JANUARY 26, 2022

CIRCULAR

THE CIRCULAR ECONOMY • MATERIALS • ENERGY • FOOD • HEALTH • THE DEATH OF WASTE

GENOMATICA, COVESTRO BREAK THROUGH IN THE RACE TO BIO-NYLON

A VILLAGE MADE OF CACAO IN ECUADOR
VALENTINO STEPS INTO RENEWABLE SNEAKERS
MAYBELLINE TO BOOST BIOBASED CONTENT
PLANT-BASED HAIR EXTENSIONS
THE BURGER BUN COUCH
ORGANIC AMMONIA FROM SUNLIGHT, WATER & THIN AIR

JANUARY 26 2022

CIRCULAR

Iowa is at the forefront of sustainability, discovering and implementing innovative clean energy practices across the state's key industries. Growth in renewable energy is a statewide priority, equally shared by Iowa's research institutions, government agencies, utility companies, clean energy advocates and industry partners. Thanks to an abundance of renewable energy sources, businesses operating in Iowa can do so while minimizing their carbon footprint – a competitive advantage that few states can offer. Discover more at IowaEDA.com.

IOWA
economic development

CIRCULAR BREAKTHROUGHS OF THE WEEK

By Rebecca Coons

1

The same scientist behind the popular Sonali jute bag has created biodegradable personal protective equipment using jute and chitosan, a material found in crustacean cells. Mubarak Ahmad Khan, scientific adviser to Bangladesh Jute Mills Corporation, developed the material to help address the massive amount of PPE being produced and discarded amid the COVID-19 pandemic. Mubarek invented jute polymer and the Sonali bag in 2015 as an alternative to plastic bags in the populous country. The material biodegrades in water within seven days. "We are going to test this new concept at Shishu Hospital shortly," he adds.

2

Two entrepreneurs hope to bring lab-grown oyster meat to raw bars and leave real oysters doing what they do best: filtering waterways so other species can thrive. Dubbed Pearlita, Nikita Michelsen and Joey Peters say the startup is the first cultivated meat company to target the slurpable bivalve. “Instead of harvesting and killing oysters from the sea we grow them, using cellular agriculture. Just as animals would, we are creating a mixture of nutrients to raise cells in a controlled environment free of disease or chemical contamination,” Peters, who is a marine biologist, says in a press statement.

3

A startup with six-figure funding support from the Industrial Biotechnology Innovation Centre is developing a surfactant from fish farming byproducts. Fish oils account for about a quarter of aquaculture’s total by-product output. Such oils are rich in fatty acids and can be converted into biofuels, but Eco Clean believes biosurfactants for use in detergents and cleaning products represent a higher-value opportunity. The startup, named Eco Clean, has partnered with experts from the University of St Andrews to advance the process.

ABLC2022

THE CAPITAL OF NET ZERO

March 16-18, 2022 • Mayflower Hotel • Washington DC

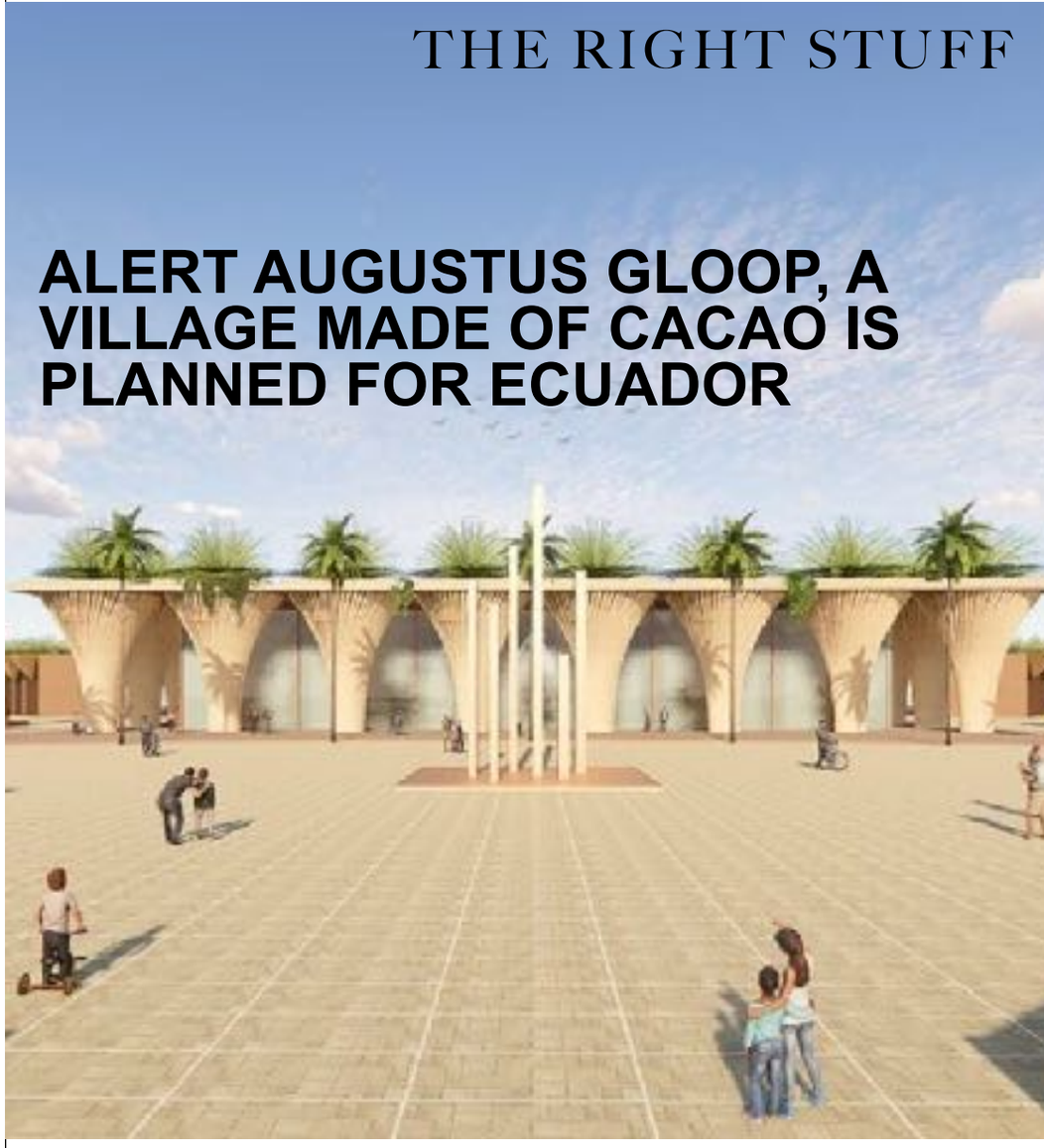
biofuelsdigest.com/ablc

VALENTINO STEPS INTO RENEWABLE SNEAKER MARKET

Luxury brand Valentino has introduced two sneakers designs made from recycled and renewable materials. Featuring uppers and sides made of viscose and polyurethane produced using corn-based polyols, the sustainable sneaks are available in the brand's Open and Rockstud Untitled styles. The sneakers also include recycled polyester laces and rubber soles.

A lifecycle assessment indicated the sneakers have a lower environmental footprint than footwear produced using fossil-based materials. Combining luxury with sustainability will set you back, however. The Open sneaker retails for $690, while the Rockstud Untitled is priced at $850. The company is also using recycled cotton and paper from sustainably-managed forests in the packaging, and vowed last year to stop using fur.

ALERT AUGUSTUS GLOOP, A VILLAGE MADE OF CACAO IS PLANNED FOR ECUADOR



In Ecuador, an entire village has been planned using renewable construction materials, including 3-D-printed cacao waste.
Complete with an education and research center and chocolate factory, Cacao Eco Village was conceived by Sydney-based architecture studio Valentino Gareri Atelier at the behest of chocolate manufacturer MUZE Cacao. The village is planned for the seaside town of Pedernales.

"We have pushed the circular economy core principles so much that they informed the design philosophy of the entire project," Valentino Gareri, founder of Valentino Gareri Atelier, tells 3D Natives. "The cacao waste, result of the chocolate production process, will be re-utilized for 3D-printing parts of the village. Waste is not only turned into a resource, but into architecture."

