Dial up the Chutzpah

Lessons from Israel for Australian AgTech

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kpmg.com.au
The AgTech question Australia must confront squarely in 2017 is what do we want to be: a builder, a buyer, or a bystander?

Already there are some great Australian AgTech ideas making an impact here and internationally. Australian startups are working to apply technology such as sensors, precision technology, farm management software, robots, online marketplaces for labour and assets, drones, and herd management technology to improve yields and quality, and reduce farm costs.

Yet despite Australia’s competitive advantages – relative available space, six different climatic growing conditions, scale of production capacity, comparable quality scientific research capability and proximity to consumer markets with whom we hold favourable free trade agreements – there remains a significant opportunity for Australia to take action and make itself a global builder of AgTech technologies and innovation.

When looking for a true global stand-out, it is hard to look past Israel, one of the world’s fastest growing AgTech markets. We know Israel has perfected citrus cultivation for its desert conditions, extended the shelf life of regular cherry tomatoes and revolutionised irrigation with drip technology. Israeli scientists are producing crops achieving a USD1 million per kilogram price point and working on making 3-D printable chicken meat a reality!

Over 300 multinational corporations (MNCs) have set up research and development bases in Israel, employing over 50,000 people. Government-funded FoodTech and AgTech incubators have been established to bring seed funding and support to emerging startups.

Naturally, I eagerly seized the chance to take part in the recent Australian Agri-Food Trade Mission to Israel run by the Australia Israel Chamber of Commerce. And the trip certainly didn’t disappoint. Key to my learnings are that Australia must move with more urgency (“yalla”) and embrace a safe to fail mindset (“chutzpah”) if we are to become, and remain a world-leading AgTech nation.

We must better coordinate our research efforts to reduce duplication and wastage, apply a commercialisation overlay to research and development and create the ecosystem that collaborates to create success stories and de-risks early stage innovation. We must measure our victories in the addressable global market, and work with our local partners, not against them.

I hope this think piece, summarising 10 key observations from my Trade Mission experience, serves to Dial up the Chutzpah and inspire further action to realise the tremendous potential for Australian AgTech.

Ben van Delden
Partner
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KPMG Australia
The startup nation

At a glance

Israel sits second on the Global Competitiveness Index Innovation Top 10 (2015-16). Switzerland is first. Australia is 26th.

Israel has the world’s highest rate of academic degree holders in relation to population size.

Australia has more universities per capita – 40 serving 24.5 million people, versus Israel’s nine universities serving 8.2 million people.

Israel has more startups per capita than any other nation. It also has more biotechnology startups per capita than any other nation.

Tel Aviv is the number one startup ecosystem outside the US. 10 percent of hi-tech companies in Tel Aviv are focused on life sciences.

Israel focuses particularly on the investment potential of the agricultural and food sector, due to growing food demand, increasing resource stress, and food related societal challenges.

Israel is number one in milk yield per dairy cow at 12,000 litres (compared to 5,669 litres* in Australia).

Israel leads the world in water recycling (80 percent; followed by Spain with 20 percent).

Israel has the highest ratio of crop output per water unit.

There is a vibrant cross pollination of innovation from the Israeli Defence Force, universities and research centres and industry.

Israel is number one in civilian Research and Development (R&D) expenditure per capita.

300+ MNCs have set up R&D / corporate venturing offices in Israel.

Notable inventions resulting from Israeli AgTech include drip technology irrigation, long-life cherry tomatoes, adapting citrus cultivation to desert conditions.

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* Dairy Australia Yield Summary
Chutzpah and yalla

The Israeli culture of innovation

Common experience shapes culture, and culture shapes economies.

Blessed with abundant arable land and relative political stability Australia has traditionally enjoyed something of a ‘she’ll be right’ culture in agriculture, where we ‘take the good with the bad’. Droughts one year, floods the next, and bushfires in between have delivered seasonal fluctuations in growing conditions and fostered a unique resilience amongst Australian primary producers.

