and consequently do not give rise to trace residues that can be perceived as high risk. **There is much work being done by the large players in the crop protection space, as well as many innovative start-ups, to develop microbial based biological control agents that protect against disease through the use of natural enemies of plant diseases.**



#### Technology enables every producer to become a local producer for the world

The local food movement has been growing strongly over the past decade, as more and more consumers embrace the farmer's market model. For consumers, particularly those at the premium end of the market, seeking to connect directly with the producers of their food not only offers a sense of

understanding the provenance of the products and ethics of the person that has produced it, but it can also shorten the supply chain and alleviate food safety issues. Virtual reality, social media, and digital market platforms provide any producer with the opportunity to become a local food producer to the world as the technology provides the opportunity to interact in a deep and engaging manner with consumers around the world. Virtual reality can put a consumer in the centre of any farm, social media provides the opportunity for conversation and a website can be used to tell the product's story and provide all relevant data to confirm the products provenance. Every producer now has the ability to set up a 'digital farmers market stand' and to be successful if they are able to articulate their story in a compelling and engaging way. FarmVR offer education through immersive technology as a way to enhance agricultural learning as a way to bring together individuals, businesses and communities so they can collaborate, share knowledge and build skills. **FarmAR is another solution, an augmented reality app supported by an advanced back-end of an artificial intelligence software implemented in fully automated cloud computing system.**



#### Public Private Partnerships deliver infrastructure to unlock the full potential of land around the world

One of the significant constraints on the productivity that is able to be obtained from any piece of land is the access it has to necessary infrastructure, in particular water, transport networks, energy and communication. The challenge for the agri-food sector is while this infrastructure is critical to maximising the value that can be extracted from a piece of land, the investment associated with building out these facilities in remote areas rarely makes economic sense. The cost of investing in rural infrastructure and the relatively small number of people that it benefits means that government is more likely to prioritise urban investment. Securing the necessary facilities to maximise the productive capacity of land is critical to utilising land effectively, and will require the design of creative funding models that could bring the infrastructure to life. One option for this investment is public private partnership structures, particularly given the long term nature of the assets involved. **It is likely that producers, processors and exporters may need to be investors in these partnerships and, as the direct beneficiaries of the assets, this could be facilitated through a co-operative vehicle.**

# Products grown

As the world's population grows in size and wealth, producers will be required to continuously re-imagine the products that they grow, catch or harvest. What we eat in 2019 is significantly different from the food that was eaten just a generation ago and will be different to what we eat in 20 years time.

The increased multiculturalism of society, together with fast food, has fundamentally changed prevailing diets in many countries around the world, and brought diversity to others. Technological evolution has also had a major impact in shaping demand for products. Exponential change and new technologies will see food products continue to evolve in significant and dramatic ways. With powerful forces shaping 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 strategies that allow them to remain relevant. Understanding and predicting how a product will be used into the future is critical to making long-term strategic planning and investment decisions today, about the technology deployed on farm and the highest priorities for innovation.



## Creation and optimisation of plants for food and fibre purposes using genetic biotechnologies

Biotechnologies, including the use of gene modification and editing, has the potential to create new, or manipulate existing cultivars, that meet the community's need for functional food and fibre products. Biotechnologists have the ability to optimise plants and create crops that have functional benefits, such as increasing certain vitamins or minerals beneficial for health, such as omega 3 fatty acids. Additional to functional capability, the ability to alter the genomes of plants to enhance the speed of growth, for example, will assist in diversification of land use and the management of climate change. Technologies also have the potential to manipulate resistance to weather conditions and diseases

meaning less chemical intervention, reducing environmental impact. There is still not a globally consistent view on the social and ethical acceptability of these technologies. It does appear that they have the potential to assist in providing the food system with greater resilience and mitigating the impact of extreme climate change on agricultural production around the world. **Tools such as CRISPR/Cas9 systems have been researched and proven as an efficient tool used for genome editing in a variety of organisms. Much research has been done into the developments in agricultural biotechnology, proving it is possible to generate food crops, such as Biofortified rice, which are nutritionally enhanced to improve the content and bioavailability of essential nutrients, such as iron and vitamin A.**



