

White paper

Israel's Medical Cannabis Innovation

**The opportunity and benefits of
investing in Israel's unique medical
cannabis ecosystem**



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In recent years, medical cannabis has moved to center stage and has become a fascinating global phenomenon. Israeli companies play a major part in this market, leading the way in research, pharma, cultivation and development of technological solutions.

The dominance of the Israeli companies has been supported by the Israeli government that has taken a proactive approach early on (since the 1990s), regulating the medical cannabis market. The Israeli Medical Cannabis Agency (IMCA or “YAKAR” in Hebrew) is leading this effort ensuring the safety of the patients, while enabling the

different players to create a vibrant and innovative medical cannabis ecosystem.

Every day, Israeli companies are making a difference in this area and are collaborating with leading players from around the globe on groundbreaking medical research efforts.

I invite you to delve into this white paper and learn about the current market trends, the unique Israeli regulative framework and the vivid Israeli medical cannabis ecosystem.

Invest in Israel is Israel’s government investment promotion agency and our role is to help foreign investors and Multinational Corporations expand their involvement and investments in the Israeli market. Our team is here to provide you with all the services and help you’ll need in this process.

I hope you will find the enclosed information useful and interesting.

Ziva Eger,

Chief Executive of the Foreign Investments and Industrial Cooperation Authority



The life sciences sector is one of Israel's most exciting and vibrant sectors. It is spread all along the Israeli economy and combines the industrial, medical, entrepreneurial and academic capabilities the Israeli market excels at.

The medical cannabis field is a unique (and new) member of this sector. While the field includes clear pharmaceutical and medical characteristics, it also involves agricultural, technological, nutritional and wellness aspects.

Medical cannabis introduces a real challenge for researchers and scientists around the world, compounded with the great demand for pain relief, and even the coveted cure, for many different patients around the world. This is the nature of the interest surrounding it.

It is a special opportunity for us at Invest in Israel to share the unique ecosystem that has emerged in Israel around the field of medical cannabis. This paper will introduce you to the main Israeli players in all areas, while shedding light on leading start-ups, breakthrough researches and supporting governmental regulations.

If you are on the lookout for new medical cannabis endeavors or investments, then Israel is a great option for you. I encourage you to approach our team at Invest in Israel and hear more about the local medical cannabis ecosystem.

Aviad Tamir,

Head of Life Sciences & Healthcare, Invest in Israel



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1. Executive Summary

The growing interest in medical cannabis in recent years has been a fascinating economic, medical, and scientific phenomenon. Many biology, botany, chemistry, and medical researchers worldwide are studying the effects and unique qualities of cannabis, while the value of the companies growing, producing and developing medical cannabis products has soared significantly to billions of dollars.

The cannabis industry is structured around five main components: Cultivation, Production, Distribution and Consumption, Research and Development and Technology. In order to have a successful local medical cannabis industry it is essential to have a comprehensive ecosystem surrounding the industry, consisting of the following areas: Academia and Research, Regulation, Medicine and Pharmacology, Agri-technology, Companies and Startups, Service Providers and Investors.

The global medical cannabis industry is currently at the market creation stage and it is highly affected by on-going regulative and commercial developments, as well as groundbreaking research. Since 2013, over 35 countries worldwide have permitted the use of medical cannabis, as well as 33 states in the US. The Canadian market is a leading example of a regulatory progress paving the way for massive economic activity, with Canada claiming 9 out of the 10 largest cannabis companies worldwide.

Looking at the European market, at least one market assessment predicts that the market value will reach \$65 billion by 2028. The Latin American market, where few countries show major interest in the field, is expected to reach \$8.5 billion in that same time. In the US, cannabis remains a

narcotic drug at the federal level, but many states allow a local cannabis market and are determining independent regulation. The US market forecasts range from \$4.8 billion to \$8.9 billion by 2021. The Australian market is also shaping up to be a significant player in the global market and its projected value by 2028 stands at US \$1.3 billion.

Israel is a global R&D and innovation leader, with a stable economy and one of the highest GDP growth rates worldwide. It has a vast and innovative life sciences sector and a cutting-edge medical device industry. In recent years the Israeli medical cannabis industry has emerged in this unique ecosystem.

The Israeli Medical Cannabis Agency (IMCA, “YAKAR” in Hebrew) was established to promote the regulatory work following the first government resolution to regulate the cannabis sector in 2011. IMCA’s objective is to provide patients with an appropriate source of supply of cannabis for medical purposes, while protecting the health, wellbeing and security of the public. For this purpose, it operates according to four policy lines: medicalization of the cannabis plant, indications for provision of cannabis, standardization of cannabis products and training physicians in cannabis treatment.

The main standardized fields of activity that currently require an IMCA license are: cultivation, production, storage, distribution and delivery, security of the supply chain, medical licensing and practice, R&D, and disposal. Some of the expected developments of the Israeli regulation include ease of export and import processes, expansion of the training of physicians, support for further research and aligning the way medical cannabis is consumed with

other doctor-prescribed medicines.

Israel's flourishing medical cannabis ecosystem consists of leading activities in the following areas:

Academia and Research: The established cannabis research heritage in Israel began in the 1960s with Prof. Raphael Mechoulam's groundbreaking research and the detection of THC and CBD, along with the discovery of cannabis receptors in the human body, and of the endocannabinoid system.

Nowadays, Israel has various entities conducting research in the medical cannabis field, from top universities to private companies and even governmental institutes. Teams are looking into the effects of cannabis in a wide range of areas, including cancer, PTSD, autism, epilepsy, Crohn's disease and schizophrenia. At the time of writing, tens of active clinical trials are being conducted. Israel is considered an attractive location for clinical trials in a number of medical fields, and medical cannabis is no exception.

The Government: The Israeli government's activity is pioneering in many ways. Israel is the first country to implement the medicalization regulatory concept for medical cannabis, which regulates the plant's medical use, in contrast to the legalization approach in other countries. In January 2019, the government of Israel also approved the export of medical grade cannabis, which fully complies with the ICM-GMP standards. The government supports research and trains doctors and pharmacists on the usage of medical cannabis.

Medicine and Pharmacy: The support and participation of the medical and pharmaceutical sectors are a prerequisite for the implementation of medicalization

and a critical condition for the development of a medical cannabis market. Israeli health providers have an important role in advancing cannabis know-how, as they are open to medical cannabis and are deeply involved in the research and regulatory processes.

Agri-Technology: Israel has developed agricultural technology placing it at the forefront of global Agri-technology. There are currently more than 460 Agri-technology companies in Israel, of which more than 25% have been founded in the past five years.

Growing cannabis poses unique challenges for the growers, derived from the multiple stages of growth and the special conditions required. Many technological and biotechnology Israeli start-ups in this field have developed products to help cope with these challenges and enable efficient and standardized growing of the cannabis plant.

Cannabis Companies and Start-Ups: The most significant expression of the success of the ecosystem is the abundance of companies and startups active in all components of the industry.

Service Providers: The global cannabis industry generates professional, legal, regulatory, and economic complexities. Service providers for the cannabis sector have been developing to contend with this complexity and accounting, legal, security and professional consultancy are the main services provided by local companies.

Investors: Israel has a long tradition of technology leadership and successful startups. These rely on the abundance of investment funds and private investors, as well as government funds. While a few main cannabis investment funds and accelerators are operating in Israel today, their limited

number to date constitutes a genuine opportunity for Israeli and foreign investors seeking to invest in the Israeli cannabis market.

The existence of a comprehensive multidisciplinary ecosystem surrounding the Israeli medical cannabis industry, and the clear advantages, experience and expertise each component demonstrates, position Israel as a contending frontrunner and world innovator in the field and as a fascinating location for potential investments and future developments.



2. Introduction

Why Medical Cannabis Today?

The growing interest in medical cannabis in recent years has been a fascinating economic, medical, and scientific phenomenon. Patients suffering from numerous illnesses view cannabis as a relief from pain and illness.

Many biology, botany, chemistry, and medical researchers worldwide are studying the effects and unique qualities of cannabis, while the value of the companies growing, producing and developing cannabis products has soared significantly to billions of dollars. A huge and multidisciplinary industry has developed around medical cannabis offering medical hope to many people worldwide. There is no question that the economic prosperity and public legitimacy of cannabis mark a change in attitude to cannabis.

From Medication to Drug

Although in the distant past many cultures used the plant and it was even administered as medication for pain relief in the 19th Century in Europe and the United States, in the early 20th Century laws were legislated restricting its use. Ultimately, in 1961, the UN Commission on Narcotic Drugs determined that cannabis was a Schedule 1 drug risk, considered to be addictive and with no medical benefits. The US, Canada, the UK and many other countries, also adopted a similar view of cannabis, in particular in light of the efforts led by the US at that time against narcotic substances.

From Drug to Medicine

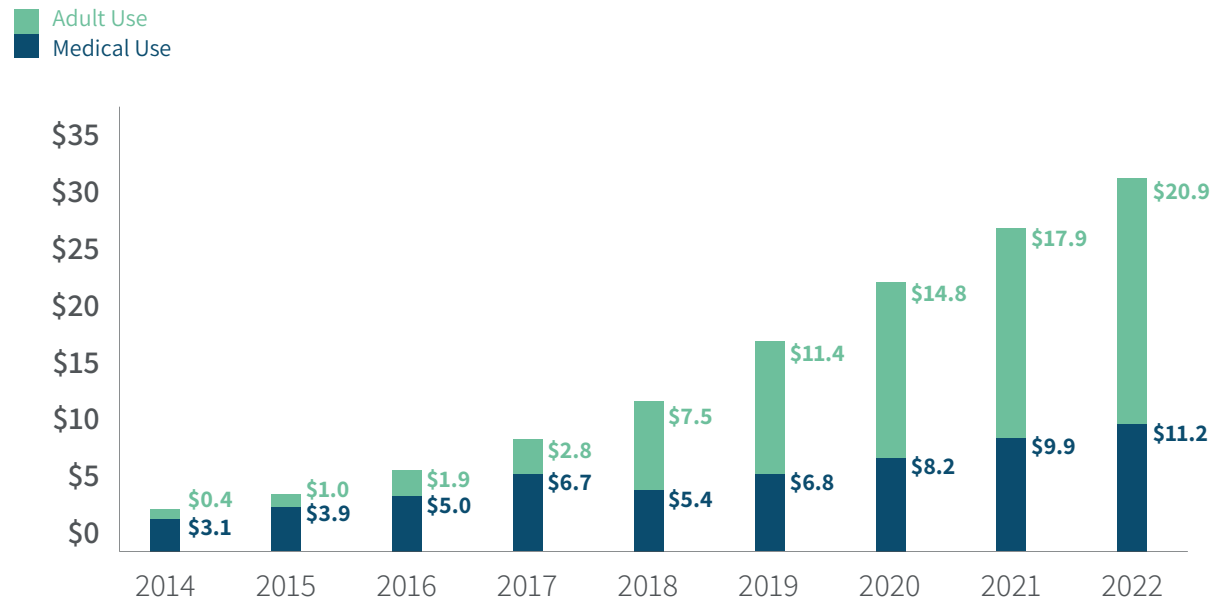
In the 1960s and 1970s, Prof. Rafael Mechoulam, of the Hebrew University of Jerusalem, was the first to discover two

of the active ingredients of the plant, paving the way for further research into its components. In the 1970s, the Dutch government decriminalized cannabis use, and in the 1980s the US Food and Drug Administration (FDA) first approved a drug containing components originating in the cannabis plant (Marinol).

Since the early 1990s, Israel has permitted medical use of cannabis for patients suffering from cancer, Parkinson's and Crohn's disease. In 1996, California was the first state in the US to legalize medical use of cannabis, and in 2001 Canada granted legal official approval for AIDS patients to use cannabis. The process accelerated in the years thereafter and in 2013-2017, many countries began to relax their cannabis laws. In the US, where federal law still officially prohibits the medical use of the cannabis plant, 33 states have already permitted its use. In 2018, the FDA approved Epidiolex, a CBD-based treatment, for the first time.

Medical breakthroughs, alongside the regulatory easements and changes in public opinion, resulted in initiatives and considerable economic interest in the field. Hundreds of companies in Canada, the US, Israel, Colombia and the Netherlands are engaged in growing the plant, processing it into various products and research its ingredients, its cultivation methods and its unique medical qualities.

Figure 1: Growth in Global Spending on Medical Cannabis and Cannabis for Adult Use (Billions, USD)



Source: Arcview Market Research/BDS Analytics

Industry Definition and Ecosystem Mapping

The Medical Cannabis Industry

The medical cannabis industry is comprised of several sub-industries: agriculture and agri-technology, medicine, pharmaceuticals, and related technological developments. The multiplicity of fields is sometimes confusing; therefore, a definition is required as to what is included in the medical cannabis industry and what are its main components.

In this report we will engage in five key links in the cannabis industry value chain, as follows:

Cultivation – The development of agricultural, biological, and technological capabilities to efficiently and economically grow cannabis with the desired properties at the appropriate standard.

Production – Processing of the plant into a wide range of cannabis products (inflorescence, oil, tablets, suppositories, additives for other substances), using technologies which utilize extraction and preservation methods for the plant's properties and the quality of the product.

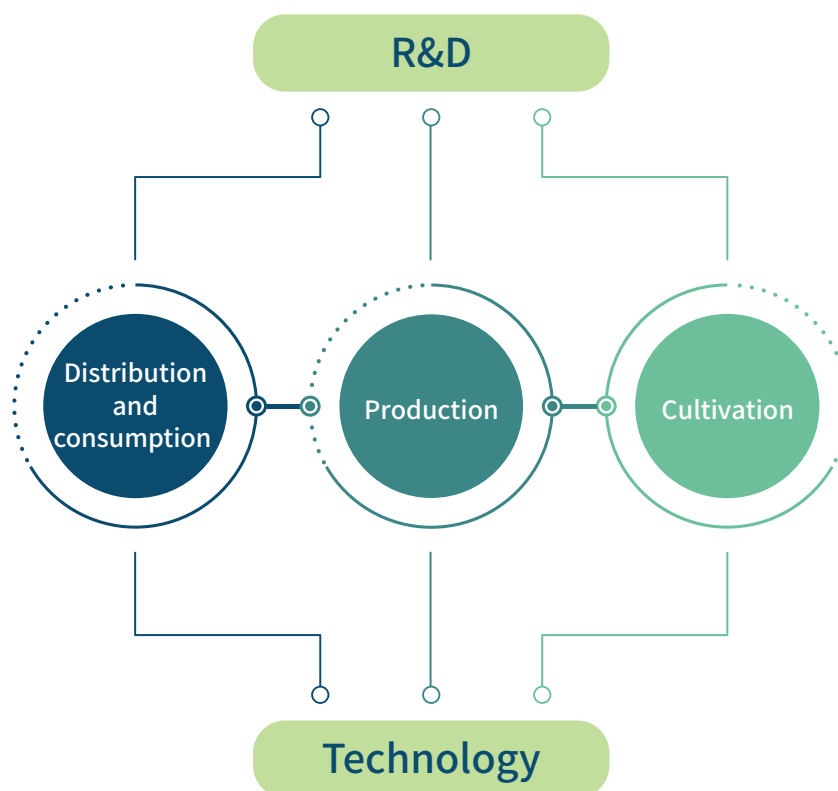
Distribution and consumption – The storage, distribution & sales and import & export of cannabis are accompanied by a range of diverse regulatory and distribution challenges. This link assures appropriate storage and transportation conditions, customer issuance and security at each stage.