What we saw in Israel was a different mindset at play, to succeed and overcome the odds. Instead of assured nonchalance, Israeli innovation culture is defined by two unique local concepts: Chutzpah, roughly meaning self-confidence and audacity, is a point of national pride. It represents a willingness to try things that might seem outlandish, to hustle for a result, even if it’s not entirely by the book. To believe that you can and will succeed.

Yalla, an appropriated Arabic term translating approximately to ‘let’s go!’ also has particular relevance due to Israel’s unique political history. Beset by permanent national security issues, there is a heightened perception of the fragility of things, which creates a restless momentum.

Both chutzpah and yalla are critical drivers of the innovation culture that is so evident in Israel.

There is a palatable collective urgency to progress that is not nearly as evident in Australia today. Such drive is not constrained to the youthful 20-something year-old entrepreneur. It is very much alive in Eran Daniel, 65 year-old co-founder and CEO of DouxMatok and his 92 year-old father who are developing technology to enhance sweetness in foods, using less sugar without affecting the taste. DouxMatok is Eran’s fifth startup and will not be this serial entrepreneur’s last!

Nowhere in Israel did we encounter growers with an accepted fate that ‘this is our lot’. It was a pervasive Israeli mindset that they can confront all challenges facing them. The Yad Va’shem Holocaust Memorial in Jerusalem serves as a reminder of just how quickly so many lives and possessions can be lost, and the surrounding frictions with neighbouring states constantly reinforces to Israeli people that life can be short.

The pervasive feeling seems to be: don’t put off your ideas or waste your time pursuing anything but your life’s purpose. Move with urgency, seize the opportunities in front of you, and collaborate to accelerate. Act with yalla!

This potent combination of yalla and chutzpah was swirling around the heads of all Trade Mission delegates when we returned to Australia. We returned determined to double our efforts to develop innovative solutions to green some of our desert areas, search out and imagine new ways to increase our yields and plant more ‘why-not’ and ‘how-might-we’ seeds in the minds of those involved in our food and agribusiness sectors.

As Trade Mission delegate Dr Christine Pitt, CEO of MLA Donor Company said: “We must teach our children the skills that will enable them to build businesses, not to simply get a job.”

Another key driver of the unique Israeli innovation culture is conscription.

Perhaps contrary to other nations’ notions about military service, young Israelis do not view compulsory service as a lost three years – rather the military experience is seen as something of a knowledge hub environment offering exposure to tech and potentially valuable contacts. The Israeli Defence Force, or IDF, is the one common incubator which all Israeli’s must pass through.

Because the IDF culture encourages constructive objection to orders, instilling a methodology for challenging the status quo that fosters innovation, it also serves as a good primer for a national ‘safe to fail’ mind-set.
Innovation and the safe to fail mindset in the defence industry often spills over into the commercial environment. We learnt that if you apply your pre IDF technical knowledge to develop innovative solutions during your military service then there are opportunities for you to commercialise the technology you had a hand in creating. We saw this in the application of military grade drone capability in the AgTech startup that Mr Israel Talpaz and Mr Barak Hachamov are founding, through to precision agriculture and new food solutions being developed.

Israel also has a unique national relationship with science and technology.

At the birth of the state, leaders of the Zionist movement including the inaugural Prime Minister David Ben-Gurion and inaugural President Dr Chaim Weitzmann viewed scientific research as explicitly at the core of what the founding leaders were hoping to create. Former Prime Minister and President of Israel, Shimon Peres, summed it up well when he noted that: “In Israel, a land lacking in natural resources, we learned to appreciate our greatest national advantage: our minds. Through creativity and innovation, we transformed barren deserts into flourishing fields and pioneered new frontiers in science and technology.”

Nevertheless, Israel produces 80 percent of its own food needs. The impetus to do more with less is acute. Repeated water shortages, and uncertainty on its borders means food security is a priority issue.

