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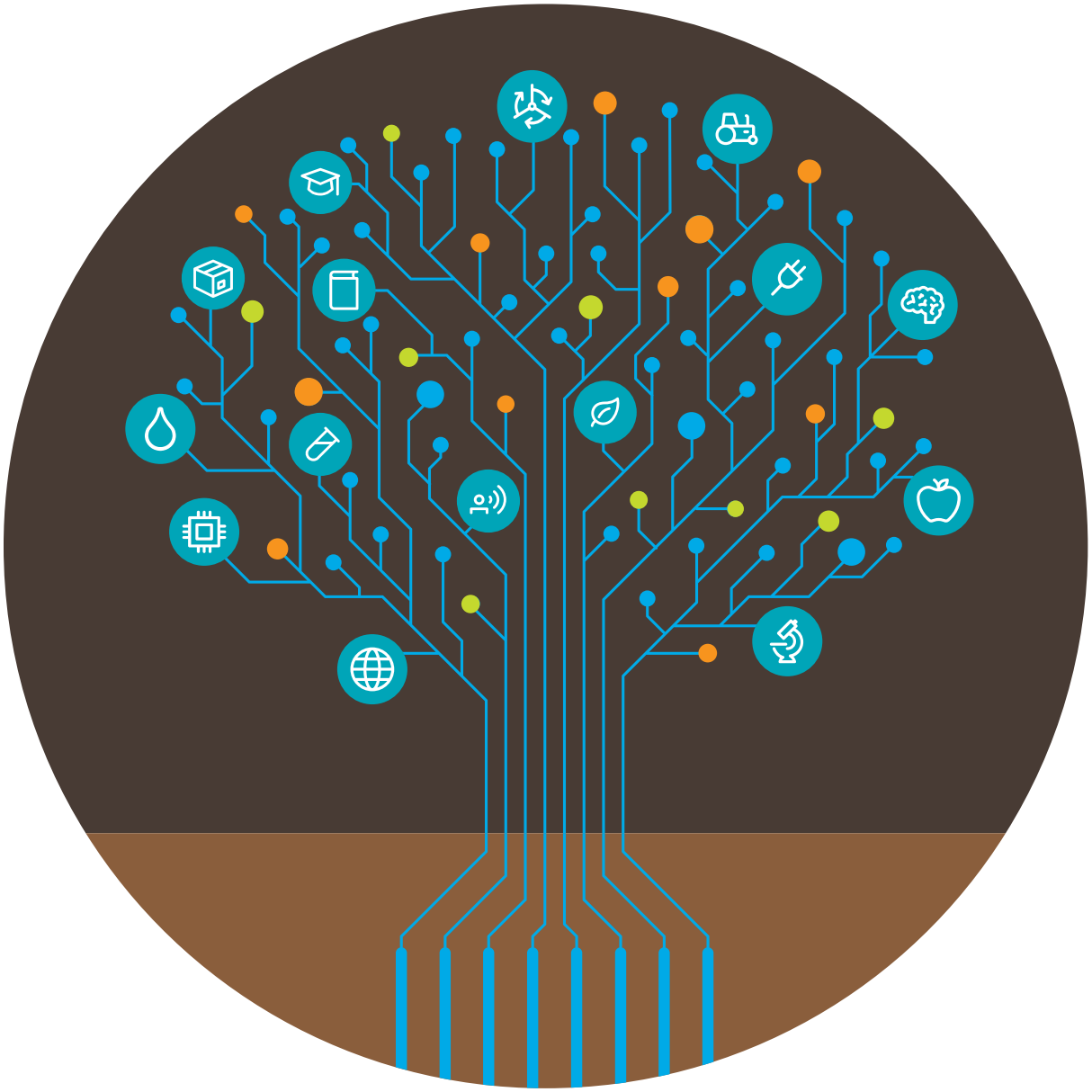

Innovation bearing fruit

Lessons from Israeli AgriTech

Growing opportunities for Australia and New Zealand

August 2018

200 years

Foreword

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In May 2018, we were fortunate to be part of a delegation from Australia and New Zealand to visit Israel, 'the start-up nation', to learn about how the country promotes growth in their tech sector, and in Agritech in particular.

Our group was organised and managed by the Trans-Tasman Business Circle in partnership with the The Israel Trade Commission, Australia and led by Miles Hurrell, Chief Operating Officer Farm Source, Fonterra. Hailing from over 25 different organisations in Australia and New Zealand – including producers, farmers, service providers, consultancies, government, academia and banking – our delegation was representative of the various points in the large agribusiness value chain.

Israel provides us with an excellent case study in nation-wide innovation. Despite significant political, historical and environmental challenges, it continues to successfully leverage its people and culture into meaningful business success through innovation.

Our challenge as a delegation was how to distil our learnings from the Israeli experience and apply them in the context of our own relatively benign social and business landscapes in Australia and New Zealand.

Agritech is vital to the future of both our countries. Collectively, our efforts to date have focused mainly on excellence of execution in agricultural volume plays. But the game is changing, and the demands of the globe are rapidly shifting value to more innovative products that better meet consumer needs. Since both Australia and New Zealand are dependent on primary production, it is a strategic imperative for us to capture these emerging opportunities. We are certain Agritech is one lever in achieving this goal.

In this report, we identify and explore many central themes that we could consider for Australia and New Zealand to help accelerate innovation in the agricultural sector. It captures our observations and insights as a team, with the intent to act as a catalyst for further debate and discussion.

Further to this intent, any member of the delegation would be happy to further discuss our experiences and observations from this memorable tour.

Publication facilitator
Deloitte and Westpac would like to thank Trans-Tasman Business Circle for their coordination of research, data, analysis and insights that have made this publication possible.

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Trade Commission
Embassy of Israel in Australia

1

Our objectives

In May 2018, a delegation from Australia and New Zealand visited Israel, 'the start-up nation', to learn about how the country promotes growth in their tech sector and, more specifically, to examine developments in Israeli Agritech. The delegation was organised and managed by the Trans-Tasman Business Circle with the support of the Israel Trade Commission.

The delegation included representatives from over 25 different organisations from both countries. Representing producers, farmers, service providers, consultancies, government, academia and banking, the participants came from various points in the large agribusiness business value chain.

This report explores our delegation's observations during our time in Israel, and how these may be applied to the Australian and New Zealand agriculture industries to drive the innovation and R&D to increase our respective countries' global presence in the sector. In particular, we focus on how we can grow our AgriTech culture and make the right investments in AgriTech to breed success.

In the spirit of chutzpah, we intend to be provocative. We intentionally ask challenging questions to spur the New Zealand and Australian agriculture and innovation sectors to consider how we might do things differently to improve the outcomes, not only for our two nations but also more generally for the global agriculture sector.

We distil this down to five central themes, which we believe have particular relevance for us in transforming our innovation sectors as they relate to AgriTech.

These themes are:

1. **The legacy of history**: Struggle turned to advantage
2. **Israeli culture**: Yozma, chutzpah and kibbutz
3. **R&D in Israel**: Investment and ingenuity
4. **The military "hub"**: Recruiting the best and developing the brightest
5. **Think global**: A global vision from the start

[1] 'Chutzpah' in Hebrew this has historically meant "insolence", "cheek" or "audacity" however in modern business parlance this is taken to mean the amount of courage, mettle or ardour that an individual has.

2

The case for change

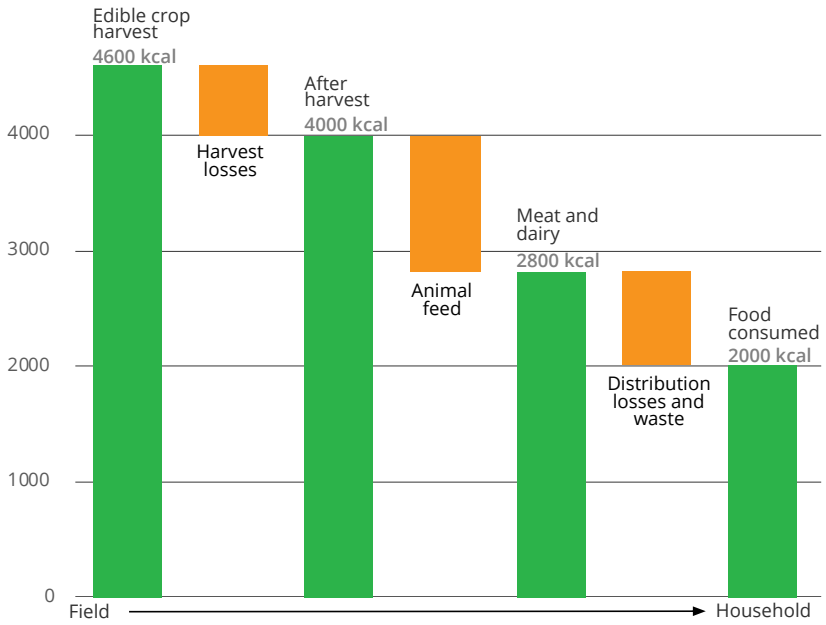
Today, our planet produces enough food to nourish the entire global population. Yet, not everyone in the world has access to adequate nutrition on a sustainable basis. The issue is one of access and waste.