Research and development – Research of the plant, its unique qualities and its effects on individuals. Understanding the correct outlines for various clinical indications during preclinical and clinical trials, alongside research in botany and

agronomy to improve and streamline the cultivation process.

Technology – Development of technologies to help overcome the different challenges of growing, producing, distributing and consumption by the end consumer.

Figure 2: Structure of the Medical Cannabis Industry



The Medical Cannabis Ecosystem

The five aforementioned links are critical for the industry's existence but are insufficient for its full development. A unique, innovative and multidisciplinary field such as cannabis is anticipated to develop where there is a broad ecosystem that includes entities and organizations that promote the industry. Such an ecosystem must be based on the following components:

Academia and research – Cannabis research involves different disciplines, such as biology, botany, chemistry, biochemistry and agronomy. There is great importance in the collaboration of academia with

government and the private sector in this field.

Government – The regulatory challenges, as well as the need for large research budgets and arranging the different activities engaged in the field, require continual government support.

Medicine and pharmacology – These are critical stakeholders in the promotion of medical cannabis, from involvement in research, through to educating patients and influencing public opinion, all the way to the issue of prescriptions and the correct and safe use for consumers.

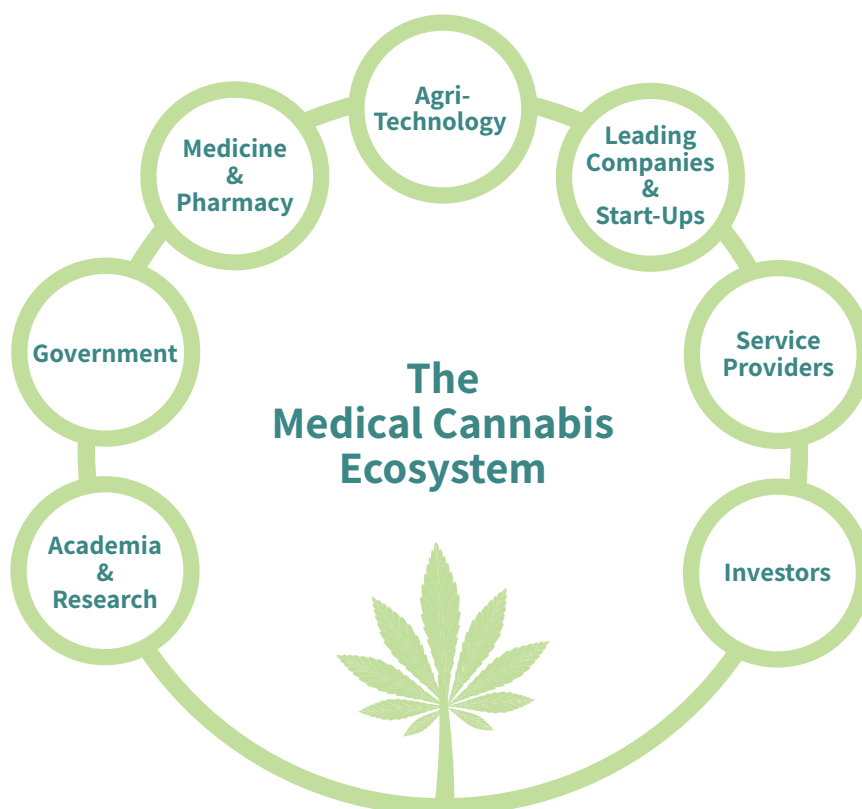
Agri-Technology – Innovations in a range of agricultural technologies that promote a more uniform, high-quality and durable crop, as well as a streamlined cultivation process.

Companies and startups – Companies operate across a diverse range of disciplines, from plant cultivation, through processing, promotion of relevant research, and the development of innovative production and consumption technologies and distributing them to consumers.

Service Providers – Due to the complexity of the cannabis market and its rapid growth, the industry must rely on a range of service providers that specialize in the sector and help build a commercial network.

Investors – The economic power driving the industry. The presence of investors and funds enables continued growth of established companies and startups.

Figure 3: The Medical Cannabis Ecosystem



Global Market Overview

A Rapidly Growing Market

In the past ten years, the medical cannabis market has seen continual growth. Following the historic legislation of Uruguay, the first country to approve the sale and use of medical cannabis in 2013, 33 states in the US have permitted its use as well as more than 35 additional countries worldwide. Other markets in Europe and Latin America are in the midst of a regulatory process that is expected to expand the permitted uses of medical cannabis and facilitate access to it.

The industry's rapid development makes it difficult to estimate its current size and provide forecasts. This difficulty is due to the rapid transformation of the market, which is affected by regulation, commercial developments, and groundbreaking research. Further to the above, there is also a major difficulty in predicting how medical cannabis will be adopted by new populations in different countries. The reviews and assessments published by various companies and research institutes make a wide range of predictions often indicating more wishful thinking than well-established forecasts.

Accordingly, in this document we have chosen to provide definitive and supported data that presents current growth and development alongside estimates by various research institutes.

The Canadian Market

Canada is the best example today of a relatively mature cannabis market. Considered the world's leading and most advanced cannabis market, it opened in July 2018 following new legislation that legalized the use of cannabis in the country.

Latest Canadian government figures show that the number of users registered as medical cannabis patients is estimated at more than 359,000, which constitutes 1% of the population. In 2018, registered users consumed about 20 tons of dried cannabis plant and 52,000 liters of cannabis oils and extracts¹ at a total estimated cost of between USD \$590 million² and \$1.2 billion.³

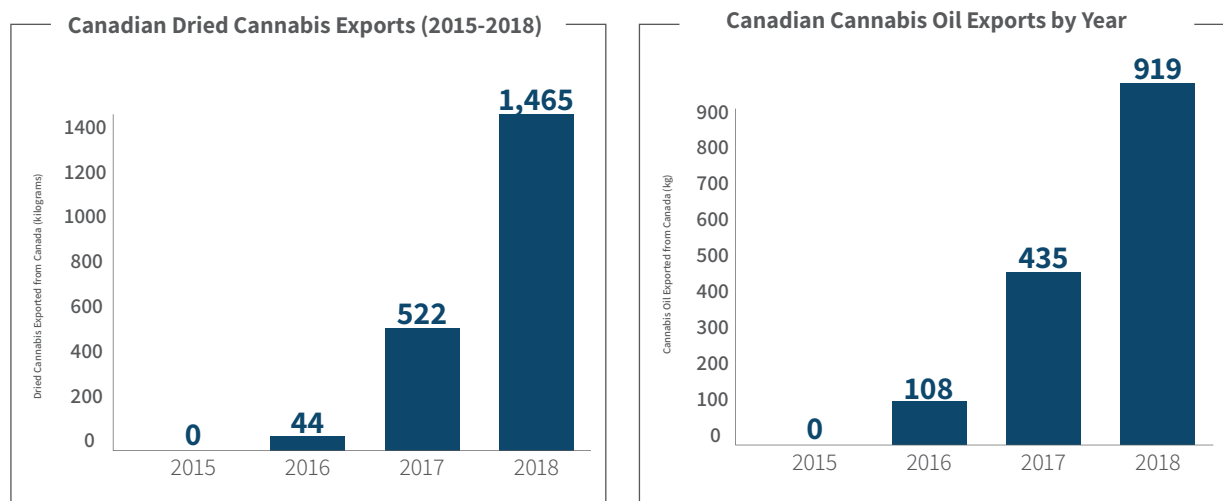
The Canadian market is considered the largest in the world today, with nine out of the ten largest cannabis companies in the world being Canadian. The market value of each of these companies, including among them Canopy Growth Corporation, Tilray Inc., Aurora Cannabis Inc., Cronos Group Inc., and Aphria Inc., has risen by more than 30% since May 2018 (August 2019). Canada is also the world's leading cannabis exporter; whereby the quantity exported by Canadian companies globally – of cannabis plants and oils – have more than doubled over the past two years.

¹ <https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/licensed-producers/market-data.html>

² <https://www150.statcan.gc.ca/n1/pub/13-610-x/cannabis-eng.htm>

³ The State of Legal Marijuana Markets - 6th Edition, 2018

Figure 4: Export Data on Canadian Cannabis Products 2015-2018



Source: Health Canada⁴

The Global Market

The Canadian market indicates the immense potential of the global medical cannabis market. While Canada has a population of some 37 million, the population of the EU, which is in the process of regulatory and legislative procedures, exceeds 500 million residents. For example, the population of Germany, one of the most progressive countries in Europe for its openness to cannabis and regulation in the field, has about 80 million residents. The population of Brazil, which is undergoing a similar legislative stage, is 200 million. Pursuant to the investment by top global cannabis companies it seems that they have identified the potential of these markets and are operating in them in preparation for future regulatory measures.

The European market is showing signs

of having great potential, also due to the presence of well-developed public health systems that can subsidize cannabis treatment. One market assessment predicts that the value of the European medical cannabis market will reach \$65 billion in 2028, and the Latin American market will reach \$8.5 billion in that same year.⁵

The American cannabis market has some uncertainties and two parallel approaches where many states allow a local cannabis market and are determining independent regulation, however cannabis remains a narcotic drug at the federal level. This situation makes it difficult to estimate the size of the US medical cannabis market, with some forecasts ranging from \$4.8 billion⁶ to \$8.9 billion in 2021.⁷

The Australian market is also shaping up to be a significant player in the global market.

⁴ <https://mjbizdaily.com/canadian-medical-cannabis-exports-tripled-in-2018/>

⁵ Prohibition Partners

Although the projected value of the medical cannabis market for 2028 is still not high, and stands at US \$1.3 billion, Australia has advantages, thanks to its regulatory progress in recent years and suitable conditions for growth and production, as well as the option of exporting to other countries.⁸

It is important to note that, in many cases, countries are adopting different regulatory regimes, and substantial differences between countries are possible, which is liable to make commercial and research cooperation difficult.

The value of the global medical cannabis market is anticipated to reach \$50-\$100 billion in 2025.^{9,10} In this case, too, wide range testifies to the uncertainties regarding the patterns of use and future regulation.

The Global Regulatory Situation

The global regulatory trend is toward legislation approving the use of cannabis for medical purposes. Several countries are also seeking to legalize recreational use of cannabis. However, it is not possible to predict with certainty when different countries will approve the implementation of plans to regulate the medical cannabis market, such as the Canadian plan or the Israeli medical reform, despite declarations by Latin American and European Union leaders, which suggest that a change is due to occur in the foreseeable future.¹¹

⁶ OurCrowd 2019 Cannabis Report

⁷ <https://www.statista.com/chart/12406/us-marijuana-market-the-grass-is-getting-greener/>

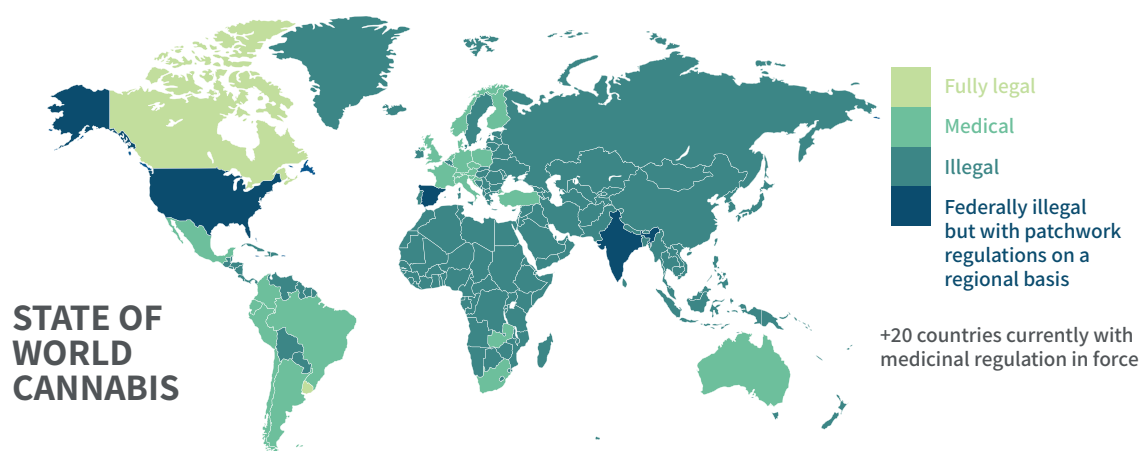
⁸ The Oceania Cannabis Report™ - Prohibition partners - 2018

⁹ OurCrowd Report on Cannabis Sector 2019

¹⁰ GVR – Legal Marijuana Market – Apr 2018

¹¹ BDS Analytics

Figure 5: The Legal Status of Cannabis Around the World



Source: BDS Analytics Top 10 Trends for 2019

Regulations in Various Countries

In regulatory terms, the most developed market today would also be the Canadian market, where the local government administers a record of all market sectors, including users, companies authorized to engage in cannabis and more. More than 30 states in the US have approved the use of medical cannabis. Nonetheless, slow regulatory progress at the federal level prevents large American pharmaceutical and biotechnology companies, which are subject to federal legislation, from entering the field.

In March 2019, the European Union resolved that it would take action toward removing regulatory barriers around medical cannabis.¹² This process is underway and is derived mainly of changes in the attitude of the World Health

Organization to medical cannabis. For the first time, the EU has also adopted the GMP standard as the working standard for the cannabis market.

Among the European countries, patients in Germany consume the largest quantity of medical cannabis, which is mostly grown in the Netherlands and Italy. Austria has one of the largest cloning markets in the cannabis plant industry. The UK was the latest country to approve the use of medical cannabis.¹³

Latin America is also at a legislative crossroads. The cultivation and use of CBD oils is permitted, however the use of the complete cannabis plant and medications is still prohibited in most countries and is totally illegal.¹⁴ Uruguay was the first country in the world to approve the use of medical cannabis, and in Colombia 142 companies have a crop license and benefit from

¹² http://www.europarl.europa.eu/doceo/document/TA-8-2019-0113_EN.html?redirect

¹³ The European Cannabis Report™ 4th Edition - Prohibition partners - 2019

¹⁴ The LATAM Cannabis Report™ - Prohibition partners - 2018

significantly lower growing costs compared with the European market.