As a result, Israelis have been forced to make near-miraculous use of the desert. 80 percent of exports of horticulture come from the desert, where only two millilitres of rain falls each year.

Most of Israel’s dairy herd are situated in desert areas and produce the most milk yield per bovine in the world – over 12,000 litres per annum, almost twice the Australian average per cow.

This more intense focus has driven innovative thinkers to the agricultural sector. Because Australian agriculture has not required anywhere near this level of innovation to succeed, often investors have shifted their focus elsewhere.
Investment in innovation has been seen by successive Israeli governments as something of a no brainer. Instead of concerning itself with capital stakes and return on investment, the government has calculated that a culture of innovation returns to the nation at a macro level. This generous culture of public funding has led to a climate in which other investors see opportunity. The venture capital pool has remarkable depth, supplemented by more than 300 MNCs that have their corporate venture arms and research and development centres in Israel to scout disruptive ideas for their businesses to invest in. Access to deep and broad capital pools creates a virtuous cycle – Israeli startups understand there is now a nation of entrepreneurs competing for capital, which applies pressure on them to be as polished as possible.

While the lion’s share of this venture capital funding goes toward communication and other tech applications, 10 percent of the startup investment in Tel Aviv is attracted to life sciences. There are several Israeli AgTech funds investing into later stage startups, but it is government seed funding support that is inspiring entrepreneurs to develop their ideas into proofs of concept and set them on their way to Series A and beyond.

By comparison, Australia currently has a lack of specific AgTech investment funds and too few small to medium sized funds, leading to an inability to diversify investment. With only 0.3 percent of our superannuation funds invested into agriculture it is a case of educating and attracting this capital into the sector. The investment community in Australia looks to invest in areas where they have a deeper understanding of the industry and its needs. Agriculture and AgTech are not typically areas of expertise for Australian investors. But this tide is turning.

Israel has not faced so acute a problem, primarily because of the role of the government through the Israel Innovation Authority and the active venture capital market. The Israel Innovation Authority (IIA) is an independent body designed to nurture and develop Israeli innovation.

It has two specified broad goals: maintaining Israel’s position at the forefront of global innovation and elevating the entire economy through technological innovation. Its underpinning philosophy is that loans for innovation do not work effectively, and that the best option is grants.

Among many other initiatives, the IIA runs a centralised Incubators Incentive Program, for entrepreneurs with innovative technological ideas who want to create a startup company. These incubators – which are privately owned by venture capital funds, multinational corporations, private investors, and others – invest in new startup companies and provide them with administrative, technological, and business support.

Today there are 18 such incubators, with one specifically designated as a Biotechnological incubator, another for FoodTech and third for AgTech. The operators, selected through a competitive national process, receive an eight-year incubator license. Selected startups in the Incubator Incentive Program receive conditional grants from the IIA of 85 percent of the approved budget, with a budget limit of NIS 3,500,000 (AUD1.26 million) for a period of up to two years. The licensed incubator uses the IIA funding, topped up with 15 percent of their own funds and in kind services, to provide seed funding to the approved startup. The IIA does not take an equity stake for the 85 percent of the funding contribution.

However, if the idea commercialises successfully and a profit is generated, there is a claw back up to the level of what the government originally funded into the entity. In addition, for IP that is sold outside of Israel the government claw back is multiplied six fold.

In 2015 USD4.8 billion was achieved by Israeli startup exits, at an average of USD87 million per exit.

Through this model the IIA believes it generates at least a 5:1 return for the Israeli economy from each shekel invested.
Universities, research bodies and industry

A nation of open doors

Australia could potentially learn much from the relationship universities and research centres have with industry in Israel.

The nine universities in Israel are organised around distinct centres of excellence, alleviating confusion and duplication in the market. Industry seems to know which university door to approach for what – and importantly that door is almost always open.

A key reason for this is that while professors and their research teams are encouraged to publish, the commercial arms in their universities are far more progressive in their harvesting and promotion of investible IP.