The shells of cacao beans, which comprise 80% of cocoa waste, will be used to make a bioplastic for 3D printing. Other local materials, such as wood and bamboo, are also envisioned in the design.
Valentino Gareri Atelier expects the site to become the "Silicon Valley" for circular economy innovators and a "destination and co-living space for change-makers to connect, co-create, get inspired, and ignite social impact."

MAYBELLINE TO BOOST BIOBASED CONTENT

The company's new sustainability program, Conscious Together, aims to create a more responsible business model for the brand by transforming its processes, innovations, and mindset to reduce its impact on the planet.

In New York, mainstay cosmetics brand Maybelline has vowed to make 95% of its formulas either biobased or derived from minerals or circular sources by 2030.

Maybelline's Green Edition make-up line is already a minimum of 70% natural-origin ingredients.

Other 2030 goals include using only 100% recycled plastic in its packaging and reducing carbon emissions for its full product lifecycle in half.

"All of us at Maybelline want to make progress and inspire the industry to make progress," Trisha Ayyagari, Global Brand President, Maybelline New York, says in a press statement. "We looked at the key areas where Maybelline could make a positive environmental impact and set ambitious goals that will guide our actions until 2030. We recognize that there is still so much to do, and we are committed to concrete actions that will help us accelerate our sustainable transformation."

LOAFA, THE COUCH FROM BURGER AND HOT DOG BUNS

Subversive artist Gab Bois has crafted a couch from burger and hot dog buns meant to resemble the vaguely loaf-like Camaleonda sofa popularized in the early 1970s by designer Mario Bellini.
Bois's work, dubbed Loafa, went viral after being shared by Estonian rapper Tommy Cash, who claimed IKEA had agreed to produce the couch if the Instagram post got 10,000 comments.

Loafa was part of a larger series of works in which Bois crafted food into everyday objects. She used brioche hamburger for cushions and hot dog buns for edges, all held together by toothpicks. "It ended up being a literal representation of comfort food," she adds.

Plant-based hair extension company Rebundle has raised $1.4 million to increase production, but will continue to prioritize the environmental justice and equality principles it was founded to address. Rebundle was established in 2019 to offer an alternative to the synthetic hair extensions commonly used in African American braiding. Not only are these extensions not biodegradable, they also often contain scalp-irritating chemicals. Rebundle's extensions are made of banana fiber without irritants and are biodegradable.

The company is also active in environmental justice and health campaigns. Rebundle accepts used synthetic hair extensions, which are shredded and incorporated into things like outdoor furniture and garden tools. The company estimates 30 million pounds of petroleum-based hair extensions are thrown out annually in the United States. It also launched pink hair extensions to raise awareness of the disproportionate impact of breast cancer on black women, noting that personal care and beauty products formulated or marketed for black women are more likely to contain carcinogens.

PLANT-BASED HAIR EXTENSIONS ATTRACT INVESTMENT, SUPPORT ENVIRONMENTAL JUSTICE

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Best Places to Work in the advanced bioeconomy 2020

1

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#3 BioDesign & Engineering Organizations

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50 Hottest Companies in the Bioeconomy 2021

TheDailyDigest

Led by a Visionary leader

Dr. Pramod Chaudhari

widely acclaimed as Ethanol Man in Industry circles

George Washington Carver Award 2020 was presented to **Dr. Pramod Chaudhari** during the **BIO IMPACT Digital Ag & Environment Conference** on September 22, 2020.

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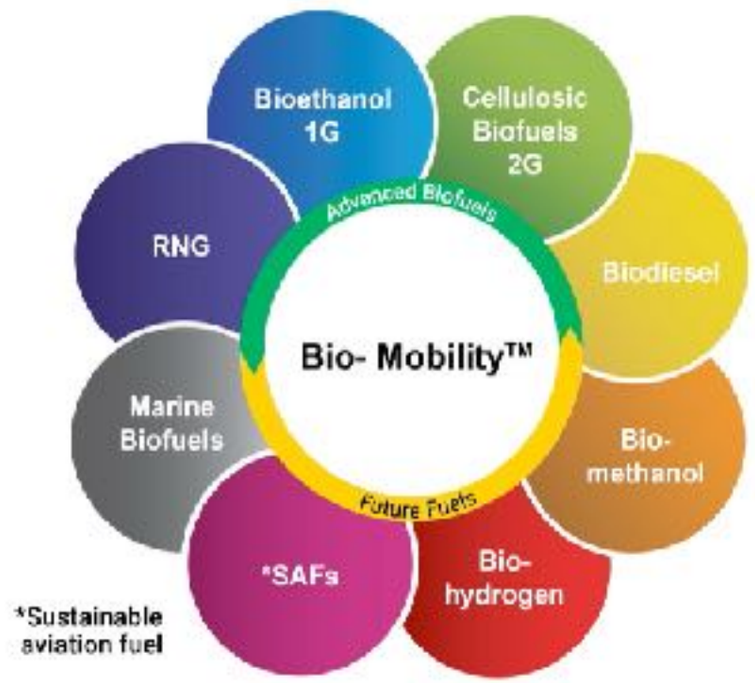
Platform of Technologies

Renewable transportation fuels



*Sustainable aviation fuel

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Bio-Mobility™ platform envisages utilization of Agri residues and organic waste to produce low carbon transportation fuels across all modes of mobility i.e. Surface, Air and Marine.

Portfolio of technologies

Renewable chemicals & Materials (RCM)

Bio-Prism

Nature Reimagined · Promise of Sustainability

RCM- made from carbohydrates feedstock	RCM- green & sustainable alternatives for commodity products made from hydrocarbon	RCM help reduce GHG emissions and conserve environment

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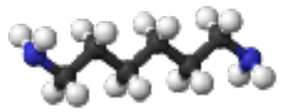
COVESTRO, GENOMATICA BREAK THROUGH ON HMD AND WHY IT'S A VERY BIG DEAL

More sustainable automotive coatings, nylon-6,6 and specialty nylons, here we come.

Today, let's chat about HMD, but not the head-mounted displays known by many as virtual reality goggles. Today, let's look at the molecule, hexamethylenedia mine, also known around the bunsen burner as HMD. In this case, bio-HMD, and Covestro and Genomatica have revealed that they now have commercial process technology, and are scaling it up.

What do we use it for? Well, the afore-mentioned coatings — automotive, construction, furniture, textiles and fibers. Adhesives, too. But really, think nylon 6,6. Which is more important to daily life than Phillips 66, or Route 66.



The nylon market

HMDA has a worldwide market of 2 million tons per year. Case in point: HMDA is a key ingredient in the $6.4B market for nylon-6,6. Each year, the automotive market uses 500,000 tons of polyurethane coating based on HMDA.

How much would manufacturers shift from fossil to bio, at the right price? More or less, all of it, did we mention ‘at the right price’? And may I add, ‘at the right price’?

It’s a big deal, nobody had this

Strategic Avalanche president James Iademarco, one of the ABLC Due Diligence Wolfpack, was, bullish, even wolfish. “Impressive. In my opinion, HMD always was the more strategic molecule in the Nylon 66 polymer and the CAPEX was always so large. Great to see headway in the space,” he remarked.

TODAY IT'S POSSIBLE

GREEN CIRCULAR DISTRICT

THE NEXTCHEM MODEL FOR RECYCLING AND DECARBONIZATION

Maire Tecnimont

NextChem

Decarbonize by recycling: today it's possible thanks to the **Green Circular District**, developed by NextChem, the Maire Tecnimont's company for energy transition.

The **Green Circular District** allows to **produce recycled polymers, chemical products, hydrogen** and **low carbon fuels**, through plastic recycling and recovering of non-recyclable waste.

The **model** is based on the integration of green chemistry technologies, as **Upcycling**, **chemical recycling** and the production of circular hydrogen and green hydrogen via **electrolysis**.

The **Green Circular District** brings benefits to the environment, economy and society, through decarbonization, recycling and recovery, production, employment and local economic development.

Officially, both partners are already processing and testing material from their initial production campaigns, and the resulting bio-HMDA is of high purity and quality, quantities not specifically disclosed except an ambition to produce ton quantities of high-quality material over the course of multiple production campaigns. We've pinky-sworn on specific campaign volumes, but if you're thinking this is a 66 kilo production run, you're way under.