The Australian market is an advanced market in regulatory terms and it has been legal to grow medical cannabis since October 2016.¹⁵ Nonetheless, there are still tight restrictions on the use of medical cannabis, thus the number of approved patients is only some 9,300.¹⁶ Significant regulatory progress has been made in the country, with the approval of the government to export medical cannabis starting from April 2018.¹⁵

The State of Israel, led by the Israeli Medical Cannabis Agency, for which a separate chapter is devoted in this review, is considered one of the leaders in legislation promoting the use of medical cannabis. The Ministry of Health (MOH) and the Medical Cannabis Agency have received many inquiries from various global regulators seeking to learn from their cumulative experience, the method chosen, and its implementation.

The Opportunity for International Trade

As a result of regulatory developments, global demand for medical cannabis has grown in recent years, followed by initial indications of international trade. Future trade potential is substantial, however due to current export restrictions (based on the very definition of cannabis as a narcotic drug), only a few countries are able to export, and therefore most are focused on domestic cultivation. This trend could change in the future, as the regulatory regime becomes more sophisticated in additional countries.

This is the place to mention that there is a global challenge to establish regulations in different countries in a way that will also facilitate foreign trade between countries and between various entities with relative ease, and will obligate all the governments and entities to regulatory collaboration and uniformity.

Global Research Efforts

Cannabis research for medical consumption is conducted by countries, research institutes, pharmaceutical, agri-technology and biotech companies. Four countries worldwide fund medical cannabis research as part of comprehensive government programs: Canada, Holland, Australia and Israel.¹⁷ Other countries approve research in their jurisdictions through regulatory means, including Spain, the Czech Republic and Denmark.¹⁸

The achievements of these institutes include:

- **OECD (Spain)** – Research into product quality control, the measure of reliability and use of cannabis as medication for several illnesses (chronic pain, cancer, epilepsy, HIV and bowel diseases). The institute collaborates with the European Union.
- **ICCI (Czech Republic)** – Research into good practice standards for the three stages (cultivation, research and production) of use of cannabis as medication, research into the entourage effect, and more. There is also considerable investment in

¹⁵ The Oceania Cannabis Report™ - Prohibition partners – 2018

¹⁶ <https://www.tga.gov.au/access-medicinal-cannabis-products-1>

¹⁷ <https://hightimes.com/news/world/most-advanced-countries-marijuana-research/>

¹⁸ <https://www.cannabisdanmark.dk/english/ongoingresearchindenmark/>

educating medical teams, patients and the general public about medical cannabis.






- **CCSA (Canada)** – Research into the effect of cannabis use in smoking and as medication on different populations (in particular adolescents). The institute is greatly engaged in education relating to medical cannabis.
- **NCSM (Holland)** – A Dutch government organization that collaborates with the International Association for Cannabis as Medicine (IACM). As part of this collaboration, the medical effects of different strains, as well as social, commercial, and legal effects are researched.
- **ACRE (Australia)** – The institute coordinates clinical studies in the field and draws up recommendations for medical and regulatory agencies on the proper medical use of cannabis and its products. The institute also implements improvements in cannabis research through collaborations with

academic institutes and is involved in training physicians and researchers.¹⁹

It can be seen that European research has been expanding in recent years, however remains focused on the effects of the plant and on the cultural and educational issues surrounding medical cannabis. The US, a global leader in research, pharmaceuticals, and biotechnology, is still absent from the research map, due to stringent federal regulation.

The absence of big pharmaceutical companies from the field at present opens the door to new players, which until now, have not yet engaged in medical products, to research, develop, and market cannabis-based products. It is hard to predict whether these companies will be able to maintain their competitive advantage over time, in particular in light of the possible trend of turning cannabis products into medications based on clinical trials and regulatory approval.

Figure 6: The Number of Countries Granting Production and Research Approvals Worldwide

Regulatory Field	 Consumption	 Research approval	 Cultivation	 Imports	 Exports
Total Countries	32	31	22	27	18

¹⁹ <https://www.australiancannabinoidresearch.com.au/about-us>

Global Commercial Trends

Two main trends characterize the major players in the industry. The first is the spread across every link in the product's value chain, due to the freshness of the market and the need to ensure product quality, from the cultivation stage through to its distribution to the consumer. See for example, the presence of Tilray across the medical cannabis value chain (Figure 7). It can be assumed that, over time, the industry will undergo consolidation and specialization trends, which will offer economies of scale.

Figure 7: Deployment Along Canada's Tilray's Value Chain²⁰



²⁰ <https://ir.tilray.com/static-files/47a9f2b7-bc42-4493-839a-be7727262b8c>

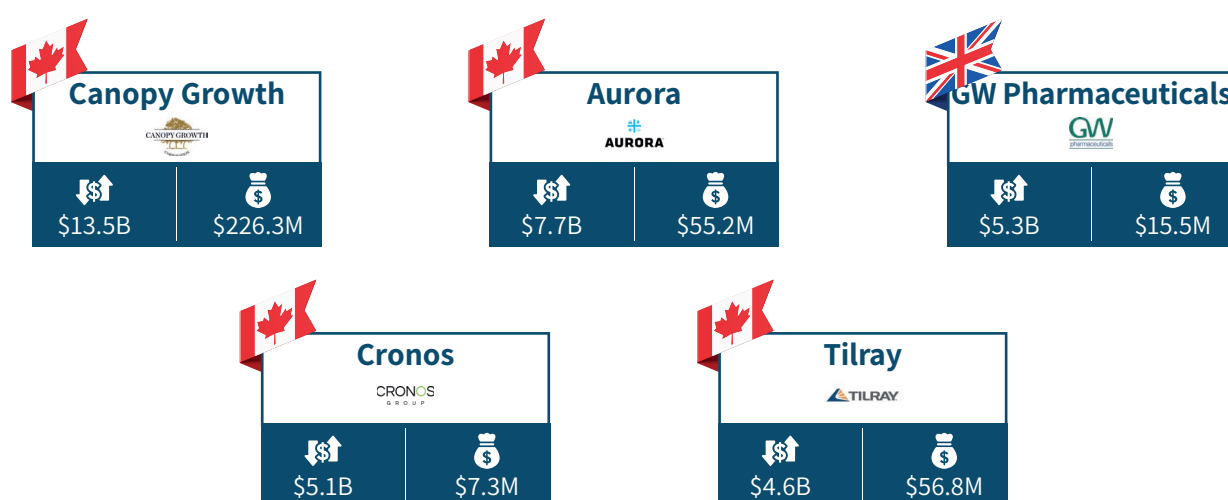
The second trend is international expansion and foundation of a foothold in several potential countries, with an emphasis on emerging markets in Europe and Latin America.

- Canopy Growth – The Canadian company acquired Germany's C3 Cannabinoid Compound Company in May 2019, Spain's Cafina in April 2019, and Denmark's Spectrum Therapeutics in September 2017, and expanded to Australia in April 2018 and to Latin America in August 2018.
- Tilray – A Canadian company with a presence in Europe since April 2019 and in Latin America since October 2018, and which exports to Australia and Africa.

- Aurora Cannabis – A presence in large European markets such as Germany since May 2017, as well as Denmark and Malta since December 2018 and is a part owner and significant strategic partner in Australia.

Alongside the players that are focusing on the cannabis cultivation and utilization links, and are developing non-medicinal cannabis-based products, we expect in the coming years more cannabis companies filing for prescription FDA-approved drugs. As such, in November 2018, for the first time, the FDA approved the cannabis-based drug, Epidiolex, for medical use for a clinical indication for epilepsy. Britain's GW Pharmaceuticals Plc developed the drug and more cannabinoid-based drugs are in the pipeline in various stages of development and clinical trials.

Figure 8: World's Largest Companies



Country of Origin



Market capitalization in Billions of USD



Profits in Millions of USD



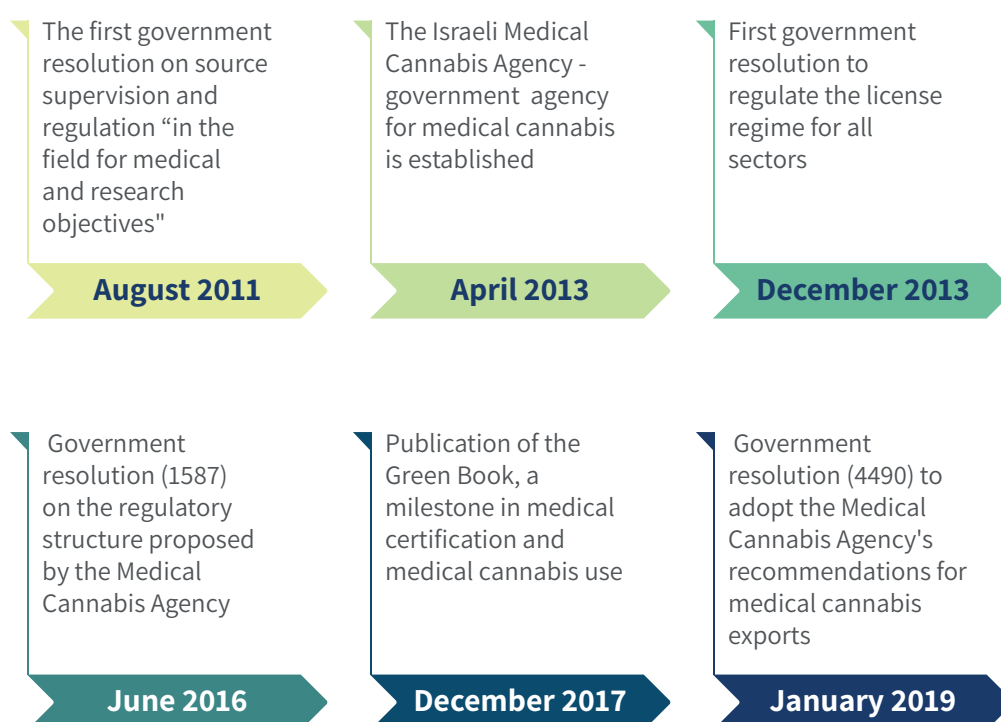
3. The Israeli Medical Cannabis Opportunity

Regulatory Framework

The medical cannabis market in Israel is a framework in which medical cannabis is supplied to more than 50,000 patients, and world-class research is carried out with government approval and encouragement. The Israeli medical cannabis reform came into effect in 2011, following the first government resolution to regulate the cannabis sector, and is currently in

advanced stages. Since the Israeli Medical Cannabis Agency (IMCA or “YAKAR” in Hebrew) was founded, there has been a meaningful public discourse and constant regulatory amendments with the objective of improving the regulatory environment for the various stakeholders in the domestic market.

Figure 9: Regulatory Developments in Israel



The Israeli Medical Cannabis Agency (YAKAR)

The systematic development of the Israeli medical cannabis market over many years has been made possible by relatively rapid regulatory progress in comparison with most countries worldwide. The Israeli Medical Cannabis Agency²¹ at the MOH, established in April 2013, is leading the country's regulatory system. The agency has been led by Mr. Yuval Landschaft from its first day. It collaborates with the Ministry of Agriculture, the Ministry of Economy and Industry, and the Ministry of Public Security to initiate regulatory amendments with the objective of putting into effect the medicalization of the cannabis plant and its products. A significant number of experts work in the IMCA committees in a range of disciplines such as pharmacology, medicine and research, security, agriculture, regulation and economics.

Israeli Medical Cannabis Agency Policy

IMCA's objective is to provide patients with an appropriate source of supply of cannabis for medical purposes, while protecting the health, wellbeing and security of the public. For this purpose, it operates according to four main policy lines:²²

- **Medicalization of the cannabis plant** – the use of cannabis solely for medical purposes, in contrast to other approaches that prevail in other countries, which focus on legalization or decriminalization;
- **Indications for provision of cannabis** – the development of medical practices for the use of

cannabis similar to the procedure for use of medications, including a dosage and prescription regime, methods of use, and striving for measurement of accurate effects;

- **Standardization of cannabis products** – creation of a cannabis products market characterized by products with fixed and supervised concentrations pursuant to clear indications (on the part of the physician) and for safe purchase (on the part of the patient);
- **Training physicians in cannabis treatment** – publication of Israel Medical Cannabis – Good Clinical Practice (IMC-GCP) book.

What is Medicalization?

According to the IMCA, while cannabis is not a medication, the concept of “medicalization” should be promoted for medical cannabis products used for medicinal purposes in the same way that prescribed medications and preparations that include ingredients classified as hard narcotics are treated. This also takes into account the fact that medical cannabis is plant-based, as opposed to a synthetic molecule produced in a chemical process in a laboratory or factory.

The objective of medicalization is to define proper usage, to engage in and indicate the use of medical cannabis and thereby to create an Israeli pharmacopeia for medical cannabis – “Cannacopeia”. This is in order to ensure medical-grade products that are professionally adapted and patient-oriented, by using a clear clinical method.

²¹ <https://www.health.gov.il/UnitsOffice/HD/cannabis/Pages/default.aspx>

²² https://www.health.gov.il/UnitsOffice/HD/cannabis/Documents/canabis_medical.pdf

The medicalization of medical cannabis includes three main interdependent fields integrated with each other and presenting a stable regulatory medical regime:

- 1. Clinical** – Promotion of the clinical use of cannabis by formulating a medical practice methodology that will constitute a recommendation tool for physicians, development of medical indications, training of physicians, and the establishment of an effective regulatory structure that facilitates patients' access to medical cannabis products and the collection of statistics as to their use.
- 2. Production and supply chain** – Promotion of medical cannabis quality through dictated generic products, promotion of a supply chain similar to the one for pharmaceuticals, and the development of quality procedures for the different links in the supply chain.
- 3. R&D** – Promotion of medical research of cannabis by encouraging studies of the cannabis plant, (its active ingredients, its physiological, pharmacological, and chemical effects), and the advantages of its use and possible risks.

Accordingly, IMCA outlined the IMC-GCP guidelines as to how to handle cannabis in each of the links in the value chain of cultivation, production, and supply of cannabis (sometimes called the “Green Book” in Israel), as well as professional research guidelines. Each link must conform to strict standards and be professional in its field.

