



Microalgae-based Biostimulants for use in Crops

A path to Sustainable, Regenerative and
Profitable Agriculture

Environalgae

Regenerative Agriculture and Biostimulants

Need for Regenerative Agricultural practices to improve sustainability in Agriculture

- ❑ In 2018, world total agriculture and related land use emissions reached 9.3 billion tonnes of carbon dioxide equivalent (Gt CO₂eq). In 2018, agriculture and related land use emissions accounted for 17% of global GHG emissions from all sectors. [1]
- ❑ Agriculture is a major contributor to global emissions of the GHGs that drive climate change. Action in this arena also makes good business sense. By addressing GHG emissions, companies (and producers) can identify opportunities to bolster their bottom line, reduce risk, and discover competitive advantages [2]

Biostimulants

- ❑ As per a 2022 report by the Food and Agriculture Organization (FAO), United Nations [3]
 - Algae and plant extracts, chitosans, and other biopolymers are also used as biostimulants.
 - Some advantages of biostimulant application include:
 - i. Improvement of efficiency in the absorption and assimilation of nutrients,
 - ii. Tolerance to biotic or abiotic stresses, or improving any of their agronomic characteristics.
 - iii. They could complement, and in some cases substitute, chemical agro-products; that could improve plants metabolism and biochemical activities.

[1] Emissions due to agriculture Global, regional and country trends 2000–2018. Food and Agriculture Organization of the United Nations. SSN 2709-006X [Print] ISSN 2709-0078 [Online].

[2] GHG Protocol Agricultural Guidance Interpreting the Corporate Accounting and Reporting Standard for the agricultural sector. World Resources Institute. [Homepage](#) | [GHG Protocol](#)

[3] Soils for nutrition: state of the art. Food and Agriculture Organization of the United Nations Rome, 2022. FAO, 2022. Soils for nutrition: state of the art. Rome.

<https://doi.org/10.4060/cc0900en>

Opportunity for Microalgae-based Bio-stimulants (MBST)

Opportunity

- ❑ The current global market for plant growth promoters and bio-stimulants is valued at USD 3.2 billion and forecasted to reach USD 5.6 billion by the year 2026 [4].
- ❑ Price is a factor that could hinder the experimental research and adoption of biostimulants can be more expensive than certain type of fertilizers. [3]
- ❑ Therefore, any sustainable & circular product that significantly improves agriculture crop quality and crop yields has a massive market potential, if it is priced reasonably
- ❑ Global Agriculture market size is about \$15Trillion and is only expected to grow further
 - Even a 20% increase in crop productivity and yield, and given the positive impact on sustainability, can create a massive market for Microalgae-based Bio-stimulants (MBSTs).
 - The current cost of production for our process, as proven at scale, is at least ten times lower than the market prices of other bio-stimulants

[3] Soils for nutrition: state of the art. Food and Agriculture Organization of the United Nations Rome, 2022. FAO, 2022. Soils for nutrition: state of the art. Rome.

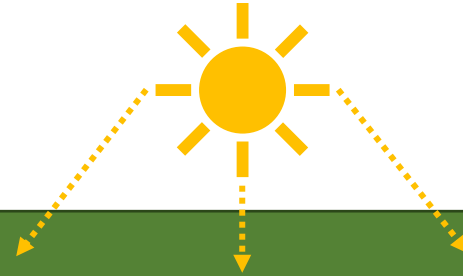
<https://doi.org/10.4060/cc0900en>

[4] <https://www.marketsandmarkets.com/Market-Reports/biostimulant-market-1081.html>

MICROALGAE FOR REGENERATIVE AGRICULTURE & SUSTAINABLE AQUACULTURE

Food Processing wash-water

Sugars, starches & minerals



Microalgae-production in open ponds
under optimal nutrient conditions

Treated Water

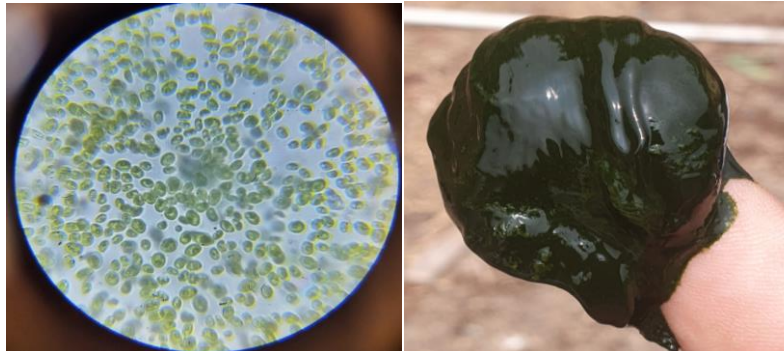
Crop Biostimulant

Global Agriculture Industry

- **US\$ 15 Trillion Industry today!**
- Regenerative agriculture being encouraged
- Population, limited land & water resources
 - Need higher crop yields