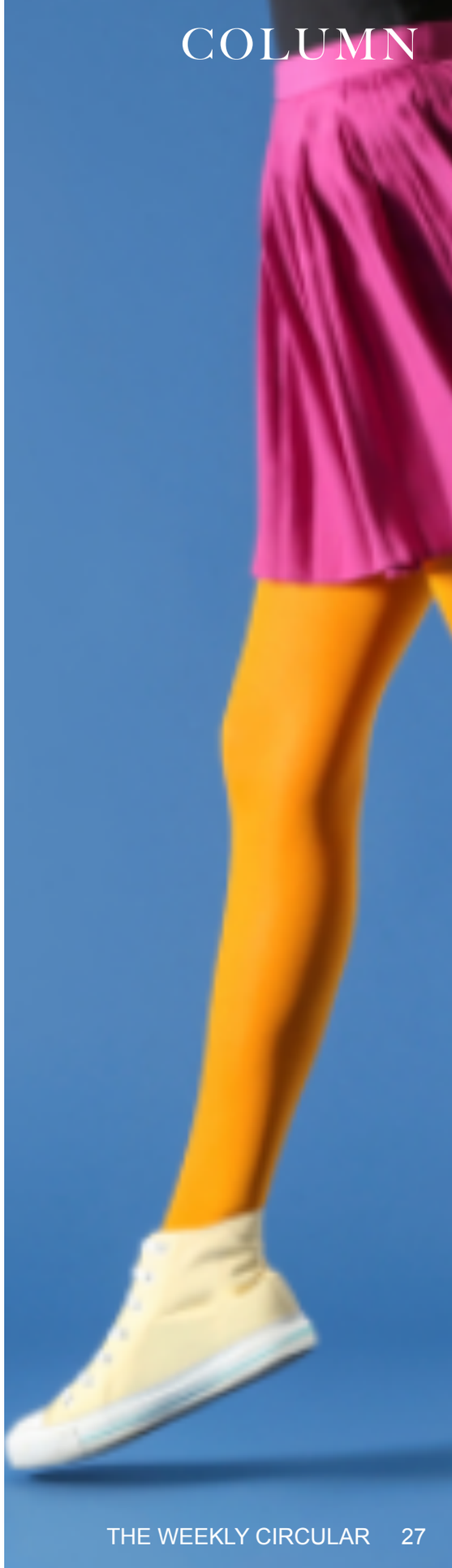
Next steps

Westward Ho! to scale, of course. How soon, when, where, and for how much? We're still asking. To0 that end, however, we can relate that Covestro has secured an option from Genomatica to license the resulting integrated GENO HMD process technology for commercial production.

The Genomatica backstory

More on Genomatica magic here. and here.

The fame of the company stems from its advances in producing BDO — renewable plastics, spandex and cosmetics, that's Genoland. Plus, there's been noise around butylene glycol and butadiene over the years, but nylon 66, that's a bigger and better opportunity.



In short, clap hands for Simpheny, a computer modeling platform "designed to make predictions of cellular metabolism and behavior thus speeding research and development for the development of biotechnology products". It's sort of the 'Matica' engine inside Genomatica.

Fellow Wolfpacker Steve Slome of Nexant said that this also further validates Genomatica's commercialization engine, which as I have told Steve MANY times, even if they [exited] BDO (which they won't), they would still be relevant because of their modeling engine. Bravo, another win for Simpheny!

The Covestro backstory

With sales of EUR 10.7 billion in 2020, Covestro is among the world's largest polymer companies. Business activities are focused on the manufacture of high-tech polymer materials and the development of innovative, sustainable solutions for products used in many areas of everyday life.

Main customers are the automotive and transport industries, the construction industry, the furniture and wood processing industries, and the electrical, electronics, and household appliance industries. Other sectors include sports and leisure, cosmetics, healthcare and the chemical industry itself. And they tout that "Covestro is becoming fully circular" — nothing we like to hear more at CIRCULAR.

Reaction from the stakeholders

The principals are pleased and delighted.

“The increased use of alternative raw materials, including the utilization of biotechnology, is an important pillar of our approach to fully embrace the circular economy and help make it a global guiding principle,” says Covestro CEO Dr. Markus Steilemann. “Our program with Genomatica, which complements our internal R&D, is one of our largest external funding of biotechnology R&D to date, and underscores both the field’s importance to Covestro and the results it can deliver.”

“This program is of great importance to us, because markets are increasingly asking for more environmentally friendly products based on renewable raw materials, which are just as powerful as their fossil-based alternatives,” says Dr. Thorsten Dreier, global head of the Covestro business entity Coatings & Adhesives. “We can reduce this dependence on fossil feedstocks with innovative technology and our partnership. With a purely plant-based HMDA, we can significantly advance our corporate objective of CO2-neutral production.”

“Genomatica is committed to delivering a portfolio of sustainable materials that can help any brand reduce the carbon footprint of its products while maintaining the performance customers count on,” said Christophe Schilling, Genomatica CEO. “Covestro is a valued partner that is leading the way in improving the environmental impact of many of today’s most prevalent materials. Together, we are taking an important step to reduce greenhouse gas emissions for a broad range of products we use in daily life.”

The Bottom Line

Oh, my. People keep trying to knock u[a bio-based Nylon 66, the market is so big, so visible, companies just can't hep themselves. For sure, this is the most credible progress we've seen to date, given HMD's strategic role. We're absent two things, more on that ton-scale ambition, and a confirmation that this is going to be produced at a feasible price. When those are received, it'll be nothing but blue skies for bio-HMD. Right now, clouds are clearing, and perhaps here comes the sun.

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fertilizer technology

"We've created an impactful solution for one of humanity's greatest sustainability challenges"

European Commission

SEAL OF EXCELLENCE

Funded by EU

Novel technology for production of organic ammonia based on atmospheric nitrogen fixation

