

//puregene



# INSPIRING A NEW CANNABIS LANDSCAPE

THROUGH TRANSFORMATIVE RESEARCH

A SUBSIDIARY OF PURE HOLDING AG

# MAKING THE DISCOVERIES NEEDED FOR A SUSTAINABLE FUTURE

Puregene researchers are dedicated to making the scientific discoveries needed to build and mature the cannabis and hemp marketplace. These discoveries will help producers with financially and environmentally sustainable varieties, regulators with critical data, and consumers with a reliable products and medicines.

## ABOUT PUREGENE AG

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## OUR PRODUCTS

Our industry tailored products and services are aimed at helping our clients succeed.

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## OUR TEAM

Introducing the amazing people responsible for Puregene's growth and success.

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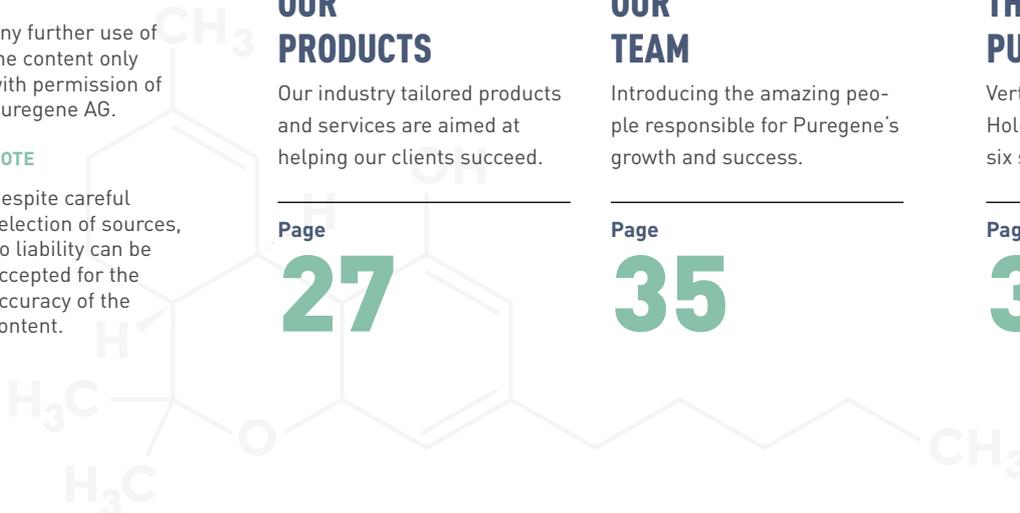
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## THE PURE HOLDING

Vertically integrated into Pure Holding AG, an overview of its six subsidiaries.

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«Behind every brilliant **discovery**, there is a cast of quiet voices and unseen hands»



**STEVENS SENN**

Chairman and Chief Executive Officer  
Puregene AG and Pure Holding AG



# dear friends.

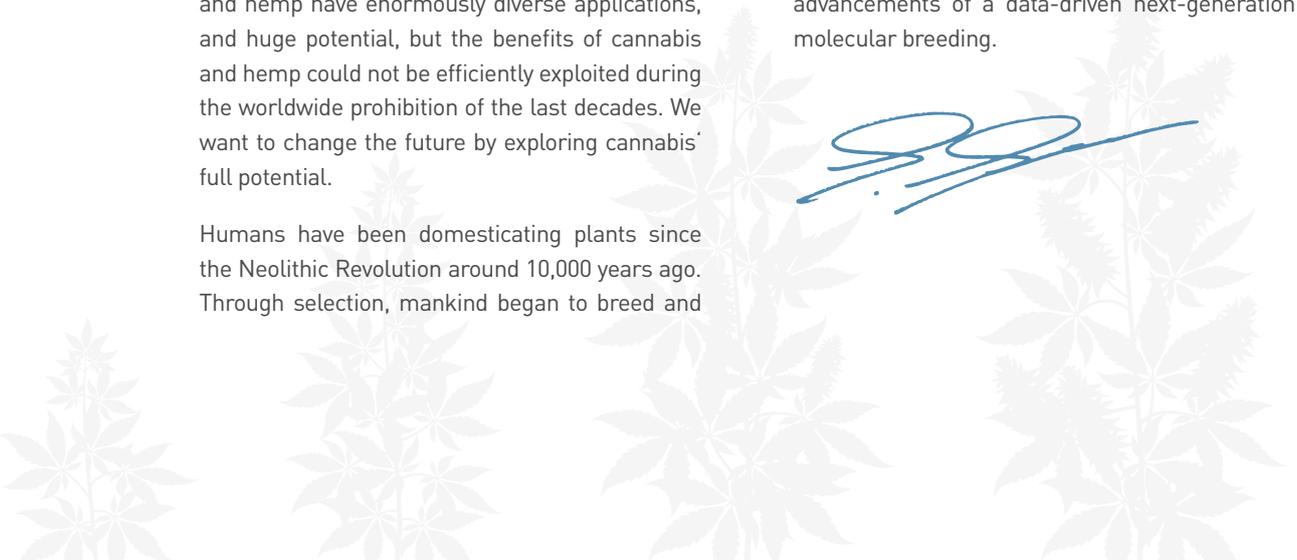
The technological advancements of the 21<sup>st</sup> century coupled with one of the most versatile plants on the planet, gives Puregene researchers the ideal foundation to harness the immense potential of this incredible industry. Thanks to new disruptive technologies such as big-data, genomics and artificial intelligence, it has only recently become possible to run a research program that is economically feasible and handles such high-throughput data.

By combining these disruptive technological approaches, Puregene has revolutionized molecular plant breeding and built a technology platform for the future. Our “Breeding 3.0” research program has been tailored to meet the dynamic cannabis and hemp industry. Cannabis and hemp have enormously diverse applications, and huge potential, but the benefits of cannabis and hemp could not be efficiently exploited during the worldwide prohibition of the last decades. We want to change the future by exploring cannabis’ full potential.

Humans have been domesticating plants since the Neolithic Revolution around 10,000 years ago. Through selection, mankind began to breed and

exploit the genetic potential of plants. As a result, different plants have changed greatly in shape, size, and productivity over the last millennia. However, the progress that has been achieved through modern technologies over the last 50-100 years in plants such as soy or maize dwarfs the millennia before and has been incredibly valuable and important for feeding humanity.

Unfortunately, due to its prohibition in the 20<sup>th</sup> century, cannabis has not seen these technological and breeding advances. With our technological approaches, the backlog of agricultural advancement of the last 50-100 years can be realized in just a few years and thus the full potential of the cannabis plant can be harnessed. This is only possible with the technological advancements of a data-driven next-generation molecular breeding.



# ABOUT **PUREGENE AG**

An introduction to Puregene, our vision,  
our responsibility, our history, and our future.



## OUR VISION

Only through discovery will the untapped potential of cannabis and hemp be realized for the world's largest industries: pharmaceuticals, cosmetics, food, building materials, and environmental sustainability.

In doing so, we aim to improve the diversity of agriculture in a way that can sustainably address the world's current industrial challenges and fundamental supply issues for the benefit of humanity.

For example, Cannabis sativa can make a serious contribution to reducing CO<sub>2</sub>. Studies have shown that it can absorb more CO<sub>2</sub> per hectare than a pine forest and is an ideal carbon sink.

To realize this vision, Puregene has developed a technology pipeline that harnesses the predictive power of plant genomics. This technology pipeline uses computational biology and machine learning to predict and assemble traits, such as cannabinoid content, disease resistances, complex aromas, flowering time and yield and essentially custom "tailor" elite varieties and traits for the global cannabis and hemp market.

With the bleeding edge technology, Puregene has also brought leading talent on board and holds a host of permits to work with cannabis and hemp. We are committed to improving cannabis and hemp genetics to realize the full potential of this industry.



ABOUT PUREGENE AG

# OUR STORY



It started in 2018, with Stevens wanting to improve the poor cannabis varieties that plagued the emerging cannabis industry. He approached Prof. Dr. Bruno Studer, head of Molecular Plant Breeding of the ETH Zurich. Prof. Studer explained to Stevens that the best way to successfully achieve his goal was to act on the building blocks of the plant - its DNA.

Prof. Studer further advised Stevens how he could employ the latest technological advancements in genomics and breeding in cannabis, resulting in the launch of Puregene AG.