IMCA also requires corporate separation between each link in the chain, in order to ensure professionalism in each field of medicalization and to sever the direct ties between the grower and patient, which prevail at present.²³

Under the IMCA concept, the medicalization of the field will allow for a basic regulatory-pharmacology common denominator that will be the first step in the future establishment of a regulated medical sector that uses cannabis-based medications, carries out clinical trials for these medications, etc. All this under the concept of evidence-based medicine.

As can be seen, Israel's regulatory structure differs from the norm in other countries, such as Canada or the US state of California, and in particular, there is no program for full legalization of cannabis for recreational use. The inherent advantage of this program is the presence of a clear government approach and perspective for cannabis that enables the industry a measure of certainty for operation that is absent in other markets. Furthermore, this program focuses on Israeli research, technology, and medicine in the medical cannabis segment, based on Israel's advantages in research.

The Regulatory Framework

At present, the MOH, through the IMCA, is in an interim regulatory situation, characterized by licensing regulations, including for patients.²⁴ By virtue of a government resolution, all those using medical cannabis in Israel are required to possess a license issued by the IMCA for their specific activity. The MOH uses licenses

²³ https://www.health.gov.il/PublicationsFiles/canabis_path.pdf

²⁴ https://www.health.gov.il/NewsAndEvents/SpokemanMessegges/Pages/16052019_2.aspx

to create a clear and meticulous regulatory framework alongside ascertainment of standards for all links in the chain. This provides patients with high-quality products and prevents the illegal distribution of the drug in the black market.

The main standardized fields of activity that currently require an IMCA license are:

- **Cultivation and Replication – IMC GAP (Good Agricultural Practices)**

- The procedure that regulates the cultivation and replication stage and presents detailed requirements to the growers for the terms for growing at the various stages of life including harvesting, drying, trimming of the flower and subsequent packaging. The procedure emphasizes various laboratory tests that the growers must perform, permitted levels of residual pesticides, microbial factors, etc., similar to the requirements for any other crop. The procedure also strongly emphasizes the IMCA enforcement mechanism and the importance of scrupulous compliance with it.

The procedure is based on the general requirements for appropriate cultivation (GAP) for plants and World Health Organization guidelines and international standards for growing fruits and vegetables, as well as the “Best Known Practices” standards used by leading countries worldwide.

- **Production – IMC GMP (Good Manufacturing Practice)** – The procedure regulates the production of uniform and generic products in the form of dried flowers, oil, tablets and suppositories. The procedure prescribes high production and quality standards. The source of

the raw materials in the production process must be a cannabis farm with a valid grower’s license, and production methods and protocols will undergo validation similar to the corresponding European production standards. In the future, the IMCA could permit the production of other cannabis-based products. Moreover, the standard also defines quality assurance processes and the method of packaging and labeling requirements and the standardization of the range of concentrations of the active ingredients.

- **Storage, distribution and delivery – IMC GDP (Good Distribution Practices)**

- The procedure regulates all the requirements for managing a cannabis business under appropriate conditions. For this purpose, the procedure includes guidelines for the permitted products, storage, distribution, transportation conditions, cannabis delivery and transfer, and binding forms for inventory management and tracking of supply. The objective of the procedure is to ensure adequate inventory for patients’ cannabis needs, while permitting delivery only to licensees, and preventing the illegal distribution of the drug in the black market as well as an impairment to drug quality due to inferior storage conditions.

- **Security of the supply chain – IMC GSP (Good Security Practice)** – The procedure prescribes the binding criteria for securing and protecting the supply chain from the cultivation stage and until issued to the patient. The procedure details the terms for obtaining a license, inter alia, by presentation of a security plan that

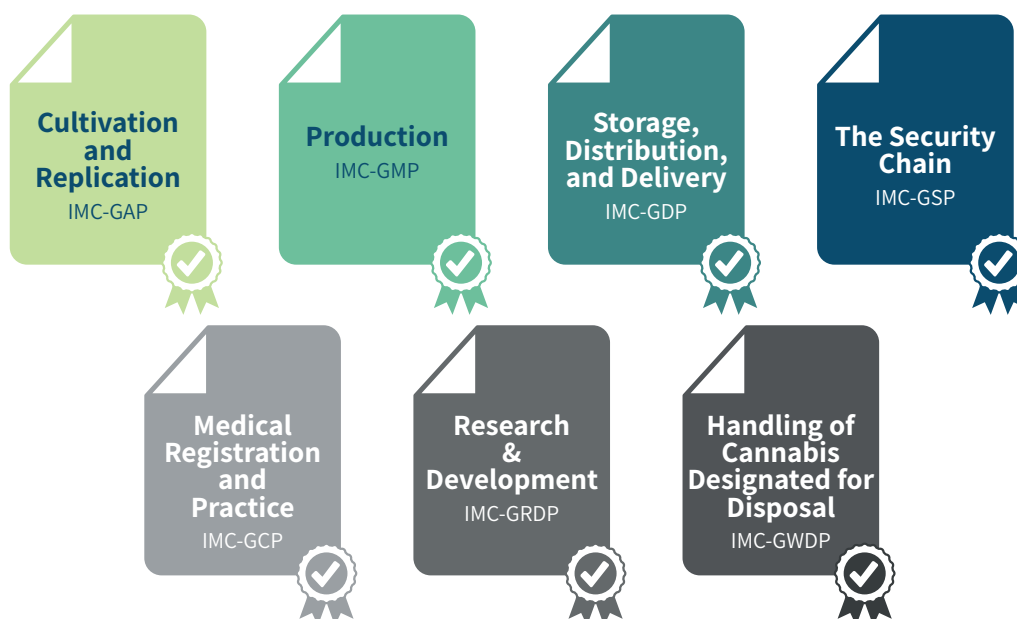
includes the security methods and their operation, and a list of employees. Furthermore, it strongly emphasizes binding security measures, such as fencing, cameras and alarm systems, and minimum-security procedures, such as the number of guards, patrols, and administration of an incident log.

- **Medical licensing and practice – IMC GCP (Good Clinical Practice)** - In contrast to the other procedures, this procedure not only determines the conditions for obtaining a license, but rather also collates established know-how regarding the cannabis plant, the endocannabinoid system, methods for administration of cannabis and its various effects (pharmacokinetics), side effects, medical indications approved by the Israeli MOH, approved products, and their suitability for the patient, dosage model, and guidelines for effective use. This procedure, also known as the Green Book, is the only one of its kind and is published in the form of drafts that are updated after consulting with a large number of clinical and scientific experts, including Prof. Raphael Mechoulam.
- **R&D – IMC GRDP (Good Research and Development Practice).** This procedure lists all the stages necessary for obtaining a research license for cannabis, while using the plant. The license is also provided for medical trials. The research committee convenes quarterly to review proposals.
- **The handling of cannabis for disposal – IMC GWDP (Good Waste Disposal Practice)** – The procedure for cannabis designated for disposal regulates the final stage in the supply chain, in order to ensure the complete

disposal of cannabis that does not conform to the quality specifications or has expired. It is carried out comprehensively at a designated site.

The procedure also specifies the terms for establishment of the disposal site. Furthermore, it details the storage process, pre-handling, preparation for removal, transportation and the disposal process and its documentation for quantities of cannabis exceeding 500 grams.

Figure 10: The Various Licenses Issued by the Israel Medical Cannabis Agency



IMCA Committees

The IMCA operates the following committees:²⁵

- **Interministerial steering committee** – monitors and coordinates the subject and constitutes a board of directors for recommendation of operating strategies.
- **Indications committee** – expansion and reduction of indications, clinical recommendations, review of the Code of Ethics and pharmacological rules.
- **Appeals/exceptions committee** – urgent treatment, mercy treatments, and appeals on rulings.
- **Security committee** – security standards for growing/growers/workers, transportation, production, supply, licensing.
- **Quality control committee** – quality and criteria issues required for the “supply chain for cannabis for medical use and research”.
- **R&D committee** – the committee includes regulatory, science, and medical representatives and its role is to review, inter alia, examination of research proposals and recommendations.

²⁵ <https://www.health.gov.il/UnitsOffice/HD/cannabis/Pages/default.aspx>

Regulatory Developments

Import and export – In January 2019, the Israeli government approved for those complying with the regulatory outline, to export the cannabis plant and its products under MOH supervision to signatory countries of the UN Single Convention on Narcotic Drugs.²⁶

While work methods and regulations are still lacking for implementation of exports, the government determined that this process would be completed by early 2020.

Training physicians and medical indications – In December 2017, the MOH published the second draft of the Green Book. On the basis of the Green Book, the IMCA is holding an official course for training physicians. The seventh class opened in May 2019. To date, more than 150 physicians have participated in the IMCA course, and demand for the courses is growing.

Research – IMCA issues cannabis research licenses pursuant to the IMCA GRDP standard. Furthermore, IMCA, together with the Ministry of Agriculture, also initiates and finances studies at the Volcani Institute and at government hospitals in collaboration with medical teams to promote standardization of cannabis products for their indications.

Supportive regulatory perspective– Realization of the medicalization program is anticipated to continue in the future and is reflected in the steps taken by IMCA and the other ministries.

The first step in regulating prescriptions – The first step towards the regulation of prescriptions was taken in May

2019, when the Minister of Health, Yaakov Litzman, announced that the ministry was working toward amending the Hazardous Drugs Ordinance. The amendment to the ordinance would permit, for the first time, registration of medical cannabis and its products for patients without obtaining a license - through a physician's prescription.

²⁶ https://www.health.gov.il/NewsAndEvents/SpokemanMessegas/Pages/27012019_1.aspx



The Israeli Ecosystem

Over the years, Israel has developed a vibrant ecosystem for medical cannabis. Although Israel is geographically small compared with other countries, its ecosystem puts it at the forefront of technological and agricultural innovation.

The Power of the Ecosystem

The story of Talent Biotech began at the Rabin Medical Center government hospital in Kfar Saba when Dr. Moshe Yeshurun, a hematologist and bone marrow transplant specialist, identified the positive effect of the cannabis plant on his cancer patients who had undergone bone marrow transplants. The medical center, with the support of Clalit Health Services and its technology implementation unit, in collaboration with a private investor, initiated research of the phenomenon.

Following initial research that emerged from this collaboration, Talent Biotech was founded in 2015 and registered a patent on the use of medical cannabis for treating fatal graft versus host diseases (GVHD), for patients who had undergone transplants. In January 2017, Talent Biotech was acquired by Kalytera Therapeutics of Canada, in what is considered the first “Exit” in the field of cannabis in Israel. At present, Talent Biotech’s drug for treating GVHD diseases is in advanced stages for receipt of FDA approval.

Talent Biotech’s story is the story of the Israeli ecosystem, which integrates different factors – governmental, medical, research, and business – which together generates success as a whole that is far greater than the sum of its parts. This chapter will review the seven components of the Israeli

ecosystem and will elaborate on some leading companies and organizations in each one of them.

Academia and Research

Research Heritage

Prof. Raphael Mechoulam, a researcher at the Weizmann Institute of Science and the Hebrew University of Jerusalem, is considered the father of global cannabis research and the scientist responsible for the first discovery of molecules of the active constituent in cannabis – THC and CBD, and for the discovery of cannabis receptors in the human body. These discoveries, from the 1960s through the 1990s, constitute the foundation for cannabis research worldwide to date. Prof. Mechoulam also discovered the endocannabinoid system in the human body: the system that sends signals that have considerable effects on preserving homeostasis in the human body and the focus of the effect of cannabis on it.

Research Entities in the Israeli Ecosystem

At present, a range of Israeli academic institutions are engaged in cannabis research: the Hebrew University, Tel Aviv University, Ben-Gurion University of the Negev and the University of Haifa. Hospitals and HMOs cooperate with independent research institutes and private entities for research purposes and numerous preclinical and clinical trials are conducted.

These studies are not the domain of universities alone; the private market is also heavily engaged in them. One example is the Israeli firm Tikun Olam Ltd., which collaborates with seven government

hospital and medical centers, and is responsible for 17 studies in the field of cannabis, including eight clinical trials.²⁷ Another example is BOL, Breath of Life Pharma Ltd., which is one of the largest cannabis cultivation and supply companies in Israel. It is currently conducting numerous clinical trials with the objective of reaching FDA-approved cannabis-based medications.

Israel is considered as an attractive geography for clinical trials in all medical fields, for several reasons, and medical cannabis is no exception. The first and most important reason is the financial aspect. The cost to conduct clinical trials in Israel is much lower than in the US or Western Europe. Additionally, while the price for conducting the trial in Israel is lower, at the same time, the reputations and the quality of its hospitals are on par with institutions in other countries. As far as the FDA is concerned, Israel is one of seven countries which the clinical trials it conducts are of equal value to those conducted in the US, creating a clear competitive edge. Another reason is the openness of Israeli physicians to conduct clinical trials on cannabis, both by virtue of many years of research in the field in Israel and their familiarity with it, and by virtue of the innovation and spirit of entrepreneurship of Israelis, which does not pass over medical researchers. The same claim is also valid for the patients upon whom some of the trials are conducted – their openness to medical cannabis trials is higher than in other countries, where the attitude towards the plant is more conservative.

Fields of Research

Israeli research into the effects of cannabis is engaged in a wide range of subjects, including Cancer, PTSD, Autism, Epilepsy, Crohn's and other intestinal diseases, and the effects of use on people at risk of schizophrenia. The scope of the research is also exceptional and in Israel, as of the date of this report, there are tens of active clinical trials, five of which are Phase II trials, and one is a Phase III trial.²⁸ This is in addition to tens of other studies being carried out on the properties of the plant and its unique medical qualities. The outcomes of these studies are impressive by any measure: Israel is ranked first in the world in the number of patents in the field.²⁹ In 2008, the Hebrew University in Jerusalem registered 33 patents in the field, topping the rankings of universities worldwide.³⁰

²⁷ Tikun Olam website – clinical trials <https://www.tikun-olam.co.il/article.php?id=1107>

²⁸ “My Trial” portal from the MOH Website (in Hebrew).

²⁹ Analysis of “Geyra Gassner Kesten | IP Law” office

³⁰ <https://www.calcalist.co.il/articles/0.7340.L-3734927.00.html>

Volcani Center



The Volcani Center is the official institute of Israel's Ministry of Agriculture for government research. The institute was founded in 1921 by Yitzhak Volcani and was transferred to the supervision of the Ministry of Agriculture in 1951. The institute's main purposes are to promote agricultural research in Israel in order to provide agricultural solutions for Israel's farmers. At present, the institute is engaged in R&D in agriculture and food engineering.

1,500 researchers work at the Volcani Center and have made breakthrough solutions in agriculture. In 2017, UNESCO awarded the center the International Research in the Life Sciences Prize.

