

# ISRAEL'S LEADING AG-TECH ECOSYSTEM

OPPORTUNITIES AND BENEFITS OF INVESTING IN ISRAEL'S  
VIBRANT AG-TECH INDUSTRY



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# THE AG-TECH INDUSTRY

**The ag-tech industry is at the intersection between agriculture and technology, dedicated to providing innovation to the agriculture market.**

The Industry is constantly on the lookout to improve traditional agriculture, and is greatly influenced by global mega-trends, by the subsequent needs of international agricultural giants, by government regulation, and by the necessities of the consumer-driven food industry. Ag-tech affects every part of the agricultural value chain, fundamentally changing the way we think of farming.



# THE AG-TECH INDUSTRY



## Industry Sectors

The ag-tech industry consists of six main sectors:

- **Plant Sciences and Input Management** – Seeking to increase crop yield, endurance, safety and nutritional benefits, botanists develop both naturally bred and genetically modified organisms (GMOs) with the desired properties. In addition, this field includes the research of input management, inventing more efficient fertilizers, safe pesticides, better crop protection, and innovative planting techniques that can provide efficient higher yields, also in tougher environments. Plant sciences are supported by academic institutions; multinational companies (MNCs) such as Bayer, BASF, Dow, DuPont, ADM, Yara and Cargill; and a plethora of startups.
- **Livestock and Animal Sciences** – The animal sciences sector is dedicated to increasing the production, efficiency, sustainability and safety of the livestock, poultry and fishery industry. By increasing the knowledge about livestock and with new technologies, researchers and investors seek to develop new ways of tracking, feeding, breeding and upbringing farm animals. Additionally, players in this sector are looking for new ways to artificially manufacture animal products, and thus bring disruption to the traditional livestock farming. Livestock innovation is driven by academic research as well as startups such as Memphis Meats and Aleph Farms, and established MNCs such as JBS, Tyson Foods and WH Group.
- **Sensors and Digital Information** – The digital revolution has promoted the incorporation of sensors and digital information technologies in the agricultural market. Sensors enable the collection of higher-quality data regarding soil, the weather, plant growth and plant illnesses. The data is analyzed by intelligent platforms, which produce actionable insights that aid farmers in protecting crops and increasing yields. These technologies also enable indoor and outdoor automation, cloud-based agriculture and highly efficient supply chain operations. Companies in this sector include CropX, Ag Leader Technology, The Yield, and Sol Chip.
- **Automation** – Automating agriculture enables easier, more precise farming. By automating operations, the farming market becomes leaner and more productive, and can ensure consistent quality of plants and livestock. Autonomous technologies can also promote novel farming systems, making urban farming as well as farming in remote environments possible. Automatic solutions include driverless tractors and robotic seeding, planting, weeding, harvesting and irrigating systems. Companies operating in this field include John Deere, Trimble, ASI and CNH Industrial.
- **New Agricultural Systems** – Arising from increasing urbanization and the growing need for food production, novel farming systems enable the growing of more food with less input in less suitable environments. Such systems also allow for the cultivation of new plants and animals, and

for the growing of plants directly by consumers. Examples of solutions already in use include vertical farming, indoor farming, aquaculture, clean meat cultivation and printing, and insect farms. The development of new systems and of technologies enabling them is driven by various companies, such as AeroFarms, Plenty, EdenWorks, EnerGaia, Ginkgo Bioworks, and Zymergen.

- **Post-Farm Ag-Tech** – This innovative sector is revolutionizing the post-farm supply chain, as well as supporting adjacent markets such as agricultural financing. Companies operating within the sector employ specialized materials, automation, information technologies and artificial intelligence in order to make agricultural logistics more efficient, prolong the shelf-life of produce, and provide precise funding to farmers.

2. Ag-tech incubators and accelerators provide much-needed funding and business support to ag-tech entrepreneurs.
3. Venture capital firms invest in early-stage companies, enabling startup growth and expansion. Ag-tech enjoys investments from both dedicated and general VC funds.
4. Governments are directing funding and incentives to the ag-tech industry in order to promote research and innovation, increase the competitiveness of local agriculture and provide consumers with cheaper, safer and healthier produce. Governments are also responsible for creating a favorable regulatory environment that facilitates the introduction of new ag-tech products to the market.

## The Ecosystem

Like many other industries, ag-tech is dependent on the cooperation of multiple players in creating a vibrant eco-system that provide the right growth envelope. Some of the major contributors to the eco-system are:

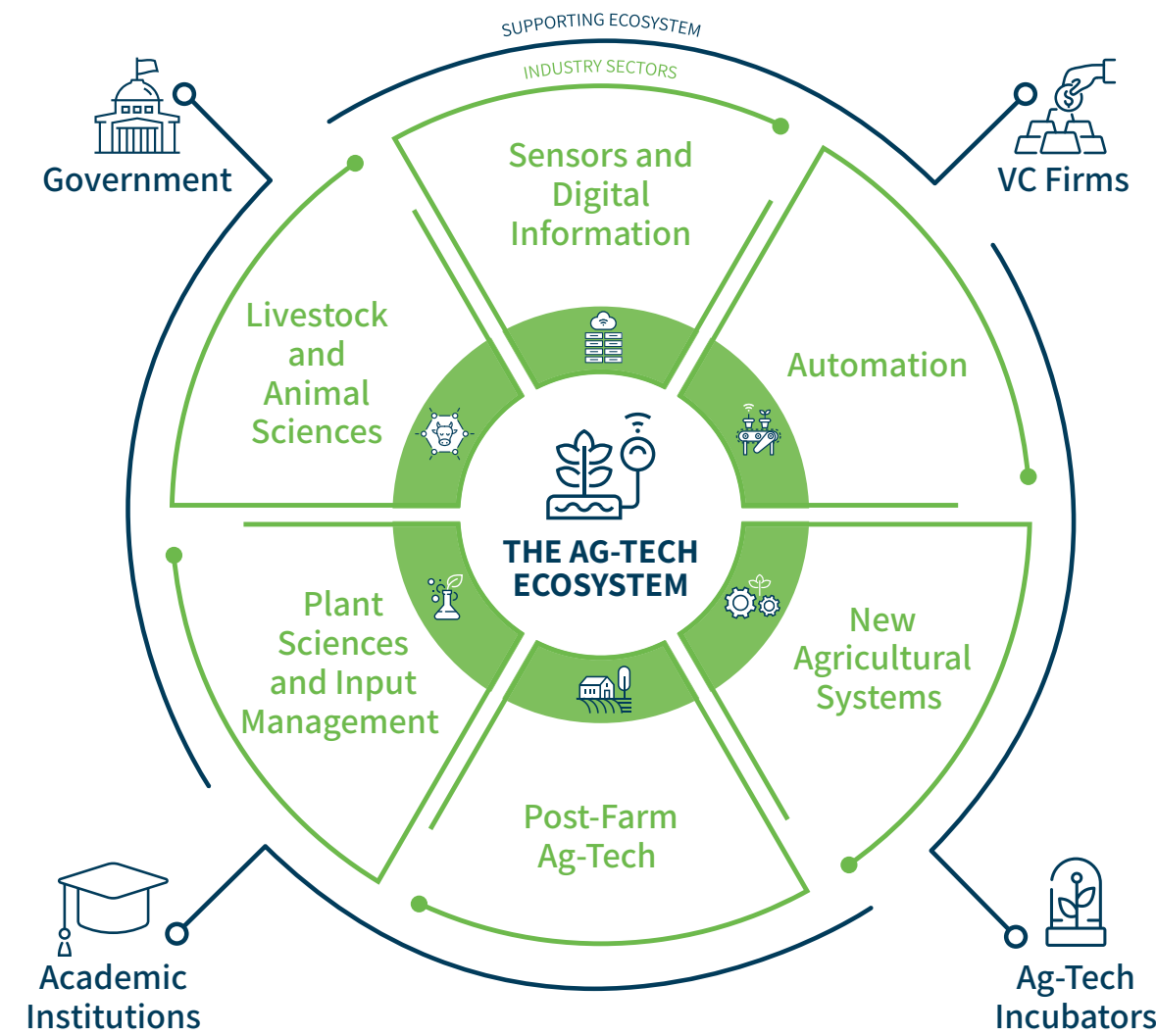
1. Agriculture and biotechnology academic institutions inject the market with various innovations and scientific breakthroughs. They utilize technology transfer practices to bridge the gap between academia and the business.