The medicinal benefits of cannabis are globally publicized. Stevens had first-hand experience of its healing potential in treating medical conditions. He recognized the value that cannabis would bring to society. He initiated a research and development project to bring these promising compounds to market.

The Swiss market, with its relatively high THC limit of 1%, was welcoming pioneers like Stevens. However, to maintain a competitive advantage in a high-price market like Switzerland, Puregene had to prove itself as a leading cannabis innovator.

He soon recognized the need for specialists and recruited molecular breeding expert, Dr. Michael Ruckle, and biotechnology expert, Dr. Gavin George, both senior scientists from the ETH Zurich. This expert team has been directing and maintaining Puregene's pioneering role in the cannabis breeding industry for the past three years.

Puregene's ever-growing team is at the forefront of discovering novel cannabis traits, developing new varieties that are unique to the global market, and harnessing the full medical and industrial potential of the cannabis plant.



## DISCOVERY IS OUR MISSION

Advancing and delivering the scientific discoveries that are needed to shape the cannabis and hemp industry.

### COMPANY OVERVIEW

#### Who we are

Puregene is a genomics-based plant breeding company that combines Swiss quality with extensive plant expertise and cutting-edge breeding technologies. We are determined to harness the full pharmaceutical and industrial potential of cannabis and hemp to benefit humanity.

Our research approach uses genomics and massive datasets to predict cannabis improvement in the same way as predicting the weather. Although, similar approaches are used in other major crops, our approach does it without genetic manipulation (GMO) or gene editing.

Using our data-driven pipeline, we can combine all characteristics of cannabis or hemp to fit the desires of our clients. Our process creates unique cannabis and hemp varieties naturally and takes cannabis research a quantum leap forward. Our research approach fundamentally reinvents plant breeding. We are harnessing nature's full potential to advance medicine, increase food production, and make more sustainable building materials.

#### Key facts

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<b>Founded</b>	2018
<b>Location</b>	Pure Campus, Zeiningen, CH
<b>Employees</b>	19
<b>Website</b>	<a href="http://www.puregene.com">www.puregene.com</a>

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#### THE PUREGENE VIDEO

Check out this short explanation video on our website to understand the importance of DNA for plant breeding!



# THC Pilot Project



PURE Holding AG supports the mission of the Federal Office of Public Health to pilot the recreational use of Cannabis in Switzerland. We see ourselves as a natural partner to the Swiss Cannabis community.



**Q1**  
2019

Dispatch on experimental articles was submitted to parliament by the Federal Council.

**Q2**  
2020

National Council approved and passed on to the Council of States. Condition of organic swiss hemp added.

**Q3**  
2020

Council of States agreed, but has a different opinion on the organic production and changed the condition to „if possible“.

**Q3**  
2020

National Council and the Council of States were able to resolve their differences, giving the experimental article the green light. FOPH started to draft the legislation.

Q1 2020

Pure submits request for special permit to conduct variety and trait discovery trial within the scope of the pilot projects.

Q2 2020

Pure receives special permit and makes first legal seed import of 1500 THC strains to Switzerland.

Q3 & Q4 2020

Pure conducts the world's first trait discovery trial in the field, 5000 THC.

Four exemp

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# INSPIRING A NEW CANNABIS LANDSCAPE

THROUGH TRANSFORMATIVE RESEARCH

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# 2020 ANNUAL THC EXEMPTION REPORT COMBINING DATA TO KNOWLEDGE

VISIT:

[PUREGENE.COM/FIELD-REPORT-2020](https://puregene.com/field-report-2020)



# MARKET POTENTIAL OF CANNABIS

Insights into the cannabis and hemp landscape,  
and how it will disrupt the global economy.



## MARKET POTENTIAL OF CANNABIS

# CANNABIS SATIVA

## THE FUTURE OF AGRICULTURE

Cannabis will be a major crop in the future and will impact every area of agriculture:



### Cannabis

- **Medicine/Pharma**  
*Already the most widely grown and utilized medicinal plant*
  - CBD – anti-anxiety, relaxation, and sleep aid
  - THC – psychoactive, appetite stimulant, pain relief
  - CBG – anti-inflammatory, anti-depressant, anti-microbial
  - CBDV – pain relief, more rapid metabolized form of CBD
  - THCV – appetite suppressant
- **Recreational**  
*Cannabinoids will cannibalize illicit drug, alcohol, and tobacco markets*



### Hemp

- **Food**  
*More production potential of protein per hectare than a soy field*
- **Fiber and fuel**  
*More production potential of fiber per hectare than a pine forest*
- **Environment**  
*More CO<sub>2</sub> fixation per hectare of rain forest and a future carbon credit crop*

## MARKET POTENTIAL OF CANNABIS

# ENDING CANNABIS PROHIBITION AND THE LARGEST GLOBAL ECONOMIES

Cannabis is a green feedstock for hundreds of very different products, from life changing medicines, to sustainable animal feed, fuel, and even CO<sub>2</sub> negative housing construction materials. It really is an amazing plant.

Unfortunately, due to a long period of prohibition there has been a lack of breeding and basic research. With the advanced genomics-based breeding and research, cannabis will very soon disrupt some of the largest global industries.

Puregene's research is unlocking the natural potential of cannabis and hemp!