Our current supply chain for food production leads to over 30 percent of the food produced being discarded between harvest and consumption.[2,]

Our current rate of food wastage is unsustainable as the population continues to grow and naturally occurring resources required for food production become increasingly scarce.

The world's population is expected to plateau in 2100 at an estimated 10 billion people[3]. Population growth of this magnitude will intensify the struggle for food unless we can transform how we produce and consume it.

Figure 1: Energy loss in food (harvest to home)
Our current supply chain for food production leads to over 30 percent of food being discarded between harvest and consumption.



Sources: UNEP, GRID-Arendal

[2]One-third of the world's food goes to waste, says the FAO: https://www.theguardian.com/global-development/2011/may/12/food-waste-fao-report-security-poor
[3]Our World in Data: World Population Growth: https://ourworldindata.org/world-population-growth

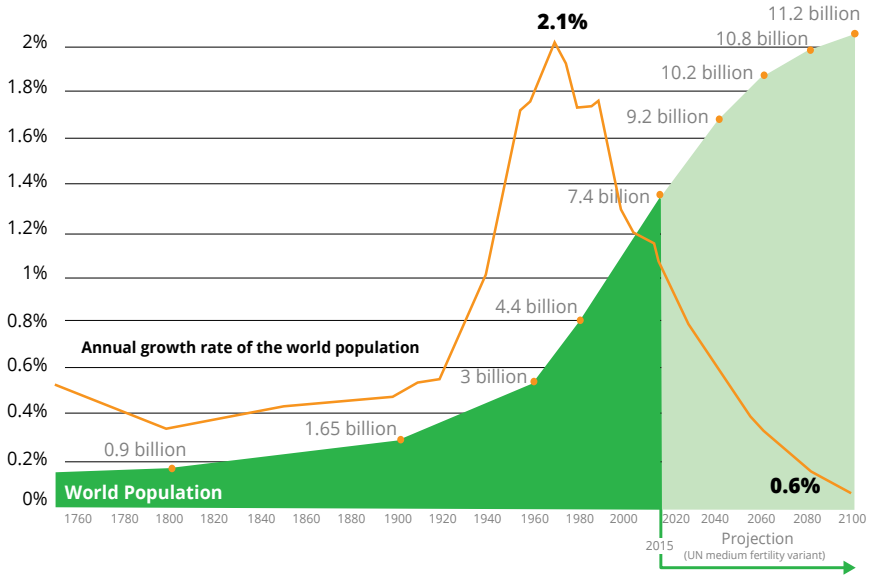
The effects of population growth will also likely be exacerbated by increasing natural resource scarcity.

The percentage of arable land per capita on the earth is nearing capacity.[4] This suggests the paradigm of land-based agricultural farming will have to change, putting the availability of food at risk. It is imperative that we find new and innovative ways to improve productivity, while also improving the efficiency of supply chains and reducing, and eventually eliminating, waste.

Underlying these trends is the increasing scarcity of water as a resource[5]. Presently water shortages are a significant concern around the globe and, according to climate change projections, this will worsen over time. The issue stems from both the physical availability of water and also its economic use across a range of competing industries.

Figure 2: World population growth, 1750 – 2100

Population growth at its current rate will intensify the struggle for food unless we can transform how we produce and consume it.

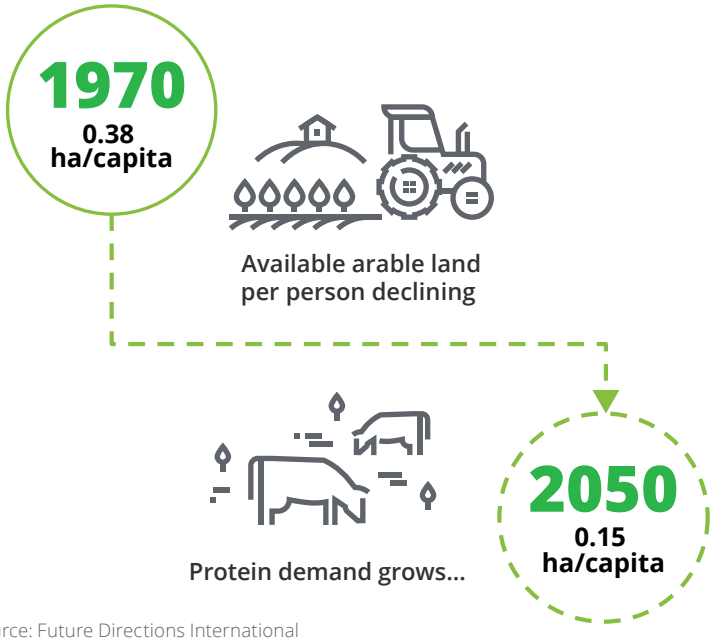


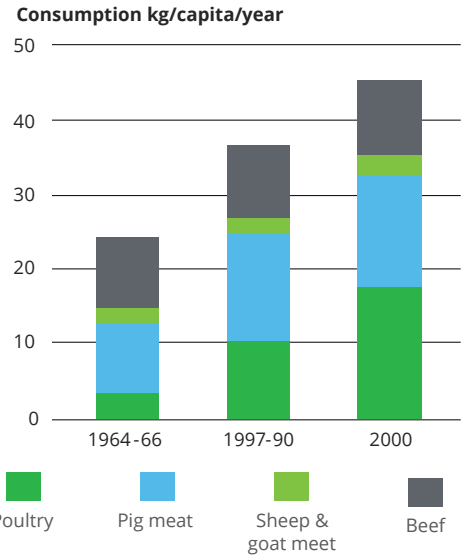
Sources: Up to 2015 OurWorldInData series based on UN and HYDE. Projections for 2015 to 2100: UN Population Division (2015) – Medium Variant. The data visualisation is taken from OurWorldinData.org. There you can find the raw data and more visualisations on this topic.

Figure 3: The seesaw of growth in protein demand, and decline in available arable land per capita

Growth of protein demand against decline of arable land

Driven by arable land limitations and increased demand for protein, agricultural commodity prices will continue to be strong overall, although there will be periods of market volatility.





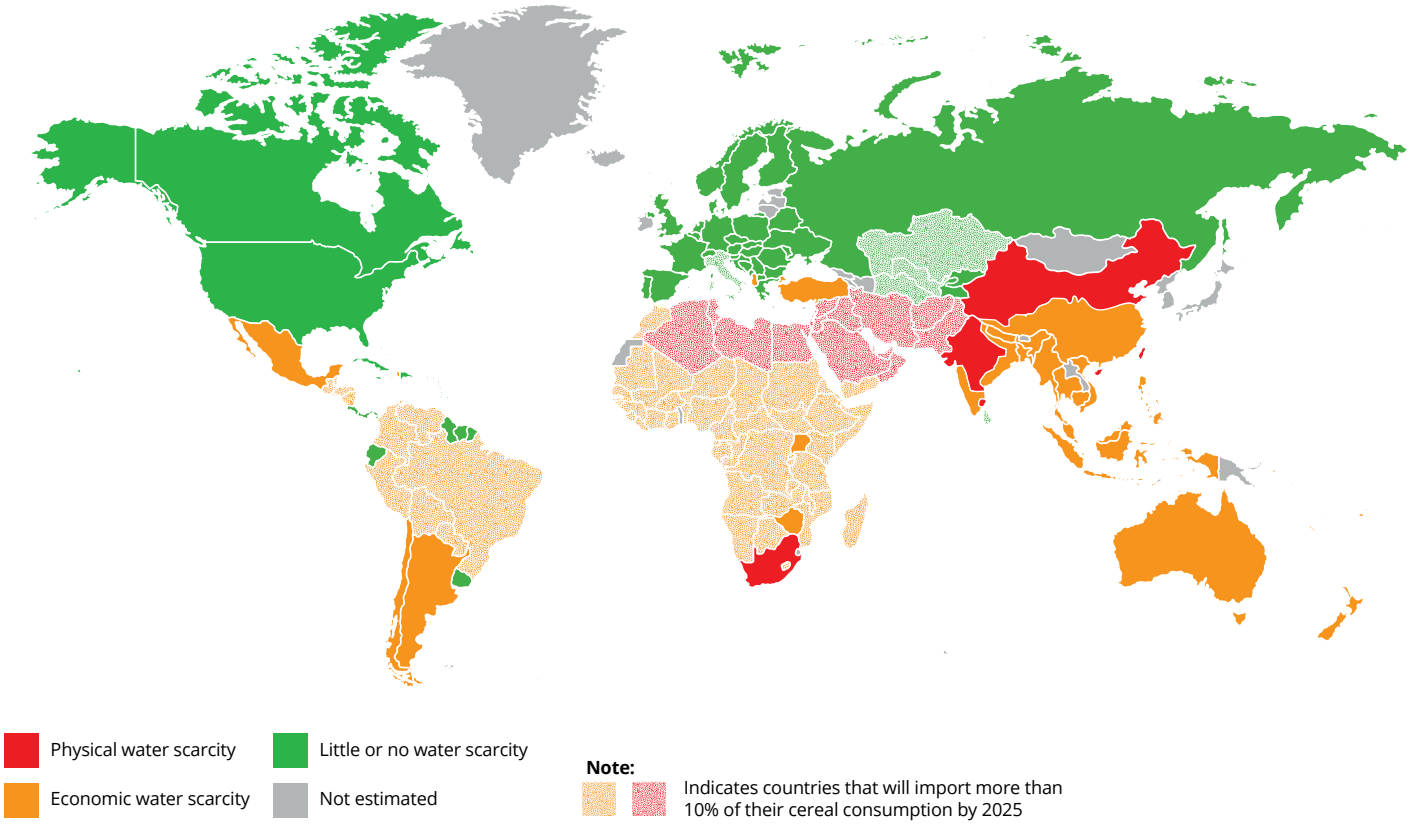
Livestock production is increasing to meet the growing demand for meat.