# THE AG-TECH INDUSTRY



FIGURE 1: THE AG-TECH ECOSYSTEM





# THE GLOBAL AG-TECH MARKET



**AG-TECH** is rapidly growing, and has been disrupting the traditional agriculture, forestry and fishery market which is valued at \$3.3 trillion as of 2018 - 4% of global GDP.<sup>1</sup>

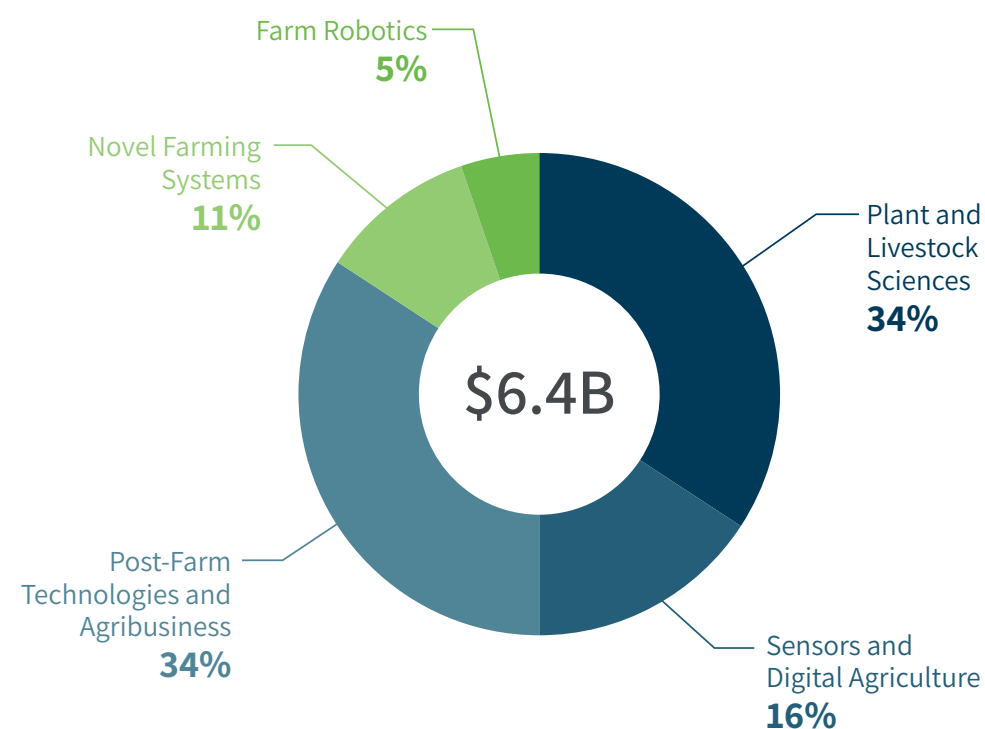
The ag-tech market is dynamic and is characterized by frequent disruptions and merges, thereby making it difficult to evaluate its precise size. However, several markers indicate its considerable

growth and gradual maturing over the past several years.

The first indicator of the industry's growth is the increasing investment directed at it. In 2012, \$150 million were invested in ag-tech globally.<sup>2</sup> This figure has since increased dramatically, with \$2.2 billion invested in 2015,<sup>3</sup> and a record \$6.4 billion in 2018,<sup>4</sup> marking a 43% CAGR over the past three years.



**FIGURE 2: GLOBAL INVESTMENT BY INNOVATION FIELD, 2018**



On the VC front, most of the 2018 investments were directed at crop protection and input management, followed by plant sciences and indoor agriculture.<sup>5</sup> Some of the biggest investments of 2018 went to Meicai, Zymergen, Indigo Ag, and Impossible Foods.<sup>6</sup> The ever-increasing interest of investors creates more opportunity for entrepreneurs, which enables the rapid establishment of startups. In 2015, the number of startups focusing on ag-tech was just under 500.<sup>7</sup> Since then it has more than doubled, currently set at over 1,000 dedicated startups, in addition to some 600 companies that supply solutions to ag-tech as well as to other industries.<sup>8,9</sup>

Another evidence of ag-tech's growth is the expansion of its comprising sectors, which are often easier to evaluate. For example, it is estimated that

the smart agriculture sector, currently valued at \$13 billion, will be growing at a CAGR of 18-19% over the next three years, reaching a valuation of \$23 billion by 2022.<sup>10</sup>

The market is also characterized by a shift in dynamics, with a rising pace of consolidation through M&As. Over 20 acquisitions were made in 2018, primarily in the fields of data-driven farm management and sensorics. These included acquisitions from the likes of Merck, Nutrien Ltd., Land O'lakes, Syngenta-ChemChina, the joint venture of Cargill and ADM, Yara, and Indigo Ag. Remarkably, 2018 saw one of the biggest exits in the industry's history with Merck's acquisition of Antelliq, valued at \$2.4 billion. This consolidation trend is set to continue as the market matures.<sup>11</sup>

# THE GLOBAL AG-TECH MARKET



FIGURE 3: REMARKABLE AG-TECH INVESTMENTS AND ACQUISITIONS, 2018



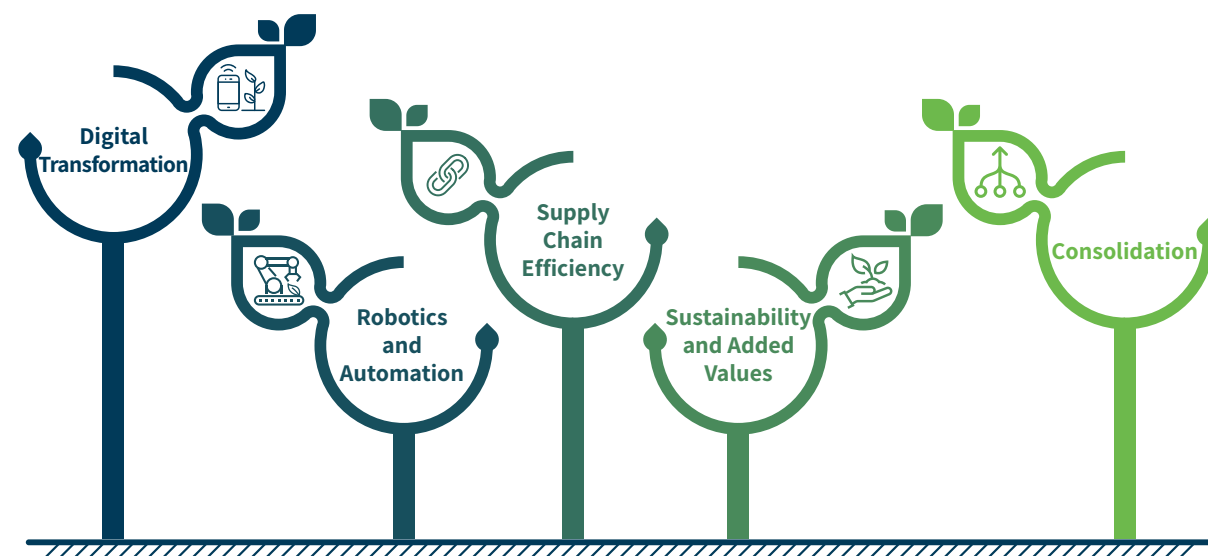


# GLOBAL AG-TECH TRENDS



AG-TECH TRENDS are heavily influenced by global megatrends such as accelerating population growth and urbanization,<sup>12</sup> the deterioration of land and water resources,<sup>13</sup> a growing middle class,<sup>14</sup> rising ecological awareness,<sup>15</sup> and the data revolution.<sup>16</sup> All of these are shaping ag-tech trends with both short and long-term implications.

FIGURE 4: GLOBAL FOOD-TECH TRENDS



## Digital Transformation

The digital revolution has not passed over agriculture, promoting the development of new sensors and big-data systems that enable more precise and predictive farming, increasing yields and reducing input.

The growing demand for food, as well as sustainability and high-quality produce, are the underlying drivers promoting the rapid adoption of the multiple technologies included in the digital transformation trend. These technologies promise to provide farmers with the tools to spot illness at an early stage; to predict their fields' expected yield by considering the effects of the weather and quality of water and soil as well as by using image analytics; and to provide them with helpful and actionable insights even as they are away from the farm.

Digital agriculture supports all sectors of ag-tech. The growing need for data is catered for by new sensing hardware and software, including real-time monitoring in the cultivation and growing of livestock, and insights resulting from big-data analysis. New agricultural systems that rely on precise climate control and irrigation processes take advantage of data to preform real-time adjustments, some of them utilizing automation. The post-farm ag-tech sector uses data analysis to increase traceability, optimization of supply chains and improve on agricultural financing.

Prominent digital information technologies include Yara's digital farming platforms based on cooperation between IBM and Trecker technology, Croplogic's real-time smart farming solutions, SensoTerra's wireless IoT sensors, Aerobotics early pest and disease detection, HydroPoint's precision irrigation, and Wefarm's small scale agriculture farmers' network.

## Robotics and Automation

Robotics and automation have been changing farming fundamentally by increasing efficiency, enabling the development of new farming practices and systems, and easing the process of home-cultivation.



The demand for higher yields and lower costs is heavily accelerating the adoption of automatic processes in cultivation, with new sowing, care and harvesting methods as well as new packaging machinery and vehicles, including drones. Similarly, livestock and poultry farms are utilizing automatic systems to optimize feeding and living conditions.

Automation also serves novel agriculture systems, playing a key role in fisheries, aquaculture, vertical farming and more. Lastly, automation influences post-farm ag-tech by enabling highly optimized supply chains as well as autonomous home-growing systems for vegetables and cannabis. Exemplary technologies include DJI's crop-protecting drones, Bowery Farming's high-tech indoor vertical farm, Iron Ox's hydroponics robots, and Verdical's autonomous restaurant and home cultivators.





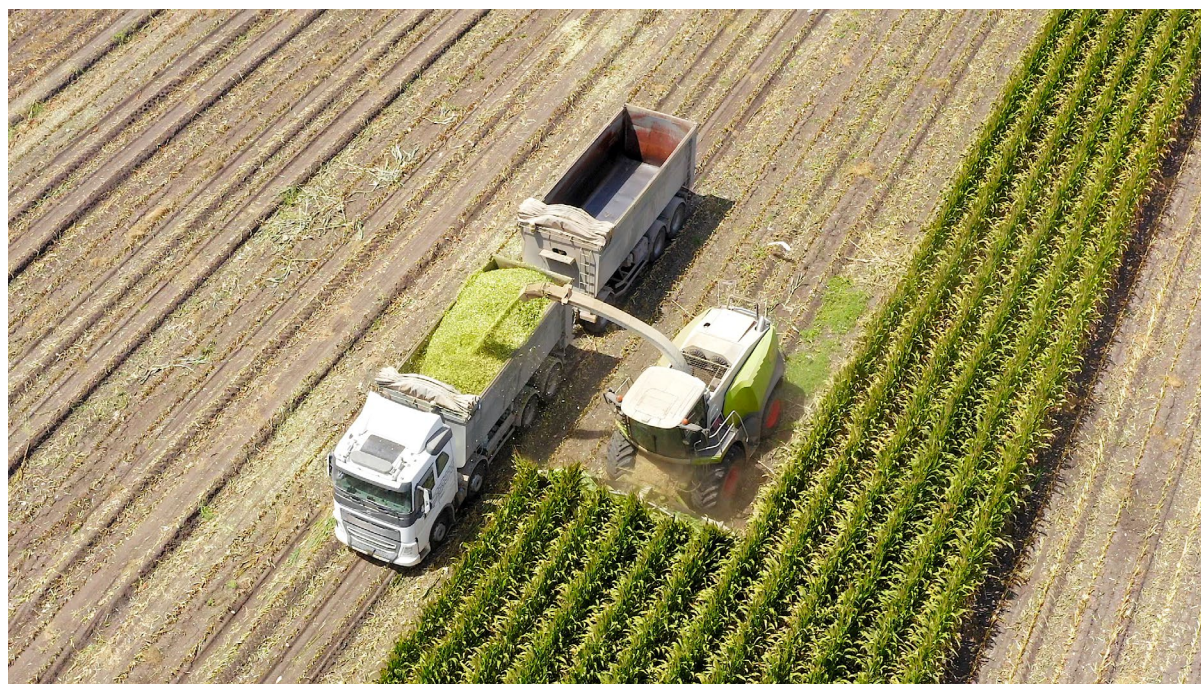
## Supply Chain Efficiency

The demand for cheaper and fresher produce has been urging farmers to improve post-farm supply chains by using new technologies and processes.