RECREATIONAL MARIJUANA  
MARKET

**\$340 billion**



ANIMAL FEED  
MARKET

**\$150 billion**



CARBON CREDITS  
MARKET

**\$200 billion** (IN 2040)



PLASTICS  
MARKET

**\$500 billion**



FORESTRY AND MATERIALS  
MARKET

**\$600 billion**



PHARMACEUTICAL  
MARKET

**\$1200 billion**

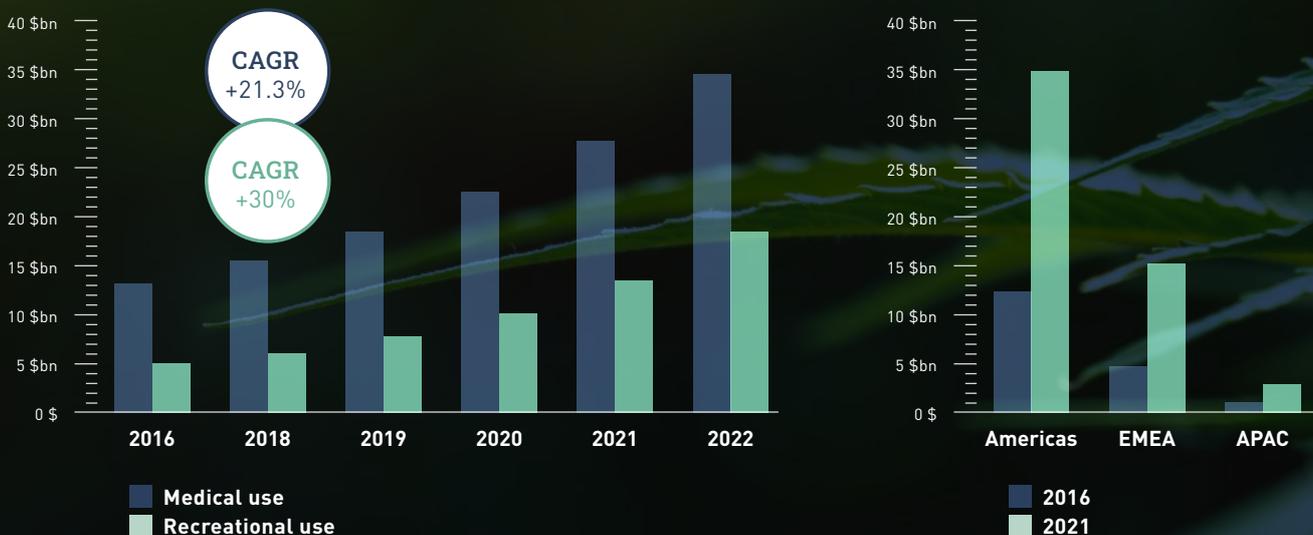


## MARKET POTENTIAL OF CANNABIS

# THE GLOBAL REGULATED CANNABIS MARKET

## MEDICAL AND RECREATIONAL USE

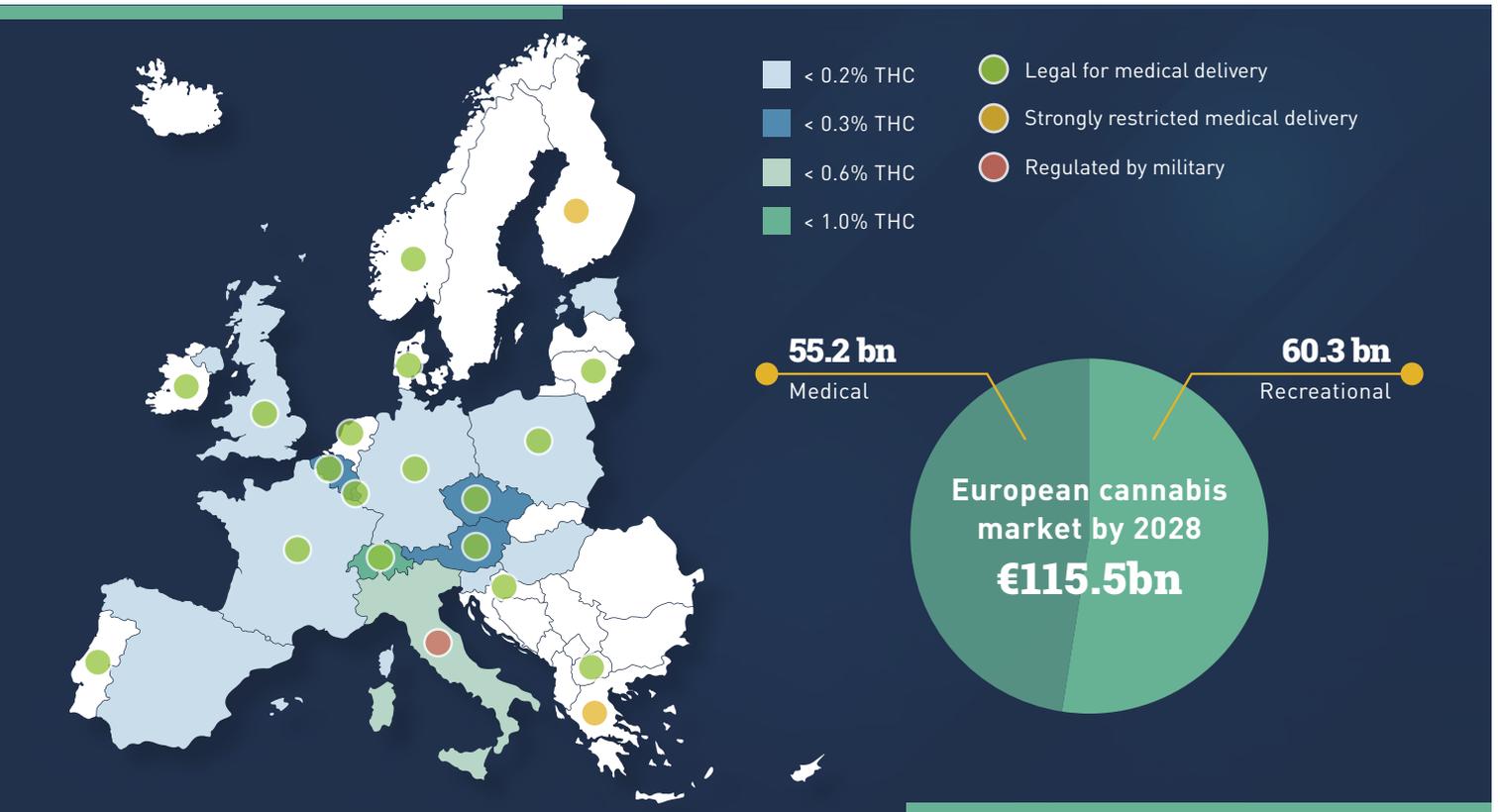
- The global cannabis market is one of the fastest growing industries worldwide. Factors supporting growth include growing social acceptance of cannabis, the increasing popularity of CBD, and a growing millennial population in key cannabis markets.
- The main drivers are an increasing number of countries decriminalizing and legalizing cannabis, as well as the growing influence of online retail outlets and improved cultivation of cannabis.
- The global industry is highly dynamic with a compound annual growth rate (CAGR) of 21% over the last 6 years, resulting in a total incremental market growth of USD 28 billion.
- The market for medical cannabis is expected to grow at a CAGR of 21.3%, while the market for recreational cannabis should grow even faster at approximately 30%.
- America is the largest market due to liberal legislation (Canada, some US states, Colombia, Uruguay, Chile, and Ecuador) and is expected to continue to grow at a CAGR of 23% in the near future. CBD is an important growth driver, which is influencing the legalization of cannabis products.
- EMEA is roughly one third of the Americas market. Several countries, such as Switzerland and Luxembourg, are initiating a political development regarding the regulation of cannabis, while Middle Eastern countries are expected to remain extremely strict on this issue.
- Although the market in the APAC region has grown at a CAGR of more than 20% during the last 6 years, it remains the smallest global market. The reason for the small size of the market is the strict legislation in most countries. Australia, Thailand, India and New Zealand are expected to be the most promising growth markets.



## MARKET POTENTIAL OF CANNABIS

# EUROPEAN REGULATED CANNABIS MARKET

## MEDICAL AND RECREATIONAL USE



- According to the “European Cannabis Report” by Prohibition Partners, Europe has a population more than twice that of the United States and Canada combined, it also has a high purchasing power and a high rate of cannabis use.
- Recreational consumption is expected to increase similarly to North America when legalization occurs.
- The health benefits of medical cannabis have been recognized by numerous insurance companies, and cannabis prescriptions are covered in certain markets. It is expected that meeting medical prescriptions for cannabis will become a basic requirement of European health policy.
- Legislation and policy making is expected to remain fragmented as politicians and businesses need time to find a consensus on legislation, particularly with regards to cross-border supply chains, product standards, and trade agreements.
- Large countries such as Germany and Spain lead the way with favorable legislation on cannabis use. Smaller countries that show a progressive attitude are Switzerland and Luxembourg.



## MARKET POTENTIAL OF CANNABIS

# SWISS REGULATED CANNABIS MARKET MEDICAL AND RECREATIONAL USE



- According to the report, the market potential of a fully liberalized Swiss market is estimated to be CHF 2.4 billion by 2028. The medical sector has a potential of CHF 1.2 billion. The recreational market is expected to be equally as large.
- In recent years, just over 3'000 Swiss patients have legally obtained cannabis preparations. However, this number is only a fraction of the people that use cannabis to alleviate various ailments. Acquiring an exemption permit, which so far only the FOPH can grant, is complicated and the products are expensive. Many people therefore buy cannabis illegally. The FOPH estimates that up to 111'000 patients rely on the black market.
- Patients pay up to several hundred Swiss francs a month for the use of legal medical cannabis. Health insurance companies only pay for the therapy in half of all cases. Cannabis is much cheaper on the black market, averaging CHF 10 per gram. The problem:
  - The intoxicating THC content of illegally acquired cannabis can be very high, and the substance is partially contaminated. Moreover, many innocent citizens run the risk of being criminalized and punished.
- Regarding Mrs. Markwalder's motion on cultivation, export and distribution of medical cannabis, the following can be noted: Now that the amendment to the Law on Narcotics has been approved by the National Council, the Council of States followed in the spring session.
- According to the FOPH, the amendment to the law and the corresponding ordinance are expected to come into force by mid-2022 at the earliest, unless a referendum is held against it. Neither the "Parents Without Drugs Association" nor the "SVP" are planning a protesting referendum.

MARKET POTENTIAL OF CANNABIS

# PUREGENE RESEARCH ENABLES EVERY CANNABIS AND HEMP VERTICAL



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**GENETICS**

01

**PRODUCTION**

02

**PROCESSING**

03

**RETAIL**



## 01 PRODUCTION

- Flower producers
- Hemp farmers
- Ag-tech producers
- Sustainable-ag projects

## 02 PROCESSING

- Pharma APIs
- Chemical processors
- Raw material manufacturers
- Bulk food and feed processors

## 03 RETAIL

- Pharma and phytopharma
- Retail food
- Construction and manufacturing
- Tobacco replacement
- Carbon credits

### Example:

Soy is grown extensively in South America, in unsustainable production practices that lead to deforestation and pollution. Cannabis has the potential to produce more protein per acre than soy, which means less land is needed, and less deforestation and less pollution. It also makes an excellent animal feed and substrate for novel meats.