## Unleashing the potential of the world's native flora for the benefit of global society

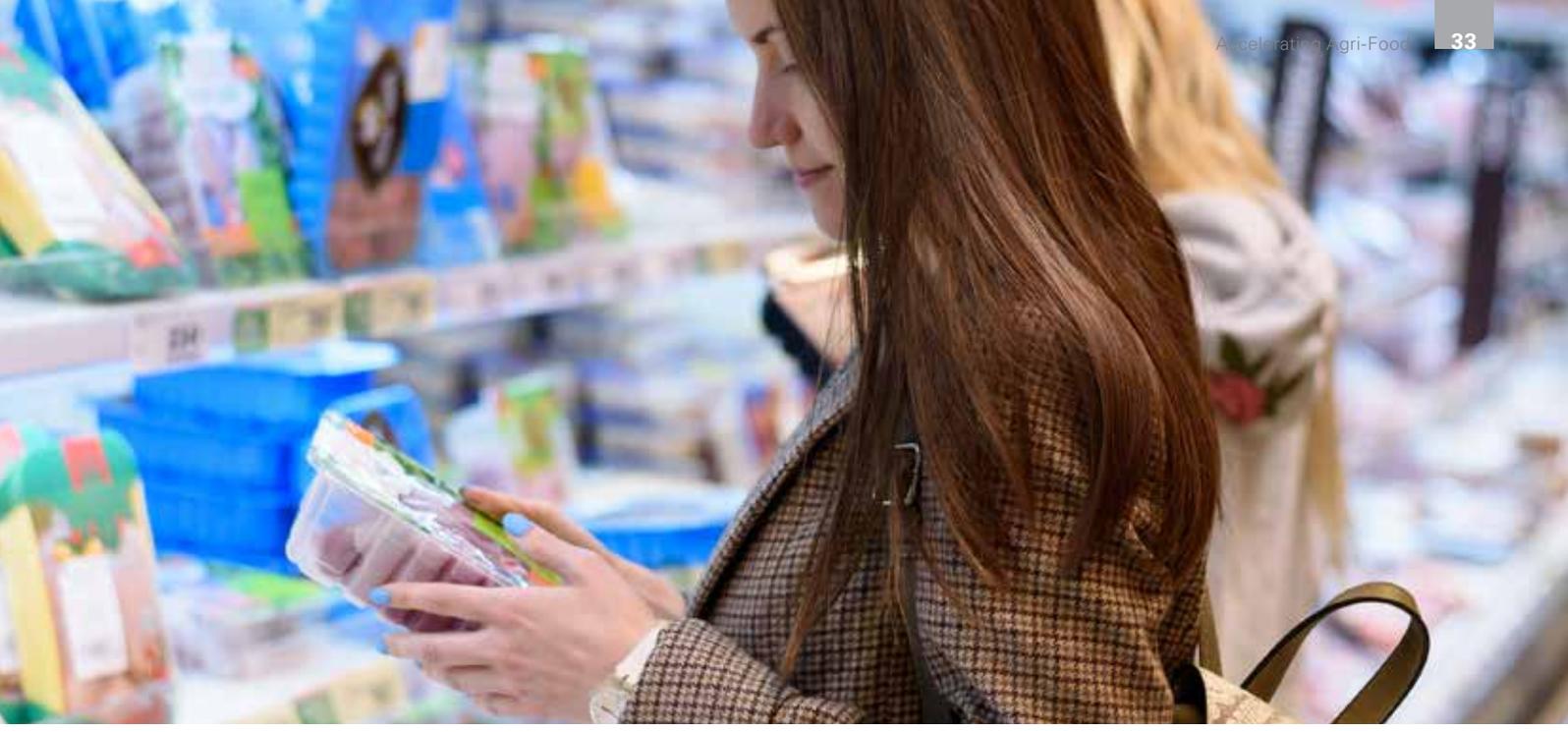
The global food system is based on very few key plant cultivars, with the Food and Agriculture Organization of the United Nations (FAO) estimating 75% of the world's food is generated from only 12 plants and five animal species. There is huge potential to discover and assess the full range of plant species that exist globally; and unleash more of the planet's native flora for the long-term benefit of society. Some of this has been used by indigenous communities around the world for food and medical purposes since ancient times. Identifying the natural properties inherent in these products could contribute to feeding the world, improving health outcomes, and supporting the economy. There is huge potential in medicinal purpose of plants, for example, with an estimated 45% of prescriptions in the United

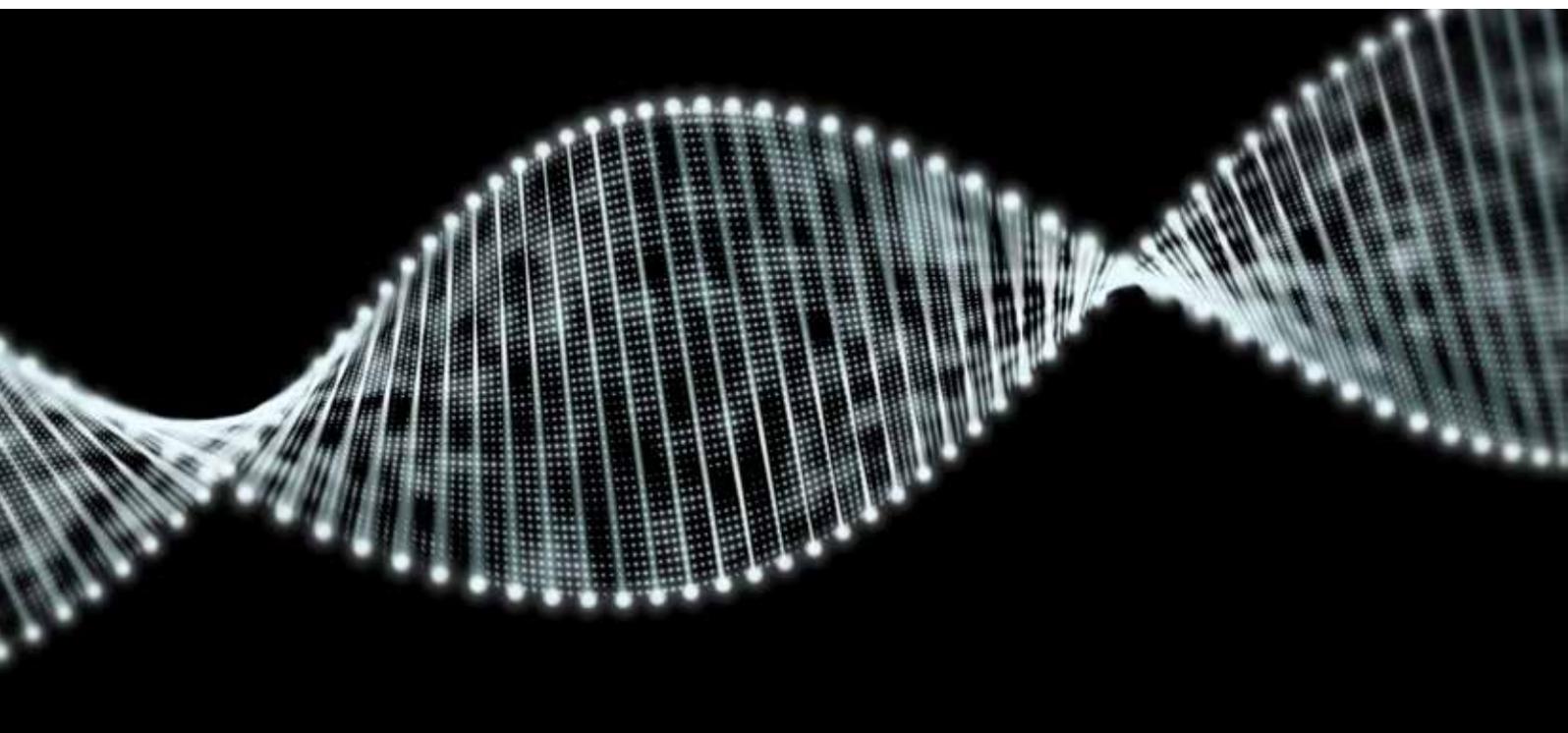
States containing at least one drug originally derived from plants. Exploring the potential inherent in native flora also provides the opportunity to work with indigenous communities, that often exist economical and socially on the fringe of society, and provide them with options to increase their economic empowerment. **It is expected that medicinal marijuana will exceed a global market worth of USD55 billion by 2024.**