The process for universities to take a commercialisation stake is well understood and well-travelled. Professors from universities are often stakeholders in startups. This means, critically, that scientists do not have to leave the university environment to become very successful entrepreneurs.

Professor Shoseyov is the scientific founder of nine companies and inventor of 45 patents. One of the companies he founded, Collplant, is an agro-biotech regenerative medicine company focused on developing and commercialising products for the orthobiologics and wound care markets. Collplant’s technology allows the cost-efficient production of high quality recombinant type 1 human collagen (rhCollagen) using tobacco plants carrying five human genes. The addressable market size is multiple USD billions, with collagen selling for USD1 million per kilogram.

Professor Shoseyov is encouraged by the Hebrew University of Jerusalem to commercialise his research. As a result they have retained the serial entrepreneur and leading scientist who in turn attracts more students and research partners to the university.

The Israeli system incentivises a culture of engagement from universities with industry, while simultaneously allowing universities to retain their best minds.

Entrepreneurs in Israel are generally able to engage universities with the genesis of a new market driven solution and work with the university to identify the right talent and technology needed to turn the vision into reality. SuperMeats is an example of this relationship in action.

The entrepreneurial founders approached The Hebrew University of Jerusalem to build a business to respond to the forecast consumer demand for the 3D printing of chicken meat, to reduce the impact of avian flu risks to human populations from poultry production and increasing consumer sentiment to access protein with lower carbon and environment footprints.

Because those entrepreneurs may well be able to access seed funding to enable research, the chances of the idea building momentum and becoming an investable business grows.

In Australia, most current measures of success are focused on research-based metrics – papers published and cited – rather than commercial impact on productivity and applied innovation.

This means there is often a disconnect between researchers and startups on the core issues facing industry. Technology is therefore developed in isolation from the farm and the farmer.
Dr Larry Marshall, the Chief Executive of CSIRO, has noted there are two reasons for this: “We don’t collaborate enough with business and we actively compete against each other in science.”

A lack of transparency over previously unsuccessful research projects can lead to duplication of funding and effort linked to replication of this research.

Israel seems to have largely overcome both of Dr Marshall’s hurdles, with a firm ethos that the real competition happens on the global stage and there is generally more benefit to be gleaned through collaboration domestically.

In Israel, funding and incentives are designed to drive a fast prototyping, safe-to-fail approach.

Contrast this with Australia, where research periods are typically too long to drive fast results, and funding is too hard to access to facilitate results in short timeframes.

Despite the current state of play, Australia has every opportunity to adapt and evolve.

Australian research centres and universities are producing quality AgTech solutions, and Australia has a reputation for producing high quality research. Nine of the top 100 life science universities in the world are in Australia. It was noted by the scientific fraternity on the Trade Mission that Australia has comparable quality science to Israel; the apparent difference being the disconnect between our science and its commercial application.

Research bodies and universities need to be able to collaborate effectively with the industry early and regularly, and should seek to better understand its needs. We need to improve access for entrepreneurs to our research capability.

Measures of research success should align with driving positive growth and commercial outcomes for industry. For example, the take up of the technology, the number of jobs created in a region or business, new dollars generated from exports or improvements to profitability of businesses applying the technology.

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Putting heads together

Co-operation and collaboration

A commonly cited challenge in the Australian innovation environment is inadequate collaboration. Israel provides a terrific case study in how this could be improved.

AgTech, by its very nature, thrives on effective collaboration. This is because it requires people with skills that are not traditionally connected to agriculture: engineers, software designers, data analysts, and business support services.

Collaboration is an area in which Israel excels. Israelis pride themselves on the idea that they are never more than two degrees removed from each other.

That certainly seemed to be the experience of the Trade Mission delegates.

The idea that it is important to collaborate locally and compete globally is necessary for the scale of ambition in many projects. Greening the desert, recycling 80 percent of water, and diverting the Red Sea into the Dead Sea are not tasks that can be undertaken without co-operation and chutzpah.