Tens of medical cannabis researchers at the center are studying three main fields:

- The gene bank - holds cannabis strains specially imported to Israel. These strains are offered to researchers and growers.
- Research of the plant and its cultivation – Volcani Center researchers seek to investigate the most efficient practices for growing the plant to maximize production of the active ingredients at the fixed standard required with limited resources. Dr. Nirit Bernstein, who specializes in the physiology of the plant, heads the research.
- Preclinical studies - research that focuses on understanding the precise medical effects of the active constituents within the cannabis plant, their different compositions and the different and relevant dosages for treating various diseases (with the objective of mapping the activity of the ingredients within the plant separately and their joint activity). Dr. Hinanit Koltai, a researcher of the anticancer and anti-inflammatory effects of the plant, heads the research.

Technion Israel Institute of Technology



Prof. Dedi Meiri manages the Laboratory of Cancer Biology and Cannabinoid Research at the Technion, one of the largest and most advanced cannabis research laboratories worldwide. The laboratory's objective is to study the effect of the cannabis plant on different kinds of malignant tumors, and to develop cannabis strains that kill the cancer cells with great efficacy, with as close a match as possible between the different strains the types of cancer and the different patients.

The laboratory is one of the only laboratories worldwide that can identify all the components of the cannabis plant (more than 100 cannabinoids and 100 terpenes) and has already developed two strains suitable for the effective treatment of two different kinds of cancer, from the 800 cannabis strains that the laboratory is currently working with.

Prof. Meiri and his laboratory receive funding from the Israeli government and private companies, including collaboration with Israel's Panaxia and the international Cronos Group.

The Government

A significant component in the Israeli ecosystem is the Israeli government, which seeks to create conditions that allow the medical cannabis market to develop.

Cannabis – From License to Prescription

The Israeli Medical Cannabis Agency (IMCA) is the key government agency for the cannabis sector in Israel. IMCA collaborates with various ministries (Health, Agriculture, Public Security, Economy and Industry, Finance, and Justice) to promote the cannabis industry in a range of disciplines through the issue of relevant licenses. In May 2019, the IMCA launched the IMC-Good Practices Regulations for each of the links of the supply chain. The Agency is currently

seeking to promote the issue of cannabis prescriptions by physicians in the same way as any other medication (without the need for a license for use).

The Government Contending with Barriers

As mentioned at length in Chapter 3 regarding Israel's regulatory structure – the government is consistently promoting the local medical cannabis market. Alongside this, as a first step of its kind, the Israeli MOH published the Green Book in 2017, followed by updates, which collates all the established information about medical cannabis, and is intended to be a source of knowledge for physicians and pharmacists. In this

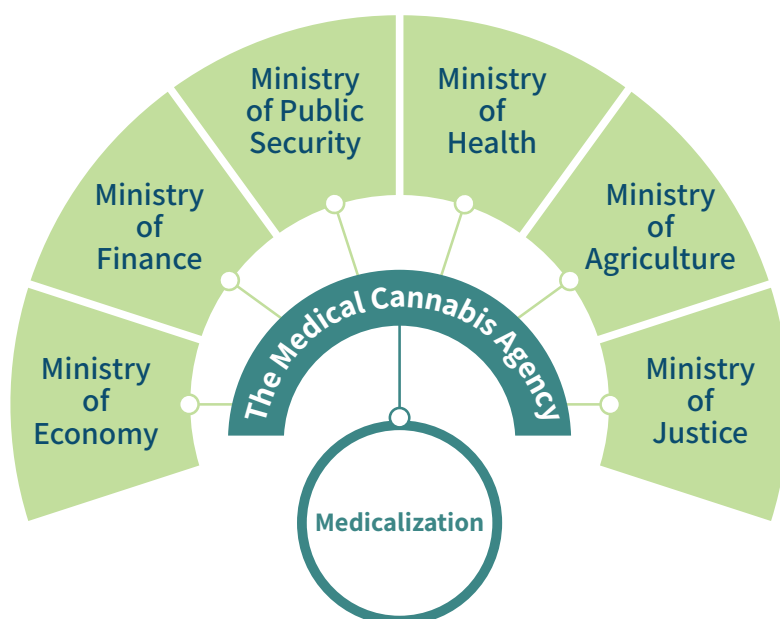
way, for the first time, an orderly medical indications structure, officially approved by the government, was published.

Israel is the first country to implement the medicalization regulatory concept for medical cannabis, which regulates medical use, in contrast to the legalization approach in other countries. Within this framework the sale of cannabis products that conform with the Israeli standard is permitted, rather than by an authorized supplier as in Canada

or Germany. As part of the reform, the MOH recently approved a vaporizer for use with medical cannabis.³¹

Israel is also the first country to host a government conference on medical cannabis (the Cannaan Conference), and in January 2019 the government of Israel also approved the export of medical grade cannabis, which fully complies with the ICM-GMP standards.

Figure 11: Government Ministries Participating in Promoting the Medical Cannabis Market in Israel



³¹ <http://www.vapepod.com/>

Medicine and Pharmacy

The support and participation of the medical and pharmaceutical sectors are a prerequisite for implementation of medicalization and a critical condition for the development of a medical cannabis market. This is evidenced by the training of medical teams, which is considered to be a major barrier to regulation in Europe, and constitutes a fundamental problem in the growing Canadian market.³²

Alongside the importance of physicians and pharmacists in the medical process, Israeli medical entities have an important role in advancing cannabis use. In recent years, a medical community has emerged in Israel with know-how and experience in treating patients with cannabis. The scope of the treatment, which began with a few cases in the 1990s, now stands at 50,000 patients.

Openness to Cannabis Treatments in Israel

Israel's medical entities are open to using cannabis. This openness is influenced by the fact that Israel was one of the first countries to approve research of the plant, clinical studies, and treatments.

The Israeli MOH trains physicians and pharmacists in the field. The training is executed by IMCA in cooperation with the Interdisciplinary Center for Cannabis Research at the Hebrew University.

This involvement by physicians in cannabis regulation is critical for responsible decision making. Physicians who run government hospital departments in which cannabis is relevant for treatment manage studies to establish the advantages of cannabis for their patients. These collaborations are funded both by the government and private funding.

An example is the collaboration between Dr. Bareket Schiff-Keren, a specialist in pain relief at the Souraski Medical Center Tel Aviv, and Dr. Ben Amit, a psychiatry and pharmacology fellow from Oxford University, with Israel's GammaCert Ltd.³³ Within the framework of the collaboration, the physicians will use the company's product which analyzes the precise cannabis components without damaging them in order to obtain the optimal fit for their patients' treatment. Other examples can be found in the story of Dr. Moshe Yeshurun, mentioned earlier, and other examples in the report.

³² <https://beta.canada.com/cannabis/cannabis-health/skyrocketing-medical-cannabis-patient-numbers-outpacing-physician-support-supply-doctor/wcm/fbddd35-beaa-4359-b18a-0a7fe14204f8/amp>

³³ <https://www.globes.co.il/news/article.aspx?did=1001282552>

Meir Medical Center



Dr. Timna Naftali is Deputy Director of the Gastroenterology Institute at Meir Medical Center, a senior lecturer at Tel Aviv University, and a leading Israeli researcher on the effects

of cannabis treatment on bowel diseases such as Crohn's disease and colitis.

Dr. Naftali began working in the field in 2009, based on the testimonies of numerous patients suffering from inflamed bowels who testified that using cannabis helped them. Dr. Naftali first carried out basic research on some 30 patients in 2013. The study found significant improvement and relief in patients. However, this was only an uncontrolled observational study and furthermore, no improvement was found in the symptoms of the disease. An advanced study from 2019 was conducted thoroughly but showed similar results. An additional study from 2018 found an improvement in the endoscopic appearance of the bowel as well as in the patient's relief. However, the results were not statistically significant.

Dr. Naftali currently pursuing further research and believes that cannabis indeed has a healing effect on bowel disease symptoms and not just on the patient's relief.

Shaare Zedek Hospital



**SHAARE ZEDEK
MEDICAL CENTER**

Dr. Adi Aran is the Director of the Pediatric Neurology Unit at Shaare Zedek Medical Center in Jerusalem. He is carrying out the first study of its kind worldwide on the effect of CBD oil on children suffering from autism. Although the study began in 2017 and is still ongoing, interim results

were published in the scientific journal *Neurology*, and Dr. Aran testifies that the initial results are very promising and show a significant improvement in behavioral problems derived from the disease.

Within the framework of the study, conducted with the participation of 100 children that Dr. Aran is treating at Shaare Zedek, oil with high concentrations of CBD was used for a period of 7-11 months. Dr. Aran states that the decision to begin the study was based on his gradual exposure to cases in which parents were able to obtain approval to treat their children with cannabis. In the study, which is only being conducted on autistic children with behavioral problems, Dr. Aran has observed that there is a link between behavioral problems, communication difficulties, and anxiety. Most of the parents of the children who have participated in the trial have stated that there has been an improvement in the level of communication and anxiety symptoms. Some have related that their children are talking and writing for the first time following the treatment with CBD oil, and that the side effects have been minor.^{34,35}

Agri-Technology

Israel's geographic location offers an arid climate, limited soil conditions, and few water sources, which challenges local farmers. Consequently, Israel has developed agricultural technology and know-how placing it at the forefront of global agri-technology. This innovation is sought after worldwide, in particular among developing countries that are required to contend with climate and agricultural challenges by means of Israeli innovation. This

infrastructure is now being used to grow the cannabis plant.

Global Agri-Technology Leader

Israel's agri-technology market is growing rapidly as it exports its products to various countries worldwide. In Israel, there are currently more than 460 agri-technology companies, of which, more than 25% have been founded only in the past five years.³⁶

³⁴ <https://www.haaretz.co.il/magazine/ayelet-shani/premium-1.4276950>

³⁵ <https://www.canna.co.il>

³⁶ Startup Nation Central - Agri-tech Report Oct 2017

The numerous companies are developing technological solutions for all market sectors, from traditional sectors such as irrigation and livestock solutions, to smart farming solutions and alternative sources of protein. A prominent example is smart irrigation solutions developer Netafim Ltd. Another is the unmanned aircraft developer, Aeronautics Ltd., that is using its defense and security platform for civil agricultural solutions.

Netafim



Netafim was founded in 1965 to promote irrigation solutions for the development of the Negev. Its motto is “grow more with less”, and it develops smart and efficient irrigation solutions for a wide range of crops. Netafim’s first and basic technology is drip irrigation, which provides specific irrigation with effective use of water. Netafim currently controls 30% of the global drip irrigation market.

In May 2018, Mexichem SAB de CV acquired 80% of Netafim at a company value of \$1.9 billion. Netafim currently has 4,300 employees working in 110 countries worldwide, owns 29 subsidiaries and 17 factories, and its products irrigate 100,000 square kilometers of agricultural land. For the sake of comparison, Israel’s territory is 22,000 square kilometers.^{37,38}

Netafim’s operations include the development of proprietary technology for growing cannabis, which includes precise irrigation, fertilization, climate control, and the development of cultivation protocols that integrate technology control.³⁹

³⁷ <https://en.globes.co.il/en/article-mexichem-completes-acquisition-of-netafim-1001222740>

³⁸ https://www.netafim.com/en/Netafim-irrigation-company_about-us/

³⁹ <https://www.netafim.co.il/crop-knowledge/cannabis/>

Another prominent smart farming company is Taranis, which is developing a product that uses machine learning technology to improve crops. Forbes has ranked the company among the world's top 50 agri-technology companies for the past two consecutive years.⁴⁰ The Israeli market export of agri-technology and water solutions totaled \$6 billion in 2018.⁴¹

The Challenge of Growing Cannabis

Growing cannabis poses unique challenges for the growers, derived from the multiple stages of cultivation and the special conditions required for successful growth. The cultivation and production process takes about three months, and involves six designated stages that require precision and professionalism. The first growth stage is the parent plant stage, in which the grower cultivates and develops the cannabis strain from shoot-bearing parent plants. The shoots are then rooted for three months by varying cultivation techniques until the vegetated growth stage. The third stage is a 5-6 week growing stage, after which the 9-11 week flowering stage begins, and ends with harvesting. Following the harvest, the flowers undergo processing, drying, and storage. Each production stage requires special conditions, including various habitats, lighting conditions, various irrigation, humidity, and temperature conditions, as well as the need to contend with diseases and pests. This special cultivation process poses real challenges for growers, requiring extensive knowledge, control, and investment.

In order to contend with the cultivation challenges, the agri-technology market has developed technology and biotechnology

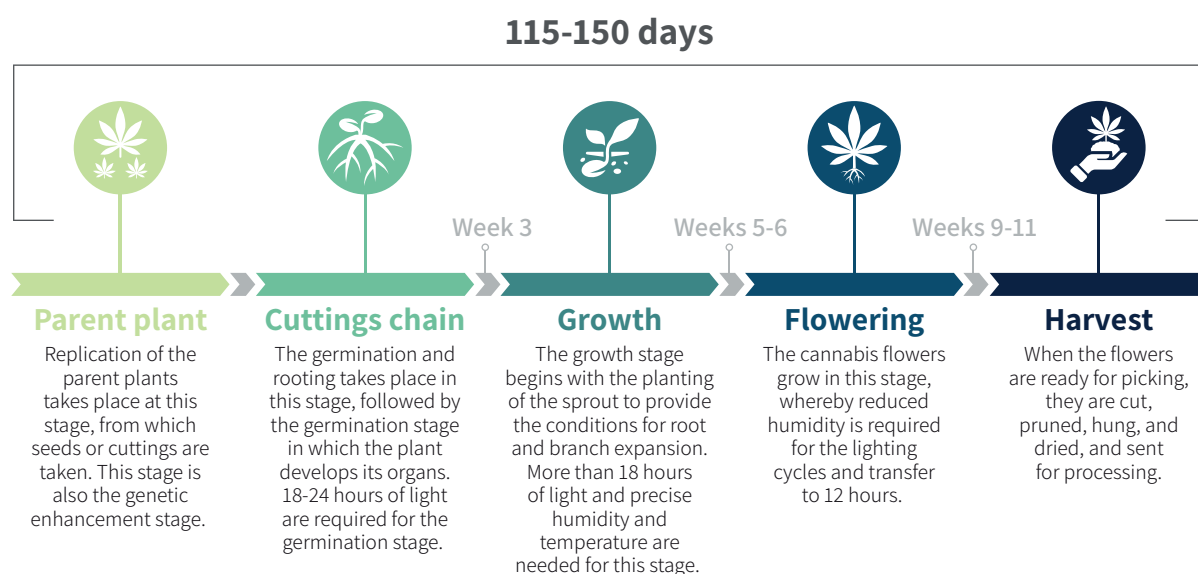
products that simplify operations and control. These developments not only make it possible to contend with the cultivation challenges, but also enable efficient and standard growing of the cannabis plant. Cannabis plant standardization is made possible, for example, through data collection technologies about the plant strains, by habitats with the growers' command and control of uniform conditions throughout the cultivation process, and with the help of automated data processing technologies that enable more uniform plants after the flowering stage.