## Reintroducing biological diversity returns interest and de-risks the global food system

Monoculture production has delivered lower-cost food for the wider population, but the downside is that it has increased the risk of crop failure through disease incursion or adverse climate events. Re-use of the same soil, rather than rotation of several crops, leads to higher incidences of plant pathogens and diseases and can ultimately deplete the soil to point where it becomes uneconomic to farm. Utilising multiple crop varieties can reduce the risk of full crop failure, and introduce greater biodiversity into a farming system. There is growing recognition that systems with greater biodiversity will deliver improved environmental outcomes; while demand for more nutritionally-dense and specialised food choices are also expanding. Increasing the range of products grown does increase the cost of production and there are challenges passing these costs through to consumers. As a consequence, new or reintroduced heritage cultivars do need to deliver attributes to consumer that they perceive to be valuable so that they are willing to pay a premium for the product.







### Reimagining a future for animal health based on lower antibiotic intensity

Anti-microbial resistance (AMR) is a serious challenge facing society, and the use of antibiotics in food production has come under increasing scrutiny. The use of antibiotic drugs and cleaning products has increased dramatically in many societies. It is suggested that these products have been misused in a number of agri-food sectors: for the treatment and prevention of diseases in livestock, in aquaculture, and in crop production. However, it should be noted that around 80% of antibiotic prescriptions are written for the treatment of human health issues. The result of collective overuse is a heightened risk of the emergence and spread of antimicrobial resistant microorganisms. Anti-microbial resistance is a concern for both animal and human health; if food has been inappropriately produced with antibiotics, there is a risk that this could contribute to AMR and result in long term and potentially significant health issues. Future production systems will need to support efforts to maintain efficacy of antibiotics; with new and proactive ways of managing animal health. There are also significant opportunities for businesses to develop natural alternative remedies to maintain animal health in a sustainable manner. **Supermarkets and retail outlets such as Waitrose, Marks & Spencer, Tesco and Sainsbury's in the UK, have taken action to measure and limit the use of antibiotics in farming systems. Waitrose has publicly stated it has banned the use of the last-resort antibiotic, colistin, and is the only supermarket that has committed to publishing antibiotic-use data from its suppliers.**



### Enhancing the nutritional density of human food supplies becomes a priority

The drive to scale-up food production has often come at the expense of nutritional quality. But as consumers learn more about the therapeutic value of food, they are demanding more in terms of functionality and quality nutrition. Given that nutrient-dense food can make a significant contribution to a population's health, and thus reduce the cost of healthcare, communities are actively seeking ways they can better produce foods that align with this. In turn, producers are looking to ways they can evolve their production systems in order to supply products with proven and desired health benefits. Sustainable land management that encompass a holistic approach to natural resources promote soil health and have been shown to create more nutrient-dense produce. **Medical providers and education institutes, including the likes of Harvard and Healthline.com, are working to educate communities on nutrient-dense foods that are easy to adopt.**



### Shrinking the number of people with nutritional deficits by closing the food waste gap

Despite the fact that more than 800 million people experience under-nutrition and malnourishment every day, around 40% of the food produced globally is wasted. This misalignment of resources has placed the spotlight on underlying failings in the food system. In developed countries, consumers discard at least 20-30% of the food they buy, largely because they buy too much or the product expires before consumption. Retailers often overstock, or discard food that is not aesthetically pleasing. Additional problems such as harvesting practices, unnecessarily high quality standards, poor storage and handling practices, and shipping timeframes all create food waste, particularly in emerging economies. With a combination of government regulation and societal pressure, greater effort is

being made to lessen food waste via supply chain improvements, recovery of out-of-date food, and investment in new innovations. Solutions to food waste have attracted significant investment in recent years as it is seen as an area with many opportunities to both mitigate malnutrition issues and enhance the sustainability of the global food system. **Australia was first country to set a target to reduce the amount of food waste it generates by 50% by 2030. To help achieve this target, the Australian Government invested to support food rescue organisations such as Second Bite, FareShare, OzHarvest, and Food Bank Australia.**