The general rise in population, coupled with a growing consumer concern over topics such as sustainability, locally sourced foods and affordability, are leading farmers to adopt more advanced technologies and business models that enable them to supply produce better, faster and cheaper. The urbanization movement, for example, promotes the adoption of new agricultural models such as indoor and vertical agriculture, thereby creating new models for agricultural supply chains.

Various solutions have been developed to support supply chain efficiency. These include digitally native, vertically integrated business models in agriculture, in which farmers integrate more links of the supply chain with their farming operations to cut on costs and increase efficiency. Other examples are data-driven logistics platforms, which provide tailored solutions to agri-businesses, and packaging materials that prolong shelf-life and prevent harmful pests and illnesses. Genetic modification of plants, in order to make them more uniform in shape and size or more immune to disease, is also highly driven by this trend.

Notable companies catering to this need include IBM, Amul, Agri SureTrack (previously IntelliFarms), Samsara, Hazel Technologies Inc. and AgriChain.



## Sustainability and Added Values

A growing ecologically-conscious middle class is demanding more sustainable agricultural processes, higher traceability, guaranteed safety of produce, and increased nutritional values and freshness.

Sustainability concerns are driving Farmers to adopt solutions that reduce soil, water and air pollution, improve the composition and nutritious qualities of soil, and responsibly eliminate harmful insects and diseases in both plants and livestock in order to ensure produce safety as well as prevent waste.

Livestock and plant tracking, which enable farmers to make real-time, precise decisions based on actionable insights, and consumer to trace the source and processes of agricultural produce are one example of such solutions. The plant and animal science sectors are also fostering innovation through breeding and gene-editing, creating products and methods that improve health benefits, shelf-life and cultivation efficiency.

This trend has affected almost all the players in the ag-tech industry, including established players such as BASF, ADM, Cargill, and Bayer-Monsanto. It has been the driving force behind the development of technologies by smaller startups such as Plenty's indoor vertical farming, Protix Biosystems alternative

livestock feed and fertilizers, Gingko Bioworks' beneficial modified bacteria, and Inari's genetically modified seeds.

## Consolidation

The industry is characterized by shifting dynamics, with MNCs frequently acquiring smaller innovative companies, as well as by mergers between established players.

Due to ag-tech's extensive R&D processes, a result of the long time required to complete cultivation cycles, MNCs are acquiring startups as a means of quickly injecting innovation into their operations. Recent years have seen an abundance of acquisitions by companies such as Deere and Company (Blue River Technology acquisition), Merck (Antelliq), DuPont (Granular), Monsanto (The Climate Corporation), Bayer (Agraquest), Syngenta-ChemChina, Orbia (previously Mexichem), and Taranis.

Mergers between established players are also copious, driven by the demand to reduce costs and increase innovation. Prominent examples of recent mergers in the industry include DowDuPont and their subsequent dissolution, Bayer-Monsanto, Agrium and PotashCorp's merger into Nutrien, and Syngenta-ChemChina.



# THE ISRAELI AG-TECH ECOSYSTEM



**ISRAEL HAS** a vigorous ag-tech ecosystem, which enjoys steady growth and is establishing itself as a promising innovation hub. This local supportive environment is promoting the advancement of Israeli ag-tech, with many opportunities for creative R&D, drawing investments from prominent MNCs such as ADM, Bayer, Phibro, BASF, ChemChina, and Tie Up Farming. In addition, prominent local players, such as Strauss and Tnuva, are partnering with local and multinational companies to direct agriculture and food research and investment, bringing new technologies to the market.

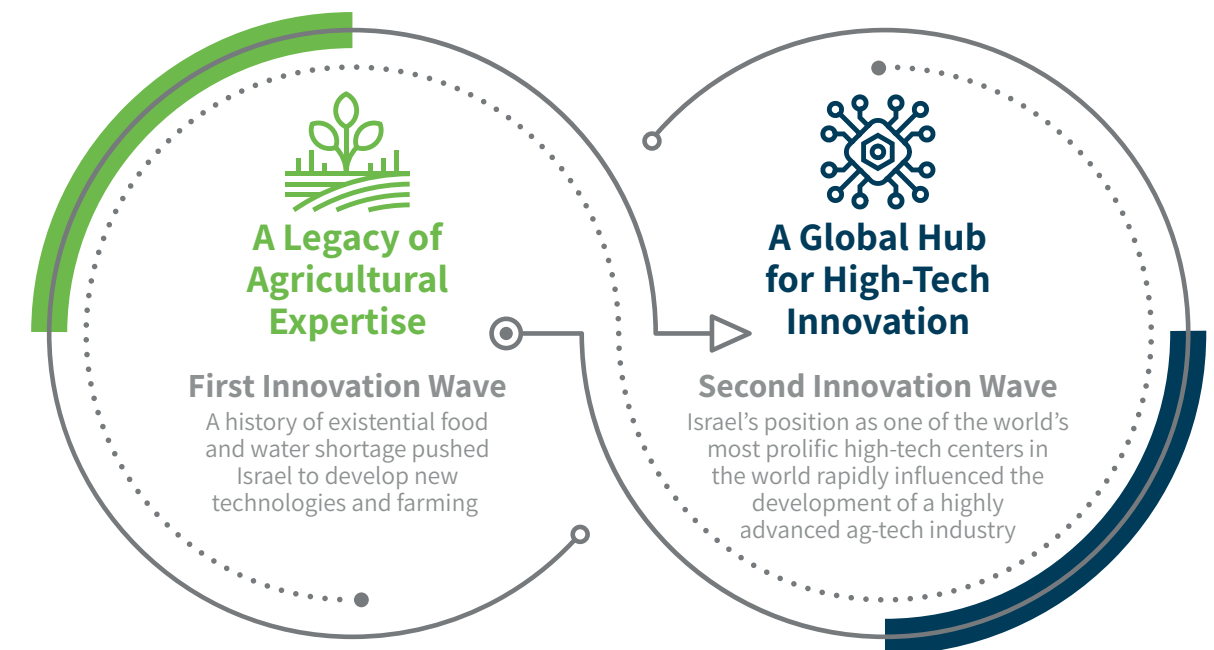
The local ecosystem has grown remarkably in recent years, building on Israel's traditional agriculture prowess combined with its growing knowledge and reputation in high-tech.

The local agriculture market underwent two major waves of innovation: the first wave, which took place up to the 2000s, established Israel as an innovator for the traditional market. The second wave followed the implementation of advanced high-tech knowledge in the field and has been taking place over the past 10 years.

The first wave came following a history of existential food and water shortage, which pushed Israel to develop new technologies and farming methods. These methods enabled farmers to grow more with less and to achieve success despite challenging conditions. Over the years, the industry developed expertise in water treatment and irrigation, greenhouses and plant science, making Israel a hub of agricultural expertise. The result has been the introduction of world-renowned innovations, such as drip irrigation and cherry tomatoes.

This exceptional agricultural tradition and expertise set the base for the second wave of innovation. A developed culture of academic knowledge-transfer and entrepreneurship, combined with Israel's position as one of the world's most prolific high-tech centers, has prompted the creation of a highly attractive and innovative ag-tech industry. Today, with government focus turning towards the capitalization on this competitive edge, Israeli ag-tech is set to become one of the most prominent industries in the global market.