From day one, Israeli startups are seeking to address a global market – businesses are built to scale up, collaborate as necessary, and commercialise fast.

Obviously size is a factor here. Israel has a population of 8.2 million (against Australia’s 24.5 million) and a land mass of 20,000 square kilometres (against Australia’s 7.7 million square kilometres).

Physical size aside, Israel’s isolation also seems to play a role, by drawing Israelis together in solidarity and forcing them to look beyond their immediate boundaries.

The connectivity therefore does not end within Israel’s borders. In fact, the connectivity of the Jewish diaspora is a key Israeli advantage.

Israelis in the Silicon Valley are renowned not just for their sheer numbers, but for their strong sense of community.

Thanks to the infamous ‘brain drain’ Australia too now has a diaspora in innovation hotspots around the globe. Mobilising the Australian diaspora presents a significant opportunity for the country.

The IIA also works actively on its network of international R&D collaboration, with 65 bilateral R&D agreements worldwide and 100 joint projects per year, including with Australian states, especially NSW and Victoria.

In February 2017, during the first visit by a sitting Israeli Prime Minister to Australia, the Federal Government signed a technological innovation and research agreement with Israel that provides a framework for Australian scientists and businesses to create ‘industries of the future’. However, although the IIA expressed a strong interest in working more with Australia, a common perception is that our nation is a challenge to co-operation and collaboration.

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EdenShield has developed a patented plant-based alternative to chemical pesticides that is eco-friendly and highly effective. EdenShield creates an aromatic shield at the entrance to greenhouses to prevent incursion and is also applied to foliage to trick pests not to land on the plant.

Chemical pesticide availability is decreasing and existing products are being banned due to toxicity. The global insect pesticide market is worth USD14 billion, and bio-pesticides are experiencing 19 percent CAGR.

The EdenShield family of natural, nontoxic products have been based off extracts from desert plants, well known for their unique capacities to survive in extreme conditions and their resistance to infestation.

EdenShield produces crop protection products, fertiliser, and plant wash products.

Trials demonstrated nearly 100 percent blockage of insects, and up to 90 percent reduction in insecticide use for targeted pests.

Rootility has developed a novel non-GMO breeding selection system which enables the breeding of root systems that enhance crop yields.

Based on the idea that plants rapidly lose productivity when operating outside optimal temperature conditions, and the performance can be dramatically increased if cold and heat tolerance is added to root systems.

Its first set of products will be aimed at the California processing tomato industry, looking to then expand to other vegetable segments, and then to selected field crops.

Rootility has proven in large scale trials with the world's largest processing tomato company that when its rootstocks are grafted with existing commercial varieties, yields increase substantially, while water consumption is reduced by up to 40 percent. Crops are better able to fight off disease and water consumption is reduced.

A semi-automatic grafting factory pilot has been established with California's largest tomato processing player.

By 2018 it is projected that Rootility will be able to graft 40 million plants in 10 weeks.

In one of the trial fields the water pump collapsed, and the plants experienced six days of total drought. The Rootility plants maintained their strength, and delivered 50t/acre vs. 28t/acre in the control.
**TIPA**
tipa-corp.com

A bio-degradable flexible plastic packaging solution aimed to reduce the impact of waste plastic on the environment. Current plastic packaging breaks down over 500 years and present zero ecological solutions.

TIPA offers a viable alternative for flexible packaging for food; its packaging is bio-based, 100 percent compostable and has similar mechanical and shelf-life properties to ordinary plastic.

TIPA bio-degradable products are targeting a share of the flexible plastic packaging market worth USD114 billion, of which compostable packaging is expected to be worth USD3.4 billion by 2020. Their mission is to be the next generation packaging solutions company, to be a mass market player in plastic packaging and replace conventional flexible packaging with TIPA’s 100 percent compostable packaging.