# GENETICS WILL DOMINATE THE CANNABIS INDUSTRY

**MIGUEL MARTIN**

CEO of Aurora

*Business Insider, May 3<sup>rd</sup> 2021*

# RESEARCH & **DEVELOPMENT**

An overview of the cannabis research that we carry out every day, and continuously advance.

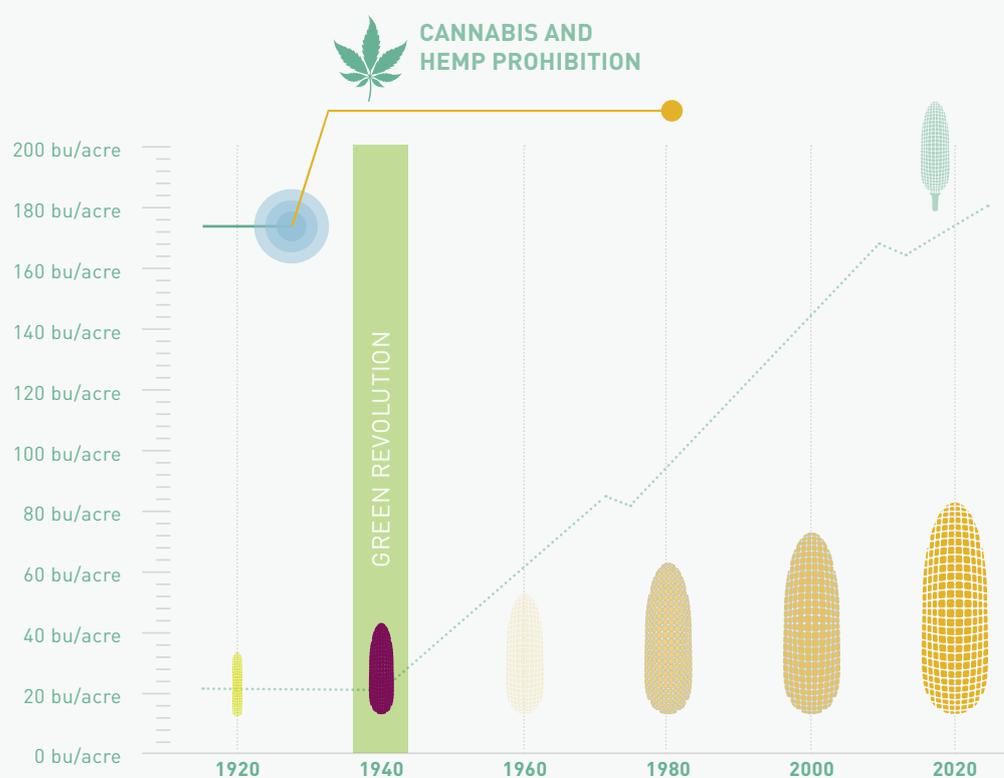


## RESEARCH &amp; DEVELOPMENT

# THE CHALLENGE IN CANNABIS BREEDING IS AT THE BEGINNING OF ITS POTENTIAL

Cannabis breeding is decades behind other crop breeding programs:

## EVOLUTION OF PLANT BREEDING



A high-quality variety is the assembly of hundreds of unique “good” traits. The precise assembly of these traits is almost impossible to achieve by chance alone. In maize, the targeted assembly of good traits into one variety started in the 1940s with the advent of hybrid breeding systems and the “Green Revolution”. Yields continued to grow into the 1980s and 2000s with the implementation of DNA based breeding and GMO technologies. Today, genomics-based breeding efforts continue to improve maize productivity to 6 times what it was less than a century ago.

Prior to the “Green Revolution” hemp was one of the most productive crops and rivaled the productivity of modern maize.

Due to prohibition cannabis and hemp have not seen over 100 years of breeding advances. The rapid implementation of these technologies will vault cannabis as the crop of the future.

## RESEARCH &amp; DEVELOPMENT

## BREEDING 1.0

## CONVENTIONAL BREEDING OF CANNABIS



- 1 Characterization of new material
- 2 Introgression of novel traits
- 3 Crosses create new genetic combinations
- 4 Offspring of each cross are grown
- 5 Plants are flowered and characterized for cannabinoids
- 6 Plants for the right production traits such as shape, yield, smell, resistance to pests and diseases are kept
- 7 The best selections are cloned for continued plot and field trials
- 8 Stabilization of phenotypes for variety trials

A high-quality variety has hundreds of unique traits. The precise assembly of these traits is a painstaking process and almost impossible to achieve by chance alone.

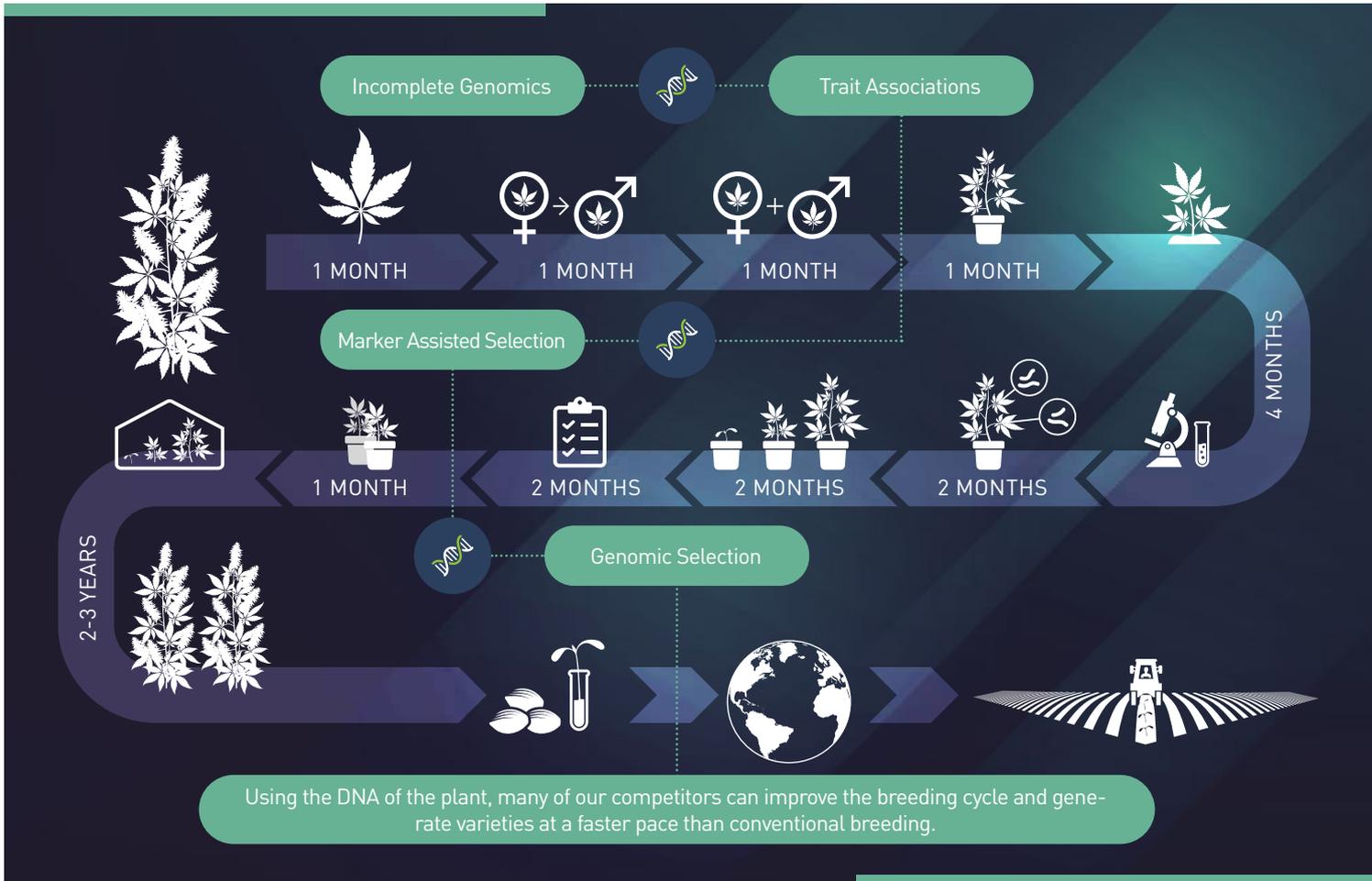
Therefore, the industry is plagued with suboptimal and unprecise varieties that suffer from poor yield or disease susceptibility due to missing their breeding targets.