**FIGURE 5: THE UNIQUE STORY OF ISRAELI AG-TECH**



# THE ISRAELI AG-TECH ECOSYSTEM



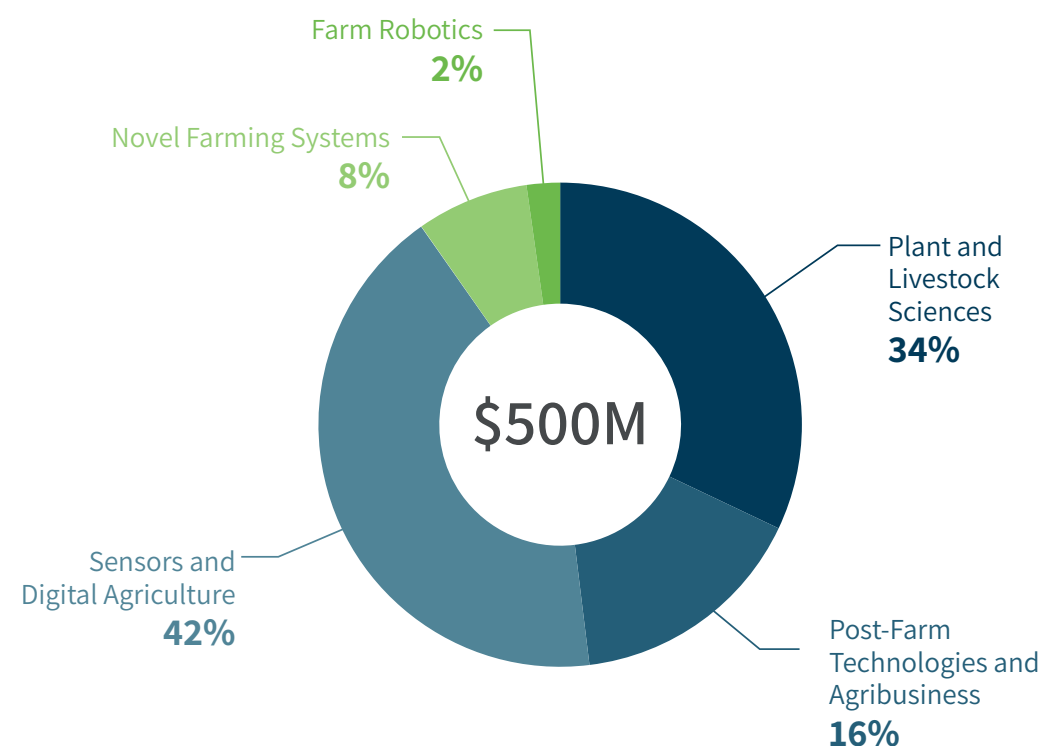
## Market Vitality

The ag-tech market in Israel is growing rapidly, driven by ground-breaking startups that cater to global consumer trends, by some of the world's leading agriculture research centers, and by increasing investment and international business partnerships. Recently, this industry has also gained the government's attention, resulting in funding and establishment of government backed incubators.

Currently, over 440 active companies operate in the Israeli ag-tech landscape, with 172 of them founded since 2014.<sup>17</sup>

The market has recently seen a dramatic increase in investment, with 2014-2018 VC investment reaching a total of nearly \$500 million and 211 deals. Most of the investment, \$208 million, was directed at the sensors and digital information sector, making up 41% of VC funding. Another prominent sector is plant sciences and input management, which raised \$158 million over the same period.<sup>18</sup> Notable investments over the past five years include Taranis with \$28 million, Prospera with \$15 million, Fieldin and Aleph Farms with \$12 million each, Rootility and CropX with \$10 million each, and AgriTask with \$8.5 million.

FIGURE 6: ISRAELI INVESTMENT BY INNOVATION FIELD, 2014-2018



The industry has also seen many acquisitions following the global consolidation trend. The largest one in recent years was the \$1.5 billion acquisition of 80% of Netafim's shares by Orbia (Mexichem) in 2017. Other notable transactions include ChemChina's acquisition of ADAMA Agricultural Solutions in the plant science sector, Allflex's acquisition of SCR in the livestock science sector, and Hebang Group's acquisition of Stockton Group in input management.

Netafim has also been developing automation and digital information solutions, integrating real-time monitoring, analysis, and automated controls into one system.

In August 2017, the Mexican chemical firm Mexichem (now Orbia) acquired 80% of Netafim for \$1.5 billion. Kibbutz Hatzerim retained 20% of the ownership.



## NETAFIM

Netafim is an Israeli manufacturer of irrigation equipment, founded in 1965 in Hatzerim, a kibbutz in southern Israel. The company has some 29 subsidiaries, 17 manufacturing plants and 4,500 employees in over 110 countries worldwide. It is known for carrying out the first tests of a water dripper device.

Netafim is a global leader in precision irrigation, and delivers tailor-made irrigation and fertigation solutions to millions of farmers worldwide, enabling them to maximize food production with the lowest environmental impact. Specializing in end-to-end solutions from the water source to the root zone, Netafim delivers irrigation and greenhouse projects supported by engineering, project management, and financing services.

## The Industry

### Plant Sciences and Input Management

Due to Israel's aforementioned history, Israeli researchers and entrepreneurs have established a highly beneficial relationship. This partnership has created a diverse, rich and established plant science and input management sector. The sector has also gained significant recognition from investors, receiving 32% of ag-tech investment in recent years.<sup>19</sup>

Established companies in plant science and input management include ADAMA Agricultural Solutions, which was acquired by ChemChina; FuturaGene, which specializes in ag-tech for the pulp and paper, biomaterials, biopower, biofuel and renewable chemical industries; Stockton Group; Haifa Group; NaanDanJain Irrigation; AlgaTech; and Tikkun Olam.



# THE ISRAELI AG-TECH ECOSYSTEM



## ADAMA AGRICULTURAL SOLUTIONS

ADAMA, one of the world's leading crop-protection companies, was founded in 1945 and is based in Lod. The company employs more than 7,000 people in 100 countries, has approximately 60 subsidiaries and operates production, formulation and R&D sites in Israel, China, India, Brazil, Europe, and North and South America.

ADAMA strives to create simplicity in agriculture by offering farmers products and services designed to simplify their work and help them grow. With a comprehensive and diverse portfolio, ADAMA's teams reach farmers in more than 100 countries across the globe, providing them with solutions for controlling weeds, insects, fungi and various diseases in order to improve their yields. The company's portfolio includes hundreds of distinct herbicides, insecticides, fungicides and growth regulators, all formulated with the needs of the local market in mind.

In October 2011 ChemChina acquired a 60% stake in Makhteshim Agan, which in 2014

changed its name to ADAMA. In June 2017, ChemChina completed the acquisition of the remaining 40% of shares. Since August 2017 ADAMA has been traded on the Shenzhen Stock Exchange.

In 2018, the company's revenue was \$3.9 billion.



## NAANDANJAIN IRRIGATION

Founded in 1937, NaanDanJain Irrigation is a global irrigation systems company based in Na'an, a kibbutz in Central Israel. The company has 14 subsidiaries, multiple international manufacturing plants, and a multinational network of sales representatives.

NaanDanJain Irrigation provides drip lines, sprinklers, micro sprinklers, irristands, residential and landscape systems, and accessories.

The company offers a wide range of customized technologies in more than 120 countries worldwide. Its products promote productivity per unit of resource, resulting in higher crop yields, risk minimization, and the preservation of nonrenewable resources.

The company is the result of the 2007 merger between NaanDan and the Indian corporation Jain Irrigation Systems Ltd. In 2012, The Jain Corporation became the sole owner of NaanDanJain Irrigation.



## STOCKTON GROUP

Stockton (STK) Group, a bio-ag technology company and a world leader in the biopesticide business, was founded in 1994. The company's headquarters are based in Petah-Tikva, with offices in California, Colombia, Ecuador and Argentina.

The company develops and markets biopesticides based on plant extracts and offers a variety of products adapted to specific regional particularities, biological parameters, and regulatory guidelines.

Stockton's flagship product, Timorex Gold, controls a broad spectrum of crop diseases, and has demonstrated an efficacy similar to that of chemical fungicides. This product, successfully sold in nearly 20 countries, is suitable for many conventional and organic crops such as rice,

coffee, grapes, tomatoes, bananas, and various other fruits and vegetables.

The STK Aqua division offers a range of do-no-harm botanical solutions, previously not available on the market, for improving the daily management of fish, helping in increasing their survival rate and enabling safer, healthier and more abundant production.

In 2015, the company was acquired by China's Hebang Group for \$90 million.

The plant sciences sector is rich in startup companies such as Hinoman, which developed means for cultivating the highly nutritious Mankai; EvoGene, which utilizes plant genomics to increase crop quality and yield; Equinom, with its computational seed-breeding technologies which recently received investment from BASF venture capital; Rootility; Groundwork BioAg; ClariFruit; Future Tense; BreedIT; Phenome Networks; ChickP; InnovoPro; and DryGair. These younger companies are gradually forming strategic partnerships with VC funds and big food companies including ICV, GreenSoil venture capital firm, PepsiCo, Strauss and Roquette.

# THE ISRAELI AG-TECH ECOSYSTEM



## HINOMAN

The plant-based protein company Hinoman was founded in 2010 in Or Yehuda.

The company breeds, develops, and cultivates Mankai, an aquatic plant of the duckweed family which is a higher source of protein than any leaf vegetable currently on the market and can be used as a whole food supplement, an ingredient within a dish, or a fresh plant. Mankai is naturally high in Vitamins A, E and B and also in various minerals and fatty acids.

Hinoman's process offers scalability for Mankai cultivation with a minimal ecological footprint, enabling the plant to grow faster and in larger quantities than through standard techniques. At the same time, the company provides control and optimization of the plant's growth and ensures that all plants are pure, clean, and suitable for clean-label application.

In March 2017, Japan's Ajinomoto has invested \$15 million in Hinoman. Under the agreement terms, Ajinomoto will also gain the exclusive rights to sell Hinoman's Mankai plant protein products on the Japanese market.

## Livestock and Animal Sciences

While not as extensive a sector compared to plant sciences, the livestock and animal sciences sector also boasts extensive knowledge in livestock, poultry and marine life farming.

A few examples of companies in this category include SCR Dairy, whose products were awarded at the World Dairy Expo in 2017; Afimilk, whose computerized systems for dairy and herd management are employed in thousands of farms worldwide; and MiRobot and Armenta. Israel also boasts a broad spectrum of aquaculture innovation, with an abundance of companies such as AquiNovo and its sustainable solution for increasing fish yield; BioFishency; AquaMaof; Agam; and GiliOcean Technology.



## AQUINOVO

Fish farming startup AquiNovo Ltd. was founded in Misgav in 2015.

The company has developed a non-hormonal additive to fish feed, which can enhance the growth of farmed fish, reduce overall production costs and risks associated with the growth period (e.g. disease and weather catastrophes) and

increase the efficiency and profitability of fish farming.