Source: Future Directions International

[4]The Future Prospects for Global Arable Land: http://www.futuredirections.org.au/publication/the-future-prospects-for-global-arable-land/

[5] The United Nations World Water Development Report 2017. Paris, UNESCO

Figure 4: Projected water scarcity in 2025



Source: International Water Management Institute - www.iwmi.cgiar.org/

Water availability and accessibility are the dominant constraining factors for crop production. Therefore, it is imperative that water is both secured and put to its best use in areas affected by scarcity. However, the full range of different applications coupled with the needs of growing populations means there will be considerable competition for water. In the future, the right and ability to irrigate will be fiercely contested between agribusiness and other sectors of the economy.

The challenges posed by these trends in global food supply will continue to drive technological innovations in the agriculture and food sectors.

While Australia and New Zealand are minor contributors to world food production in general, we do contribute significantly to world wheat and dairy exports[6]. In the last 40 years, agriculture in both countries has sustained linear growth in crop and livestock production (on a per hectare basis). What has underpinned this is the creation and uptake of new technologies, the targeted use of these technologies, and the increased use of inputs. In parallel to this, there have been deliberate strategies to extract economies of scale and the focused substitution of labour with capital. Future productivity gains will rest on continuing improvement in per hectare production and be reducing the percentage of waste per hectare, making the need to address both productivity and efficiency in the sector is of paramount importance for Australia and New Zealand.

All challenges are opportunities. In this context, Australia and New Zealand are presented with an opportunity to become world leaders in agricultural innovation, helping to meet the increasing food needs of a growing global population.

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[6]https://www.grassland.org.nz/publications/nzgrassland_publication_11.pdf

3

AgriTech

Globally, AgriTech is the small but growing segment of the start-up and venture capital universe that is aiming to improve the global food and agriculture industry. Some observers call AgriTech the new FinTech.

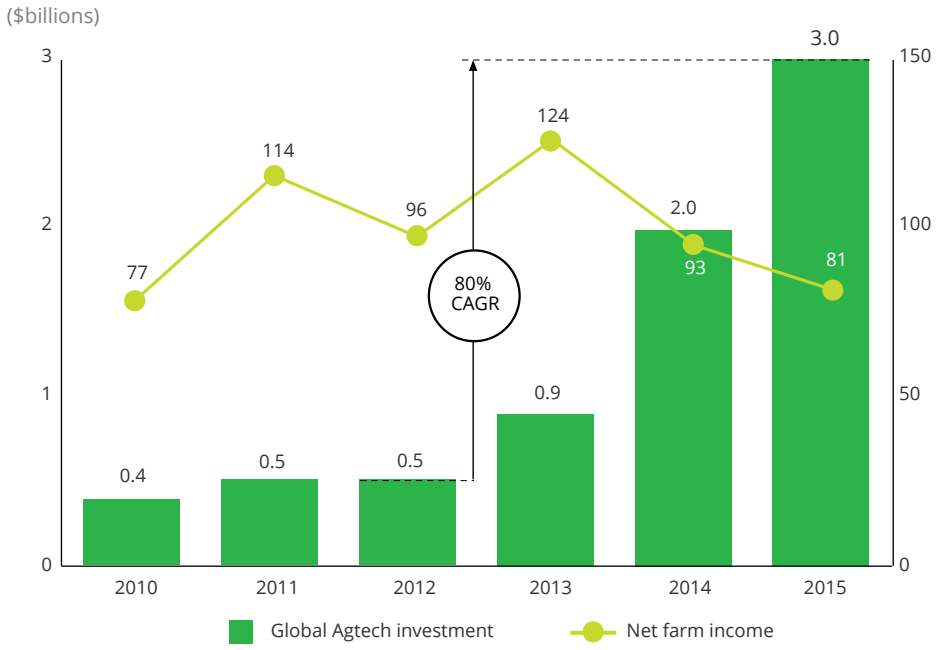
Before 2012/13, investment in AgriTech was relatively stagnant. At the time, the vast majority of innovation had a sharp focus on improvements to the Biotech sector and had a strong weighting towards plant genetics. Further, the investment activities and innovation efforts were primarily conducted by players within the agricultural industry with minimal involvement from outside the sector.

Then, in late 2013, there was a genuine shift in momentum. AgriTech investment grew 75 percent to reach $860 million across 119 deals globally. It is estimated that AgriTech subsequently increased 170 percent in 2014, and continued to show strong growth in investment in 2015.

The momentum shift in 2013 is attributed to a confluence of three underlying trends that are still relevant today:

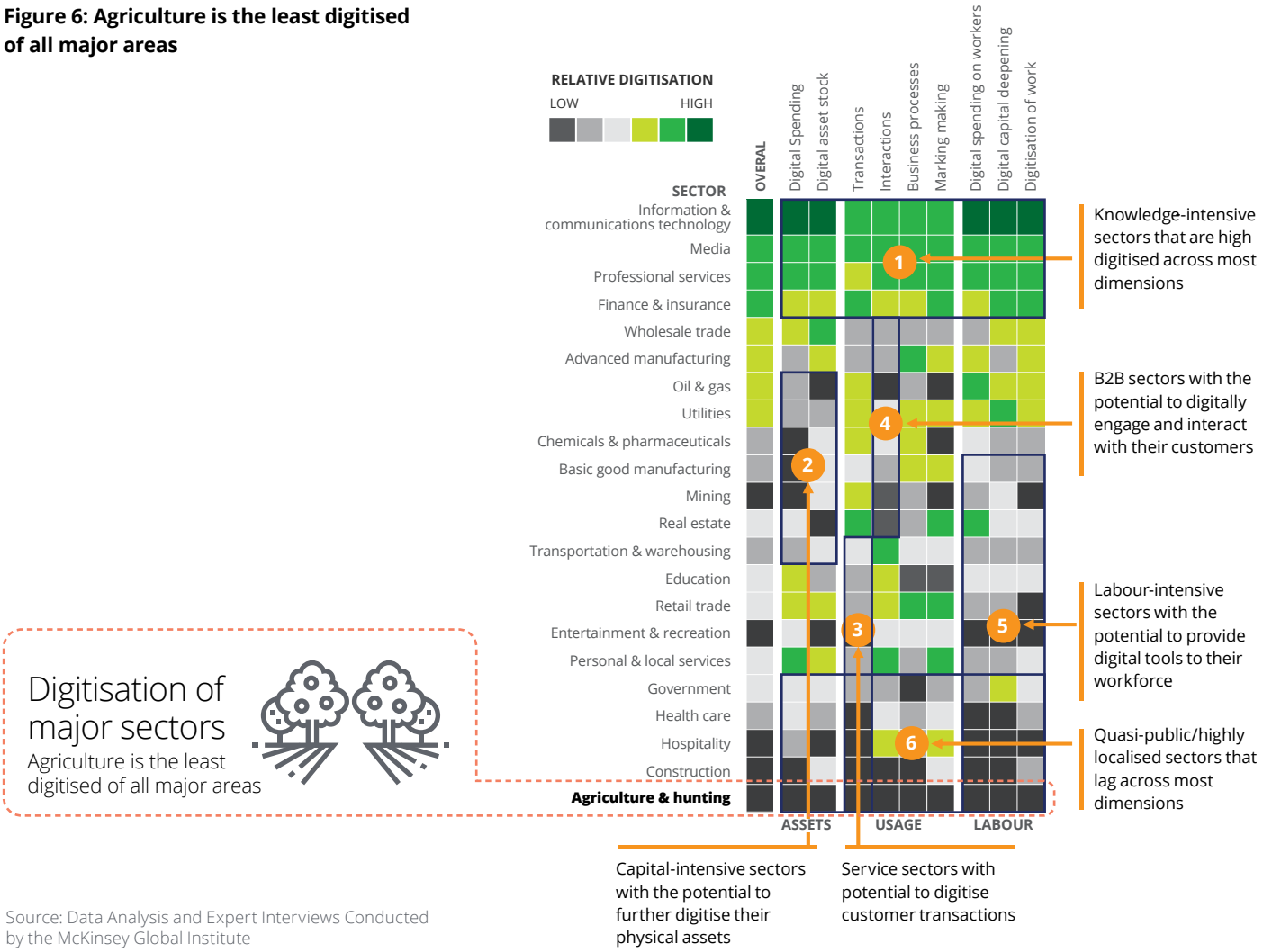
1. A set of macroeconomic trends that tipped the balance between supply and demand in agriculture;
2. Shifting consumer tastes; and
3. A convergence of new hardware technologies that freed computation from the desktop and automated collection of big data.