## RESEARCH &amp; DEVELOPMENT

## BREEDING 2.0

## ANALOG USE OF DNA TO IMPROVE CONVENTIONAL BREEDING



There are many companies and academic institutes studying the cannabis genome to improve breeding.

Too frequently, poorly assembled genomes, rudimentary association studies, small data sets on simple traits, and basic marker assisted selection of a handful of traits are reported. It's essentially conventional breeding with some help from the DNA of the plant.

Puregene's breeding program is fully digital and is built around the incredible power of today's genomics technologies. Our pipeline uses supercomputers, big-data, and machine learning on the cannabis DNA to precisely and accurately "tailor make" new cannabis varieties.

## RESEARCH &amp; DEVELOPMENT

## BREEDING 3.0

## PUREGENE'S DATA-DRIVEN VARIETY ASSEMBLY PLATFORM

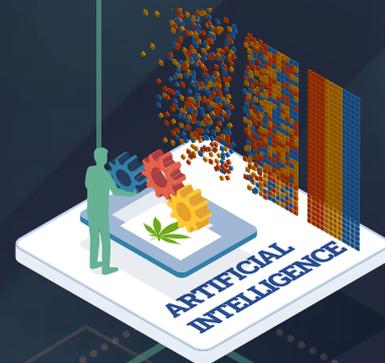
## 02 DATA CAPTURE

HIGHT-THROUGHPUT PLATFORMS  
CAPTURE MILLIONS OF DATAPOINTS



## 04 REASSEMBLY

PREDICTION ALGORITHMS COMPILE  
DESIRED CHARACTERISTICS



## 01 DIVERSITY

STRUCTURED POPULATIONS  
ENABLE DATA CAPTURE



## 03 DISASSEMBLY

INDIVIDUAL TRAITS MAPPED  
TO THE GENOME



## 05 NOVEL VARIETIES

OUTPUTS INDUSTRIALLY FIT  
AND IMPROVED VARIETIES



OUR **INNOVATION**  
IS YOUR **ADVANTAGE**



01

**DIVERSITY****More genetic diversity means more trait possibilities**

Our genetic diversity comes from legally and ethically sourced seeds from all corners of the globe and is not limited to low THC plants. Thousands of crosses made each year give endless unique combinations of traits and DNA sequences.

Puregene has sequenced the largest collection of unique plants in the industry's largest Pan-genome project and discovered over 15 million differences in the cannabis' DNA.

That's a lot of potential building-blocks for future varieties.

02

**DATA CAPTURE****High-throughput capture of millions of trait and genetic datapoints**

Traits are defined as the differences between plants. We measure every physical and chemical difference and convert each trait into numbers. Using advanced image processing and chemical analytics we generate over 120'000 images, 20'000 laboratory samples, and over 2'000'000 data points per year.

Additionally, with robotics, automation, and next-generation sequencing we precisely sequence every plant's unique genome in our massive germplasm library.

Each datapoint helps us to disassemble and reassemble the building-blocks of cannabis.

03

**DISASSEMBLY****Assigning individual traits to their genetic code**

Discovering the exact section of DNA that is responsible for each trait is our expertise. Our bio-informatics team writes dedicated AI and statistical algorithms to search our enormous datasets for the specific section of the DNA that controls each trait.

Our scientists have deconstructed over 300 simple and complex traits into 1000's of locations within cannabis' DNA.

This functional understanding of cannabis' DNA is key to tailor building our varieties.

04

**REASSEMBLY****Prediction algorithms combine every desired trait**

Similar to predicting the weather our genomic prediction specialists use new AI-based techniques to assemble new varieties. With AI we harness natural potential. We do not use genetic engineering, gene editing, or gene modification (GMO).

Only with today's super-computers can we accurately tell our breeders, which plants to cross-pollinate, test and select so they attain the exact traits desired. With Puregene's AI assembling traits into a variety is as simple as building Lego bricks.

05

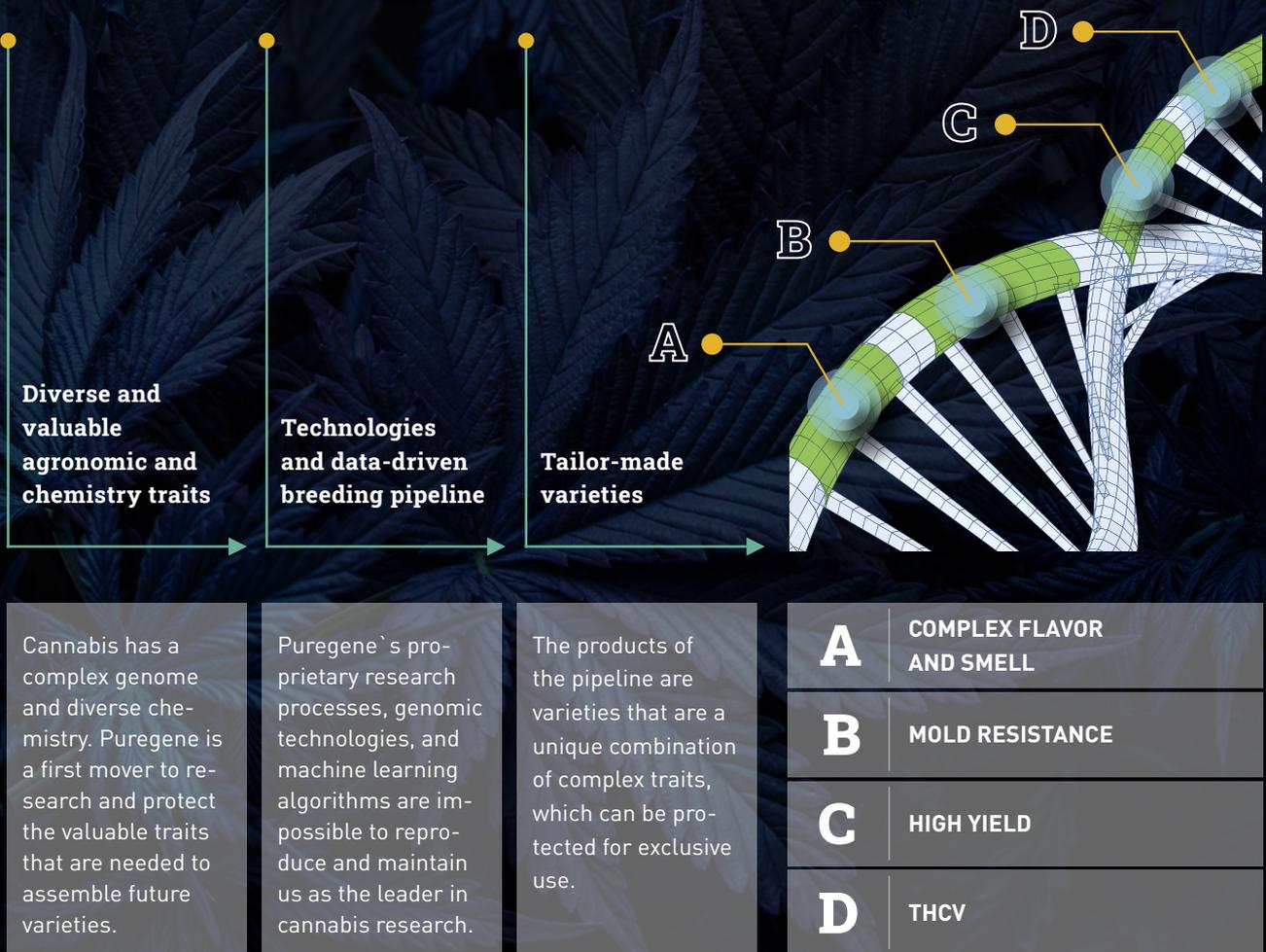
**NOVEL VARIETIES & RESEARCH****Solutions for tomorrow's challenges**

Working with our experts you can create a unique and solution driven variety to meet your production and market needs. We go the extra mile to help you maintain it, keep it disease free, and properly position in the market.