The EU Horizon program: *"Disrupting a multi Billion € industry"*

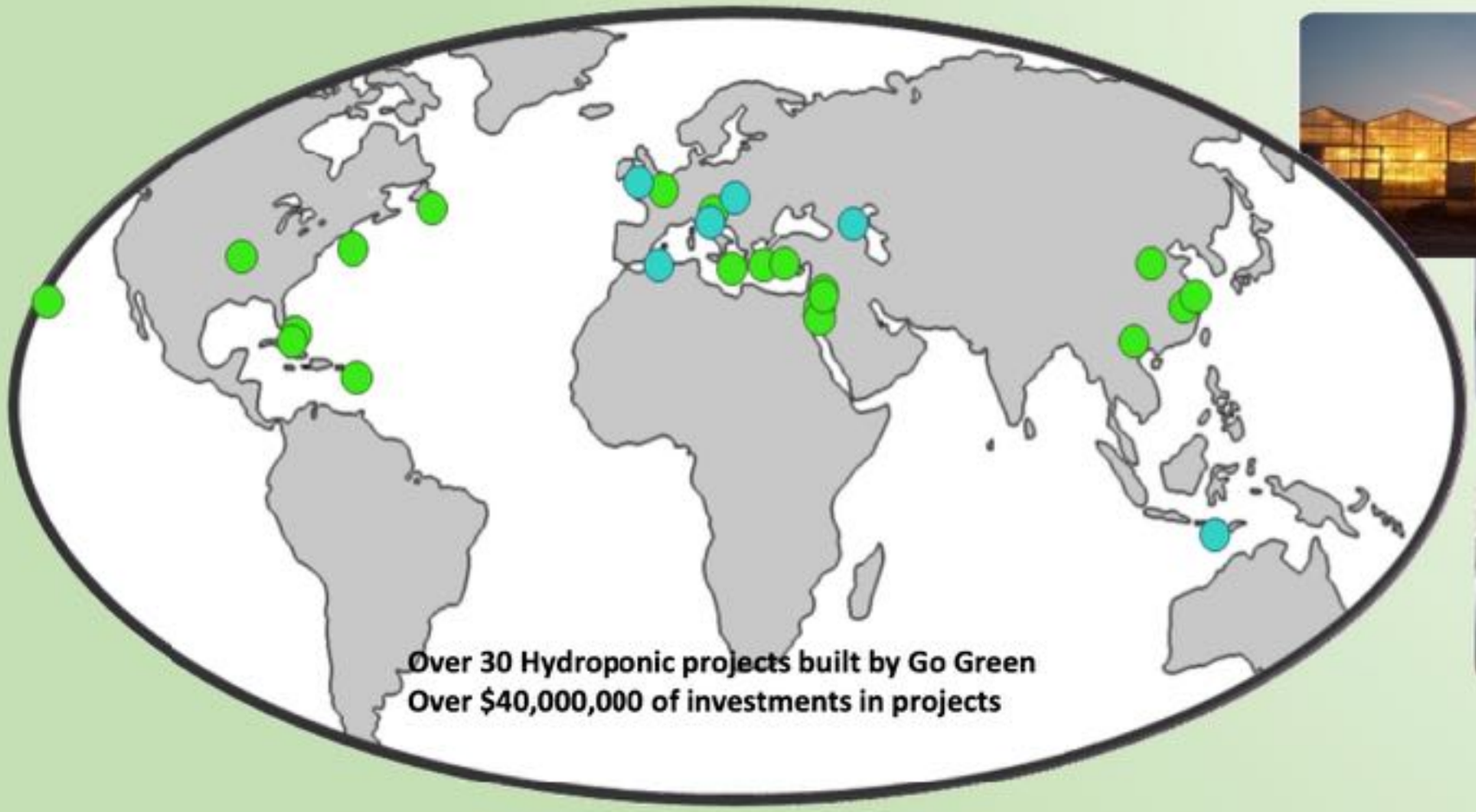
INTRO VCLIP 30 sec

INTRO VCLIP 3 min

Please play video

A spinoff from GOGREEN FoodTech
And GrowPonics – A Leading Hydroponic Greenhouse Builder and Operator

GrowPonics - Global Experts in Hydroponic Technologies



cyamonia bio
Fertilizer technology






All the farms that use fertigation (Hydroponics, drip irrigation, sprinklers…) <u>cannot use organic fertilizer</u>, our farms and thousands more.
They have to use *chemical fertilizer* composed of *synthetic ammonia*.

"As leaders in our industry and out of responsibility to the environment, we wanted to go green, and use organic fertilizers instead of chemicals"

Organic Fertilizers - Industry Pains :

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- ***Unapplicable in fertigation systems - not dissolvable in water***
- ***Insufficient nitrogen quantity***
- Pathogen threat – animal manure or sewage water
- Hormone residue threat
- Antibiotic residues
- High sodium content
- ***Expensive*** - application and logistics

Non-Organic Fertilizers - Industry Pains :

- Are based on ***synthetic ammonia*** for nitrogen supply
- Produced by the Haber Bosch process– 1.5 billion tons of CO_2 emission

Note: Fertilizers are needed to feed the world.
Nitrogen (ammonia) is the no. 1 ingredient in fertilizer
and is the only mineral that is difficult to obtain from organic sources

All non-organic fertilizer production is based on the Haber Bosch process for the production of nitrogen. (It is called atmospheric nitrogen fixation).

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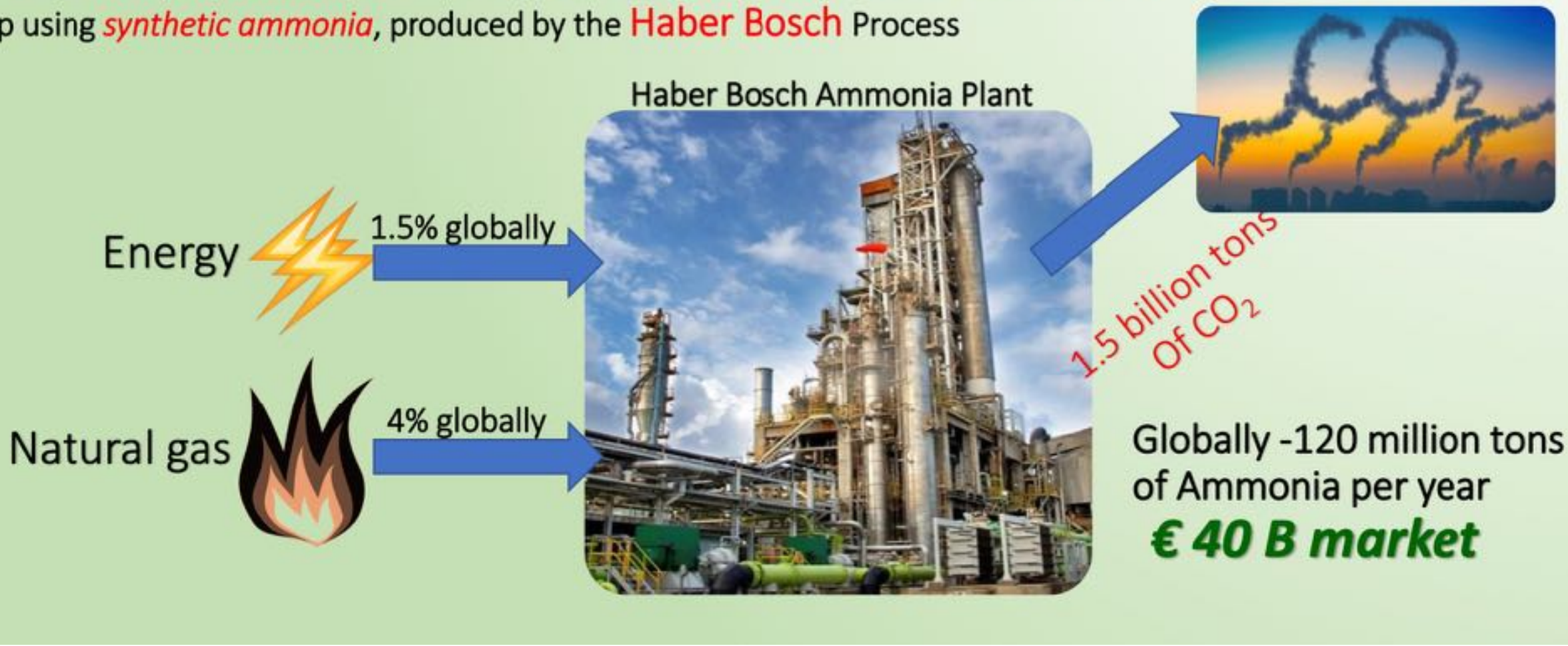
Our Goal: *Replace Chemical Fertilizer Production.*

Stop using *synthetic ammonia*, produced by the Haber Bosch Process



The Need - Market Study:

Federal Ministry of Food and Agriculture

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Fertilizer technology

The German Government Strategy for the Future of Organic Farming

"20 percent organic farming in Germany by 2030" is the Federal Government's target, as set out in the Sustainable Development Strategy, because organic farming is a particularly resource-efficient, environmentally sound and sustainable form of agriculture.

- In 2020, the organic market in Germany grew by **22%** to **€14.99 billion**[1].
- About 20% of the organic produce is imported.
- Every day, on average five farms convert to organic - roughly **500 football fields**[2].

2018 — **8.2% farmland**[2]

2019 — **9.7% farmland**[1]

2030 — **20% farmland**

1. https://www.bmel.de/EN/topics/farming/organic-farming/strategy-future-organic-farming.html
2. https://www.deutschland.de/en/topic/environment/how-germany-is-promoting-organic-farming


European Commission
Meeting EU Green Deal Objectives
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The European Green Deal will improve the well-being and health of citizens and future generations.
Cleaner air, water and soil
Zero CO_2 emissions
Cleaner energy
Clean sun energy
Renovated homes, schools and hospitals
Reusable or recyclable packaging, less waste
In line fertilizer production
No packing materials
Better public transport alternatives
Local production
Healthier food
Pathogen free
More charging points for e-cars
High quality fruits and vegetables
Less pesticides and fertilisers
High yield organic farming
Better health for current and future generations
More environmentally-friendly products in our shops
Sustainable approach
This is a EU Commission Slide

Solution – Nitrogen From the Air

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Use of natural nitrogen fixing bacteria called ***Cyanobacteria***
to create organic fertilizer from air, water, and sun.