Figure 5: Evolution of AgriTech Investment
Global AgriTech investment is up, despite lower farm income.



Sources: US Department of Agriculture, August 30, 2016; AgFunder

Figure 6: Agriculture is the least digitised of all major areas



Source: Data Analysis and Expert Interviews Conducted by the McKinsey Global Institute

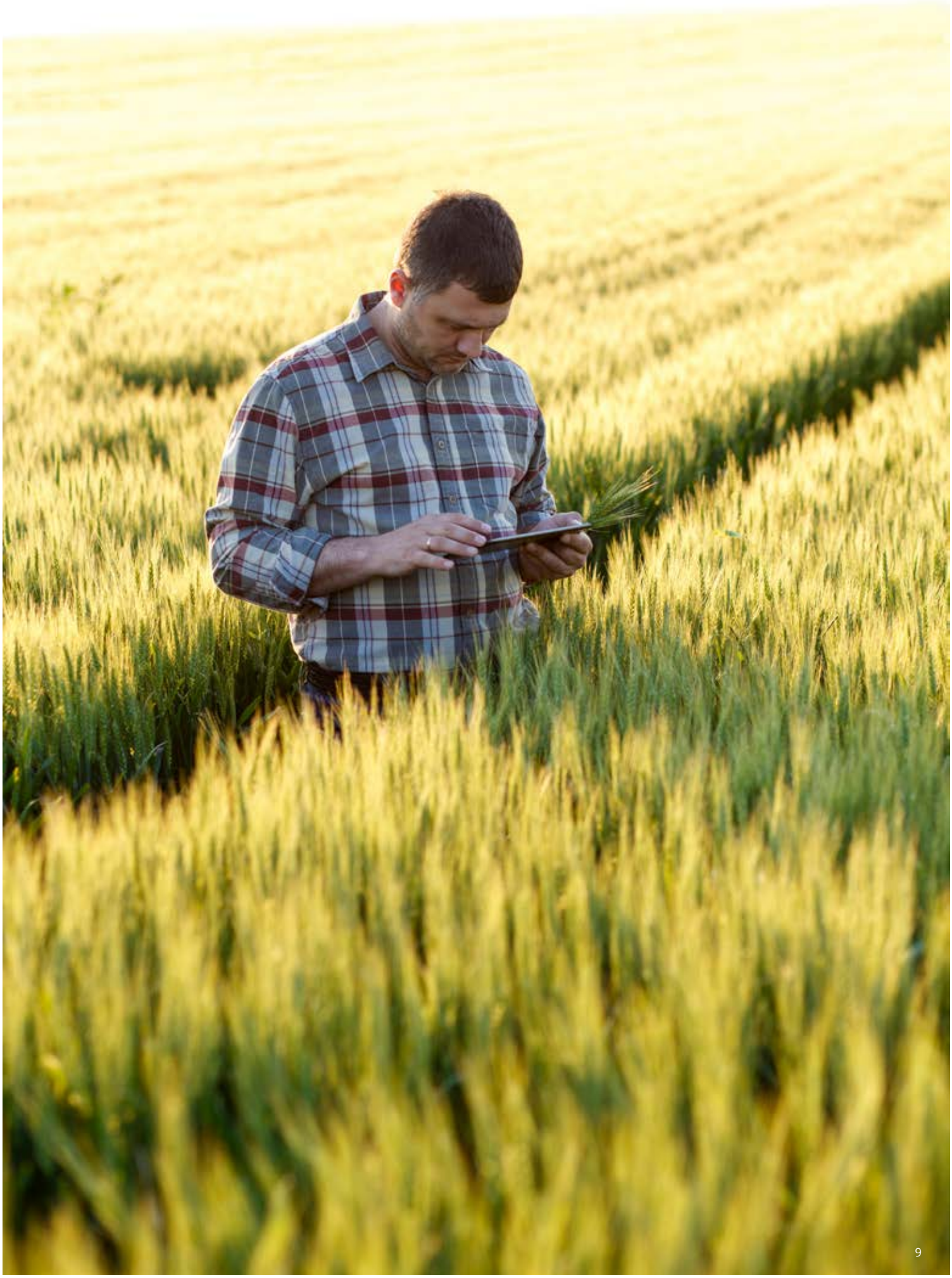
In 2017/18, mega funding rounds from companies like Farmers Business Network, Gingko Bioworks, Indigo Ag and Plenty are redefining the AgriTech investment landscape. With the first wave of AgriTech start-ups maturing, companies are looking to scale in a sector that now has around a $3 trillion value at the farm gate. Across the value chain, this sum expands to $7.8 trillion across the entire agri-food sector, responsible for feeding the planet and employing well over 40 percent of the global population.

However, despite this recent push and the undeniably crucial role that technology plays in the operation of the Agri-Food sector and the pace of innovation has not kept up with other industries. Today agriculture is the least digitised of all major areas of the economy, according to the Harvard Business Review.

Against this backdrop, the need for Agritech and innovation in the agricultural sector is higher than ever before. The lack of digitisation is evident, and change is critical if the challenges of our growing global population are to be adequately addressed.

In New Zealand and Australia, AgriTech start-ups have been focusing on challenges such as CO2 emissions, chemical residues and run-off, drought, opaque supply chains and distribution inefficiencies, food safety and traceability, farmer welfare, and sustainable meat production.

New Zealand and Australia both benefit from the quality of scientific research, free and open markets, proximity to Asia and ideal growing conditions with ample arable land. Despite these favourable circumstances, the pace of the commercialisation of ideas seems to be a slowing. The culmination of all these factors represents a significant opportunity for both countries to leverage their strengths and potentially position themselves at the forefront of global Agritech innovation and commercialisation.



4

Why Israel?

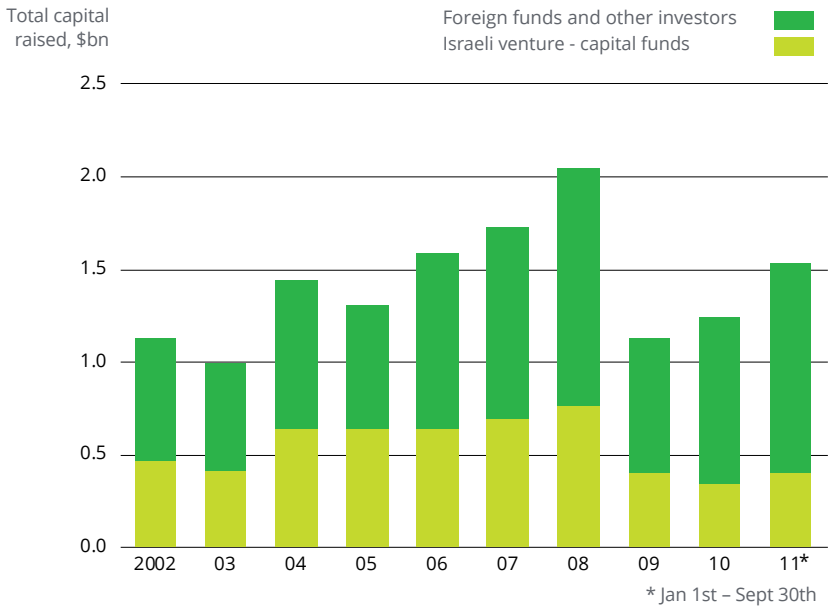
Israel has a population of over 8 million, confined to only 22,000km^2. For comparison, the nation's size is approximately one-third that the size of Tasmania, and one-thirteenth the size of New Zealand.

Israel's limitations are numerous: small size; uncertain geopolitical climate; disconnect from other producing and importing countries in many regions; and a challenging agricultural environment with only 20 percent of the land being arable. While these limitations could cripple the nation, Israel has triumphed in the face of adversity and become a world leader in AgriTech and consequently an almost entirely food-self-sufficient country.

Israel is a global research and development hub with over 300 multinational corporations running Israeli-based operations, often focused on R&D, employing more than 50,000 people.[7] Much of the research is focused on AgriTech. The Israeli government is active in setting up and funding AgriTech incubators to drive investment and support for the sector, which is now attracting an increasing number of investors from across the globe decreasing the need for domestic investment in start-ups.

Figure 7: Shift to foreign funding of ventures in Israel

Capital raised by Israeli high-tech companies, $bn
There is an ongoing shift towards foreign sourcing of venture funding in Israel.



Source: Israel Venture Capital Research Centre

A report released by the Israeli non-profit innovation body Start-Up Nation Central in October 2017 showed that the first six months of 2017 saw Israeli companies raising USD 80M for on-farm technologies that focus on productivity improvements. This represents 7 percent of global funding for such technologies. In the same period, smart farming innovators raised USD 12.5M (5.9 percent of this subsector's global financing), and upwards of USD 26M in the second half of 2017. And the sum value of investments by Q3 2017 in the smart farming subsector exceeded the entirety of the previous year. These are impressive numbers for international agriculture investing in a country that is over 50 percent desert.