## RESEARCH &amp; DEVELOPMENT

## BENEFITS OF THE PUREGENE PLATFORM

## THE INTELLECTUAL PROPERTY ADVANTAGE



To date, the scientists of Puregene have developed a proprietary technology pipeline based on the power of genomics.

Puregene's technology and data-driven approach allows it to be the a global research leader in the cannabis industry. The pipeline uses advances in genome sequencing technology and machine learning algorithms to create "tailor made" on-demand plants without GMO technology.

Puregene is building an encompassing IP portfolio that protects its pipeline, innovations, plants, and products for the benefit of its clients.



## RESEARCH &amp; DEVELOPMENT

# DECIPHERING OF THE FIRST FULLY PHASED SUPER-PANGENOME

«Our substantial investment in improving cannabis genetics is a long-term commitment to the future of the industry. With this innovation, we are now creating the best new varieties in the world.»

**DR. MICHAEL RUCKLE PhD**

Director of Plant Science at Puregene

Puregene deciphered the first fully phased Super-Pangenome of the cannabis species. At the time it was one of the largest projects in agriculture.

It is the foundation and first milestone in the development of a next-generation of breeding programs.

Through the collaboration with the Israeli company NRGene and ETH Zurich, Puregene is now able to bring modern cannabis varieties to market quickly and in a

targeted manner - a novelty in the industry.

With the information of the location on the genome of every characteristic of the plant, Puregene can research new and better cannabinoids and breed cannabis varieties efficiently and purposefully - all this without GMO. The result is high-quality varieties that offer higher yields and better resistance to pests and diseases.

By genetically decoding the plant, Puregene can provide tailor-made cannabis varieties according to individual needs and in compliance with country specific regulations - always under the seal of Swiss quality.

## RESEARCH &amp; DEVELOPMENT

# DISASSEMBLING AND DISSECTING THE CANNABIS PLANT TRAIT DISCOVERY



In 2020, Puregene conducted the world's largest trait discovery project in cannabis.

8`000 genetically different plants were grown and analyzed, the result is the understanding of over 300 different traits and their location on the genome. This is the largest operation worldwide for cannabis and hemp breeding. The scale is required to generate big data sets needed for Puregene`s breeding 3.0 and is being repeated every year.

#### HOW IT WORKS:

Plants are assessed in the field for different qualities and characteristics. These characteristics are traits. For example, mold resistance is a trait that the breeder scores 1-5, depending on how infected it is with grey mold. Photos of the plants are taken to machine learn gray mold infection better than our breeder. DNA of these plants is then analyzed and using AI the location of the trait on the genome is discovered. Now, using AI, new plants can be bred in a targeted manner to be resistant.

**Plants in the field**

**25`000**

*20`000 on CBD field*

*5`000 on THC field*

**Different genotypes in the field**

**8`000**

**Quantifiable traits identified**

**> 300**

## 2020 ANNUAL FIELD REPORT

Here you can find the Puregene 2021 Annual Field Report with detailed information and evaluations about last year`s THC field season.





# Unprecedented scale

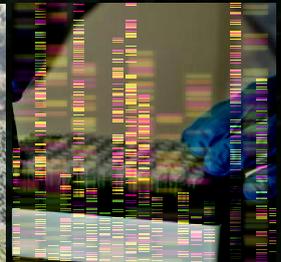
## DIVERSITY

**1'000s** of unique plants and seeds  
**75** sequenced and assembled genomes



## DATA CAPTURE

**2'000'000** trait measurements and datapoints  
**50'000'000** targeted polymorphisms sequenced



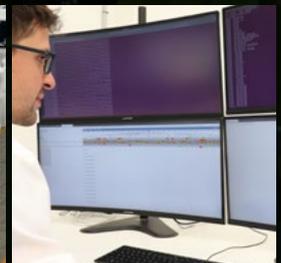
## DISASSEMBLY

**312** physical and chemical traits assessed  
**1'000** genomic loci functionalized



## REASSEMBLY

**1'000s** of unique crosses per year  
**1'000'000s** of possible combinations



## VARIETIES

**10'000** variety predictions assessed  
**200** clean-stock varieties in tissue culture



# OUR PRODUCTS

Our industry tailored products and services aimed at helping our clients succeed.



## OUR PRODUCTS

## WHAT WE OFFER

**TRAIT LICENSING**

Puregene develops and protects relevant properties for cannabis, such as pest resistance, novel cannabinoids, and higher yield. Protected traits are assembled into existing or new varieties and licensed.

**TAILORED GENETICS**

Puregene breeds tailor-made varieties from our suite of traits. These varieties are then optimally suited to the client's environment or end product needs.

**ELITE GENETICS**

Puregene predicts market dynamics and uses customer feedback and market experience to breed high-performance elite strains ready for the cannabis market.

**RESEARCH & GENETIC SERVICES**

Puregene carries out custom research to optimize your grow, test for pathogens, fingerprint your plants, and provide clean tissue-culture plantlets to keep your production on track.

All services can be deployed as individual products or in the form of a breeding and research program, that we establish in your facility tailored by Puregene's experts to make your varieties and you technology leaders in the cannabis industry.





## OUR PRODUCTS

BUILD YOUR **PLANT**

01

**CANNABINOIDS**

CBD / THC / THCV / THC-free

02

**TASTES**

Lemon / Strawberry / Spice / Skunk

03

**PEST & DISEASE RESISTANCES**

Viruses / Botrytis / Mildew / Spider mites

04

**YIELD**Faster growth / Taller / Bigger flowers /  
Bigger seeds

05

**APPEARANCE**Compact flowers / Purple flowers /  
Branching / Trichomes

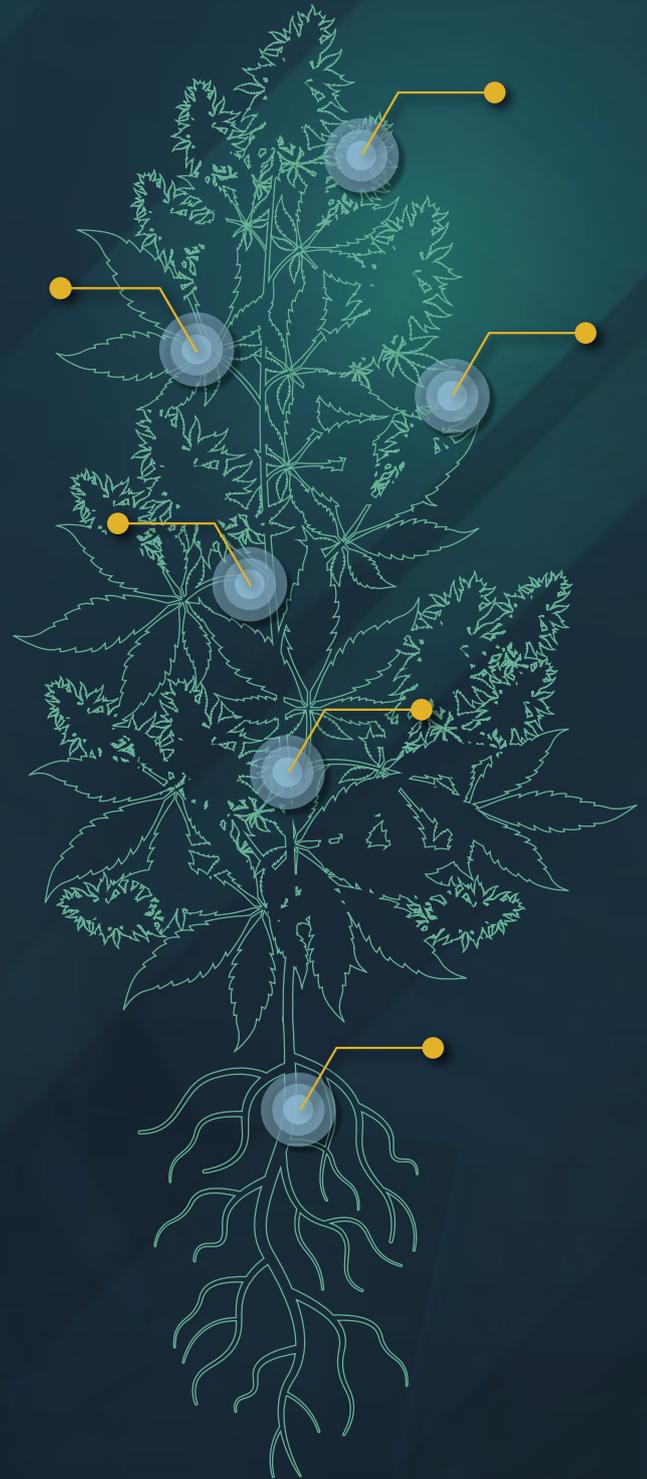
06

**FLOWERING**No Males / Autoflower / Early-flowering /  
Fast-flowering

A trait is a measurable characteristic, such as THC content. Like your own eye color, each cannabis trait is determined by its DNA.