Efficient plant cultivation is assisted by smarter and more efficient technologies such as efficient energy lighting that works in coordination with solar energy in the greenhouses, smart irrigation that controls the water acidity and effective water doses, and climate control systems that control temperature and humidity.

⁴⁰ <http://www.taranis.ag/english/news/>

⁴¹ Israel Export and International Cooperation Institute – agrotechnology and water – trends summary 2018 (in Hebrew)

Figure 12: The Cannabis Growing Process



Israeli Cannabis Solutions

With the growth of the Israeli cannabis market, many technological and biotechnology start-ups in the agri-technology field have developed products to help with the plant's cultivation. For example, the Israeli company Roots – Sustainable Agricultural Technologies Ltd. enables temperature control of the cannabis plant roots to provide it with the optimal conditions in every stage of the cultivation. The DryGair system, developed at the Volcani Institute, enables the optimal growth of cannabis in greenhouses through humidity control in the growth environment. The system removes water through energy-saving controlled cooling and evaporation to provide optimal growing conditions. Additional examples are the Israeli company LightCann 420 Ltd., which develops efficient

lighting for optimal cannabis cultivation in enclosed habitats; Groundwork BioAg Ltd. that has developed mycorrhizal fungi that have a symbiotic relationship with the cannabis roots, and EdenShield Ltd. that has developed safe pesticides for use with Medical Cannabis. Thus, Israel's growing agri-technology market constitutes an important accelerator and catalyst for the development of standardized and attainable cannabis products.

Indorz



Indorz Ltd. was founded in 2016 by a group of engineers and farmers. The company develops AI systems that offer an integral solution that enables farmers to optimally control all elements of each plant's cultivation environment, using advanced sensors and proprietary algorithms.

The system can analyze, predict, and propose insights and recommendations for automating the farmers' cultivation process in indoor habitats (rooms and greenhouses). The system was built specifically for the life cycle of cannabis seeds and their unique cultivation process.

Cannabis Companies and Startups

Israel's integration of the ecosystem elements mentioned so far have created one of the most promising cannabis industries worldwide.

Cultivation

The Israeli cannabis cultivation market benefits from agri-technological knowledge that enables stable and consistent growth. At present, there are eight companies that conform to the Israeli cultivation standard (IMC-GAP), and the Israeli MOH estimates that three more growers will obtain a cultivation license by the end of 2019. Although the number of growers is large compared with the size of the domestic market, the companies are expected to significantly increase their production when the market is opened for export.

Among the cannabis growing companies are Seach Sarid Ltd., which has been

operating in Israel since the early 2000s and which holds about 17% of the Israeli market;⁴² InterCure Ltd. Subsidiary Canndoc Pharma Ltd., one of the largest cannabis companies traded on the Tel Aviv Stock Exchange; Tikun Olam Ltd., BoL Pharma Ltd., Pharmocann Ltd., IMC Agriculture 2010 Ltd., RCK Cannabis, and Better Ltd.

⁴² <https://www.globes.co.il/news/article.aspx?did=1001284774>

PharmoCann



PharmoCann, founded in 2008, is one of the pioneers in Israel's cannabis industry. At present, the company supplies cannabis to some 4,500 patients a month, possesses ten proprietary strains, and produces about 3.5 tons of cannabis per annum on its 20-dunam (five-acre) farm. In addition to cannabis flowers, the company also produces cannabis oil, collaborates with the Prof. Dedi Meiri's

Laboratory of Cancer Biology and Cannabinoid Research at the Technion, and provides supply services and training to its patients.

In May 2019, Pharmocann's merger with Medical Compression System (D.B.N.) Ltd., which has a market cap of some NIS 66 million on the Tel Aviv Stock Exchange, was approved.⁴³

CannDoc Pharma



CannDoc has been operating in the global cannabis market for over ten years. In 2008, the company obtained the first cultivation and production license in Israel. It is a leader in cannabis research,

cultivation, processing and distribution in Israel, possesses a proprietary cannabis strain bank, and produces flowers and oils. In 2019, CannDoc plans to launch a number of clinical trials in collaboration with different hospitals.

In September 2018, CannDoc merged with InterCure, which is traded on the Tel Aviv Stock Exchange at a market cap exceeding NIS 700 million. In May 2019, the company filed a request to issue shares on Nasdaq.

Ehud Barak, Israel's former Prime Minister and IDF chief-of-staff, serves as CannDoc's Chairman.^{44,45}

⁴³ <http://www.bizportal.co.il/capitalmarket/news/article/763431>

⁴⁴ <https://www.globes.co.il/news/article.aspx?did=1001252479>

⁴⁵ <https://www.globes.co.il/news/article.aspx?did=1001282235>

Seach Sarid



Seach Sarid, a veteran Israeli cannabis company, began growing selected cannabis in 2008. The company grows and develops genetics of the cannabis plant adapted for medical indications of the MOH, produces cannabis for patients, extracts oils and produces end products. The company also offers its customers kosher cannabis products under rabbinical supervision.

Seach Sarid was the first company to obtain growing and replication licenses from the IMCA under the regulatory program. The company is currently estimated to hold about 17% of the Israeli cannabis market, producing more than three tons of cannabis flowers per annum on its 14-dunam (3.5 acre) site.

In May 2019, Seach Sarid signed a merger agreement with Beyond Time Ltd., which is traded on the Tel Aviv Stock Exchange.^{46,47}

Better



Better Ltd., founded over a decade ago, has since accumulated a wealth of know-how and experience in growing cannabis. Better Israel serves as the company's R&D center and domestic sales channel. The company serves more than 5,000 Israeli patients a month. It has three wholly or partially owned subsidiaries: Better Czech, Better Germany, and Better Australia, for which Better holds a production, sale, and import license.

Better has been developing proprietary cannabis strains with desired medical properties, as well as strains that yield rich harvests with immunity to pests and mold.

Prominent figures in the company include Dr. Donald Abrams, an international expert in treating diverse diseases with cannabis.⁴⁸

⁴⁶ <https://www.globes.co.il/news/article.aspx?did=1001284774>

⁴⁷ <http://www.ice.co.il/advertising-marketing/news/article/765066>

⁴⁸ <https://www.themarket.com/amp/markets/premium-1.7136464>



The Production Link

The production link in Israel benefits from the progressive research environment and the involvement of medical teams. The sector includes enterprises for production of end products and of medical consumer products such as inhalers. Four companies currently conform to the IMC-GMP Israeli standard: Panaxia Ltd., which offers a wide range of products and has a storage and distribution license; Medimor Ltd, which conforms to the strict FDA standards and produces medical devices for cannabis consumption⁴⁹ as well as Bazelet Pharma Ltd. and BoL Pharma Ltd.

Panaxia



Panaxia has been operating in the pharmaceutical industry for 40 years, producing a range of products such as oils, tablets, concentrates for vaporizers, capsules, patches and creams. The company heavily invests in R&D for

products and within this framework it has completed clinical trials on cannabis, which have demonstrated its effectiveness in treating children with epilepsy with minimal side effects. Two additional clinical trials are in preliminary stages.

Panaxia maintains partnership relations with several companies worldwide, such as Ultra Health Inc., which controls more than 30% of the New Mexico medical cannabis market, biotechnology developer Salus Biopharma LLC, and Rafa Laboratories Ltd., an Israeli prescription drug supplier and marketer.

In May, Herodium Investments, which is traded on the Tel Aviv Stock Exchange at a market cap of NIS 60 million, approved a merger with Panaxia.⁵⁰

Prominent figures in the company include Prof. Dedi Meiri, a consultant to the company, and Nobel Prize Laureate in Chemistry Prof. Aaron Ciechanover.

⁴⁹ <http://www.medimor.com/>

⁵⁰ <https://www.calcalist.co.il/markets/articles/0,7340,L-3762027,00.html>

BoL Pharma



BoL Pharma Ltd. – Breath of Life, was founded in 2008, and provides services and products for treatment of a wide range of diseases. The company has 11 proprietary strains,

provides cannabis products to some 12,000 Israeli patients a month and in its recent prospectus, stated that it has 400 dunams (100 acres) of agricultural land and can produce 340 tons of cannabis oil as of 2019. Furthermore, the company is leading eight Phase II clinical trials at present, and eleven trials are due to reach the Phase II stage by the end of 2019. It also announced that it intends to file for FDA approval for a joint clinical trial with Dr. Adi Aran for the treatment of symptoms of autism with cannabis.

Breath of Life is the only company in Israel authorized to engage in both cannabis cultivation and production. The company produces flowers and oil and also provides training services to patients. The company's professional consultants include a number of doctors with extensive cannabis treatment backgrounds.

Prominent figures include the company founder Hagai Hillman, CEO Dr. Tamir Gedo, and Dr. Adi Aran.⁵¹

⁵¹ <https://www.calcalist.co.il/markets/articles/0.7340.L-3762831.00.html>

Bazelet Pharma



Bazelet Pharma was founded in 2011 and processes cannabis at its plant for four of the eight authorized cannabis growing companies in Israel (Better, CannDoc, IMC, and Seach Sarid). Its products include flowers (whole and ground using proprietary technology), oils, capsules, and a vaporizer inhaler. In addition to its factory, the company also has a logistics center, training center, and customer services center. Bazelet Pharma provides services to some 9,000 Israeli patients a month.

Bazelet Pharma is one of the four companies of the Bazelet Group. The company also owns a cannabis technology incubator, Bazelet Nehushtan, an additional cannabis production plant and logistics center, as well as a knowledge export entity.

The Distribution and Consumption Link

The distribution and consumption link has a key role in securing the supply of cannabis for patients and in product quality assurance. Six authorized distribution and storage companies, which conform to the IMC-GDP standard, currently operate in Israel, of which one company has a cannabis products storage and distribution license designated for research purposes only.⁵² Furthermore, more than 80 pharmacies are currently authorized to distribute cannabis, 25 of which belong to Israel's largest pharmacy chain, Super-Pharm. Authorized cannabis distributors include pharmaceutical logistics firms ChemiPal Ltd., Solomon Levin and Elstein Ltd. (SLA), IMP, Novolog, Trialog Clinical Trials Ltd., and Panaxia.

The R&D Link

Each of the players in the Israeli cannabis industry carries out research and development of their products. The large companies in the field develop new cannabis-based products, strains with special properties and ingredients, and study the unique qualities of existing products through collaborations with government hospitals. One example of this kind of collaboration is the clinical trial conducted by BoL Pharma and Sourasky Medical Center Tel Aviv, which is examining the effect of medical cannabis on dialysis patients suffering from chronic pain.⁵³ Another collaboration is a joint clinical trial by Tikun Olam and Meir Medical Center, led by Dr. Timna Naftali, to examine the use of cannabis to treat Crohn's disease without side effects. These kinds of collaborations also take place with other companies such as the global GW Pharmaceuticals.

⁵² https://www.health.gov.il/Subjects/cannabis/Pages/licensed_workers.aspx

⁵³ https://my.health.gov.il/CliniTrials/Pages/MOH_2018-08-05_003562.aspx

Stero Biotech



Stero Biotech develops CBD-based medications to replace steroids in the treatment for a variety of diseases and was founded in light of the results of previous preliminary clinical trials. The company's products are intended to treat more than 100 diseases based on multiple registered patents.

The company collaborates with Clalit Health Services, Israel's largest HMO.

The Israeli leadership in the field of research also includes the services required for the research process. The ability to carry out world-class studies in each of the stages needed to establish and validate the research and to subsequently bring it to the level required for FDA approval requires the highest level of expertise, a wealth of experience, familiarity with the regulatory processes of the various entities, and the appropriate licenses. A number of Israeli companies provide this service at a world-class standard and are currently active in the medical cannabis field including Nexter Ltd., Pharmaseed Ltd., and Formulex Pharma Innovation Ltd.

Pharmaseed



Pharmaseed is Israel's largest GLP-certified private research organization leading in the development of life-science early stage technologies from discovery to the first in man/patient stage. The company specializes in both efficacy proof-of-concept studies and

safety evaluation in various animal models, as well as complementary in vitro/ex-vivo services. Pharmaseed's competence lies in the pre-clinical translational and regenerative projects, with particular expertise in CNS, angiogenesis, cancer, inflammation, pain, stem cell and cellular therapeutics, metabolic disorders and toxicology.

Pharmaseed obtained ICMU certification to work with cannabis-based products and its portfolio includes local and multinational companies developing medical cannabis products for various indications.

Pharmaseed is currently examining the effects of cannabis-derived treatments on sleep disorders, epilepsy, skin and wound healing, cancer, anxiety, pain and much more.

The Technology Link

The technology link rests on a wide range of Israeli startups that are developing technologies in many areas. One of the most prominent ones is medical devices for cannabis consumption, which includes companies such as Kanabo Research Ltd., the first company to obtain MOH certification for its cannabis vaporizer, and Syqe Ltd., which conducts clinical trials with Rambam Health Care Campus and the Technion to demonstrate the uniformity and quality of treatment with its inhaler.

Other Israeli companies are also developing devices to test cannabis ingredients, such as GemmaCert Ltd., which has developed a scanner for the cannabis flower to analyze its precise composition, and HiGrade Ltd., which has developed a mobile app that uses an auxiliary device and photography to obtain information on cannabis strains, their composition and their quality. Other prominent startups are in agri-technology, such as Seedo Ltd., which is developing a product for the autonomous growing of the cannabis plant at the patient's home.

GemmaCert



GemmaCert's technology makes it possible for the user to examine the composition of the cannabis flower by scanning with three different technologies that together provide extensive information without harming the flower. The product is intended for cannabis patients who want to ensure the cannabis quality, growers who want to test their products without using laboratory services and patients and researchers who want to examine the composition of the cannabis.

Syqe Medical



Syqe Medical Ltd. is an Israeli pharmaceutical company founded in 2011 that develops technologies to deliver the raw plant's active ingredients by inhalation. The company has developed an inhaler that delivers a measured dose of the plant as part of the medical treatment. The company has completed a number of clinical trials, which demonstrate the accuracy of the inhaler and its compliance with pharmaceutical standards.

The inhaler is adjusted for medical cannabis that is stored in a unique cartridge that contains pre-charged evaporation chips in a precise and uniform quantity of the raw cannabis flowers, raised in strict conditions. The inhaler controls several innovative mechanisms, including PulseBreath™, intended to increase the availability of the active ingredients found in medical cannabis for absorption into the patient's lungs. The inhaler enables regulation of temperature and airflow according to the patient's needs.