[7]Study: Foreign R&D Centers Play Key Role in Israeli Tech: https://www.haaretz.com/israel-news/business/study-foreign-r-d-centers-play-key-role-in-israeli-tech-1.5485746

The investment in Israeli AgriTech has led to rapid growth in the number of AgriTech companies in the country. Of the more than 460 active Israeli AgriTech companies, 25 percent were founded in the last five years, and 50 percent were established in the previous ten years.

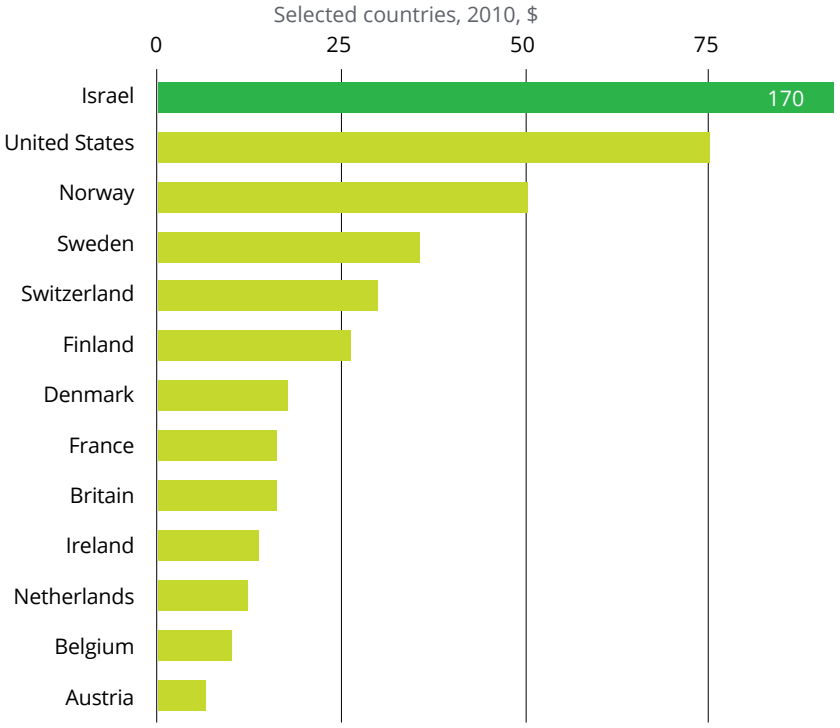
The momentum created by significant investment in the sector has led to the establishment of a large number of new, technologically innovative companies focused on developing new solutions to some of the world's greatest agrarian problems, including food insecurity and safety, manual labour shortages and environmental strains. These companies leverage innovation and talent from the high-tech ecosystem to build on decades of experience in overcoming agricultural challenges.

Our delegation spent a week visiting and engaging with people from across the country to learn first-hand about how Israel mobilised itself to become an international leader in agricultural technology and production systems. The tour was centred on the AgriTech Conference being held in Tel Aviv but also included the opportunity to meet with many players in the AgriTech ecosystem, from start-up owners to funders to research organisations and even working farms.

It is clear that investors and farmers in both Australia and New Zealand could learn from the Israeli example and grow the AgriTech sector here to overcome our unique agricultural challenges and expand our offerings to global markets. As stated above, through our interactions we distilled five standout themes that we believe New Zealand and Australia could learn from the Israeli example. We turn to these five themes below.

Figure 8: Israel attracts the most venture capital funding per capita in the world

Venture-capital investment per person
Israel attracts the most venture capital funding per capita in the world.



Sources: National Venture Capital Association; European Private Equity and Venture Capital Association; Israel Venture Capital Research Center; UN

Figure 9: The Delegation's trip to Israel

It is clear that investors and farmers in both Australia and New Zealand could learn from the Israeli example and grow the AgriTech sector here to overcome our unique agricultural challenges and expand our offerings to global markets.

Theme 1

The legacy of history: struggle turned to advantage

Throughout history, the Jewish people have faced adversity and persecution. Through this shared history they developed a culture of "chutzpah" – roughly defined as audacity and self-confidence, which results in an ability to meet challenges head-on and, with some creativity, transform weaknesses into strengths.

When Israel was founded in 1948, the nation faced seemingly insurmountable challenges, such as limited access to natural resources and a dry and arid climate not well-suited to European-style agricultural approaches. These challenges were amplified in the early days by enormous population growth through immigration. On the day that independence was declared the population of Israel was 806,000. Within two years over 480,000 more people had immigrated to Israel[8].

Despite the adversity, Israel found a path. The country invested heavily in training and education with a clear strategic intent to maximise the one resource it could - human capital. This was fortified by regular waves of immigration from communities dispersed across the globe. As a consequence, the economy naturally skewed towards technical and scientific disciplines and, later, to innovation-heavy industries.

The paradox in Israel's focus on human capital is that globally Israel lags in the bottom 40 percent for student performance in mathematics and science, consistently trailing the likes of China, Japan, Singapore, South Korea, and Switzerland. A senior advisor to Start-Up Nation Central believes the reason behind this is that most education scoring models like PISA evaluate students based on their ability to provide specific answers on a standardised test. Rather than focusing on testing, Israel's education system focuses on motivating young people to become innovators and entrepreneurs who will take a leadership stand and turn challenges into advantages. This has led Israel to be ranked second in the world in innovation, according to the World Economic Forum's competitiveness report.

What stood out to the delegation is that Israel is not just concerned with the economics of an innovation. Equally, they consider how it will transform the nation's limitations into a source of competitive advantage, and make them a leader in the chosen field. This has resulted in Israel becoming world leaders in desert agriculture, irrigation systems, water recycling and desalination technology.

[8]https://www.jewishvirtuallibrary.org/jewish-and-non-jewish-population-of-israel-palestine-1517-present

Food for thought for Australia and New Zealand:

How can we encourage businesses across Australia and New Zealand to shift their mind-set to focus on transforming our perceived challenges to opportunities and jointly leverage our uniqueness to drive globalisation of our agricultural brands?

Unlike Israel, Australia and New Zealand are two countries with much simpler geopolitical positions and relatively stable natural and political environments. Agriculture is ingrained into the national psyche of both nations as a foundation industry. It is a dominant contributor to aggregated exports, particularly in New Zealand where farm businesses occupy just over one-third of the New Zealand landscape.

However, agriculture in our economies is not without a struggle. Since the 1960s, the contribution of the sector to GDP has been on the decline. Both countries are faced with systemic issues in agriculture. Our antipodean struggle is "the tyranny of distance" from our overseas markets. Unsurprisingly, trade partners who are further apart trade less with each other.[9] This is spurred by the additional costs associated with communications, loading and shipping. Despite technological change and globalisation, these levers for reform have not yet levelled the playing field for agricultural exports as much as they have for manufacturing.

Despite our geographical challenges, we must not lower our aspirations. Learning from the Israeli example, we should start considering our distance from global markets as an opportunity to become leaders in global supply chain logistics. This type of innovation could then be commercialised, and the intellectual property shared across the globe. Further, there is merit to the isolation of both countries. As political strife and cross-border tensions grow in many parts of the world, the tyranny of distance could now be seen as an advantage for both countries. Our products have a distinct branding appeal as "premium" products from "distant shores" in the low risk, unpolluted and underpopulated South Pacific.

Both Australia and New Zealand need to actively pursue strategies that turn this apparent disadvantage into a commercial advantage. This requires a greater focus on how we can boost our international connections, lift our share of international trade in agriculture and take advantage of the opportunities from emerging economies like Asia, Latin America, and Africa. We think both countries can exploit some of the benefits of size – being small, agile and innovative – and take this to the larger economies of the world.
The emphasis then needs to be "becoming more globally connected" and shifting our collective mindset to see every challenge we face as a new opportunity to become the world leader in something. We believe this is best achieved through investing in an innovation agenda for AgriTech that will differentiate our products and drive closer co-operation with the global Agritech industry.

This will require inputs from both the government and businesses. For the government, it means establishing more international connections through formal diplomatic relations, multilateral agreements or bilateral trade, double taxation and air services agreements. Further, harmonising regulatory settings to align with those of other countries will help connect both countries with the global AgriTech industry. For businesses, the focus will need to be on solving the critical problems facing consumers around the world while simultaneously drawing on leading international AgriTech research and solutions to meet our own needs while helping our local AgriTech companies achieve global reach.

The opportunity associated with greater connectivity is enormous. If our two nations act in unison, we would have the ability to establish a global connectivity plan that develops joint Agritech research partnerships. Locally we could build demonstration sites to showcase our science and technology, underpinned by research, government and industry relationships, to the world.

[9]https://www.jewishvirtuallibrary.org/jewish-and-non-jewish-population-of-israel-palestine-1517-present

Theme 2

Israeli culture: 'Yozma', 'Chutzpah' and 'Kibbutz'

Israeli culture is unique and influenced by both the diversity of its people and the overlap between social and commercial community connections. This is a small and multidisciplinary country, with one degree of separation resulting in high connectivity.