Every cannabis plant is just a collection of thousands of these traits defined by thousands of pieces of DNA.

At Puregene we see the DNA of cannabis as the building-blocks of future varieties.



## OUR PRODUCTS

# PUREGENE HELPS YOU COMPETE IN A DYNAMIC MARKETPLACE

Cannabis breeding is nowhere near its maximal genetic potential, and meaningful improvements now require modern genomics methodologies to keep pace with the rapidly changing market demands. As the global leader, Puregene is creating novel genomic technologies and is applying these technologies to cannabis to meet market demands.

## THE CHALLENGE:



- Cannabis varieties are fashionable and come in and out of style, making variety development very demanding.
- Pharma is rigid and the demand for product consistency is not biologically possible using current production systems.
- Regulation in the THC market is only now being established and validated varieties is being mandated in many markets.
- The industry will require clean and true varieties to meet the consistency demanded by the medicinal and recreational markets.
- Producers must rapidly adapt their genetics to meet changes in the dynamic marketplace.
- Volatile product prices from producing the same variety everyone else has.

## THE SOLUTION:



- Create a research program that supports our client's production system and maximizes its potential for yield and consistency.
- Create a research program that supports the future goals for our client's brand identity and corporate vision.
- Ensure exclusive genetics that are tailored for the production system, market, and brand identity of our client.
- Expand and develop new services that help our clients meet new market challenges that can be addressed at any time.
- Fully integrated R&D into the vertical of our client that supplies all the science, innovation, and research they need.
- The fully integrated R&D program will work with our client's production, business development, policy, regulatory, marketing, legal, IP, PR, investor relations teams, to meet their needs for scientific advice, strategy, and content.

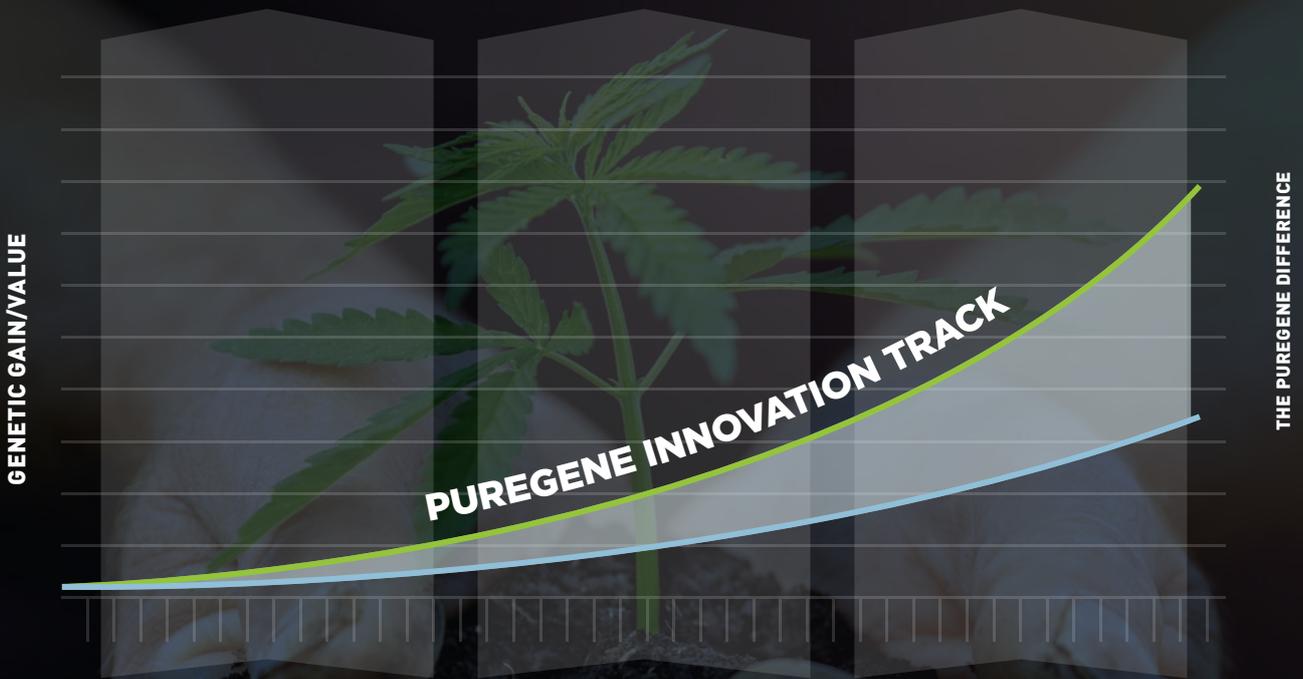


OUR PRODUCTS

# SETTING YOU ON THE INNOVATION TRACK EXCLUSIVE TAILORED VARIETIES WITH CONTINUOUS IMPROVEMENT

Breeding is a continuous process of improvement. In order to become a beacon for the industry in a competitive and changing market, it is essential to take the lead with continuous innovation.

## EXCLUSIVE TAILORED VARIETIES - CONTINUOUS IMPROVEMENT



### PRODUCTION

- Disease Free
- Higher Yields
- Lower Inputs
- Consistent Yields



### PROCESSING

- Valuable Extracts (THCV)
- Content Optimization
- Easier Harvest



### PRODUCT

- Dynamic Consumer Traits
- Pharmaceutical Properties
- Unique / Exclusive
- Higher Value

- Exclusive and tailored varieties create value for agricultural production, industrial processing and consumer products.
- All of these areas fundamentally rely on plant traits, which can be addressed with appropriate breeding programs.
- In comparison to the limitations of classical selection, Puregene's breeding platform combines large-data, high-throughput and AI, making it the most advanced breeding program in the world.
- Ultimately, Puregene only succeeds if our client succeeds, therefore every client is viewed internally as a strategic partnership.

OUR PRODUCTS

# PUREGENE'S PROTECTION FOR OUR CLIENTS





### WHY WE PROTECT OUR TRAITS:

Have you ever had an amazing idea, that you have poured your money, time, and life into, only to have it stolen, copied, and sold at a fraction of your investment? We hear this story every day from our clients and that is why we have invested so extensively into legal protection of our traits and varieties.

- Patents are designed to protect great ideas for the inventor.
- We use global patent laws to protect the traits that we discover at the DNA level.
- These traits are used to assemble every tailored variety.
- Patent infringement can be easily detected using our in-house DNA-based technology.

These patents protect the use, breeding with, and even end products produced with our clients' exclusive varieties.

### WHY WE PROTECT YOUR PLANTS:

Our clients come with the vision of being able to design an exclusive variety for their brand, but without proper protection there is little defense against unlicensed production.

- We protect the cannabis plant to promote innovation in the industry
- We facilitate the invention of new varieties by our clients, and our patents protect their amazing ideas
- We DNA fingerprint every plant we tailor for our clients and submit them with global plant protection authorities.
- Therefore if our client's feel their plant was stolen we can prove it at the DNA level, and seek damages.
- Knowing that your plants are protected secures your investment and creates barriers to entry for your competition.



# OUR TEAM

Introducing the amazing people responsible  
for Puregene's growth and success.



## OUR TEAM

# PUREGENE'S FUTURE WITH PROF. DR. BRUNO STUDER

Prof. Dr. Bruno Studer originally seeded the idea that paved the way for Puregene.

As a member of the Advisory Board, Prof. Dr. Bruno Studer was always in close contact with the company. When Stevens met with him in autumn 2020 to share the latest developments within the company, he was stunned. Even as a professor at the ETH and a long-time expert in molecular plant breeding, he was surprised by the development and expertise of Puregene. The Super-Pangenome, several THC permits, researchers, the Pure Campus in Zeiningen, the scale, breadth, and quality of experiments, as well as the rapid growth of the company are just a few examples.