TIPA has patent families registered worldwide and IP protection in both potential customers’ and in raw material and films manufacturer territories, and is seeking to raise USD25 million in next capital round.

**CollPlant**
collplant.com

Addressing the problem that collagen for medicinal and cosmetics is presently harvested as a second life product from animals and cadavers, and is therefore expensive to collect. Collplant is an agro-biotech regenerative medicine company focused on developing and commercialising products for the orthobiologics and wound care markets. Collplant’s technology allows the cost-efficient production of high quality recombinant type 1 human collagen (rhCollagen) using bioengineered plants carrying five essential human genes. This virgin sourced collagen is naturally free from prions, infectious pathogens, allergens and immunological responses that can be found in animal and cadaver sourced collagen.

The addressable market size is multiple USD billions, with collagen selling for USD1 million per kilogram. Founded by Professor Oded Shoseyov from Hebrew University of Jerusalem’s Institute of Plant Sciences and Genetics.

**BactuSense Technologies Ltd**
thekitchenhub.com

The food and beverage (F&B) industry is under intense pressure from regulators and consumers alike to increase food safety and avoid recalls. BactuSense develops a novel, cost-effective chip-based device, for rapid, label-free pathogenic bacteria detection that can be placed in every plant production line.

A 30 minute test for live bacteria in food-processing plants, hospitals and municipal water supplies. The Bactusense optical biosensor, uses silicon-based microchips to trap bacteria from any liquid – such as water, milk or blood – flowing through the system. The optical scanner then identifies the trapped microbes as solution flows across the top of the chip, bacteria enters pore of chip and changes light reading if live bacteria is present.

The system could be configured in different versions to identify specific kinds of bacteria in water, food, air, soil and body fluid samples. Each chip in the system will cost less than USD1 to manufacture.

Sources: Startups and trip notes
### Theme: Culture of innovation

1. Shine more light on Australia’s quiet science and technology achievers – seek ways to better tell our own stories of innovation at airports, public spaces and institutions.

### Theme: Access to capital and investing in innovation

2. Redirect some of Australia’s public innovation funding to fill the seed funding gap in the market – help de-risk innovation and encourage a safe to fail mind-set.

3. Explore the merits of licensing government incubators for AgTech and FoodTech, which would create competition for the licences.

4. Create a regenerative framework for publicly funded innovation – to recoup funds invested in startups upon successful commercialisation and introduce a multiplier factor for successful sale of IP to offshore investors. This would promote greater alignment of support between government agencies and industry innovators.

### Theme: Open doors

5. Provide research direction to Australian universities, Research Development Corporations and state departments of agriculture via commercialisation KPIs and some shorter grant periods to promote ‘sprint’ innovation.

6. Refresh the incentive models so researchers are remunerated for the successful commercialisation of research, where the prize is the outcome from the research not the research grant itself.

7. Enable three-month research exchanges to Israeli universities and research bodies such as the Agricultural Research Organization, the Hebrew University of Jerusalem, and Tel Aviv University so that Australian scientists can gain an understanding of working in that ecosystem.

### Theme: Co-operation and collaboration

8. Establish a national network of AgTech hubs. The Israel trip reinforced the need to create AgTech hubs, a key recommendation of the previous KPMG Powering Growth report. It also taught us that we need to promote discussion about the lessons from trying and failing, not just the sugar coated successes.

9. Closer co-operation with the global AgTech industry provides key advantages, including allowing Australian entrepreneurs to draw on leading international research to help build local AgTech businesses with global reach.

10. Invest in bringing developed AgTech solutions from overseas and adapt them to the local environment. Develop joint AgTech research partnerships and demonstration sites to showcase the science and technology, underpinned by research, government and industry relationships between Australia and Israel.

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1. Powering Growth: Realising the Potential of AgTech for Australia, authored by KPMG Australia and StartupAUS, supported by the Queensland Government and Commonwealth Bank of Australia, October 2016.
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