AquiNovo's technology uses a type of protein that, when consumed by fish at an early stage, inhibits fish "puberty" and reproduction, diverting the energy of fish towards growth. Fish become larger faster, which shortens their growth cycle. Thus, the fish are ready for the market earlier, making aquaculture more sustainable and cost-efficient. In addition, AquiNovo says its technology could help reduce, and even eliminate, the use of hormones in fish farming.

The company is a product of Yisum, Hebrew University's technology transfer organization, and the Trendlines incubator. In November 2017, the company raised \$1.5 million from multinational farming company Neovia.

Another example of animal science is poultry farming, where companies such as eggXYt and Soos Technology have been working on solving inherent productivity and sustainability issues.

Finally, this sector also serves the alternative protein market with companies such as Aleph Farms and Redefine Meat, which utilize 3D printing technology to print beef, Future Meat that cultivates clean meat, SuperMeat, Hargol and FlyingSpArk.



## ALEPH FARMS

The lab-grown steak company Aleph Farms was founded in 2017 in Ashdod.

The company specializes in high-quality sustainable cell-grown meat. Its cell-grown meat resembles the taste, texture, and structure of conventional meat thanks to a proprietary 3D platform that uses various types of cells to form complex tissue.

The technology, co-developed with Prof. Shulamit Levenberg of the Technion - Israel Institute of Technology, relies on a natural process in cows to regenerate and build muscle tissues. The company discovered a way to isolate the cells responsible for that process and grow them outside of the animal to form the same muscle tissue typical to steaks.

The company has partnered with the Russian laboratory 3D Bioprinting Solutions, as well as with two US companies. Experiments were conducted on the International Space Station using a 3D printer to assemble cells harvested from live animals in order to create a piece of edible steak.

Recently, the company completed a \$12 million Series A financing round.



# THE ISRAELI AG-TECH ECOSYSTEM



## Sensors and Digital Information

As one of the biggest high-tech hubs in the world, the sensor and digital information sector in Israel is naturally prolific. Israeli solutions in this field are abundant and diverse, ranging from smart farming platforms for precise and predictive farming, to advanced sensorial hardware and software, IoT and cloud-based platforms, all with advanced artificial intelligence capabilities. The sector is widely recognized as one of the more attractive ag-tech sectors in Israel, receiving 42% of ag-tech investments in 2014-2018.<sup>20</sup>

Prominent technologies include Prospera's AI based platform for the optimization of agricultural processes, including insights on workforce, irrigation, fertilization, and pesticides; Taranis' pest and disease prediction software which utilizes aerial imagery, field sensors and weather forecasts; Saturas' proprietary sensor for accurate measurement of stem water potential; AgriTask's smart farming system which integrates a wide variety of tasks and produces actionable insights; CropX's ag-analytics platforms which uses sensors to adapt and optimize irrigation in real-time; FieldIn's award winning farm control platform; AKOLogic's, which developed the first "agricultural cloud" in the world, enabling farmers to connect and usefully share information, providing traceability, and increasing crop safety and yield; and SeeTree's AI and drone platform which monitors trees to improve productivity and ensure health.

Other players in this sector include the more established Netafim, Sun Corporation owned Bacsoft, Phytect, Evogene, Afimilk, Varcod and SupPlant.



Taranis is an intelligence platform for agriculture companies, founded in 2014 in Tel-Aviv. The company employs 60 people and has five overseas offices.

The company's solution enables farmers to monitor their fields, make informed decisions, and take appropriate action, helping them increase their yields and cut costs.

Taranis uses sophisticated computer vision, data science and deep learning algorithms to effectively monitor fields. The technology combines field imagery in three different levels from satellite images, through plane imagery to drone leaf-level imagery, and uses AI deep learning technology to recognize crop health issues, thus predicting and preventing crop disease and pest-based losses.

Taranis targets high volume commodity crops which account for 70% of the global crop market. As of 2019, some 19,000 farmers use the platform to prevent diseases and pest infestation in crops such as wheat, corn, soybeans, cotton and potatoes on a cumulative 20 million acres of fields in Argentina, Australia, Brazil, Canada, Israel, Russia, the United States and the Ukraine.

As of November 2019, the startup raised a total of \$30 million.

as with a plethora of third-party information services and also supports the entire agricultural production process, ranging from soil fertility management, growth monitoring, to harvest logistics.

The company operates in 20 countries and covers more than 50 crop types. The client base includes farmers, food and beverage companies, agricultural insurers, input providers and governments as well as developmental organizations. The company serves some of the most prestigious names in the agriculture industry such as General Mills, Suzano, and Bom Jesus.

Recently, AgriTask completed a \$8.5 million Series A financing round.



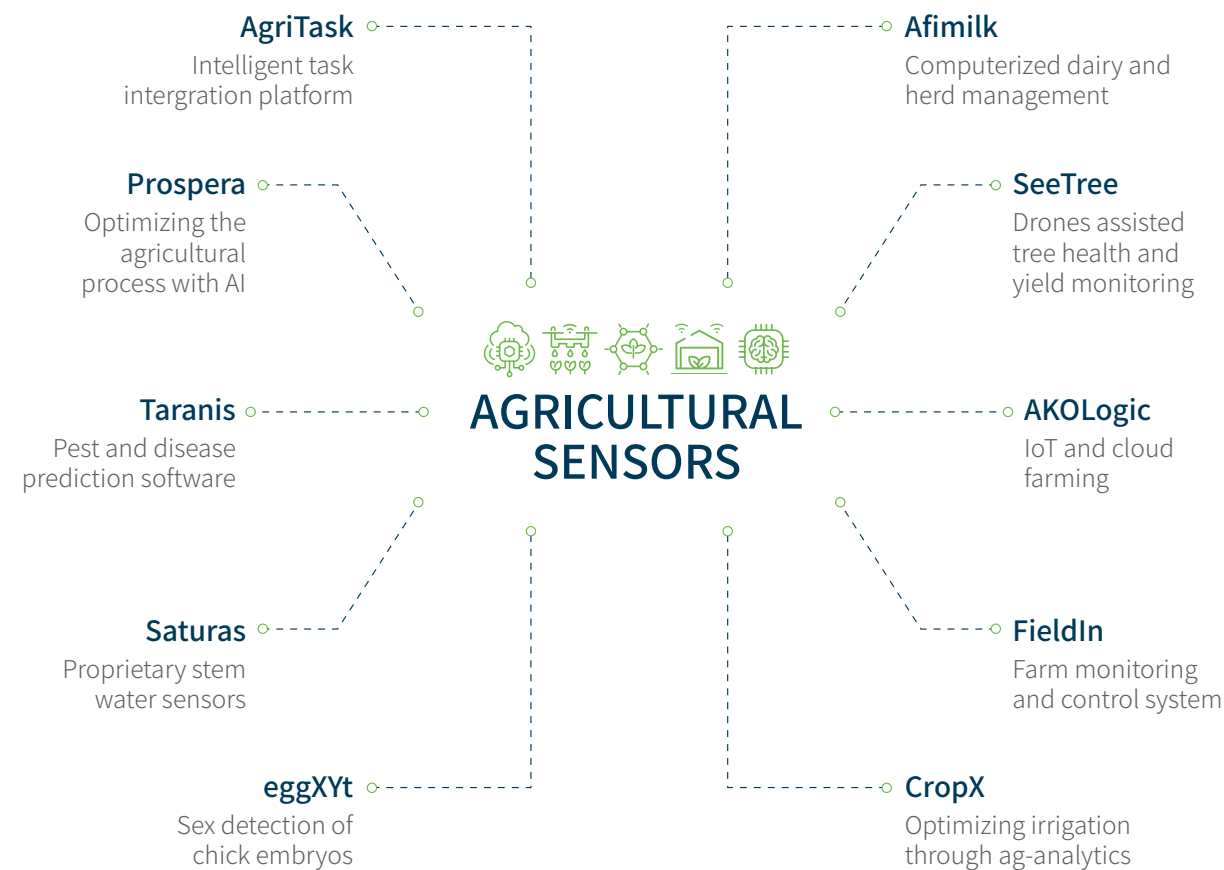
AgriTask is a business intelligence platform for agriculture, founded in 2005 in Tel-Aviv.

The company offers farm managers a single unified platform for all of their agricultural management and optimization needs. Its platform enables remote supervision, benchmarking, and assistance, facilitating agronomic and agro-economic decision-making. The platform integrates with hardware, (e.g. sensors on the ground, machines, meteorological stations, satellite multispectral imagery) as well

# THE ISRAELI AG-TECH ECOSYSTEM



FIGURE 7: ISRAEL'S DIGITAL AGRICULTURE MARKET



## Automation

With the global market on the lookout for robots and automated drones, the Israeli ag-tech automation sector has been benefiting from the richness of the country's sensor and digital information products. Entrepreneurs in this field are coming up with elegant and affordable solutions, increasing yield productivity and safety.

Notably, many companies are developing solutions based on autonomous drone swarms. Drone technology includes Tevel Aerobotics Technologies' swarm of trimming and harvesting drones; SkyX's and Agridrones Solutions' spraying drones; and AgroScout's and Aerodrome's sensor-packed drones.

Other agricultural areas being automated are water irrigation and fertilizing, with solutions from companies such as Netafim, CropX, Saturas, Baccara Manna, Tevatronic and AutoAgronom; and the animal farming sectors with Afimilk, MiRobot, and ENGS systems.

based analytics software to optimize crops. Once installed, the sensors automatically collect data from the soil — e.g., moisture, salinity and temperature — and send it to the cloud, which then gives the farmers real-time actionable information. This helps farmers set out optimal irrigation, fertilization and other plans for their fields, so they can conserve resources such as water, fertilizer and energy. In addition, the company generates irrigation maps that automatically apply the right amount of water to different parts of the same field.

As of August 2019, the startup raised \$24 million.

## New Agricultural Systems

Over the last decade, Israeli researchers and farmers have developed and adopted new manners of cultivation, in order to deal with the country's challenging climate and soil conditions, water shortage and salinity, and limited area designated for agriculture. These solutions are now helping farmers worldwide in confronting the challenges of urbanization and climate change.