To date Syqe has more than 100 employees at its offices in Tel Aviv and plant in Tiberias.

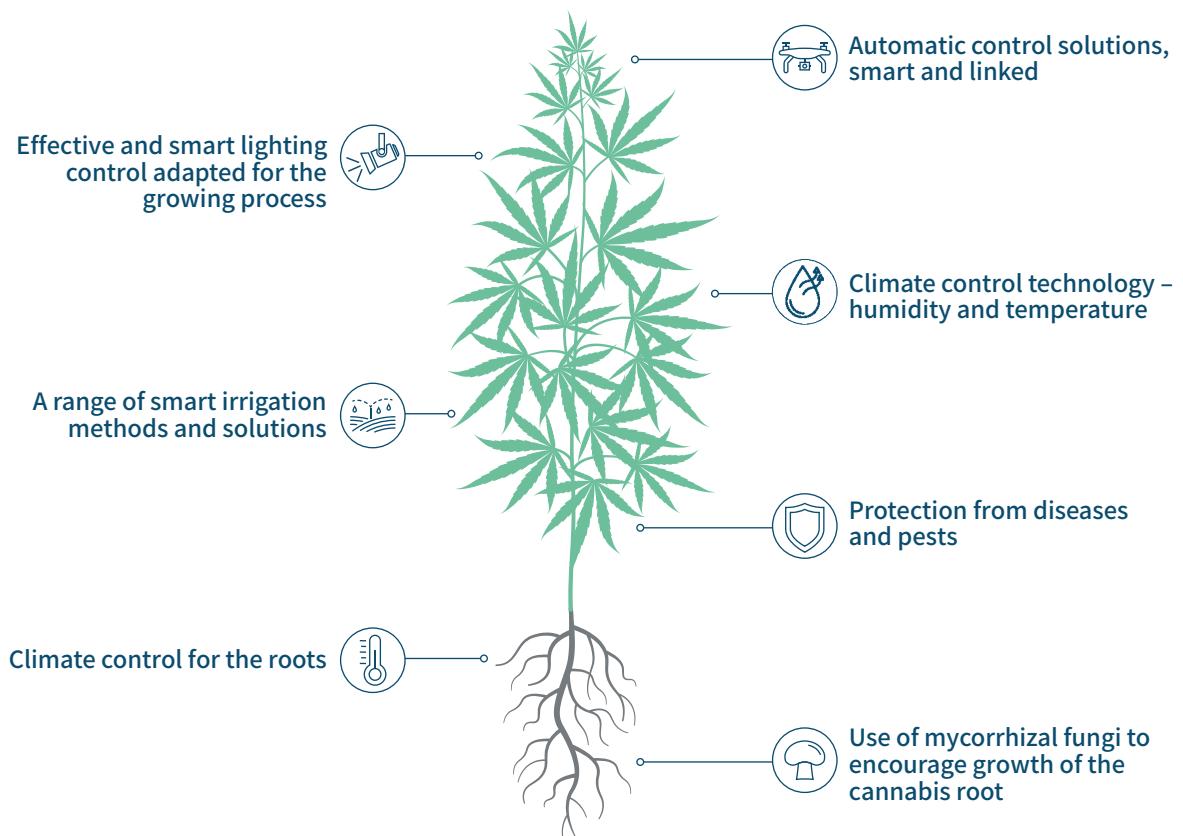
Kanabo Research



Kanabo research

The company's flagship product, VapePod, is a vaporizer approved for medical cannabis consumption by the Israeli MOH. The product's advanced and safe heating technology enables the uses of a cartridge with a predetermined dose of active ingredients, which delivers a precise dose to the patient.

Figure 13: Cannabis Growing Technologies



Service Providers

The cannabis industry generates professional, legal, regulatory, and economic complexities. Secondary cannabis services have emerged to contend with this complexity, such as services for real estate, accounting, investment funds and accelerators, professional consultation, training of medical teams and patients, marketing and logistics. The following Service Providers are prominent in Israel:

of Israeli security companies are operating in the cannabis industry, of which Security Circles Ltd. stands out as a provider of comprehensive security to BoL Pharma, as well as Magal Security Systems Ltd., which is listed on Nasdaq at a company value of \$100 million and protects installations in Israel and Canada. Moked Emun Ltd. and Ben Security 1989 Ltd. are also engaged in the sector.

Accounting Services

The listing of Israeli cannabis companies on the Tel Aviv Stock Exchange has resulted in a demand for accounting services knowledgeable about financial aspects in the field of cannabis and the prominent CPA firms currently engaged in the Israeli cannabis industry include the Israeli affiliates of KPMP, EY, Deloitte, and BDO.

Legal Services

The Israeli licensing process, international trade legislation, and medical and marketing aspects require support by experts. In addition to small law firms that specialize in cannabis, longstanding law firms with expertise in the subject are also worth noting. For example, Israel's largest law firm, Herzog Fox Neeman, recently opened a cannabis desk. The Shibolet law firm provides a wide range of services all along the value chain. Amit Pollak Matalon & Co. is also heavily engaged in the industry.

Security Services

Security is nothing new to the Israeli industry, and it is one of the sectors in which Israel has substantial expertise and experience. In particular, strict Israeli cannabis regulation requires IMC-GSP compliant security specifications. A number

Security Circles



Security Circles specializes in private security services, protection, and customized investigations. The company is also engaged in security for medical cannabis and for the cultivation and production networks of BoL Pharma, one of the largest companies in the industry in Israel.

The company provides security consultancy services for the establishment of a security system, supports the implementation of solutions for each link in the supply chain, arranges and coordinates

the security network with the Israel Police and IMCA, as well as hires and trains high-quality personnel to secure cannabis sites.

Professional Cannabis Consultancy Services

Israeli consulting firms have identified the need for expert knowledge in the cultivation, production, distribution, and management of cannabis to support the numerous companies founded in Israel. Companies operating in the market include Cannabis GMP, Nextep, Targo Consulting, T.H. Consulting, and Ram Bio-Pharma.

Investors

Israel has a long tradition of technology leadership and numerous and successful startups. They rely on an abundance of Israeli and foreign investment funds and private investors, and government funds. Israel has long stood out favorably in global indices for entrepreneurship and investment, such as the World Economic Forum's⁵⁴ Global Competitiveness Rankings, in which Israel was ranked second after the US in 2018, the OECD R&D Expenditure Index,⁵⁵ and the Global Talent Competitive Index (GTCI), which ranks Israel in sixth place.⁵⁶

The limited number of investors in the Israeli medical cannabis industry to date constitutes a genuine opportunity for Israeli

⁵⁴ <http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/#series=GCI4.D.11.02>

⁵⁵ https://mof.gov.il/ChiefEcon/InternationalConnections/DocLib4/Article_PotentialInvestment.pdf

⁵⁶ <https://gtci.study.com/the-gtci-index/#gtci-rankings-table>

and foreign investors seeking to invest in the Israeli Medical Cannabis market.

Cannabis Investment Funds

Israeli investors include big players, which launched funds to invest in cannabis in 2018, such as Ayalon Investments (which established a designated \$15 million fund for investing in the field of cannabis in Israel and worldwide), Sela Investments (some \$12 million), and IBI (some \$41 million in several funds designed for investment in Israel and North America). Other prominent companies are Israel's OurCrowd, which, in January 2019, jointly launched a \$30 million fund exclusively designated for cannabis, based on crowd-funding, with 7thirty Opportunity Fund of the US; Israel's Everest Investment Banking and PipelBiz, which jointly launched an \$8.5 million fund; and

Shavit Capital, which invested \$40 million in Syqe.

Accelerators

The technological innovation that characterizes Israel in a range of industries, together with the medical cannabis industry's early stage, resulted in several players investing in designated accelerators for startups in the field of medical cannabis. Prominent accelerators include iCan Ltd., Cann10 Ltd. and Yisum Research Development Company of the Hebrew University.

OurCrowd



OurCrowd, founded in 2013 by serial entrepreneur Jon Medved is a global venture investing platform that empowers institutions and individuals

to invest and engage in emerging companies.

With \$1.1 billion of committed funding and investments in 180 portfolio companies and 18 venture funds, OurCrowd offers access to its membership of 33,000 individual accredited and institutional investors, family offices, and venture capital partners from over 183 countries to invest alongside, at the same terms. Since its founding in 2013, OurCrowd portfolio companies have been acquired by some of the most prestigious brands in the world, including Uber, Canon, Oracle, Nike, and Intel.

In the cannabis industry, it is worth noting that the company has invested in BOL Pharma, a company poised to become a worldwide leader in pharmaceutical cannabis, and has also partnered to establish a \$30M designated early-stage CannabisTech investment fund together with the Colorado-based 7Thirty Opportunity Fund.

iCan



iCan is one of the leading companies in the Israeli ecosystem, which combines, alongside its accelerator, extensive consultancy services and convenes major conferences. The company's accelerator supports various companies in the field of cannabis, from growers to distributors, and from technologies and pharmaceuticals to marketing platforms.

The company was founded in 2014 and currently has six startups in its accelerator. It has invested around \$15 million to date.

Cann10



Founded in 2015, Cann10's operations range across many sectors in the Israeli and international cannabis industry. In addition to its fields and growing capabilities in several countries, the products that it produces, and the numerous conferences that it convenes, the company invests heavily in educating physicians and the general public about cannabis and collaborates with academic institutions worldwide. The company's operations include an accelerator that locates and supports early-stage startups in different sectors of the cannabis industry, from consumption technologies, through companies developing preparations and pharmaceuticals from the plant.

Mergers and Offerings as Means of Investment

Part of the capital flowing into the Israeli cannabis industry originates from mergers of existing cannabis companies with large companies traded on the Tel Aviv Stock Exchange. In this way, the companies obtain capital and an opportunity to be listed without the need to meet the terms for an IPO. On the other hand, the investor companies merging with the cannabis companies benefit from the partial control of the merged company's shares in exchange for investing a relatively small amount of capital compared with the value of the cannabis companies. There are numerous examples of this kind of merger, such as CannDoc Pharma with InterCure, Seach Sarid with Beyond Time, PharmoCann with Medical Compression Systems, and Panaxia with Herodian Investments.

Foreign Investment in the Israeli Ecosystem

The foreign investments in the Israeli Cannabis market range from international cannabis companies that are expanding their operations to pharmaceutical companies with R&D operations. A good example is the Canadian Cronos Group, which has a market cap of approximately \$5 billion, and established an R&D center in Israel in May 2019.⁵⁷ Furthermore, Cronos Group is also in the process of obtaining a license to grow cannabis in Israel, which will make it the largest international company in the Israeli cannabis production and distribution link.

In addition, pharmaceutical companies such as GW Pharmaceuticals are exploiting

the extensive knowledge and openness in the market and are participating in clinical trials in Israel. Another example can be seen in the investments made by international investment funds, such as Cannabis Growth Opportunity Corporation, which has invested \$500,000 in Israeli cannabis research company PlantEXT Ltd.,⁵⁸ and the aforementioned 7Thirty Fund.

⁵⁷ <https://www.globenewswire.com/news-release/2019/05/07/1818293/0/en/Cronos-Group-Opens-Cronos-Device-Labs-New-Global-R-D-Center-in-Israel.html>

⁵⁸ <https://finance.yahoo.com/news/cannabis-growth-opportunity-corporation-announces-120000302.html>





Companies and Start-Ups



Government



Investors and Accelerators



Medical Cannabis Ecosystem | 2019



Service Providers



Research and Health Associations



Agri-technology



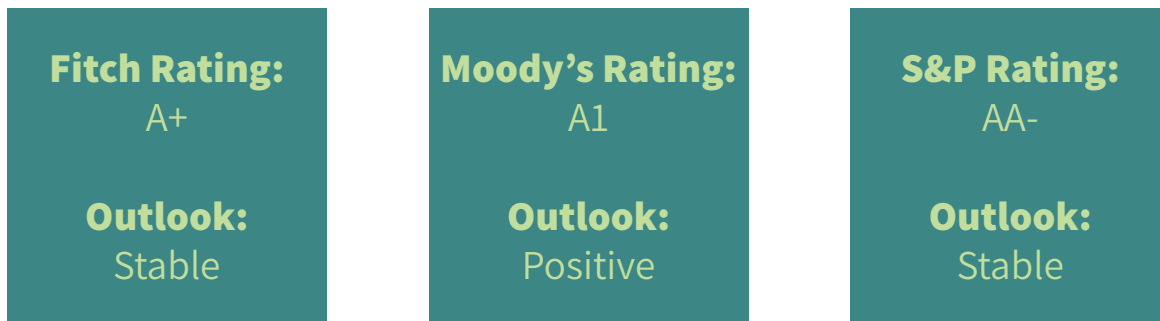
4. Why Invest in Israel Today?

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, creates 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.^{59,60}

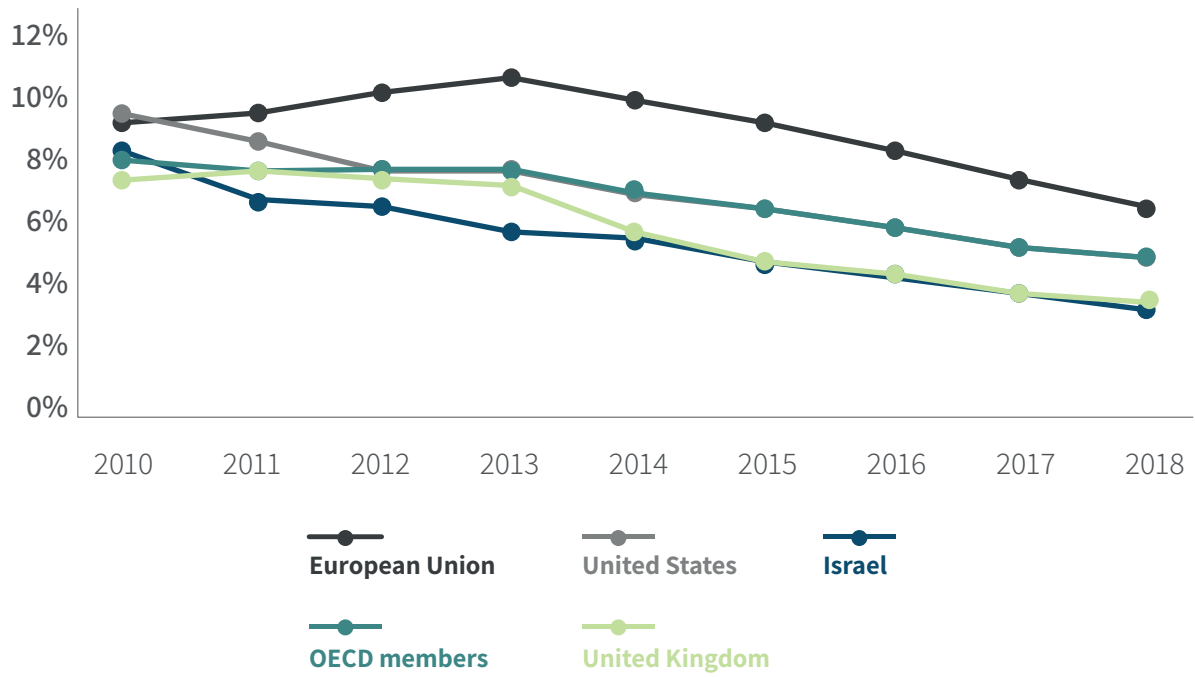
Figure 14: Israel's Credit Rating



⁵⁹ Economic Survey of Israel (March 2018) OECD:

⁶⁰ Graphs updated from Shine 2019

Figure 15: Unemployment Rate (%)



Global R&D Leader

Israel is one of the leading countries in research and development and integrating capabilities in creating innovation and sophistication in 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.⁶¹ Multinationals, including General Motors, Facebook, and Microsoft, just 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 active in the field of life sciences.