### Molecular science is used to recreate exclusive food experiences

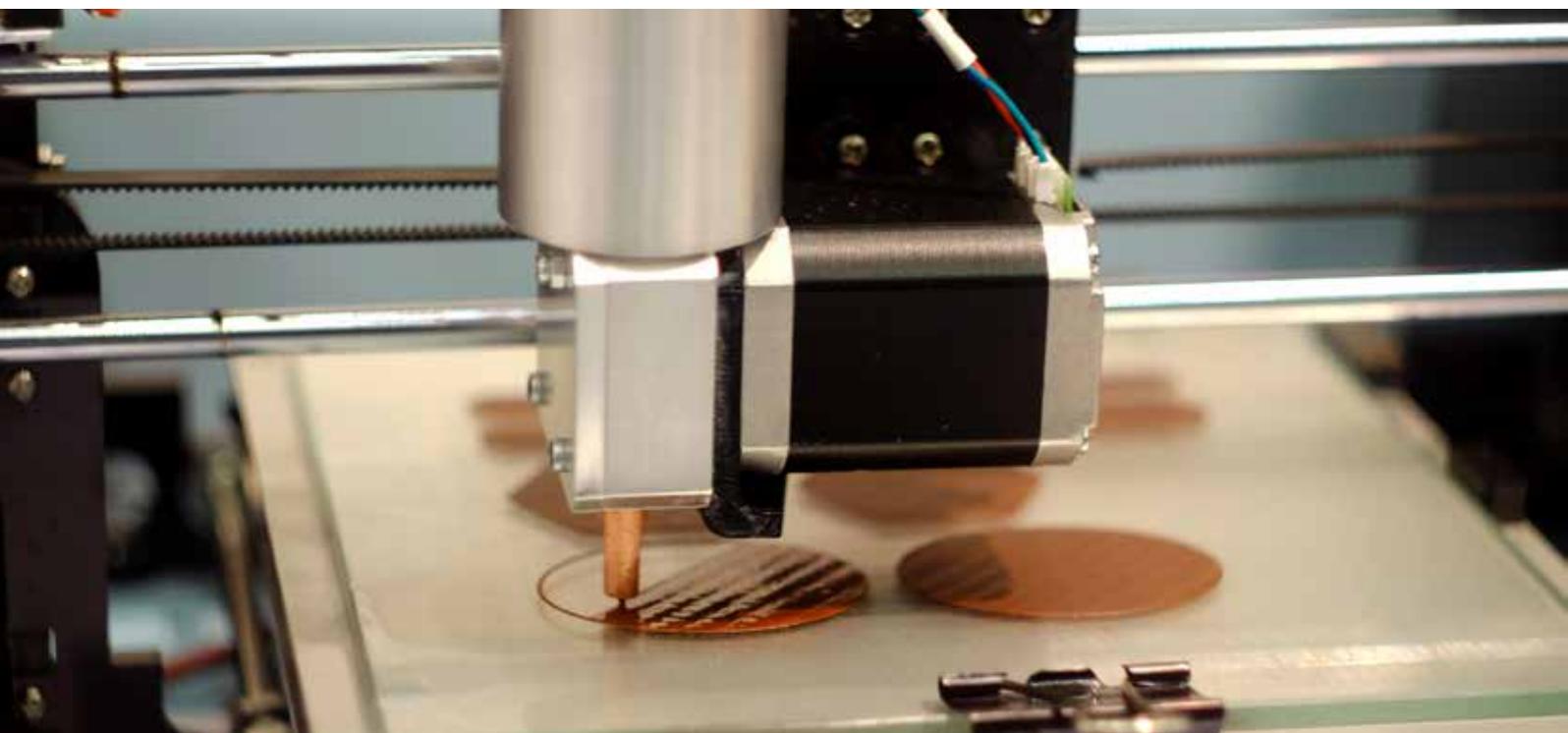
Some novel food producers argue that food and beverage products are nothing more in substance than a combination of acids, fats, proteins and other chemicals. They are using this perspective to analyse the composition of products, particularly products like wine and spirits, with the goal of reproducing them through blending the composite chemicals. They argue that molecular designed food offers the opportunity to recreate storied products at scale for the benefit of all consumers, using the great wines of the world, aged whiskeys or classic ports as examples of the products they could supply. The question about this innovation is whether consumers will accept the disconnection of the product from its historical terroir, in favour of a more affordable option that is being produced through a chemical engineering process (although they argue that the process of distilling spirits or making wine is fundamentally an industrial scale, chemical manufacturing process). **The US company, Endless West, is an example of a start-up business focused on producing molecular spirits, it notes that it believes in the creative capacity of science to develop products where others see boundaries.**



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# Processing and distribution

There is much discussion in this report about disruptive technologies and the impact they will have on how we grow, process, distribute and experience food in the future. More than ever before, purchasing decisions are driven by information. This ranges from technical information on product functionality and authenticity provided by the product manufacturer or a traceability solution, to reviews written by users and social media commentary on the product and its competitors.

Highly-informed consumers are steering innovation in agri-products, to ensure the products they purchase meet their expectations and fit within their lifestyles. Many factors come into play here. Some consumers want products with strong functionality at discount price points, while others are looking for unique and highly curated experiences.

When it comes to distribution, digitisation has totally transformed the sector. Entirely new distribution models have emerged that connect consumers more directly to the producer – thus shifting where margin is captured along the value chain. Models are reflecting the time and convenience pressures consumers are under, and allow them to filter for specific attributes (be that price, nutrition, provenance, reviews or any other criteria). The challenge for retailers is remaining relevant in a world of unlimited choice online, and where delivery moves ever-closer to instantaneous.



## Integrated urban food systems increase the food resilience of cities

Historically food was grown in the country and consumed in a largely subsistence manner. As cities have expanded over the last century, the disconnect between people and the sources of their food has increased; markets and supermarkets have become the prime source of food for many people. City authorities have taken a relatively passive position in respect of the food security of their cities however we have observed that more cities are looking to develop food resilience strategies. There are a number of reasons for this; the risk to social stability if significant and

sustained food shortages occur, the impact on the environment and roading networks from having food distributed around the city each day and the health consequences that are being observed in cities from poor diet and lifestyle choices that residents are making. As a consequence, city governments are looking to develop integrated strategies to ensure that sufficient, nutritious food is available to their residents while also looking to gain enhanced environmental outcomes by integrating food production areas into the design of urban areas and tourism benefits from building the profile of a city as delivering distinct food experiences. Strategies being used include integrating food production into cities to grow crops closer to citizens (through the use of urban farms, vertical farming technologies and green veins along arterial routes), creation of farmers markets so consumers can engage with growers and investing in city food stories and promotions to attract visitors to a city. **Singapore, an island state with a population of around 6 million people, has recently created the Singapore Food Agency (SFA) to connect all aspects of the city's food strategy into a single agency. The SFA is responsible for diversifying sources of food imports, promoting grow local initiatives and ensuring the safety and security of the city's food supply.**



## Plant derived technologies replace products sourced from fossil fuels and other non-renewable commodities

Modern lifestyles increasingly rely on access to a wide range of consumer products which are made from non-

renewable resources. Many products that are used in day to day life including food packaging, toys, clothes, homewares and household cleaning products are created with the intention of being used once and disposed of. There are often no options available for these products to be recycled. Advances in materials science means that new opportunities are becoming available to utilise the properties inherent within plants, including waste biomass, to unlock sustainable product solutions that could potentially supersede products made from plastics, metals, fossil fuels and other non-renewable sources. The obvious indicator of this trend is the emergence of takeaway food packaging made from bamboo fibre and drink bottles made from bioplastics, which are replacing products that have historically been made from plastics. The more transformational opportunities emerge when focus is placed on converting renewable biological resources using green chemistry techniques and biotransformation to create renewable plastics, adhesives, coatings, pulp and biofuels. **Scion, the New Zealand Crown Research Institute that works with forest products, is developing new bio-products that have specific functional benefits over traditional products, including lighter weight, heat and water resistant, greater strength and higher levels of flame retardancy.**