- A Totally safe natural bacteria that can be found in fresh water bodies

Photobioreactor:

Cyanobacteria

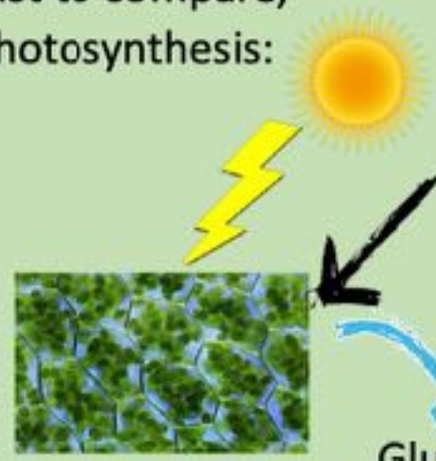
The new fertilizer will improve crops yields and quality

Process

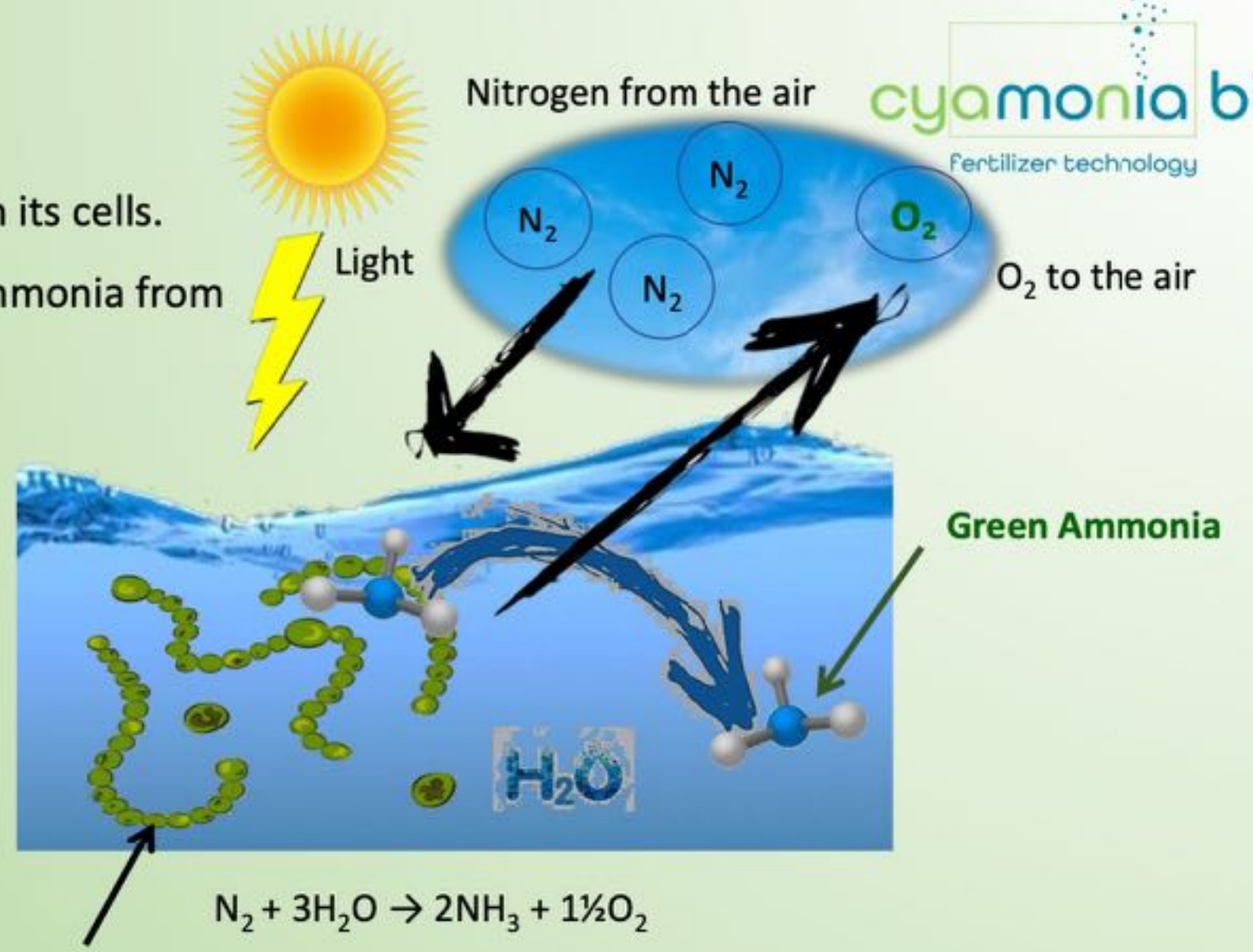
Cyanobacteria produces ammonia NH_3 in its cells.

Controlled use of an inhibitor releases ammonia from the cells into the water.

Just to compare,
Photosynthesis:

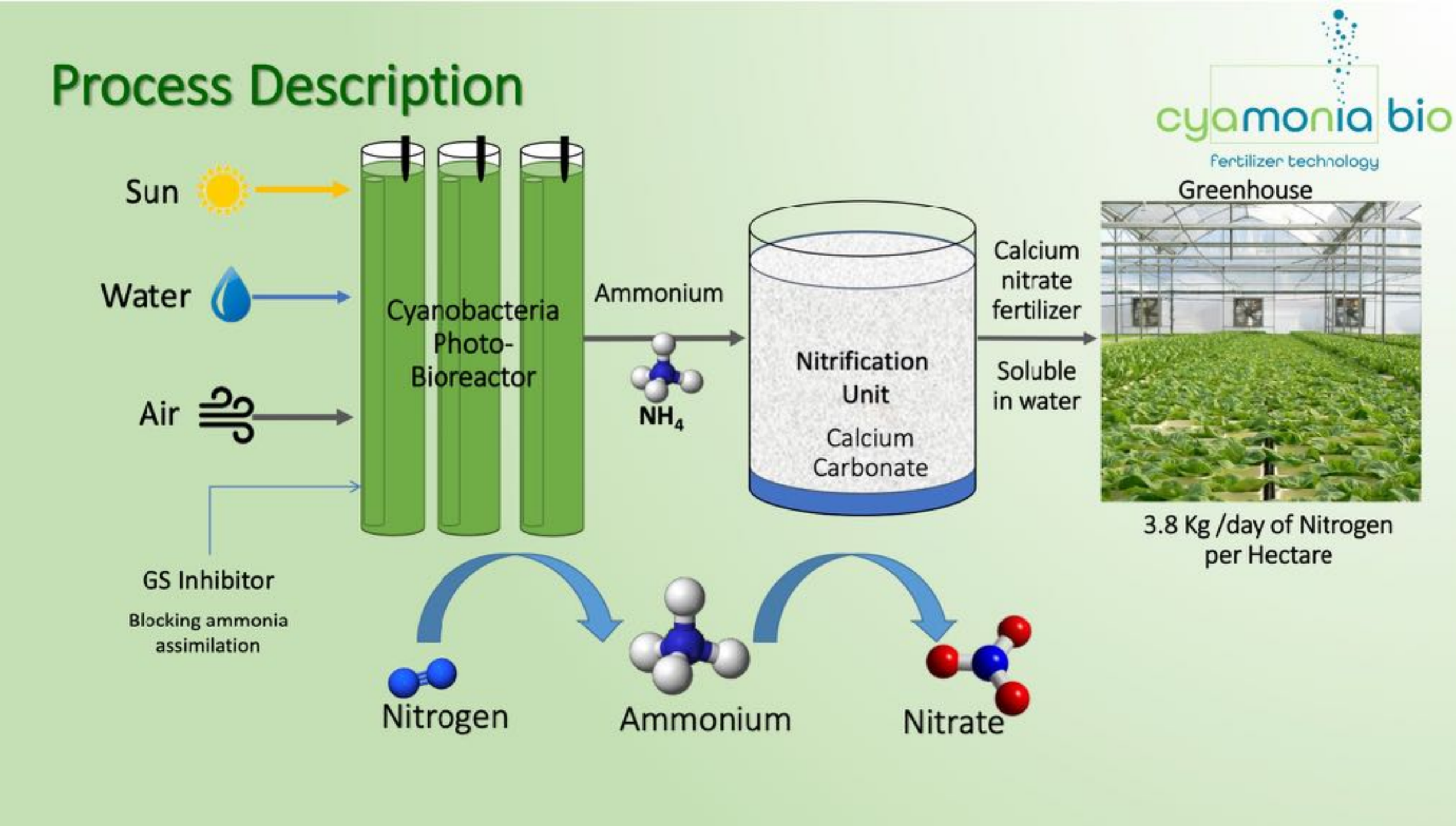


$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$



$N_2 + 3H_2O \rightarrow 2NH_3 + 1½O_2$

* GS - Glutamine Synthetase


Process Description
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Fertilizer technology
Sun
Water
Air
Cyanobacteria Photo-Bioreactor
Ammonium
NH_4
Nitrification Unit
Calcium Carbonate
Calcium nitrate fertilizer
Soluble in water
Greenhouse
3.8 Kg /day of Nitrogen per Hectare
GS Inhibitor
Blocking ammonia assimilation
Nitrogen
Ammonium
Nitrate