During a conversation with Stevens, Prof. Dr. Bruno Studer pointed out that Puregene's technology is the only way to achieve the vision of tailor-made crops. It is likely to be even more powerful than the highly controversial CRISPR technology.

Puregene therefore has a great opportunity to exploit this technology. Because it can be applied to many other crops that have the same breeding challenges as cannabis, this technology will solve an array of problems existing in plant breeding.

*«I am extremely proud that a luminary of modern plant breeding, Prof. Dr. Bruno Studer, has not only accompanied us on our way, but will also be working in the company in the future.»*

**DR. PHILIPP RÖSLER**

Member of the Board Pure Holding AG  
Former Vice Chancellor of Germany



Professor and Head of Molecular Plant Breeding at ETH Zurich, was responsible for the research cooperation between Puregene and the ETH Zurich and will now join our research team.

**Research areas:**

- Plant breeding
- Molecular breeding
- Genetics and genomics
- Genome-wide association studies

## OUR TEAM

PUREGENE EXECUTIVE TEAM  
OVERVIEW**DR. PHILIPP RÖSLER**

Member of the Board Pure Holding AG  
Former Vice Chancellor of Germany

Cannabis is emerging from its history as contraband and a forlorn commodity to worldwide acceptance in medicine and a utility for a myriad industry.

Pure Holding AG is leading the way and sets the standards for an innovative and professional Swiss cannabis industry.

Puregene's world-leading molecular cannabis breeding pipeline enables us to breed tailor-made cannabis strains and thus make the full medicinal potential of the plant available. In 2020, Pure received several exemption-permits from the Swiss Federal Office of Public Health for the cultivation and research of THC-containing material.

This positions Pure at the forefront of research to drive transformative innovation in cannabis.



## PROFESSIONAL STAFF



### STEVENS SENN

Chief Executive Officer of Puregene AG  
Co-Founder of Puregene AG

- Before joining Puregene, Stevens Senn had already started two successful companies (Grunhaus AG and my3Dworld GmbH).
- As the CEO, he is responsible for the overall strategy and management oversight, as well as maintaining relationships with major stakeholders and clients.



### DR. GAVIN GEORGE

Director of Research & Intellectual Property  
Co-Founder of Puregene AG

- Dr. Gavin George was awarded a PhD in Plant Biotechnology in 2010 from the Institute for Plant Biotechnology at the University of Stellenbosch.
- Dr. George subsequently worked for 7 years at the ETH Zurich as a Postdoctoral Researcher where he investigated the molecular basis driving plant growth.



### DR. MICHAEL RUCKLE

Director of Plant Science  
Co-Founder of Puregene AG

- Before joining Puregene, Dr. Ruckle was a lead Postdoctoral Scientist in Molecular Plant Breeding at ETH Zurich.
- Dr. Ruckle received his Doctoral degree from Michigan State University in Plant Biochemistry and Molecular Biology.



### DR. DANIEL CARRERA

Head of Genomics Research

- Before joining Puregene, he conducted research at ETH Zurich, where he completed his PhD in Plant Biochemistry and is an expert in plant metabolism.
- Following his doctoral studies he worked at the Global Crop Protection division of BASF, Germany.



### MAXIMILIAN VOGT (PhD)

Head of Plant Breeding

- Before joining Puregene, Maximilian Vogt was a PhD student at the ETH Zurich in Molecular Plant Breeding and is an expert in hybrid breeding systems.
- In cooperation with Deutsche Saatveredelung and Norddeutsche Pflanzenzucht, Max advanced the field of the hybrid breeding system in perennial ryegrass.

# THE PURE HOLDING

Vertically integrated into Pure Holding AG,  
an overview of its six subsidiaries.

pure  
campus

## THE PURE HOLDING

## COMPANY SNAPSHOT

## Our story

As a plant, cannabis has undergone a rapid change in Switzerland from an intoxicant to a medicinal plant for medical purposes. In 2011 the narcotics law was amended and cannabis containing up to 1% THC was allowed to be legally cultivated. This also did not remain hidden from the founders of Pure Holding AG, which is why they converted a former garden center into a „hemp experience farm“ with Pure Production AG in December 2016. Here cannabis was produced indoors, outdoors and in greenhouses and at the same time the general population was given access to this long-forbidden plant.

To expand indoor production capacity, DEOM Production AG, was founded a short time later. This was followed by a real boom on the tobacco substitute market, whereby Pure Holding AG took over the role of market leader and became one of the largest cannabis producers in Europe. Even then it was clear to Pure Holding AG that in the rapidly changing and growing cannabis market, new genetics had to be integrated into the production process. For this reason, Puregene AG was founded in 2018 and for over a year, basic research on cannabis genetics and cannabis production overlapped at the „HanfHof“. The increasing demand from other European countries has opened up new market potential for us. For this reason, Pure Europe Sarl and Pure Europe GmbH were founded to ensure that our products can be distributed throughout Europe.

Pure Pharma AG is the youngest member of the constantly growing Pure Holding AG. Its goal is to give as many patients as possible access to the highly effective cannabis plant and its medical potential.

## Key facts

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<b>Founded</b>	2016
<b>Location</b>	Pure Campus, Zeiningen, CH
<b>Employees</b>	85
<b>Website</b>	<a href="http://www.pureholding.ch">www.pureholding.ch</a>
<b>Subsidiaries</b>	<b>Puregene AG, CH</b> <b>Pure Production AG, CH</b> <b>Pure Pharma AG, CH</b> <b>Pure Europe GmbH, GER</b> <b>Pure Europe Sarl, LUX</b> <b>DEOM Production AG, CH</b>
<b>Network</b>	CH Strategic partners LUX Distribution GER Distribution SLO Distribution hub USA Propagation partner IL Strategic partners ZA Strategic & propagation partners

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## THE PURE HOLDING

# COMPANY HISTORY AND KEY MILESTONES

## 2016

- Stevens Senn registers the first CBD flowers as tobacco substitutes with the FOPH and founded Pure Production AG.

## 2017

- Opening of the "Hanf-Erlebnishof" in Zeiningen, Switzerland's first cannabis competence center, with over 100 information signs on the cannabis plant and several thousands of visitors annually.
- Entry of Pure Production AG into the retail market. Distribution of the strong tobacco substitute product brands through renowned retail partners (>4'000 POS).

## 2018

- Registration of Pure Holding AG to simplify the corporate structure.
- Registration of Puregene AG.
- Puregene AG service agreement with NRGene.
- Registration of Pure Europe GmbH.
- Registration of Pure Europe Sarl.

## ENGAGEMENT AND QUALITY STANDARDS

As a company that puts product and service quality above all else, Pure achieved SCC certification in October 2020 and ISO 9001:2015 certification in February 2021. In addition, outdoor cultivation will be GACP certified in 2021 and GMP standards will be implemented in the indoor production by the end of 2021. These standards demonstrate the company's ability to consistently deliver products and services that meet customer and regulatory requirements.





## 2019

- Scale-up of production capacities i.e., extension of collaboration with the local farmer network. Cultivation of several hundreds of thousands of plants resulting in several tons of CBD flower and biomass.
- Exemption permit in South Africa for Puregene AG's research on THC germplasm in collaboration with Stellenbosch University.
- Deciphering of the first fully phased Super-Pangenome for cannabis, one of the largest genome projects in agriculture, by Puregene AG.

## 2020

- Former German Vice-Chancellor, Dr. Philipp Rösler, joins the Board of Directors.
- The Group received four THC exemption permits on behalf of the FOPH and Swissmedic for research, cultivation, analysis and import of THC-seeds into Switzerland.
- Opening of the research site in Zeiningen „Pure Campus“, the world's leading research facility for molecular cannabis breeding.
- Pure performed the world's largest trait discovery field trial on cannabis, which encompassed the complete diversity of the species and the largest legal THC rich experiment of its kind.

## 2021

- Dr. iur Beat Walti, national councilor and chairman of the FDP parliamentary group, joins the advisory board.
- Capitalization of CHF 10m with a company valuation of CHF 100m.
- Prof. Dr. Bruno Studer, Head of Molecular Plant Breeding at ETH Zurich, is joining Puregene.
- Puregene's field data is extremely successful and the genetic understanding of over 300 valuable cannabis traits could be realized.