## Personalising nutrition to the individual disrupts traditional agri-food value chains

Historically, food products have been produced at scale, with a single offering developed to meet the needs of millions of customers. As health



and wellness becomes top of mind for many consumers, and they seek products that fit their specific requirements, meaning traditional one-size-fits-all production methodologies are increasingly becoming less relevant. Consumers can now purchase kits to test their DNA and other genetic markers to gain insight to what they should eat to maximise health outcomes. This has enabled unique food prescriptions to be designed for an individual addressing their requirements. Traditional value chains will need to evolve so they have the ability to deliver dietary solutions in a world where the market for a particular product spec may not be a million people, but one person. This approach to personalisation will require investment to meet the expectations of consumers. It is no longer good enough to define the pack size or flavour options for a particular product, the consumer wants to make these choices and with a world of infinite flexibility they expect to be able to specify the format that fits their needs online. We are also observing retailers respond to this trend with their offerings, a good example being quick service restaurants (QSR) no longer defining the flavours of drinks you can buy but giving the consumer the option to personalise their unique flavour mix.

**23andMe.com and DNAFit are solutions that tune individual diets, exercise regimes and lifestyle choices based on medical DNA test.**



#### **Printing technologies offer game-changing foodservice solutions**

Food printing offers a wide range of benefits including the ability to deliver tailored product options to consumers and the ability for restaurant operators to tailor their product experience in a way traditional foodservice products do not allow them to do. Alternative ingredients such as proteins from algae, beet leaves, or insects can be utilised in the ink and converted into nutritious products. Printing technology means that by-products and waste that would historically have been thrown away can be converted into food inks that can then be printed into edible food. Foodservice operators, who now account for over 50% of food sales in some markets, have been able to develop their business by supporting restaurant operators to deliver experiences by selling replicable products at low cost. The evolution of food printing technologies frees restaurant operators from standard specs and provides them with a chance to use printing technologies to create unique food offerings for their outlets, which could even be 4D in nature, so that the product could mature after printing. We expect to see foodservice operators evolve their business models in the coming decade to focus on supplying printers and food inks. These types of technologies can also boost the

visual appeal of food products as they enable new shapes and combinations to be introduced to the market. **BeeHex, a company which specialises in creating intricate bakery items, was founded following a NASA project to automate personalised meals for astronauts on deep-space missions. Foodini is currently selling their smart kitchen appliance online for USD400.**



### Incorporating 'mobile meals' into busy lifestyles drives food innovation

As cities continue to grow and expand, people are spending more time travelling to and from work, school and other activities than ever before. Commute time has overridden time traditionally spent on food preparation, with meal times often spent in transit; thus driving the need for convenient and nutritious food options. Dietary habits are also evolving – with many consumers adopting daytime fasting, multiple small meals, or other alternatives to three meals a day to enable them to maximise their productivity or achieve health and wellness goals. Increased understanding of the nutrition requirements of the human body will drive innovation in product formulation, packaging, and distribution to supply sustenance solutions that fit seamlessly into modern lifestyles. These products will be designed to fit within a specific lifestyle niche and distributed in such a way that makes them easy to access by people wanting to use the products. Significant innovation will occur in packaging so that food solutions are able to be consumed more effectively and tidily on the go; for instance the processing of fresh fruit may extend from chopped fruit in a pot to the supply of gels or purees that contain whole fruit but are cleaner and easier to consume. **A new era of 'food shortcut' innovations will emerge; responding to how and when consumers find it more convenient or nutritionally optimal to eat.**



### International trade thrives when the benefits are shared amongst participating countries

With consumers expecting that food will be available all year round rather than only being on the shelves when it is in season, international trade underpins food availability around the world. At the same time, the international trading environment is becoming more complex as World Trade Organisation rules have increasingly been superseded by countries entering

into direct agreements with each other (or multilateral agreements between groupings of countries such as the Comprehensive and Progressive Trans Pacific Partnership Agreement (CPTPPA). The importance of trade and the impact that it has on the economic fortunes of countries means governments are taking strong positions to protect their trading positions. Some commentators suggest rather than being mutually beneficial, trade is contributing to inequality with parts of a community winning and some seeing no benefit and often being left in a worse position. It is becoming increasingly apparent that future trade arrangements will be about significantly more than the movement of goods between countries; they will signal the political relationship the countries wish to have and will need to clearly demonstrate that benefits are distributed widely across the economy. **As a consequence an agreement, although notionally between governments, is actually an arrangement between economies and agri-food exporters need to be actively engaged in the negotiations as the arrangements around food are usually sensitive, given the focus most governments place on ensuring food security.**



### Big Food seeks to partner with disruptive innovators to maintain consumer relevance

Traditional food companies are finding it increasingly difficult to maintain organic sales growth in their traditional brands and product categories, as consumers seek out novel new foods and experiences. Historically, the food companies and supermarkets have curated the product ranges that are being offered to the market however technology now enables consumers to seek out options that they are interested in and curate their own product ranges. By their nature, traditional food companies are heavily invested in infrastructure, which makes it challenging to pivot quickly in response to market signals. The companies tend to tie innovation activities to their existing brands and manufacturing capabilities as a consequence they find it difficult to respond to challenger brands that are often asset light and consumer led. Big food companies are using a number of strategies to respond to this challenge, including internal incubators, partnering with accelerators, or investing in disruptive start-ups to access novel products, innovators and their pipeline of ideas. Partnering or investing with nimble start-ups present win-win

opportunities for both parties. It allows large companies to create disruptive solutions outside of their traditional portfolios; while small organisations secure investment to scale their products faster. **Big Food giants such as General Mills, Kellogg's and Campbell Soup have all been investing into start-ups, or corporate venture capital funds, to gain access to innovative solutions in food.**



### Concern about the environmental impacts of plastic waste accelerates packaging innovation

The increasing evidence that recycling systems for single-use plastics are ineffective has come under the spotlight recently. For decades, policymakers have focused on increasing the collection of recyclables and raising the diversion rate, rather than making a systemic change to the nature of packaging materials used. The weakness in the system has been highlighted globally when China closed its borders to importing recycled materials from around the world. The need to divert the majority of used products from being sent to landfill or ending up in the environment (particularly the oceans) accelerates the need to develop sustainable alternatives in the food system. Organisations are looking to natural products – such as bamboo, stone wool, or mushrooms – as a way to create packaging that is not detrimental to the environment. Bioplastics that are fully compostable and provide food safety protections are evolving, along with reusable packaging systems. It also opens an opportunity for plastic waste or byproducts to be recycled into new products. **Algae-based alternatives have been developed as a biodegradable alternative to single-use plastic packaging. Mushroom-based packaging has also gained popularity with the likes of Ikea.**

# Consumers and consumption

To cope with the increasing pace of life, consumers are seeking products and services that help them to manage the challenges of everyday life; from wearable technologies, artificial intelligence interfaces such as Alexia, self-driving vehicles and personalised operating systems, the list goes on.