Advantages

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Fertilizer technology

- Green biological process
- No pathogens, hormones, antibiotics residues
- 100% available to plants
- No sodium
- In-line / on-line produced on-site

10

Commercial Pilot Installations – in 2022

Adjacent to, or inside, precision agriculture farms that use our organic fertilizers

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fertilizer technology

Pilot in Kfar Bialik, Israel

Business Model

- Reactor CAPEX: $ 612,000
- Reactor OPEX: $ 100,000

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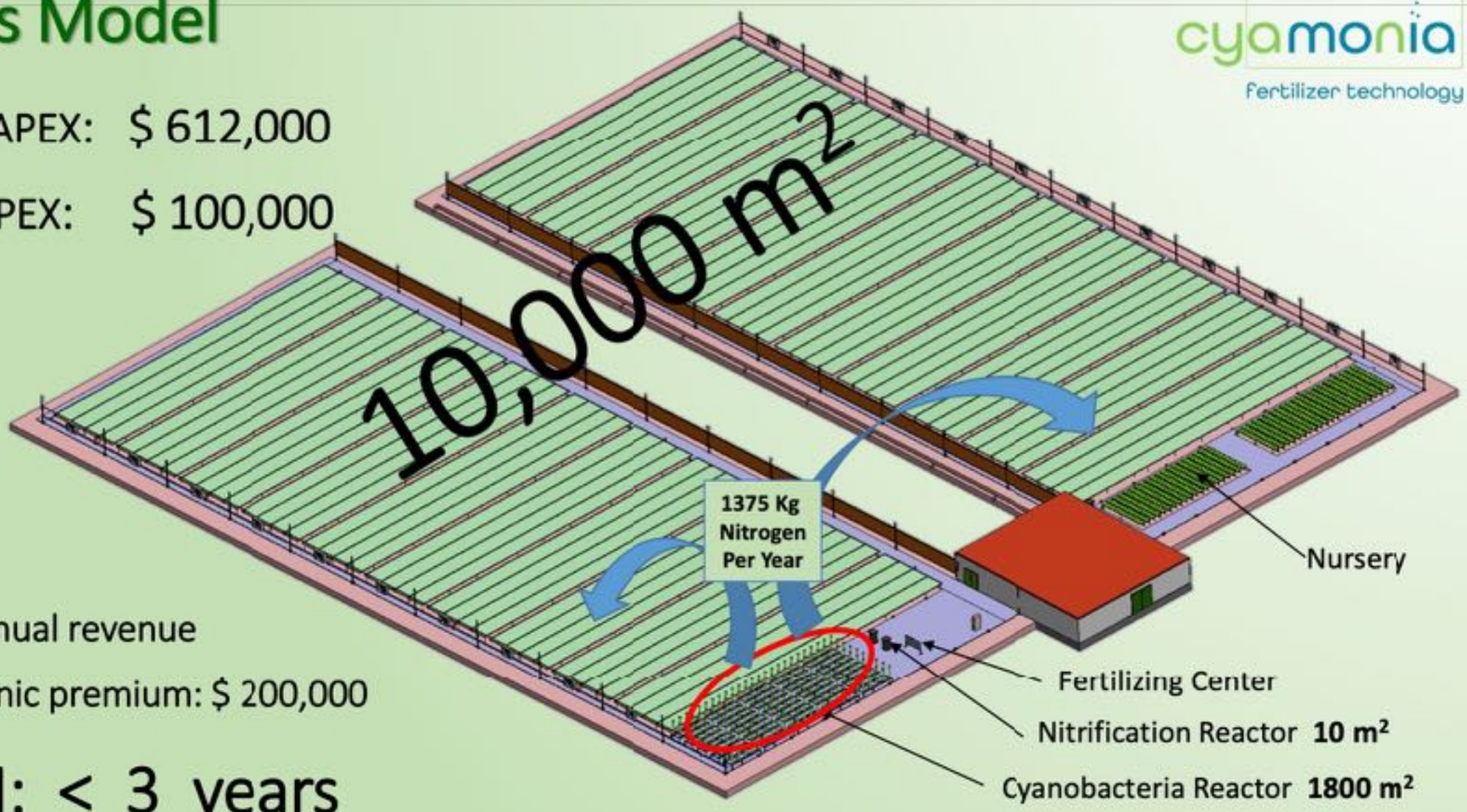

- Additional annual revenue based of organic premium: $ 200,000

ROI: < 3 years

Business Model: Clients P&L ($'000)

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		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Typical revenue from a 1 Hectare hydroponic production area		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Revenue from the 1 Hectare with an organic premium **(1)**		3,300	3,300	3,300	3,300	3,300	3,300	3,300	3,300
Additional revenue		300	300	300	300	300	300	300	300
Operating Expenses of Bioreactor									
Production materials cost		1	1	1	1	1	1	1	1
Utilities		16	16	16	16	16	16	16	16
Equipment service support and licence contract		52	83	83	83	83	83	83	83
Additional operating expenses of bioreactor		69	99	99	99	99	99	99	99
Additional annual profit per hectare		231	201	201	201	201	201	201	201
Investment in bioreactor installation	(612)								
Additional annual profit per hectare		231	201	201	201	201	201	201	201
Cash flow	(612)	231	201	201	201	201	201	201	201
Cumulative cash flow		(381)	(180)	20	221	421	622	822	1,023

(1) https://www.bmel.de/EN/topics/farming/organic-farming/strategy-future-organic-farming.html
https://www.deutschland.de/en/topic/environment/how-germany-is-promoting-organic-farming

Business Model: Cost of Bioreactor (CAPEX) ($'000)

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Equipment	Material	Work	Quantity	Total cost
Clear PMMA pipe 94x100 mm	29		7,040	200,640
Clear PMMA cone bottom funnel	3		7,040	21,120
PMMA Bob	0.5		7,040	3,520
Rubber ring	0.2	0	7,040	1,408
Air connector	0.3	0	7,040	2,112
PVC connector	0.6	0	7,040	4,224
PVC Pipe 40mm (manifold)	5	3	440	3,520
Metal stand for 16 Columns	30	20	440	22,000
500L plastic nitrification unit	125		2	250
5000L containers for supernatant	350		2	700
50 m3 anaerobic digester	18,000	2,500	1	20,500
200L containers for medium	91		4	363
LED strip (2m)	0		14,080	0
250 m^3/hr air pump 7.5kW	7,500		1	7,500
Water pump 2 hp 2kW	150		2	300
Dosing pump	150		5	750
5 m^3/hr reverse osmosis system	3,000		1	3,000
Tubing and fittings	4,000		1	4,000
Valves	300		8	2,400
pH electrode inc. controller	120		2	240
EC electrode inc. controller	120		2	240
Temperature probe	100		2	200
Ammonia electrode inc. controller	5,800		1	5,800

Equipment	Material	Work	Quantity	Total cost
Greenhouse Improvements required for Bioreactor				
GH structure	54,000	21,600	1	75,600
Ventilators	2,000	1,000	1	3,000
Thermal screen	10,800	2,000	1	12,800
Heating system	10,000	5,000	1	15,000
Automatic side screens	6,000	1,200	1	7,200
Electricity and control	6,000	2,000	1	8,000
Data collection robot	20,000	7,000	1	27,000
Control system	25,000	6,000	1	31,000
' Total cost of Bioreactor				484,387
Required Gross Margin				12.5%
Bioreactor selling price				**553,585**
Shipping:				
Door to door (40' containers)				32,500
Tax				0
Unloading				300
Total				32,800
Installation				25,500
Total capital cost				**611,885**

Financial Model P&L - Post Series A Funding Projections - $10,000,000 ($'000)