The people are natural risk takers, and the government has found a way to foster a culture that does not stigmatise failure. Instead, the community works together to rebuild, re-evaluate and eventually succeed.

Diversity is a significant contributor to the Israeli start-up state of mind. While ~75 percent of its population is perceived as being homogeneously Jewish (25 percent are Arab Israelis or non-Arab Christians and Muslims), it is a country of immigrants with people coming from places and cultures as diverse as Eastern-Europe, the former USSR, Ethiopia, France, northern Africa or Spain. Not to mention Jewish families who were settled in Palestine before 1948. The culmination of diversity and the "migrant spirit" is that it creates natural risk-takers – the perfect candidates to become entrepreneurs. As a consequence, there is a strong sense of what the Israelis call Yozma and what we call "getting on with it".

The sense of Yozma supports Israelis in risk-taking ventures. One of the reasons Israeli entrepreneurs have the chutzpah ("fearless daring") to push their ideas forward is a strong sense that the community and the opportunities it creates will allow bouncing back if their venture fails. We often heard it said by Israelis that when someone says "no" it's just the start of a negotiation!

In Israel, smart policies around bankruptcy and other similar regulations are less onerous than in much of the OECD, also helping to remove the social stigma of failing. Further, the sense that an entire ecosystem and community will still be available despite failure plays actively in the entrepreneur's psyche.

In fact, we heard several times on our trip of regular 'failure nights' organised by the entrepreneurial community (colloquially called 'f**k up nights'). These evenings would see individuals share how they failed with the community in the spirit of sharing learnings with others. This openness, acceptance and positive mindset to failure is what we saw time and time again on our visit.

Community, as experienced in Israel, differs from what can be seen in New Zealand and Australia. There is significant overlap between social circles and community connections often becoming industry connections and vice versa. These connections are embodied by kibbutz. Kibbutzim (plural of kibbutz) started as utopian communities, a combination of socialism and Zionism, based on agriculture and the strong connection to the land felt by the Jewish people. The concept grew out of strong socialist ideals that were more common at the time of the Zionist movement that for the people to create a secure state they had to have strong connections to working the land.

With the passing of time, the spirit of kibbutz has been incorporated into day-to-day life in Israel. The desire for collaboration and a sense of shared purpose lives on in the lifestyle of Israelis, and this was noticed by the delegation in many of our interactions during the trip.

Supporting innovation in Israel is the Israel Innovation Authority (IIA). A body established by the Israeli Government but with independent terms of reference. The IIA is designed to foster innovation across all sectors in Israel and works closely with incubators, universities, kibbutzim, and multinationals.

In the AgriTech sector, the legacy of kibbutz can be compared to the tried and tested method in other "tech" industries, especially in FinTech, which saw the rise of various global hubs concentrating on research, incubators, accelerators, investors and regulators. These "hubs" are supported by a strong ethos, reliable infrastructure and proper funding.

It is important to highlight that the kibbutz could not be replicated everywhere. However the culture that surrounds Israeli communities, and the spirit of non-governmental hubs of innovation and collaboration, is something that can be holistically applied to New Zealand and Australia.

Figure 10: Map showing Israel's aridity limit, and the spread of kibbutzim across the country

Aridity limit and the spread of *kibbutzim* across Israel

Kibbutzim began as communities based on agriculture and are beginning to set their eyes on the AgriTech sector.

Average annual precipitation (mm)

- > 500
- 200 - 500
- 100 - 200
- < 100
- Kibbutzim (rural settlements)
- State border

Food for thought for Australia and New Zealand:

What can we do to transition our culture to one that makes "heroes" of those in society who try, fail, learn and ultimately succeed?

Historically, both New Zealand and Australia felt some connection to the land and with agriculture. Typically, strong family ties existed within rural communities that echo many of the elements of the kibbutz culture. Today, however, both countries are mostly urban, so the cultural underpinnings of agricultural community-based innovation are on the decline.

But across the world, and in New Zealand and Australia, there is a growing community around Agritech. We are witnessing an "AgriTech moment", which is underpinned by several trends: a new generation of farmer who is more tech-enabled with greater digital connectivity, increased demand for food and fibre and innovations in the ways to access to finance.

The possibilities for AgriTech to be a critical part of the global economy, and for Australia and New Zealand to play a leading role, are real. About 1.5 billion people around the world live in small farm communities. Taken together these 1.5 billion people would be the largest country on earth; raising their incomes and improving their productivity is a significant business and development opportunity.

New Zealand and Australia could consider establishing quasi-governmental bodies to act as a catalyst for the creation of vibrant AgriTech communities, similar to the IIA. The purpose of these bodies could address critical questions such as:

- How do we consolidate, manage and redirect public funds for AgriTech to help jump-start innovation and collaboration across academia and the business community?
- How do we develop a set of AgriTech "innovation hubs" between Australia and New Zealand which focus on local areas of expertise and how do we leverage and connect the hubs that already exist?
- What would be a means for researchers and the public at large to invest in start-ups and upon successful commercialisation, ensuring returns flow to those who have provided capital and expertise?
- How do we build an industry culture of closer cooperation across region and between industry and commercial worlds?
- How would an Australian and New Zealand innovation peak body actively reach out globally and connect to innovation centres in such places as Israel, to coordinate secondments of students and research staff in both directions?

Finally, to better support this community we should consider smart policy shifts around bankruptcy regulation. Any policy shifts to reduce the stigma associated with failure, particularly in innovation, would create a culture where entrepreneurs are encouraged to pursue the risky yet revolutionary ideas.

Theme 3

R&D in Israel: investment and ingenuity

Lacking natural resources, Israel has consistently prioritised education and research. The nation spends 4.1 to 4.25 percent of GDP on civilian R&D – more than double the European Union average of 1.9%, and one and a half times more than the US average of 2.79%.[10]

In contrast, spend on R&D in both New Zealand and Australia lags behind the rest of OECD. While the average OECD spend on R&D as a proportion of GDP is 2.4%, in New Zealand, it is 1.3 percent, and in Australia, it is 1.9%.[11]

With over 4 percent of GDP invested in R&D, it is not confined to start-ups. Instead, R&D investment is spread across start-ups, established companies and universities, hence the perception that the entire country is a virtual start-up.[12]

Israel's investment in R&D has not occurred by accident. Instead, the Israeli Government has made a series of conscious and decisive moves to wean the country's economy from reliance on the public sector and trade, and incentivise venture capital funding and foreign investors.

In 1993 the Israeli Government created the Yozma Group (using the Hebrew word for "initiative" as described above). It invested heavily in new venture capital funds and attracted foreign investors by offering them insurance on risk, attractive tax incentives and promising to double any investment with funds from the government.

The Yozma Group effectively created the Israeli venture capital market through the formation of its first venture fund, and then successfully launched two further funds in 1998 and 2002. Since inception, the Yozma Group has managed more than USD 220 million in its three funds and have made direct investments in about 50 portfolio companies.

The result of the Yozma Group programme is that Israel's annual venture-capital outlay rose from USD 58 million to USD 3.3 billion between 1991 and 2000 and the number of start-ups backed by Israeli venture funds rose from 100 to 800. According to the OECD, this was "the most successful and original programme in Israel's relatively long history of innovation policy." [13]

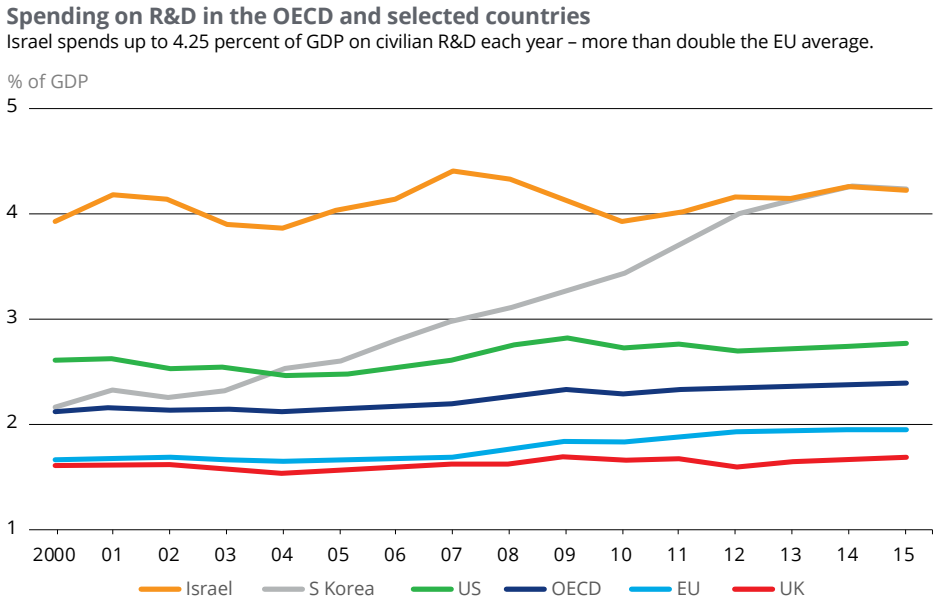
[10] Highlights from the OECD Science, Technology and Industry Scoreboard 2017 - The Digital Transformation: Israel

[11] 2015 Data, https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm

[12] A notion popularised by the best seller "Start-Up Nation" by Dan Senor and Saul Singer

[13] http://oecdobserver.org/news/fullstory.php/aid/3546/Start up_nation:_An_innovation_story.html

Figure 11: Spending on R&D in the OECD and selected countries



Source: OECD

As a direct consequence of both government action and Israeli culture, many multinational tech companies have R&D centres in Israel, including Intel, IBM, Microsoft, Google, Facebook, and Apple. Most of these centres were a result of local acquisitions of Israeli start-ups.