The distance that individuals travel to work on a daily basis is a major contributor to busier lifestyles. With limited affordable options to live closer to their place of work as urban areas grow, commute times are increasing meaning traditional meal times are often spent in transit and not in a kitchen. In a time poor world, taking the time to stop for a meal is becoming a luxury few can afford, and as consequence an ever increasing percentage of the food consumed will be eaten 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. Increased pace of life is also increasing pressure on our bodies, with less time to consciously eat and exercise, recover and sleep. Emerging modern health conditions are exploding and the cost of our curative healthcare systems are out of control. Food is becoming medicine, and an integral part of healthcare regimes as a key tool used in managing the effects of existing health issues and the stresses associated with modern life.



## Delivering clarity and confidence to consumers on food provenance

Increasingly, consumers want to know where their food has come from and how it has been produced. This is occurring for a range of reasons – from simply enjoying the provenance story behind the product, to ensuring it aligns with a consumers personal values (such as animal welfare, social justice, or the environment) to gaining confidence about its safety, which is a dominant priority for consumers across Asia. This is being driven by an increased level of product recalls,

food fraud and food sabotage events that are occurring around the world. Ongoing scares will intensify the efforts that organisations need to make to be able to provide consumers with the confidence over the integrity of the products they are offered. This will see the adoption of digital, chemical and bio-technology solutions all designed to provide irrefutable proof of the integrity of the product. Other traceability solutions, such as blockchain, will offer streamlined data access to consumers and provide all the information that they could require in relation to the ingredients used in a product, how it has been produced and shipped to the retailer. Proactive producers are recognising that they will be asked to provide information into blockchain tools and are front-footing this issue, to ensure that they are able to use the data collected to provide a competitive advantage. As these technologies become mainstream, all producers will be held accountable for the integrity of their part of a value chain. **In 2018, an international scientific lab that specialises in honey fraud detection found almost half the samples selected from supermarket shelves was fraudulently marketed as Manuka honey. Organisations such as Midlands Apiaries, manufacturers of Puriti manuka honey, have introduced jars that contain 11 consumer security and anti-counterfeit features, such as invisible ink and laser etching, to combat food fraud.**



## Eating for the environment – a rebalancing of protein in the diet

The food system in many countries has evolved with a heavy emphasis on protein (this is demonstrated in

the analysis prepared by the World Resource Institute on page 39, which shows that most of the world eats more protein than they need and in many regions the balance between animal and plant protein is close to 50:50). While protein is a building block for cell growth, over-consumption can have negative health effects – including links to cancer and other serious illnesses, which consumers are becoming increasingly conscious of. There is a growing movement, particularly in Europe, to educate consumers about the impacts of eating too much protein and encouraging them to consider a transition in their diet to reduce animal protein consumption and increase consumption of nutrient dense plant-based foods. Earlier in 2019, the EAT Lancet Commission released a report on the impact that the diet can have on the environment. Based on an analysis of scientific evidence the report concluded that there is a need for consumers to transition their diet from animal proteins to plant based proteins to help mitigate the increase in greenhouse gases. **It was reported that the global average protein consumption was approximately 68 grams per person per day – which is one-third higher than the average daily adult requirement.**



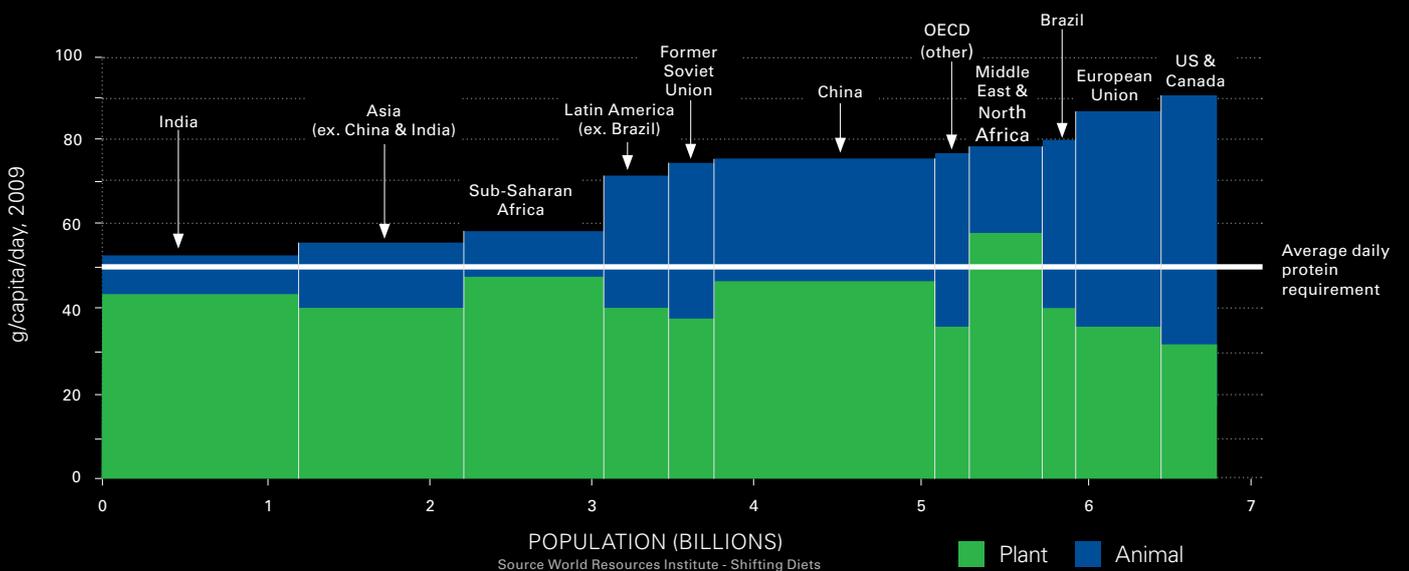
## Food is fashion – the desire for new tastes and textures proliferates around the world