		2022	2023	2024	2025	2026	2027	2028	2029
Bioreactor price for 1ha		612	569	541	530	530	530	530	530
Number of bioreactors sold		**10 (1)**	**60 (2)**	**180**	**550**	**950**	**1,425**	**2,138**	**3,206**
Revenue :									
Bioreactors sales		6,119	34,143	97,308	291,383	503,299	754,948	1,132,422	1,698,633
Service and support (3)			306	2,142	7,649	24,475	53,540	97,137	162,532
Licensing (4)			520	3,641	13,003	41,608	91,018	165,132	276,304
Total a revenue		**6,119**	**34,969**	**103,090**	**312,035**	**569,382**	**899,506**	**1,394,691**	**2,137,469**
Fertigation market size		7,729,603	8,355,701	9,032,512	9,764,146	10,555,042	11,410,000	12,334,210	13,333,281
Market share		**0.1%**	**0.4%**	**1.1%**	**3.2%**	**5.4%**	**7.9%**	**11.3%**	**16.0%**
Cost:							**8.1% (5)**		
Cost of bioreactor production (6)		484	426	392	380	380	380	380	380
Total bioreactors - cost of sales		4,844	25,576	70,589	209,217	361,375	542,062	813,093	1,219,640
Service and support – cost			223	1,521	5,278	16,643	35,872	70,910	118,648
Bioreactor licensing expenses			29	193	650	1,958	4,015	6,800	10,565
Total cost		**4,844**	**25,828**	**72,302**	**215,145**	**379,976**	**581,949**	**890,803**	**1,348,853**
Operational profit		1,275	9,141	30,788	96,890	189,406	317,556	503,888	788,616
As of sales		21%	26%	30%	31%	33%	35%	36%	37%
R&D		1,556	2,998	5,655	15,602	28,469	44,975	69,735	106,873
Marketing		806	2,248	5,155	15,602	28,469	44,975	69,735	106,873
G&A		622	1,199	2,062	6,241	11,388	17,990	27,894	42,749
Profit before tax EBITDA	**10,000**	**(1,709)**	**2,695**	**17,918**	**59,446**	**121,080**	**209,616**	**336,525**	**532,120**
As of sales		-28%	8%	17%	19%	21%	23%	24%	25%
Assumptions									
Bioreactor - price reduction (7)			7%	5%	2.0%				
Bioreactor - cost of sales reduction (8)			12%	8%	3%				
Cost of service and support		75%	73%	71%	69%	68%	67%	66%	66%
Bioreactor licensing program cost		10%	10%	9%	9%	8%	8%	7%	7%
Bioreactor - cost of sales deduction		15%	13%	11%	10%	10%	10%	10%	10%
Cash Flow		**8,291**	**10,986**	**28,903**	**88,349**	**209,429**	**419,045**	**755,570**	**1,287,690**

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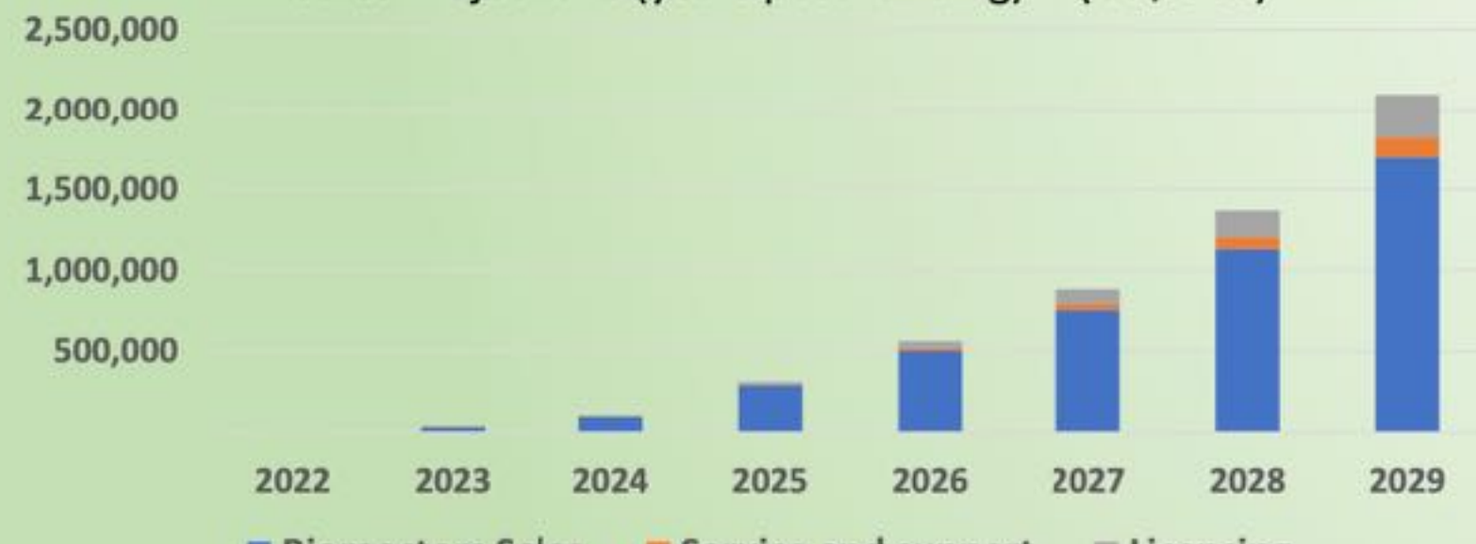
(1) First 10 reactors sold will be financed by the company (See use of proceeds)
(2) A Financial partner will need to be obtained for project finance
(3) Recurring revenue
(4) Recurring revenue
(5) Compound Annual Growth Rate (CAGR) Fertigation Market
(6) Preceding slide
(7) Aggressive marketing plan
(8) 3 year R&D plan

Financial Model P&L Post Series A funding - $10,000,000

Sales Projections (years post funding) (US$'000)



	2022	2023	2024	2025	2026	2027	2028	2029
Bioreactors sold	10	60	180	550	950	1,425	2,138	3,206

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Three revenues stream:

- Sale of Bioreactors
- Service and support
- License fee

Exit Strategy :

- IPO in 2023

The fertigation market is expected to register a CAGR of **8.10%** from 2019 to 2027 and reach **USD 11.41 Billion** by the end of 2027

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Use of Proceeds

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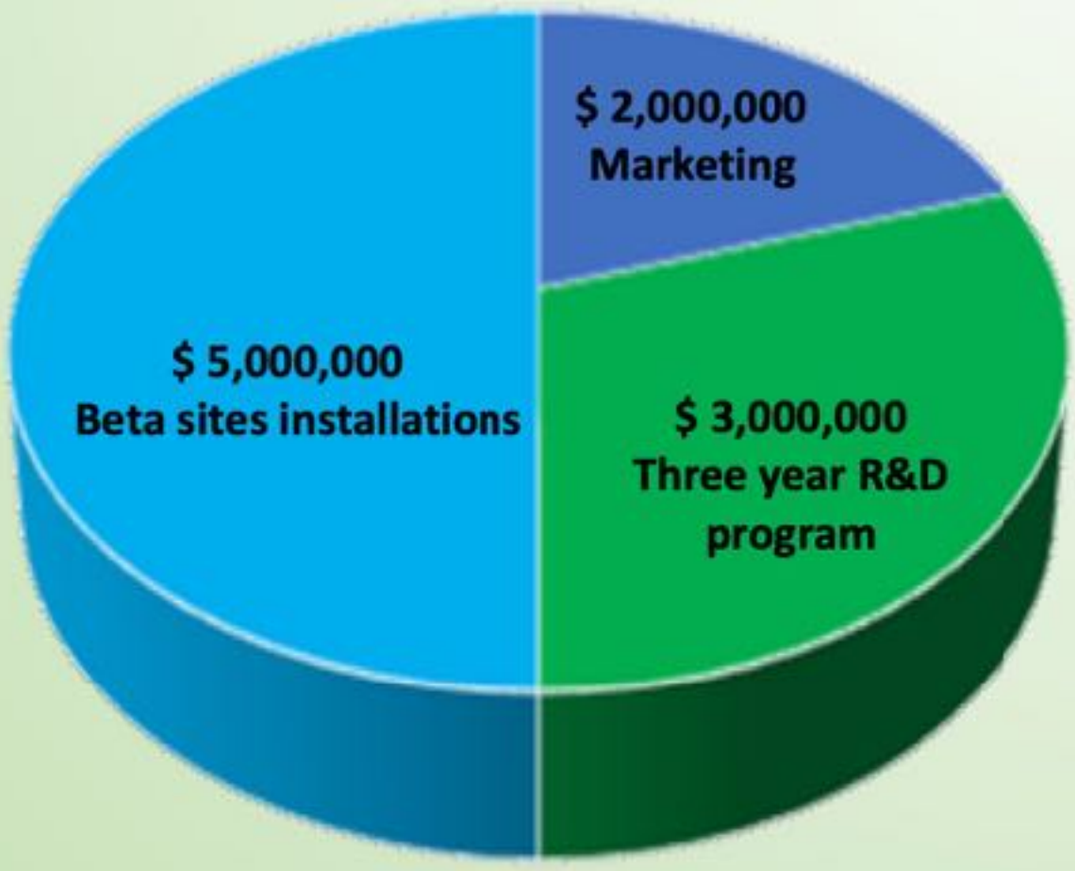
- $ 3,000,000 - Three year R&D program
  To add to the €2M that the company already has for R&D
- $ 2,000,000 - Marketing and Headquarters
  Management and marketing team
  The R&D centre will stay in Israel
- $ 5,000,000 - Beta sites installations
  Government support will be added