Supporting the government-driven initiative is the embedded focus on commercialisation, spanning all potential fields of innovation, and the ease of movement from academia to both the public and private sectors.

While in Israel, our delegation met many individuals pursuing academic research while simultaneously patenting and implementing their discoveries into commercial ventures. There were three aspects of this academic research and commercialisation that impressed the delegation.

The first was the coordination of universities in Israel. The nine universities in the country are organised around specific areas of expertise. This approach limits confusion, competition for internal resources and suboptimal investment. Instead, competition is focused on the global stage and individual institutions which are capable of supporting the endeavours of the others.

The second was the way Israel has coordinated the commercialisation of academic research. Universities in Israel are very active in supporting and coordinating the commercialisation of new ideas. More often than not academic staff are direct stakeholders in start-ups and usually do not need to leave the educational institution to realise the upside of entrepreneurial activity.

The third was how Israel has advanced the concept of technology transfer. Companies such as Yeda Research & Development Co. Ltd and Yissum Research Development Company have the exclusive right to commercialise the unique intellectual property of the academics from the Weizmann Institute of Science and the Hebrew University of Jerusalem respectively. These partnerships provide efficient means of systematically "packaging" innovation from research centres in both universities and the military, and sharing them with the market.

The success of this process is supported by the fact that the Israel Institute of Technology (Technion)'s net research budget is roughly US$90 million. By comparison, the Massachusetts Institute of Technology (MIT) invests US$1.5 billion. Yet their income from commercialisation of research is similar.

These partnerships in Israel result in a networked team providing liaison and commercialisation services for both industry and researchers. This helps to overcome one of the major downfalls of technology transfer offices that their focus is on the terms of the deals, instead of the volumes and speed of those deals. The point they miss in doing so is that serendipity is an essential element in successful commercialisation. This means that researchers and entrepreneurs must be ready when opportunities present themselves, which is a cultural strength Israelis seem to possess.

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Food for thought for Australia and New Zealand:
How can we re-orient our approach to innovation to better align our efforts and encourage our innovators to consistently "think global" rather than focusing solely on meeting local market demand?

As stated earlier, New Zealand and Australian spend on R&D lags behind the rest of OECD. If R&D spending were to increase, both countries would likely see growth in productivity, which is a particular challenge for New Zealand given the nation's relatively small economy and distance from other markets.

Both nations have heavy reliance on farm productivity. Therefore, innovation and R&D in agriculture are substantial for both countries, and there will always be an argument for an increase in investment.

What is of more significant interest, however, is how we can learn from how Israel structures academic research and commercialisation.

Across both Australia and New Zealand, there are research centres in academia and the private sector producing world-renowned, high-quality research. Nine of the top 100 life sciences universities are located in Australia alone. However, there is a divide between the academic side of R&D and the commercial side.

Academics in Australia and New Zealand are generally required to leave the university environment to commercialise their ideas or, alternately, the university licenses the rights to design to someone else. How could we reorient our view of academia to better enable commercialisation of that intellectual property? Our current approach of separating the academic pursuit of intellectual property from the commercialisation of the said intellectual property has created an artificial wall that impedes liaison between industry and academia. If we were to re-frame how we view success for academics, from research outputs and teaching outcomes to a focus on commercial results, we could limit the discontinuity that currently exists between research and entrepreneurialism. Transformation of this type would likely increase the flow of information between universities and their commercial R&D arms, and would probably reduce wasted or duplicated effort.

The delegation believes that Australia and New Zealand could together drive a commercialisation agenda in their combined research organisations, with the intention of competing globally rather than locally. This will require changing researcher KPIs to encourage more innovations to be brought to market, aligning research centres around Centres of Excellence and implementing cooperation mechanisms between industry and the universities. A focus on developing our internal connections will assist both countries in these efforts.

Theme 4

The military "hub": recruiting the best and developing the brightest

Israel has mandatory military service for both men and women. This has had a significant impact on Israeli society and has helped infuse multiple aspects of an entrepreneurial culture.

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There is the expected direct boost from defence-related research, where the country has had to excel to compensate for its challenging security environment.

Military research has produced countless civilian spin-offs and provides the country with a constant stream of elite specialists trained in the Israeli Defence Forces (IDF) advanced intelligence and technology units. One prominent example is Gavriel Iddan, a former rocket scientist specialising in missile optics who invented a pill with the built-in camera, using the same technology to revolutionise medical diagnostics. The company he founded, Given Imaging, was sold in 2014 for USD 860 million. More recently, companies such as ICQ, Check Point, and Metacafe were launched by former IDF specialists. Because of defence and intelligence research, Israeli companies are global leaders in cybersecurity, imaging, civilian drone technology and many other types of high-tech devices.

Israel's military reserve system is unique and innovative and is also a catalyst for an innovation-driven culture. After completing their mandatory military service, Israelis are assigned to the IDF's military reserve to provide reinforcements during emergencies as a matter of routine course. One Israeli we met described the impact of this on Israeli culture by saying, "hierarchy is not core to the culture when taxi drivers can command millionaires and twenty-three-year-olds can train their uncles." Given this, unlike a traditional military hierarchy, the reserve system helps to reinforce a less structured and anti-hierarchical ethos, which exists in every aspect of Israeli society.

It is critical to understand this aspect of the Israeli military. Many nations have had compulsory enlistment, but few have been able to turn it into an engine for innovation. Australian and New Zealand research centres and universities are already undertaking high-quality research and

producing top-notch AgriTech solutions. And Australia and New Zealand have comparable quality science and technology to Israel in the Agri space; but a notable difference in the lack of 'veteran and reserve' communities and connections, as well as the disconnect between our science and its commercial application.

The primary sector needs people from a diverse range of backgrounds. It requires app developers and consumer experience experts, as much as scientists and farm labourers. This insight is consistent with was has been highlighted throughout this report: the need to prepare students' solving skills, as well as the need to develop connections. The intention being that whether they end up working in research, in the public or commercial sectors, they feel that they belong to an 'army of problem solvers'. Research bodies and universities need to be able to collaborate effectively with the industry early and regularly and should seek to understand its needs better while we also need to improve access for entrepreneurs to our research capability.

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Food for thought for Australia and New Zealand:

How can we expose the next generation of innovators to challenges that encourage collaboration and leadership?

While we are unlikely to replicate the Israeli military service there are some components that we could consider integrating into New Zealand and Australia. If we were able to enable young people to enter into businesses and other situations where they are expected to collaborate on challenges and take up leadership positions we may find we can shift the mentality and ethos of the next generation.

We need not reinvent the wheel. There are existing programmes that we can build on to expose young people to the agriculture sector and encourage innovation. One route would be to develop current internship programmes and identify how we could expand them to cover a greater variety of players in the agricultural industry. By creating a rotational model that has each intern working at a range of players in the industry, we could expose those who are passionate about agriculture and innovation to a variety of challenges faced by the sector. By presenting young people to multiple players in the agriculture industry, we would set the next generation up with a cross-function view of the industry which may drive greater collaboration in the future.

An alternate route would be to identify how the agriculture industry can partner with programmes like *Young Enterprise*[14] to increase the student interest in AgriTech and provide them with an opportunity to try to address challenges facing the sector. Young Enterprise is designed to teach students how to adapt to changing circumstances, fail fast, succeed and learn how to collaborate in teams, with the ultimate goal of helping students to unleash their entrepreneurial spirit.

Further to this, Australia and New Zealand could combine our centres of research and innovation into a network of institutions that contribute and collaborate on intellectual property development rather than compete. Within this, we could share knowledge within the innovation network through programmes of secondments between the commercial world, government, and research that would be akin to tours of duty in innovation, supported by the appropriate policies.

[14]http://youngenterprise.org.nz/about-us/

Theme 5

Think global: a global vision from the start

Israel's global vision is applied both internally and externally. As a nation, they welcome diversity with unique immigration policy. Externally, they recognise that they are a small country with a small market, therefore entrepreneurialism and commercial innovation must skew towards ideas that chase international interest.

Israel's policy on immigration is unique in that it is an open door policy that applies almost exclusively to Jews. This has resulted in Israel being transformed into a dynamic cultural melting pot with immigrants from over 70 nations. Immigrants are by definition risk-takers, "a nation of immigrants is a nation of entrepreneurs,"[15] and therefore these people do not just bring their diverse talents and backgrounds, they bring an ability to challenge boundaries.