As with any other category of consumer goods, food products evolve in response to changes in market preferences. In developed countries, it is an inescapable fact that food is fashion – and producers need to be continually innovating with new tastes and textures to maintain



## Average protein consumption exceeds recommended levels globally

Protein consumption exceeds average estimated daily requirements in all the world's regions, and is highest in developed countries.





their relevance to consumers. This offers an opportunity for producers to front-foot the newest taste profiles and food experiences. When it comes to café-sweeping fads such as chia seeds, Kombucha or cold-brewed nitrogen coffee, it certainly pays to be a pioneer. Not only is taste important, but having an Insta-worthy aesthetic is also critical. A current search on Instagram for pictures tagged “food” presents over 400 million searches. Recognising that food is fashion means a food producer can’t expect to cash in on a successful product for decades as they have in the past; a successful product is an indication that it is time to start innovating to find your next market shifting experience. **What may start out as food fashion can quickly become big business. Not too long ago, plant-based meat products were viewed as a passing fad. In 2019, pioneering company Beyond Meat went public with a USD1.5 billion valuation.**



#### **Premium consumers seek out storied, artisan, ultra-fresh products**

As the number of affluent consumers grows around the world, there is an increasing number of consumers with the financial capability and desire to seek out and experience highly-specialised choices around the foods they eat. The significant wealth that has been accumulated by the baby boomer generation who have reached or are approaching retirement and still have their health and a strong desire to experience new products, means they are actively seeking out storied, artisan and ultra-fresh products. It should also be noted that some millennial households are high-income with no children and approach life with a “treat myself mentality.” Both of these groups have a willingness to pay a premium for products that are perceived as having health benefits and/or offer superior quality. Market-savvy producers are using story-telling techniques to create intrigue around their products, and

build connections with consumers. They may provide information on their farming practices, the story of care at every point along the production cycle, and the ethics and quality that are embedded into growing the product and bringing it to market. **For around USD9,000, you can order the Very Expensive Pizza from renatoviola.com. The seafood-topped pizza will be cooked by a master pizza chef at your residence (if you live in Italy), and is served with rare cognac and champagne.**



#### **Reimagining food experiences as traditional culinary tours expand in food tourism**

For many people, food provides a voyage of discovery through the diverse range of global cultures and lifestyles. As well as exploring ethnic foods in restaurants where they live, more people are being encouraged to travel, with food tourism being a burgeoning sector of the travel market. Culinary tourism is no longer just for the elite – with a full range of local cuisine and indigenous experiences, including AirBnB Experiences that showcase local street foods. Research from the World Food Travel Association reports that 81% of respondents say they learn about food and drink when they visit a destination; while 47% shopped for food at local grocery or gourmet stores. For most travellers, food is not the only reason that they travel but having the opportunity to try the local cuisine is an aspiration for over 90% of travellers. This gives food producers in host countries the opportunity to provide visitors with immersive food experiences while they are travelling and try to send them home as ambassadors who will seek out the food they have experienced and promote it to friends and family. **Organisations are creating food tourism offerings at a range of levels – from individual operators, to regional networks, and national level. Eat New Zealand, launched in 2018,**

**is a collaborative platform that’s designed to put Aotearoa cuisine on the international traveller’s map.**



#### **The primary focus on protein is progressively superseded by a focus on broad nutritional density**

Over the last decade, the food system has focused on the amount of protein being produced and consumed. Whether it is Masterchef or social media, everybody has been focused on the sources of protein on the plate. This has been compounded by many diet and lifestyle plans, especially those related to health and fitness, placing their primary focus on the protein sources and the amounts being consumed each day. It is our view that the focus on protein has been overplayed, while it is undoubtedly an important attribute of food, it is only one element of food and we expect the next decade will see focus move onto a wider range of attributes inherent in the product. This shift in focus will emerge as individuals become more educated on wholefoods and balanced diets and understand protein is only one component of a food product. There is a growing recognition that it is the balance of nutrients, minerals, fats and other elements that determine a food’s long term impact on health and vitality. The focus on broad nutritional density will result in a rebalancing of the protein equation within diets. **Consumers are becoming more educated and doing their own research into understanding the optimal level of macro and micro nutrients to be included in their unique diets through the use of apps and creating tailored diet plans that have broad nutritional density.**

# Directing actions - Articulating impact

Impact is a word used regularly throughout this report. Consumers increasingly look to buy from businesses that are clear on purpose and articulate the contribution they are making to the wider community. Maintaining social license to operate requires companies to demonstrate that they are about more than just the bottom line. Young people want to work with organisations that aspire to make the world a better place for everybody.

Globally, the United Nations Sustainable Development Goals (UN SDGs) are being used by many organisations (governmental, civil society and commercial) as a framework to determine how they can maximise their contribution to society and to articulate the impact their actions have on society. KPMG analysis suggests 4 in 10 of the top 250 companies globally are already actively using the SDG's for this purpose.

The 17 SDGs, released in 2015, grew out of the Millennium Development Goals (which lifted a billion people out of poverty) but they have a wider purpose; the development of a sustainable,

resilient and peaceful global society. As a consequence their relevance beyond government and development agencies is significantly greater.

Other organisations have associated the SDG's with worthy goals like eliminating global hunger and providing universal access to sanitation, that while important are not practical goals for their organisation. They have consequently not engaged with the agenda in a substantive manner. On a recent trip to the Netherlands, a key takeaways was that every organisation visited used the SDG's to direct their social engagement strategy and to articulate their purpose and impact.