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R&D Program

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Control systems, automation, robotics, and software – developed in parallel

Preliminary	Current year (Aug 2020)	First year (Aug 2021)	Second year (Aug 2022)	Third year (Aug 2023)

• Feasibility studies	• Strain selection
	• Batch process design in airlift columns
	• Cultivation scale-up optimization
	• Ammonia separation proses .
	• Contamination containment treatments
		• Testing new methods:
		  • LED hybrid systems
		  • GS Inhibitor synthesis
		• Process integration:
		  • Scale up
		  • Ammonia separation
		  • Nitrification
		  • Biomass digestion
			• Testing advanced methods:
			• Micro-carriers
			• Continuous process
			• Ammonia separation:
			  • Gas phase
			  • Cross flow filters
			• Optimization of batch process in columns
				• Next generation methods:
				  • Mutant strains
				  • Trickling reactor
				  • Light distribution optics
				• Further optimization off the cultivating process

Management:

Lior Hessel CEO
Entrepreneur with vast know-how
in hydroponics and agriculture.
Founder and CEO of Growponics

Kobi Cohen CFO
25 years experience in global innovation
financial management

Assaf Shemesh Project Manager
Experienced bioreactor process engineer.
M.Sc. on cyanobacteria.

Professor Sammy Boussiba
Scientific advisor

World leader in ammonia translocation
in cyanobacteria
The inventor of the Algatech technology
www.algatech.com.

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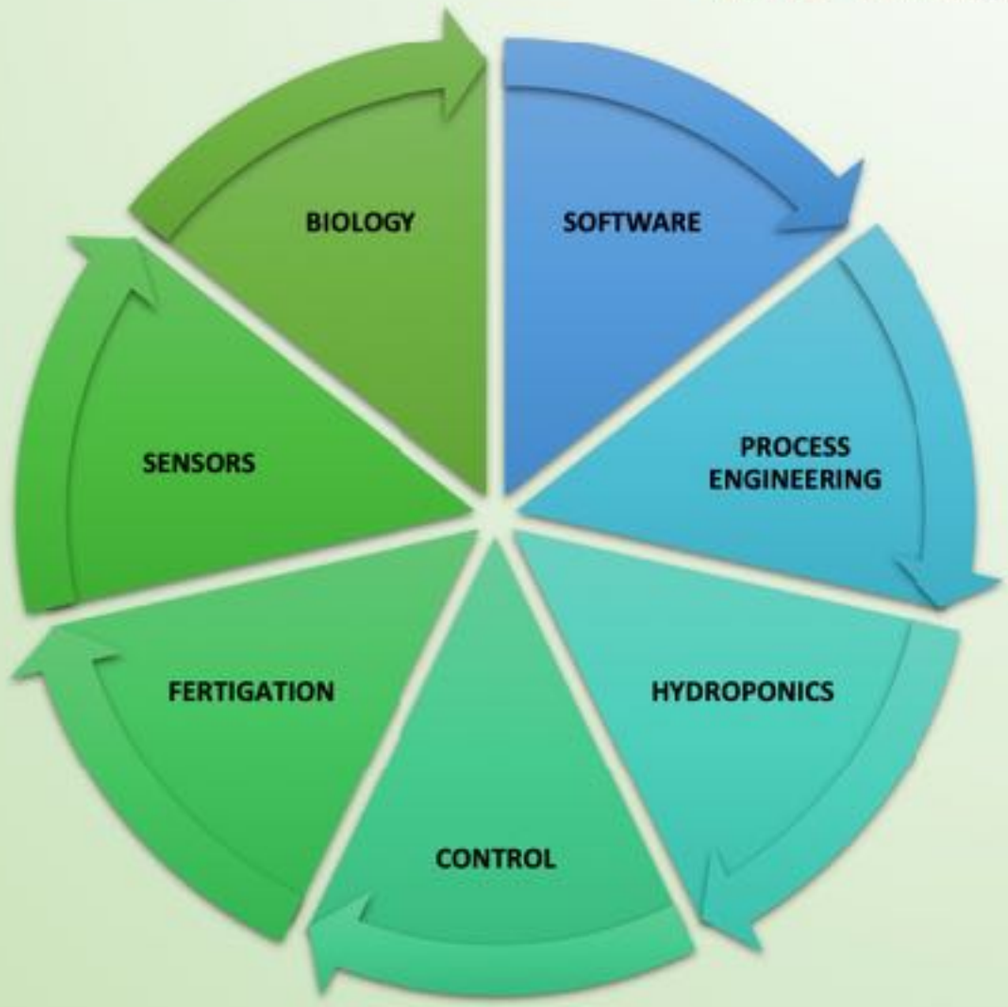

IP Status

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- Provisional patent 62/724,457, August 2018
- PCT # IB2019/057284, Aug 2019
- Application in Europe and in the US

Covering process engineering, algorithms, machine learning and AI

Competition

	Cyamonia	Pivot Bio	Azotic Technologies
Species	Anabaena sp.	Klebsiella variicola	Gluconacetobacter diazotrophicus
Energy source	Sun	Sugar	Sugar
Application	On site fertigation or hydroponics	In furrow.	In furrow or foliar
Applicable in fertigation	Yes	Yes	Yes
Applicable in hydroponics	Yes	NO	Only foliar application
Crops	All	Maize, wheat, sorghum	rice, wheat, maize, soybean and others
% of N supply	100%	20-30%	Up to 50% w/o yield increase
Organic input certified	Not yet	No	Not yet
Enables organic certification of the farm	Yes	No	Requires additional organic fertilizers
Time to market	Six months	Commercial	Commercial
Funding raised	€2.5M from the EU	$430M series D	N/A. From angels and Virya LLC

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1. **Pivot Bio** https://www.pivotbio.com/product

   - **Founded – 2011, USA, private. >200 employees. Funding: $430M series D.**
   - **Summary:** They sell two products, one for corn and one for sorghum and wheat (cost about 20$/acre) containing a proprietary bacteria. The treatment is applied at planting in-furrow. Replaces up to 40lb of nitrogen per acre. (only 20-30% of the nitrogen requirement of the plant)

2. **Azotic Technologies** https://www.azotictechnologies.com

   - **Founded - 2012, UK, private. <50 employees. Funding:**
   - **Summary:** They sell an end product (costs about 10$/acre) containing a bacteria called - *Gluconacetobacter diazotrophicus*. This seed/furrow/foliar treatment enables the plant cells to fix up to 50% of their nitrogen

Relocating to Connecticut

cyamonia bio
Fertilizer technology

The company is relocating is headquarters to Connecticut leaving an R&D center in Israel.

Location and affiliations in CT – TBD

The objectives are:

- **Collaboration with Uconn**
- **Target BioPath candidates**
- **Access the US AgTech industry**
- **Work with the Ag funding industry**

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Contributing to Sustainable Production of Food

www.growponics.co.uk

Lior Hessel liorh@growponics.co.uk

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