Among the technologies developed in Israel are Green Wall Israel's vertical agriculture solutions, suitable for indoor and outdoor cultivation while ensuring maximal utilization of space and optimal use of inputs; AlgaTech' solution for cultivation of micro-algae on a commercial scale; Aleinu's aeroponic urban farming for greenhouse cultivation



Founded in 2015, CropX has developed a soil sensor platform for adaptive irrigation.

The company uses soil sensors and cloud-



# THE ISRAELI AG-TECH ECOSYSTEM



in rugged environments; and also Seakura, Hi-Cap, Seedo and Hinoman.



## ALGATECH

Founded in 1998, AlgaTech deals with commercial cultivation of micro-algae. It is based in Kibbutz Ketura near Eilat, with offices in New York.

AlgaTech has pioneered the manufacturing of unique ingredients from microalgae on a large commercial scale. The company sells to over 30 countries and to the leading brands in the food, food additives and cosmetics sectors. The company's factory covers 20 acres and includes over 600 bio-reactors.

In May 2019 the French biotech group Solabia, a producer of natural ingredients for cosmetics and skincare, acquired 80% of the company from the private UK equity fund Grovepoint and the JCA Charitable Foundation, while Kibbutz Ketura - which founded AlgaTech - remained with a 20% stake.

## Post Farm Ag-Tech

A prominent company in this field is Trellis, an AI-based integration platform which spans over the entire ag-tech value chain. The platform enables players, from farmers to food producers, to predict, plan and prepare the yield by considering weather forecasts, supply chain characteristics and dynamics, market trends and more. This enables the optimization of the entire value chain from farm to plate: lowering costs, improving traceability and quality, and enabling accurate resource allocation through credit and agricultural insurance.

In the field of agricultural insurance, OKO developed a satellite imagery-based affordable insurance plan for small farms, a product which was awarded the Orange Social Venture Prize in 2019. Other technologies include Tama Plastic Industry's post-farm crop protection materials; Sufersca's edible coating for fruit and vegetables which prolongs shelf-life; Amaizz's advanced drying, refrigerating and storage solutions; and AKOLogic's IoT platform which factors market and regulatory information to assist farm decision-making.



Tama Plastic Industry specializes in agriculture protection products. Considered one

of the leading plastic companies in Israel, it was founded in 1950 by Mishmar HaEmek, a kibbutz in the north. The company has production sites in Israel as well as in Poland, Hungary, Brazil, Italy, UK. It also has marketing offices in various locations such as the USA, Canada, Germany, Mexico, France, Ireland, Sweden and the UK.

Tama has developed and patented netting products to secure goods that need air circulation onto pallets. The company also designs and manufactures housewares and garden ornaments. Its products include round-bale net wraps for crop packaging, pallet-wrapping nets, reinforcement nets, twine for round bales, plastic slats for poultry flooring, benches and benchtops for nurseries and garden centers, and shade nets for protection against solar radiation, frost, wind, hail, and birds.

One of Tama's products is the John Deere B-Wrap, jointly developed with John Deere. This product was developed especially for bales stored outdoors in harsh weather conditions and is designed to shed water so hay is not damaged by rain, snow, or ground moisture. The product is breathable, to allow water vapor to escape from inside the bale.

Another example of Tama's products is the RMW cotton wrap that was created specifically to lower the risk of plastic fragments and cotton contamination. The wrap ensures reliable automatic packaging for nonstop harvesting, helps maintain the quality of cotton in round

modules exposed to extreme conditions, and helps eliminate waste.

## The Israeli Ecosystem

The Israeli ag-tech ecosystem, which consists of Academia, VC firms, Incubators and the Government, has been accelerating the industry's already rapid growth. The Israeli ecosystem is highly interconnected, with many players cooperating to rapidly turn groundbreaking research into effective products, and to quickly provide capital that enables these products to reach the market.

## Academia

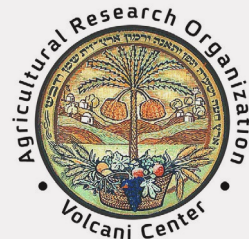
The Israeli academia is the source of much of the market's innovative ideas, due to a highly developed academy-business-technology transfer culture, combined with the aforementioned expertise in agriculture. These traits ensure that scientific discoveries are quickly translated into functional products, sold to entrepreneurs and incubators.

The technology transfer culture started with the formation of Yissum, the Hebrew University's technology transfer organization (TTO), one of the first of its kind in the world. Yissum is responsible for the research behind the development of products from FuturaGene and BreedIT. Today, eight TTOs operate in the ag-tech sector, responsible for the development of over 59 products, of which 22 have made significant impact on the market.<sup>21</sup>

# THE ISRAELI AG-TECH ECOSYSTEM



In addition to Yissum, notable examples are Kidum, the Agricultural Research Organization's TTO, which serves as the research arm of the Israeli Ministry of Agriculture; BGN Technologies, whose micro-algae cultivation process led to the success of Algatech and to the development of BotanoCap's bio pesticides; the Technion's T3; Weizmann Institute of Science's Yeda, and more.<sup>22</sup>



## AGRICULTURAL RESEARCH ORGANIZATION (ARO) – VOLCANI CENTER

The Agricultural Research Organization, also known as the ARO or Volcani Center, was founded in 1921 and is based in Rishon LeZion. Playing a key role in the development of the Israeli agricultural industry, ARO, the largest agricultural research institute in Israel, has been at the service the farming community facing the challenging environmental and economic conditions. The institute has played a prominent part in the formation of the state Israel and its sustenance in early years.

The organization supports Israeli agriculture research, focusing on plant, animal, soil and environmental, and food sciences, as well as on plant protection and agricultural engineering. ARO also operates four research stations in different parts of the country, and serves as a testing center for agricultural produce and equipment. Israel's Gene Bank for Agricultural Crops is also located on the ARO Volcani Center campus.

ARO's technology transfer organization, Kidum, is responsible for the transfer of numerous technologies into the Israeli ag-tech market, including Afimilk's milk component analysis and breeding programs, DryGair greenhouse dehumidifier, and Amitec climate control technology for dairy, poultry and plant farms.

Another unique source of agricultural innovation is MIGAL, an independent organization which conducts academic research, agricultural R&D and technology transfer, and offers incubation services. MIGAL specializes in ag-tech, bio-tech and nutrition research, placing sustainability and environmental sciences in a high priority as it develops technological solutions for the industry. The organization is a leading partner in a wide variety of local and international projects, including conferences, workshops and fairs, which bring together farmers, students, research experts and entrepreneurs.

## VC Firms

The Israeli ag-tech VC landscape is rich with local and international firms. One of the most active VC firms is Trendlines, which has invested in 19 startups in 2018 alone.<sup>23</sup> Trendlines also operates an incubator and runs the annual AgriVest conference in partnership with GreenSoil Investments, one of the first ag-tech focused VCs in Israel. Many other VCs have made notable impact on Israeli ag-tech, including Viola, which invested in Taranis; ICV, which invested in Prospera and Groundwork BioAg; Copia, which specializes in investment in technologies developed by academic research centers and has participated in six deals in 2018;<sup>24</sup> Rimonim, which invested in eggXYt and SkyX; OurCrowd which boasts a partnership with Bayer and DuPont, Strauss' The Kitchen, JVP and Netafim, and AgriNation VC.

Corporate VCs are also highly active in the industry. Examples include Finistere, AgFunder, Tyson Foods, Cultivian, Bits X Bites, New Protein Capital, Anterra, SHIFT Invest and Five Seasons.<sup>25</sup>



## TRENDLINES

Trendlines Group is an innovation commercialization company, founded in 2016

and based in Misgav, a regional council in northern Israel.

The group invents, discovers, invests in, and incubates innovation-based medical and agricultural technologies. The group is involved in all aspects of its portfolio companies, from technology development to business-building.

Trendlines invests principally through its incubators, which include two Israeli government-franchised incubators, Trendlines Medical and Trendlines Agtech. There is also a Singaporean incubator, Trendlines Medical Singapore, with its own in-house innovation center, Trendlines Labs.

In 2012, the group initiated the international AgriVest conference, which brings together industry, business, government, and academia to discuss the trends, issues, and inventive solutions for the future of agriculture and ag/food-tech.

Among the agriculture startups that take part in the company's incubators: AgroScout, the autonomous crop disease detection company; EcoPhage, the natural crop protection startup; and Metomotion, the robotic system for vegetable greenhouses company. Other startups are Aquinovo, Saturas, Hargol, and Agam



# THE ISRAELI AG-TECH ECOSYSTEM



## Incubators and Accelerators

Israeli incubators and accelerators are the link between academic TTOs and entrepreneurs seeking to establish new startups, and investors looking to fund ag-tech startups. Many incubators form partnerships with other players from the ecosystem. Examples include HUGrow, the Hebrew University's agriculture incubator which is tied to Yisum, their TTO; EIT Food accelerator which is in partnership with the Technion's TTO, T3; Yakhin Impact incubator, which works in cooperation with the international TechForGood organization; and The Kitchen and Fresh Start incubators, which have developed close ties with academic and government players.



### YAKHIN IMPACT

Founded in 2018, Yakhin Impact is an incubator based in Netanya.

Its program, developed by the Yakhin Group in cooperation with TechForGood, is for entrepreneurs focused on reducing the negative environmental effect of agriculture and preventing food waste. The program provides a customized toolbox adapted to their specific needs, which includes access to knowledge, experience, and potential investors.

The incubator's work model focuses on connecting old industrial infrastructure with the venture's technological startups. The participating firms receive direct access to Yakhin's land and agricultural infrastructure and can conduct pilots and trials as well as receive agronomical, financial and legal assistance.