Figure 16: GDP Growth Rate (%)

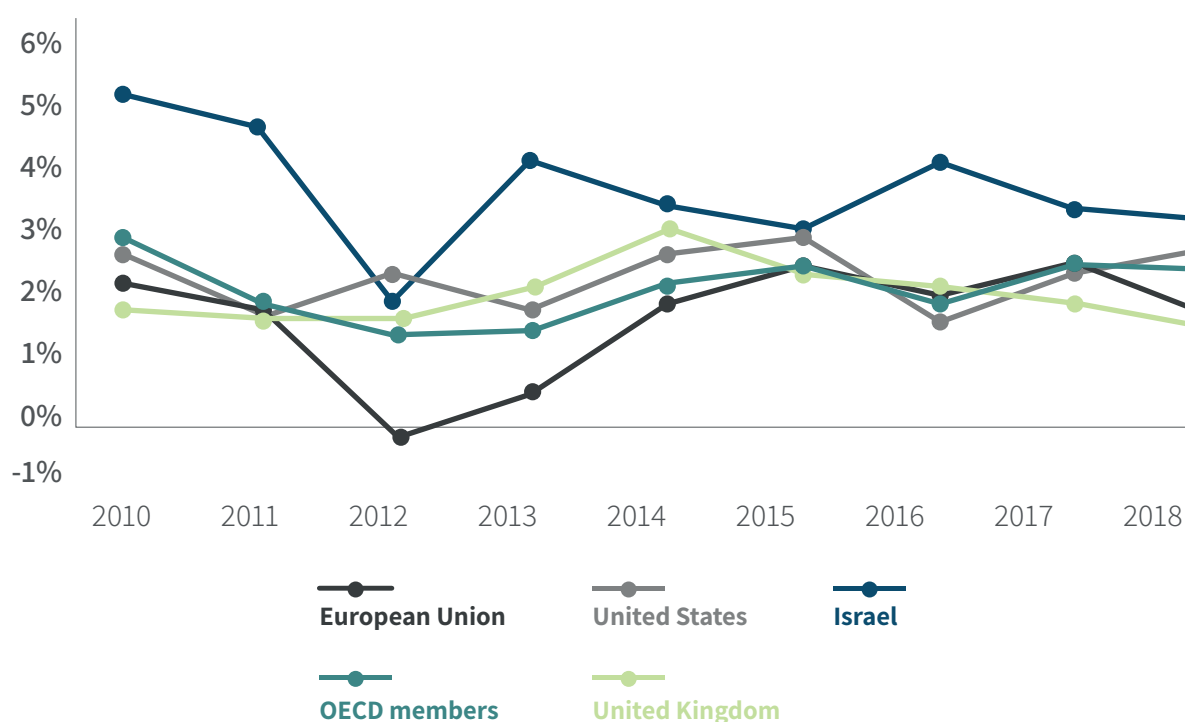


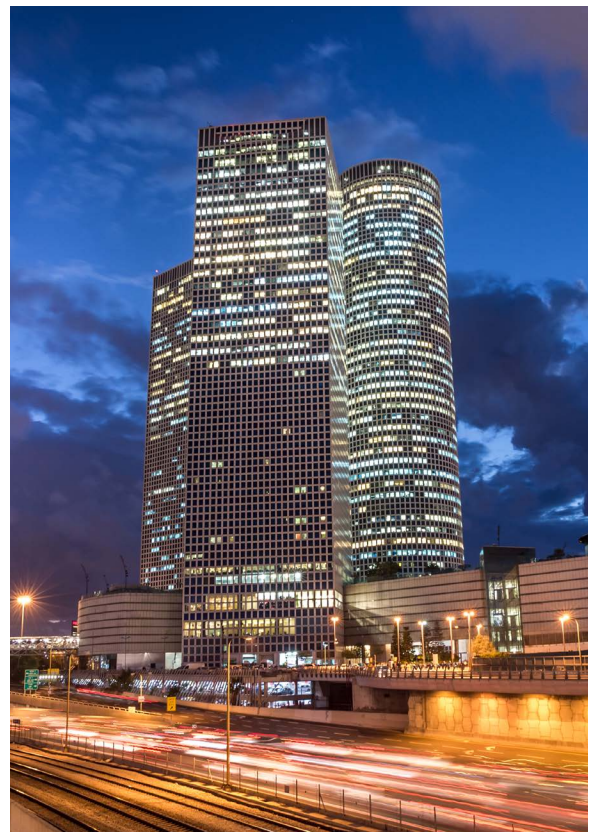
Figure 17: Israel's R&D Achievements⁶¹



Start-Up Nation

These figures, combined with the proven abilities of the Israeli market in technology and innovation, position Israel as a preferential 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,⁶² thanks to the power and reputation of the domestic market. Israel was ranked second in the world in venture capital availability index, according to the Global Competitiveness Report.⁶³

Venture capital availability in Israel and the efficiency of the financial sector create an optimal environment for the prosperity of the innovation industries and the record number of startups operating nationwide. Tel Aviv is currently ranked first in the world in the number of startups per capita.⁶⁴



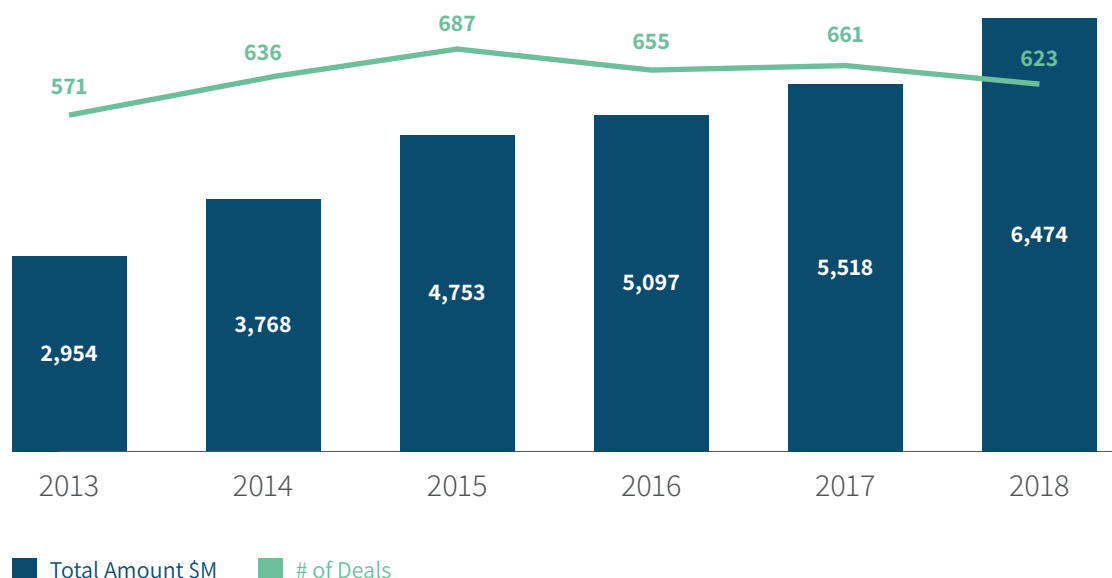
⁶¹ Global Innovation Index - WIPO, 2018

⁶² Israeli High-Tech Companies Capital Raising - IVC research center -ZAG S&W, 2018

⁶³ The Global Competitiveness Report, 2017

⁶⁴ Global Start-Up Ecosystem Report - Startup Genome, 2018

Figure 18: Israeli High - Tech Companies Capital Raising 2013-2018



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

Top Israeli Industries

Life Sciences

One of the foci of Israeli innovation is the life sciences industry, which operates in a range of research disciplines and thrives thanks to the combination of human resources, the academic environment, and governmental support of companies. As of 2017, 1,450 life sciences companies operated in Israel in the fields of medical devices, medical technology, diagnostics, and more.

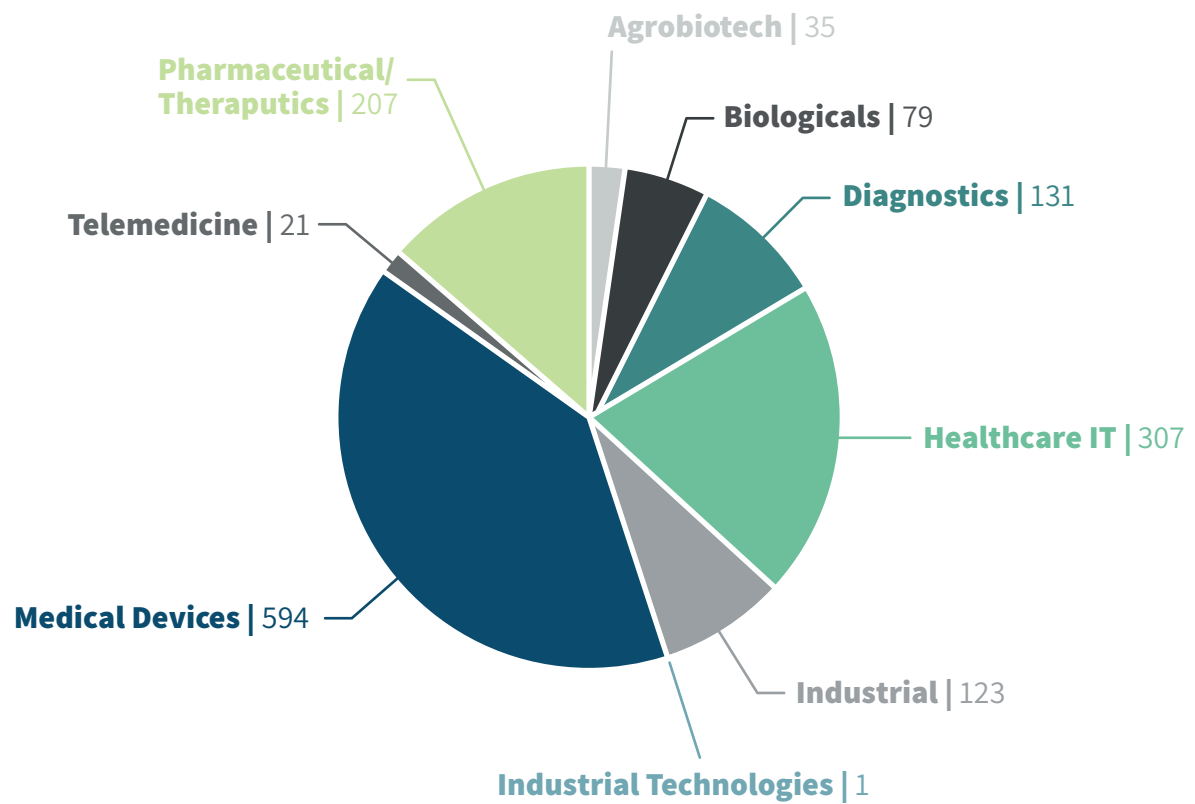
Medical Devices

Some 68% of the companies operating in the field of medical devices are startups, a third of which are in the early stages of financing. The sector benefits from the support of the Israeli government and private organizations.⁶⁶ The fruits of research in this field are expressed in the number of medical devices patents filed in Israel, which positions the country as the world's leader in number of patents per capita in this sector.⁶⁷

⁶⁶ Israel's Life Sciences Industry IATI Report 2019

⁶⁷ The Israel National Technological Innovation Report 2018

Figure 19: Israeli Life Sciences Industry Sub Sectors



Source: IATI Database, IVC-Online Database.

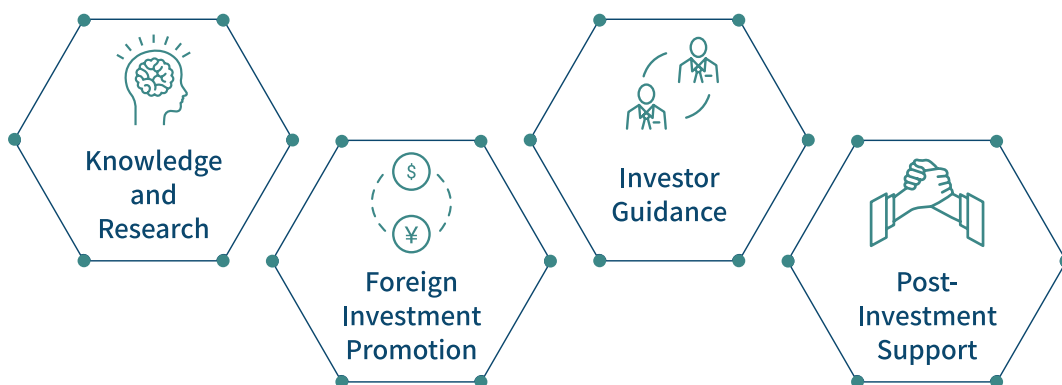
5. Invest in Israel – The Israeli Investment Promotion Agency

Invest in Israel is a government unit at the Ministry of the 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, and support in the implementation stage following the investment.

Paul Mullen, Manager of the joint digital health venture between GE Healthcare and the pharmaceutical corporation, Roche:

After we decided to establish our development center, we began exploring several sites around the world and we decided to place one of our main hubs in Israel. Israel has a unique value proposition in terms of its artificial intelligence and digital health personnel, along with their ecosystem. Invest in Israel was a key player in assisting us along the way, with its multidisciplinary approach and unique gateway for investments.





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The information included in this paper is relevant for August 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.



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