As in the US, where about 50 percent of tech start-ups have a foreign-born founder, a disproportionate share of Israel's immigrants have become entrepreneurs. No influx has proved more fruitful than the 800,000 who started arriving from the former Soviet Union in 1990. One in three a scientist or engineer, this wave of immigrants now plays a prominent role in Israel's innovation economy.

However, the success of Israel's immigrants has not happened by accident. The valuable lesson from Israel is that countries need to make it possible for immigrants to succeed and put down roots, or these countries will suffer economically. Temporary tech workers – as vital as they are for alleviating skills gaps – generally don't create new business models or build companies. Instead, immigrants who are set up to succeed in their new home can make substantial contribution to the economic vitality of the nation.

Israel's geography and climate underscore its success in building commercial innovations. In recognising their inherent challenges related to scaling, weather, and isolation, they have developed an ecosystem of government support to promote tech companies that can export knowledge and technology around the world. Further, in trying to solve their internal agricultural challenges, Israel has identified an area of expertise that is valuable internationally and has shared this expertise by creating a value proposition around the high level of knowledge and technology.

[15]"Start-Up Nation" by Dan Senor and Saul Singer

The high standard of development in the industry can be attributed to close cooperation and interaction between scientists, extension services, farmers, and agriculture. These four elements have transformed the agriculture industry in Israel into one that is renowned for its efficiency and productivity. This is all in a country where, as previously mentioned, more than half of the land is desert. In AgriTech, it has become synonymous with a globally renowned brand as a provider of high-quality agriculture technology and expertise.

In focusing on exporting its knowledge to global markets, Israel has also created a global brand for itself and has designed a virtuous cycle. The "think global" attitude is emphasised by the growth of Israel's high-tech industry, where innovative start-ups focusing on data applications have flourished with international support. According to the Israeli government, today there are 70 active venture capital funds with bases in Israel, and a further 220 international groups who invest in Israeli innovations.

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Food for thought for Australia and New Zealand:

How can we transform the "tyranny of distance" to become our strength?

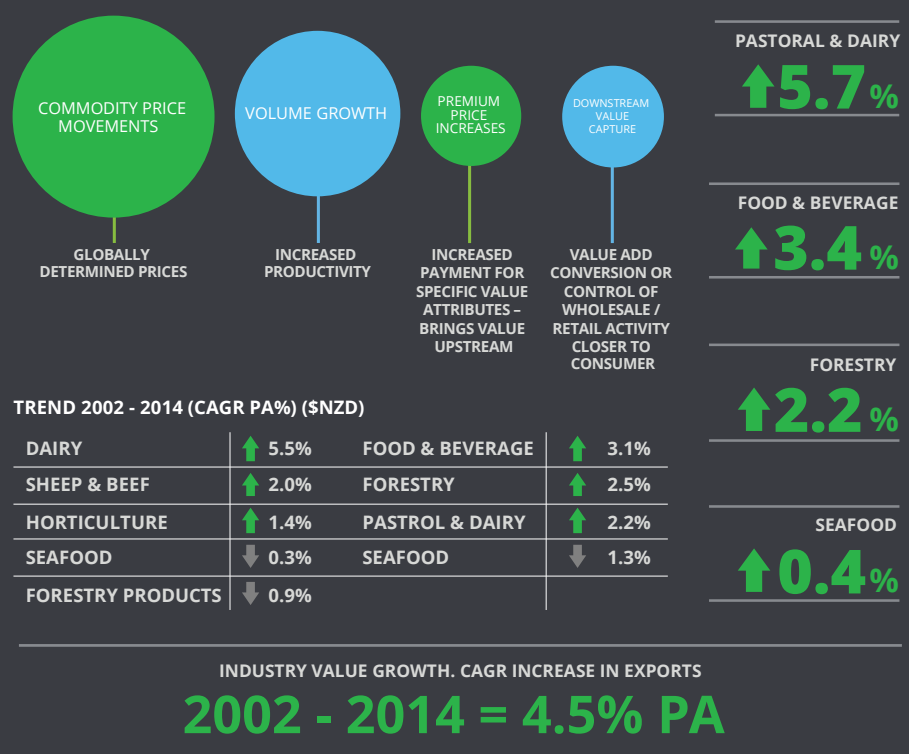
The agricultural sectors of both New Zealand and Australia are already global players. In Australia, each farmer generates enough food to feed on average 600 people. Approximately 60 percent of this is exported. New Zealand is the world's 12th largest agricultural exporter by value but is the biggest exporter of sheep meat and dairy product and the second biggest exporter of wool and softwood log.
It is clear that taking "brand New Zealand" and "brand Australia" to the world is doable. However, simply labelling products with "made in Australia" or "made in New Zealand" will not be enough.

We need to invest in understanding global consumers and the market and to deliver products and changes that exhibit value beyond what the rest of the world supplies.

An analysis of the New Zealand agriculture sector shows that between 2002 and 2014, the annualised growth in the value of primary sector exports was 4.5 percent per annum. But while there has been progress in adding value through the attributes of products, customer relationships, innovation, and branding, we need this to expand faster rather than relying on commodity price movements and volume growth.

The challenge of scale means that smaller Australian and New Zealand companies find it challenging to build a deep relationship without having the size to satisfy demand and gain sole supplier relationships. That is why many settle for being subordinated to a broader supply chain, with pricing power taken away from them. This is also why investing in AgriTech can change this dynamic and unlock this untapped added value.

Figure 12: Revenue from Agriculture in Australia and New Zealand has been dominated by price and volume shifts – not value add



However, learning from Israel, we should be looking to turn this challenge into a strength. We should consider how we can use our unique value proposition and innovation or "value-add" services to meet both domestic and global needs. Crucial to applying this learning, however, is understanding the word "value" and how it can be applied across Australia and New Zealand.

The "tyranny of distance" could potentially be an advantage. A question we would like to pose to industry and policymakers is how can we can leverage distance and relative isolation to become a strength? Australia and New Zealand offer many lifestyle benefits as a consequence of this isolation and smaller populations. Can this be used to attract the next generation of entrepreneurs? This may require tweaking immigration settings, welcome programmes, university links, and business grants focused on immigrant start-ups.

The word 'value' is used in many ways. It can refer to the importance, worth or usefulness of something; the material or monetary worth of an item; the value of an object compared to the price paid; as well as the principles and judgments made around what is most important in life; depending on where an organisation sits along the supply chain, the perception of value and how it is defined may vary.

For farmers and growers, for example, using their land and water to grow more produce can create more value for them.

For a distribution business, adding value is often centred on selling products for a higher price after their services, processing or branding has been completed.

For co-operatives and the Government, the "value-add" may lie in creating an enticing opportunity for the next generation of entrepreneurs, including grants, opportunities and support systems that enable immigrants to enter our AgriTech sector.

Research shows that for many contributors, the default thinking around value creation centres on strategies aimed at growing their business revenue. Further analysis suggests that the majority of revenue strategies are linked to one or more of four key value levers: commodity price movements, volume growth, premium price increases, and downstream value capture.

To spur "value-add" innovation within Australia and New Zealand we should work cultivate a culture of "global first" in commercialising innovation. To do this will require investment from both government and private bodies. Some initiatives that could be activated, to facilitate the transition to "global first" thinking and "value add" innovation, would be:

- Government or industry sponsored awards for AgriTech innovation;
- Development of a regional annual AgriTech conference that attracts global players to this part of the world;
- Investment in developing global relationships and facilitating the transfer both ways of new technologies to the Australian and New Zealand markets; and
- Marketing our uniqueness to attract the next generation of entrepreneurs and provide programmes to attract immigrants to our universities and AgriTech start-ups.

5

Conclusions for Australia and New Zealand

Australia and New Zealand are dependent to a significant extent on excellence in primary production and exporting the resulting product around the world

Given the isolation of our respective countries and abundance of agricultural production, both countries have responded to the challenge of distance through a focus on operational excellence. Continual improvement in productivity and efficiencies along the supply chain from perfecting a simple farming system has enabled New Zealand and Australia to compete internationally irrespective of distance.

Historically, Europe and particular the UK was the prime market for both Australia and New Zealand, with demand being counter-seasonal. The key to success was to maximize volume at a competitive price.

Over the years both Australia and New Zealand have diversified away from the traditional markets towards emerging markets in Asia, particularly China. The lessons we learned on our delegation echo insights we made of the Israeli economy. However, there are still significant learnings that our two countries need to consider in order to compete effectively in the sector in the coming years. Our learnings from the trip have led to five critical questions for Australian and New Zealand Industry and policymakers to consider:

1. How can we encourage businesses across Australia and New Zealand to shift their mind-set to start with a global lens rather than trying to meet local markets?
2. What can we do to transition our culture to one that makes "heroes" of those in society who try, fail, learn and ultimately succeed?
3. How can we re-orient our universities to commercialise more and collaborate more to take on problems for the world?
4. How can we expose the next generation of innovators to challenges that encourage collaboration and leadership?
5. How can we transform the "tyranny of distance" to become our strength?

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The authors would like to thank the efforts of the following delegates to the conference and consultants who provided invaluable review and suggestions to these materials.

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