Some of the startups taking part in this incubator include WeedOUT, the biological weed killer company; Viridix, the soil sensor technology for precise irrigation; Bio-Pel, the slow-release essential oil pesticides startup; and Clarifruit, the quality detection for produce company.

Alternatively, players like Trendlines have combined their funding and incubator programs, and are offering entrepreneurs both financial and professional support in early stages.

## Government

The Israeli government actively promotes the ag-tech industry, establishing grants and cultivating opportunities through the promotion of academic research. Israel has taken several unique steps to promote its local ag-tech industry:

- The Israeli Innovation Authority (IAA) backs ag-tech through various tools. Primarily, the IAA has already participated in 40 investments, issuing over 35 grants to startups through the government-backed incubators Fresh Start,

The Kitchen, and Trendlines.<sup>26</sup> Another notable investment is the IAA backing of the Phenomics Consortium, which consists of players like Elbit, Hazera, Evogene as well as researchers from six different academic institutions. The IAA also cooperates with the Ministry of Agriculture, providing financial support for agricultural technology pilots essential to the R&D process.<sup>27</sup>

- GrowingIL – the IAA, in association with the Ministry of Economy and the NGO Startup Nation Central, has established GrowingIL, a non-profit venture under the Israel Innovation Institute. GrowingIL works to actively connect different players in the ecosystem by promoting partnerships and creating the necessary environment and tools to facilitate the process. In addition, GrowingIL works to educate farmers

and investors on technological advancements and their benefits.<sup>28</sup>

- The Israeli government backs agricultural research through the aforementioned ARO, which seeks to provide solutions to the pressing challenges of the country's farmers, as well as to guide and assist research in Israel. The government also backs other universities which are responsible for much of the market's innovation.
- The Ministry of Economy has recently included ag-tech startups in its "high salary plan", which supports employers with subsidies to mitigate the high cost of salaries in the sector. This provides early stage startups with an easier start, and allows larger scale players to invest more in R&D.

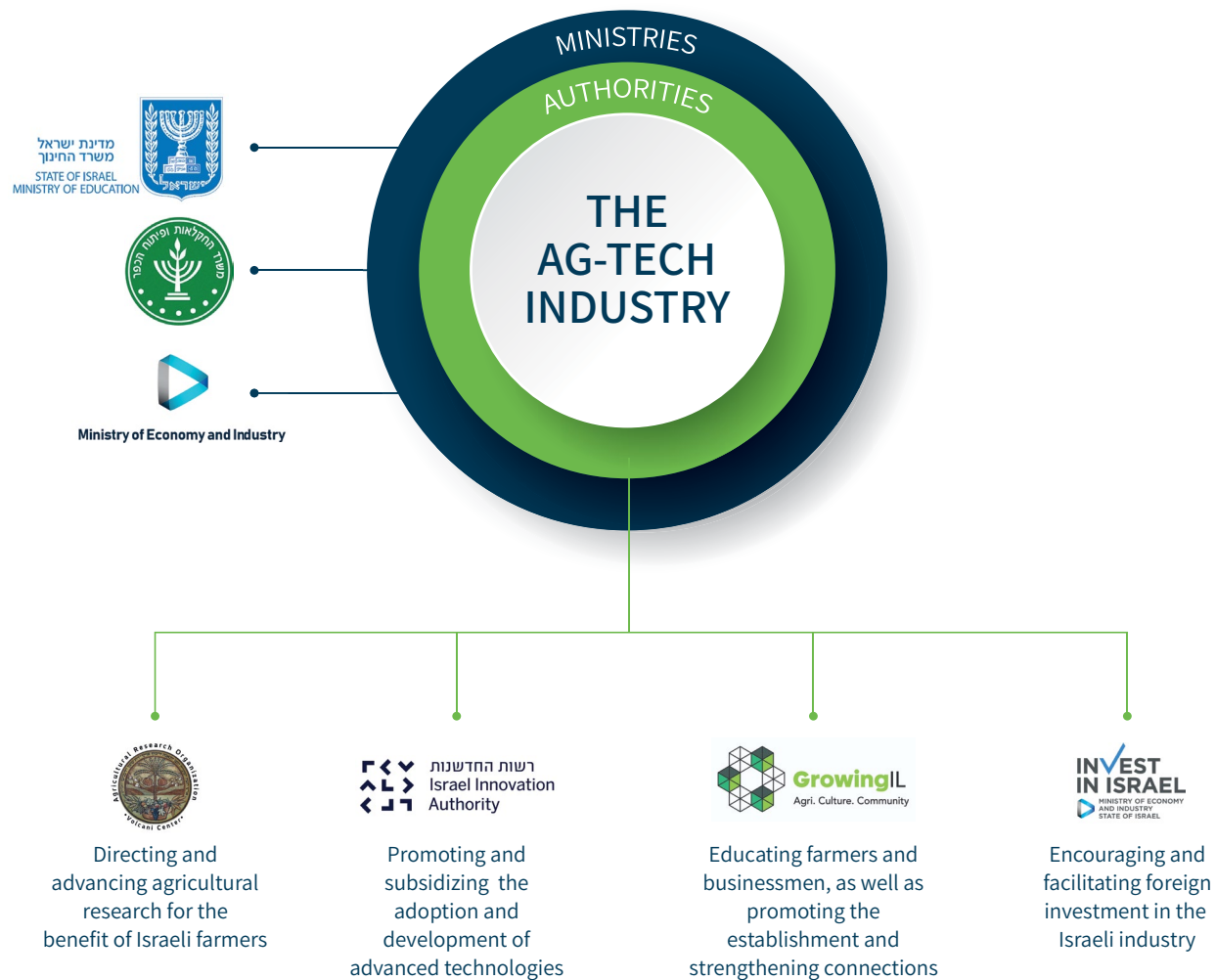




# THE ISRAELI AG-TECH ECOSYSTEM



FIGURE 8: VIGOROUS GOVERNMENTAL PROMOTION OF AG-TECH



## Manufacturing Opportunities

Some livestock sciences companies have already begun production pilots in the Israeli market, a notable example being Flying SpArk. The company, which cultivates fruit fly larvae in order to produce protein, has initiated trial programs with Nestle, Ikea and Pepsico, aiming to launch the product by 2020.<sup>29</sup> Other examples include Hargol FoodTech, which has established its first cricket farm in Elifelet and is working on establishing two more farms in Israel's northern region; Future Meat, which announced that its recent round of funding will be directed at establishing the world's first cultured meat pilot production facility;<sup>30</sup> Aleph Farms; SuperMeat; and Redefine Meat.

The plant sciences sector's technology has also prompted advanced cultivation opportunities in Israel, including AlgaTech's commercial on-land cultivation of micro-algae. The company, which sells the highly healthy and nutritious algae to giant

food and cosmetic companies around the world, operates one of the biggest photobioreactor facilities in the world. The facility is located in Israel's Arava, a harsh, hot and dry environment, which thanks to innovative technology has proven beneficial to the efficient cultivation of the algae. Other plant science companies manufacturing in Israel include crop-protection products manufacturer ADAMA Agricultural Solutions, mankai plant company Hinoman, vertical agriculture solutions provider Green Wall Israel, and various cannabis cultivators such as BOL Pharma and Canndoc.

Israel's prowess in robotics, appliances and artificial intelligence also creates opportunity, with more mature fields such as medical devices (Mazor), industrial production lines (GBIM) and defense robotics (Roboteam, SIBAT) already manufacturing and exporting products abroad. Israel's prominence in the drone market also makes it a possible candidate for manufacturing airborne agricultural solutions, with over 93 startups already operating in this field.<sup>31</sup>



# WHY INVEST IN ISRAEL TODAY?



**ISRAEL'S ECONOMY** is one of the strongest in the world. The Israeli market is characterized by openness and diversity, a track record of competitiveness and continual steadfastness even in the face of global economic crises.

Israel's anchored banking system, elastic labor market and seasoned policy makers are well positioned to protect investor's interests throughout turbulent global market conditions.

The Israeli economy is characterized by strong growth and low unemployment figures. The cautious fiscal policy implemented in Israel, which includes a low interest rate and price stability, has created a relatively low public debt on a declining trend. The OECD predicts that the growth that has characterized the market will continue and increase in the coming years, in light of the planned capital investments from the maritime natural gas reserves that were discovered in recent years.<sup>32</sup>

FIGURE 9: ISRAEL'S CREDIT RATING

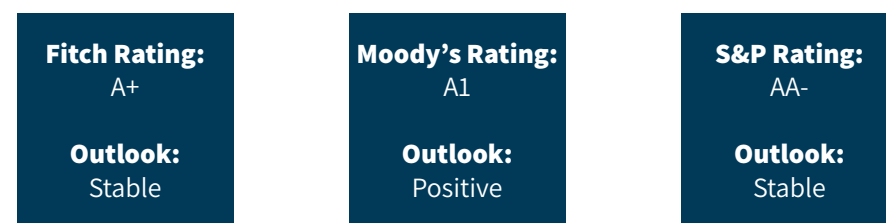


FIGURE 10: UNEMPLOYMENT RATE (%)