The SDG framework provides a blueprint for strengthening any community and they are relevant to ensuring the vibrancy of rural communities wherever they are in the world. The SDG framework provides agri-food organisations with a framework they can use to help guide them in determining where they can have the greatest impact on all the communities they are part of; the towns and villages they source products from, the wider

stakeholder group of their organisations and the global markets into which an organisation sells its products.

When faced with 17 goals, all of which make worthy contributions to the functioning of society, the tendency is to try and do something for every goal. The reality is that no organisation can address all the challenges the SDG's seek to make progress on themselves. Effective users of the goals recognise their impact is amplified by going deep rather than wide. Focusing actions on two or three goals aligned to organisational purpose and working with like-minded partners will deliver greater impact and benefits for communities, for consumers and for organisational stakeholders.

**For the agri-food sector, the SDG's provide many opportunities to design programmes to deliver the impact that this Agenda has suggested organisations need to have to ensure they attract talent, maintain their license to operate and develop sustainable positions in the infinite games they are playing.**



# Five impact opportunities for agri-food organisations

**2.4: By 2030 ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaption to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.**

No individual organisation can feed the world but each has a role to play in helping the world to feed itself. The commitments that governments have made under the Paris accord will require producers to adapt their farming activities as the global community starts to transition towards a zero carbon. Learnings during this transition can be shared internationally to help emerging economies develop robust, climate resilient food production systems that help to eliminate hunger by 2030.



**3.4: By 2030, reduce by one third premature mortality from non-communicable diseases (NCDs) through prevention and treatment and promote mental health and wellness.**

The health impacts of NCDs on the global community are significant and are clearly linked to the food that people eat. The need to focus on having a clear plan for ensuring that communities are able to access and eat the right nutrition in the right way every day is critical to the long term stability of a country and the future prosperity of the agri-food sector. Proactive action to ensure the right food is available and people have the skills to prepare and cook the food in the correct ways must be a priority for every organisation in the sector.



**5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life.**

Women are partners in most agri-food production businesses but their influence on the leadership of the sector is limited due in part to history. Organisations should ensure they are taking active steps to diversify the thinking and perspectives that shape their strategies and actions and this means that more women need to be given opportunities to take on leadership roles in organisations across the industry. Given the industry's customers are very often women utilising the knowledge and insight already in the industry just makes sense.



**12.3: By 2030, halve per capita food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.**

Taking practical steps to eliminate wastage across a supply chain presents organisations with a wide range of opportunities to have material impact on the availability and quality of food supplied to different parts of the market. Taking steps to reduce wastage makes economic and environmental sense. It could be about taking steps to ensure no food is thrown away, that there are commercial opportunities to use recovered or wasted food, that consumers are given tools to only buy what they need and use up left overs or ensuring the quality of product is maintained in supply chains. Small interventions can make major contributions to halving food waste globally.



**14.b: Provide access for small-scale artisanal fishers to marine resources and markets.**

Consumers are looking for products that have authentic stories attached to them. The opportunity to connect traditional fishers to markets presents opportunities for all in the industry, whether it is the fisherman themselves, indigenous communities that have access to fishing rights or the commercial fishers that have supply chain and marketing capabilities. Looking for new business models that create value for all in the industry through connecting authentic harvesting stories to customers presents opportunities for value to be collected and shared across the industry.





# Sources

- <https://royalbcmuseum.bc.ca/exhibits/living-landscapes/thomp-ok/env-changes/biodiv/ch3.html>
- <http://www.fao.org/3/y5609e/y5609e02.htm>
- <https://www.foodaidfoundation.org/world-hunger-statistics.html>
- Bureau of Labor Statistics, Price Changes as of November Each Year.
- <https://www.oecd.org/health/obesity-update.htm>
- [https://www.who.int/gho/ncd/mortality\\_morbidity/en/](https://www.who.int/gho/ncd/mortality_morbidity/en/)
- <https://www.who.int/news-room/fact-sheets/detail/diabetes>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4346933/>
- <https://data.unicef.org/topic/nutrition/malnutrition/>
- <https://www.marketwatch.com/press-release/global-medical-marijuana-market-is-projected-to-cross-55-bn-by-2024-2019-02-11>
- <https://www.statista.com/statistics/502267/global-health-and-wellness-food-market-value/>
- <https://www.ft.com/content/f99b0399-ee67-3497-98ff-ee4b04cfd5>
- Nielsen Global Health and Wellness Report, We Are what we eat, January 2015.
- <https://news.sanfordhealth.org/sanford-health-plan/millennials-wellness-generation/>
- New Zealand Organic Market Report 2018, Organics Aotearoa NZ,
- CB Insights
- <https://www.nationalgeographic.com/environment/future-of-food/food-technology-gene-editing/>
- [https://www.washingtonpost.com/news/wonk/wp/2015/03/05/the-slow-death-of-the-home-cooked-meal/?utm\\_term=.0d8d8ff84c94](https://www.washingtonpost.com/news/wonk/wp/2015/03/05/the-slow-death-of-the-home-cooked-meal/?utm_term=.0d8d8ff84c94)
- <https://www.statista.com/statistics/502267/global-health-and-wellness-food-market-value/>
- <https://globalhealthsciences.ucsf.edu/news/non-communicable-disease-could-cost-global-economy-47-trillion-2030>
- <https://www.oecd.org/els/health-systems/Obesity-Update-2017.pdf>
- <https://www.unicef.org/press-releases/2018-global-nutrition-report-reveals-malnutrition-unacceptably-high-and-affects>
- [https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Economic%20Studies%20TEMP/Our%20Insights/How%20the%20world%20could%20better%20fight%20obesity/MGL\\_Overcoming\\_obesity\\_Full\\_report.aspx](https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Economic%20Studies%20TEMP/Our%20Insights/How%20the%20world%20could%20better%20fight%20obesity/MGL_Overcoming_obesity_Full_report.aspx)
- [https://www.who.int/gho/ncd/mortality\\_morbidity/ncd\\_total\\_text/en/](https://www.who.int/gho/ncd/mortality_morbidity/ncd_total_text/en/)
- <https://www.unicef.org/press-releases/2018-global-nutrition-report-reveals-malnutrition-unacceptably-high-and-affects>



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