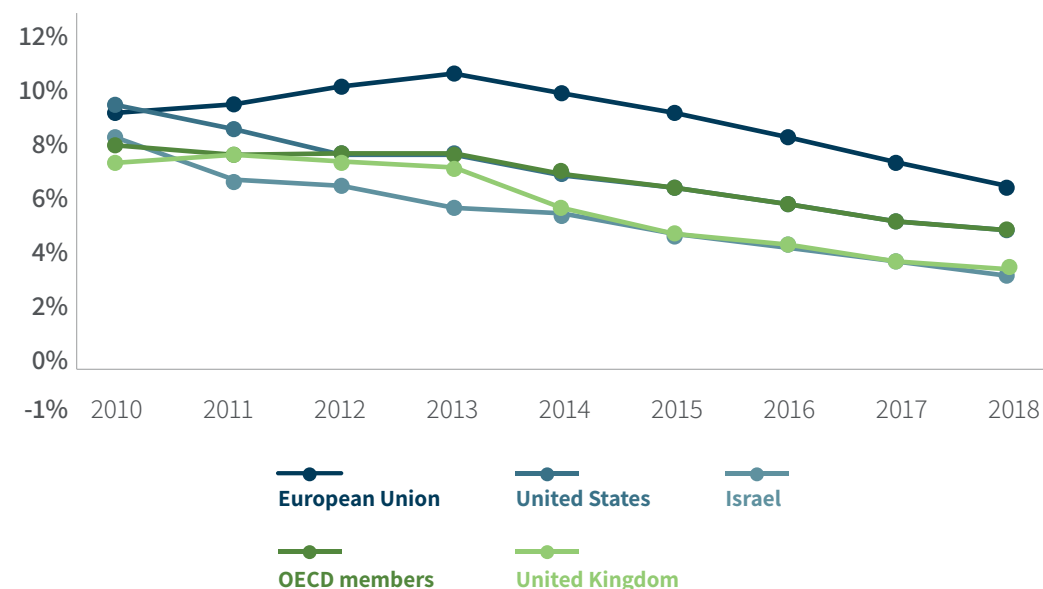
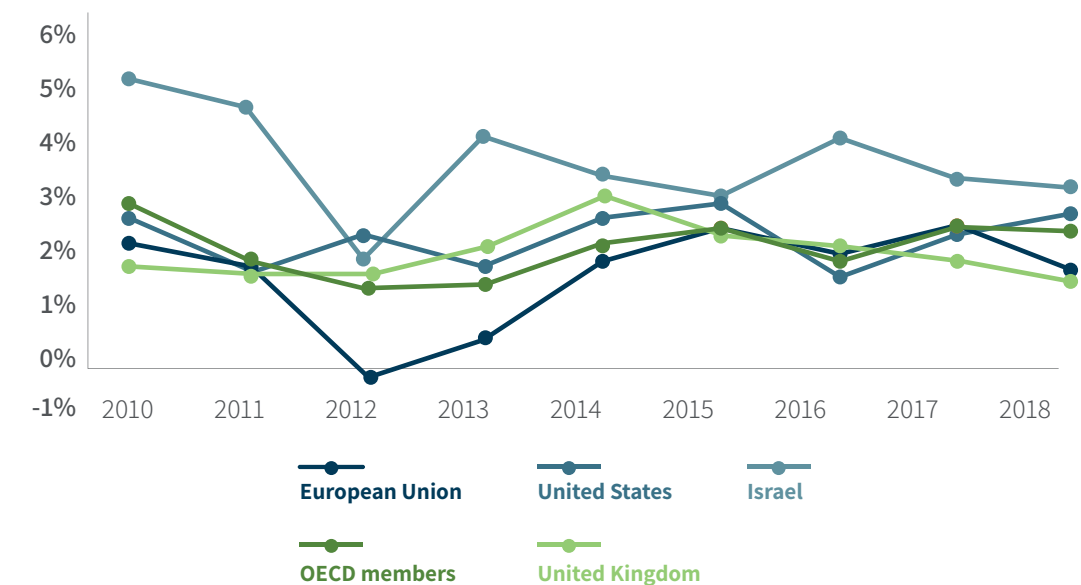


FIGURE 11: ISRAEL'S GDP GROWTH RATE (%)



## Global R&D Leader

Israel is one of the leading countries in research and development, as well as in integrating innovation and sophistication capabilities into the business sector. Over the years, Israel has led global R&D investment indices, and in the share of gross expenditure in R&D as a percentage of GDP.

International companies have identified the Israeli advantage in this field and have integrated with it whereby a substantial part of R&D is financed

by international entities and undertaken by Israeli enterprises. Multinationals including General Motors, Facebook and Microsoft, to name a few, operate more than 300 R&D centers, scouting centers, and corporate venture capital funds in Israel. Furthermore, Israel has world-class research institutes, headed by the Weizmann Institute of Science, the Technion, Tel Aviv University, and the Hebrew University, which are all active in the field of life sciences.



# WHY INVEST IN ISRAEL TODAY?



FIGURE 12: R&D AS PERCENTAGE OF GDP (2018)

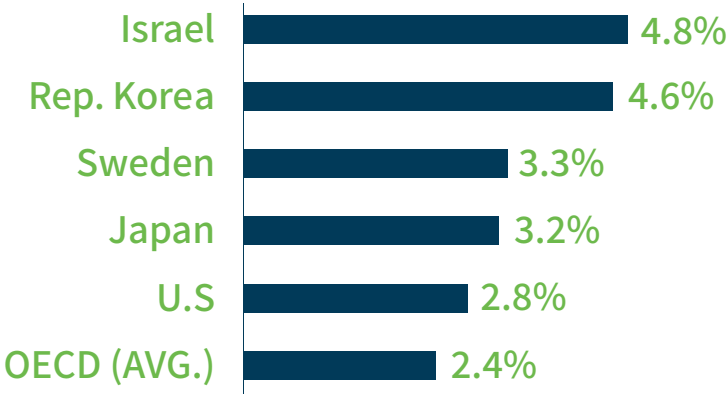


FIGURE 13: ISRAEL'S R&D ACHIEVEMENTS <sup>33</sup>

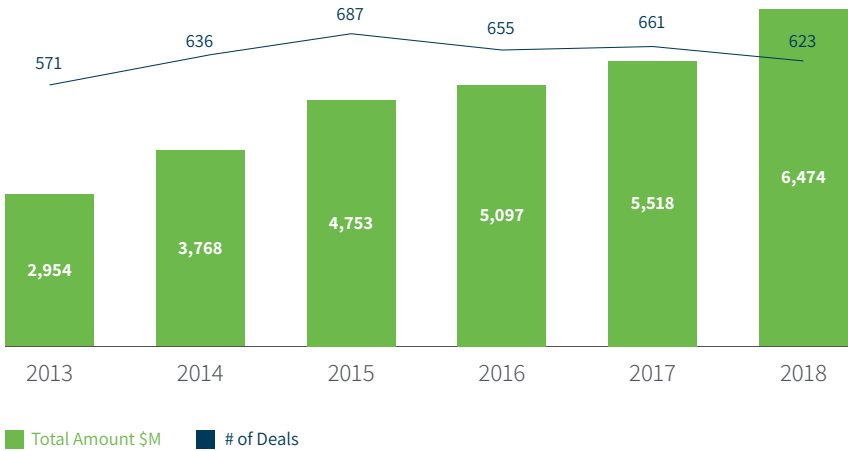


## Start-Up Nation

These figures, combined with the proven abilities of the Israeli market in technology and innovation, position Israel as a preferred target for investment in various industries. Israeli startups raised \$6.4 billion in 2018, a record after six years of steady growth. 88% of this sum was raised by external investors,<sup>34</sup> thanks to the power and reputation of the domestic market.<sup>35</sup> Israel was ranked second in the world in venture capital availability index, according to the Global Competitiveness Report.<sup>36</sup>

Venture capital availability in Israel and the efficiency of the financial sector have created an optimal environment for the prosperity of innovative industries, and a record number of startups operating nationwide. Tel Aviv is currently ranked first in the world in the number of startups per capita.<sup>37</sup>

FIGURE 14: ISRAELI HIGH-TECH COMPANIES CAPITAL RAISING 2013-2018

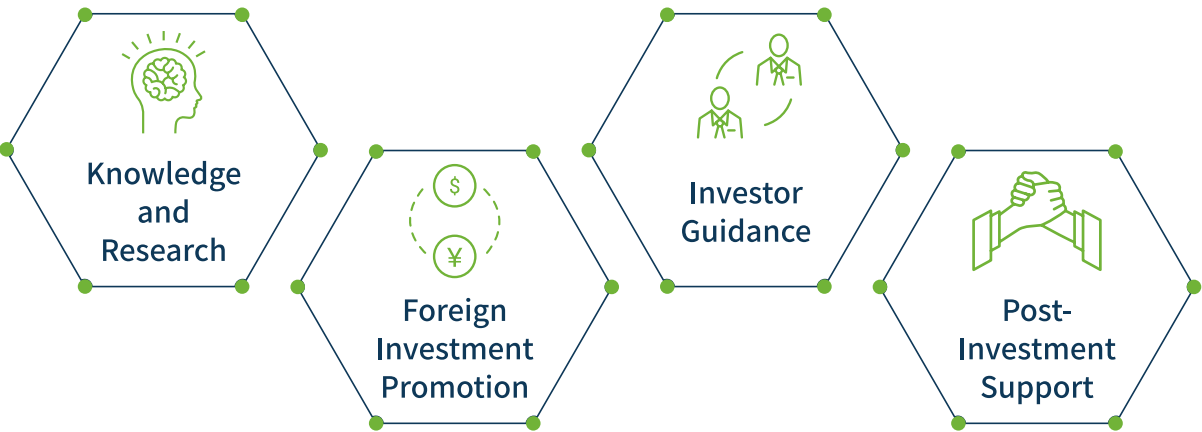


Source: Israeli High-Tech Companies Capital Raising - IVC research center -ZAG S&W, 2018

# INVEST IN ISRAEL – THE ISRAELI INVESTMENT PROMOTION AGENCY



**INVEST IN ISRAEL** is a government unit at the Ministry of Economy and Industry that is responsible for the success of foreign investments in Israel. The unit's role is to support the investor throughout the investment process and bind all services, plans, benefits, and needs to ensure a smooth, purposeful and successful investment process.



The services offered by Invest in Israel are diverse, ranging from the collection and analysis of data relevant to the investment and the Israeli market, through to introductions and help with the investment process with all the relevant entities, to support in the implementation stage following the investment.







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The information included in this guide is relevant for December 2019. The content included is intended to provide only a general outline of the subjects covered and it is necessary that specific professional advice be sought before any action is taken.