Microalgal Bio-stimulants

- Long-known to be an excellent stimulant
- Massive scalability when integrated with water treatment
- Produced in *Sustainable & Circular* process
- Highly effective in stimulating crop growth, improving crop quality & crop yields
- Doesn't need freshwater or arable land



Microalgae biomass

- Proteins, lipids, vitamins, pigments, bio-available minerals & other biomolecules
- Nature's richest food-source
 - Sustainably produced (GHG emissions reduction)
 - Circular product (*Best out of Waste/ Waste to Gold!*)
 - Massive cost advantage over any other process

Aquaculture feed

Global Aquaculture Industry

- **US\$ 300 Billion Industry today!**
- Sustainable Aquaculture being promoted
- Growing protein-meal demand
 - Overfishing for fishmeal destabilizing ocean ecosystems

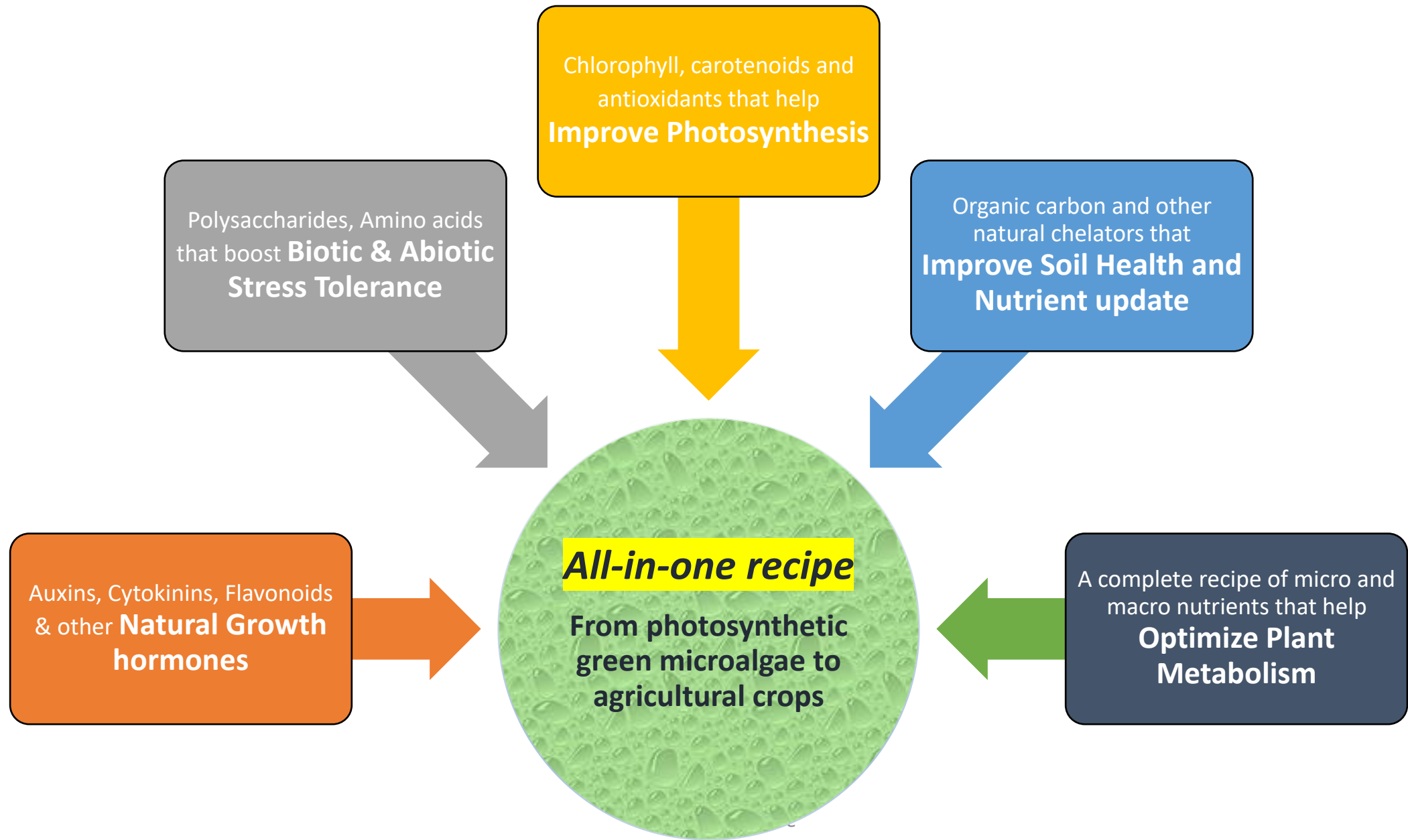
Microalgae-based feed

- *Natural* & primary source in food chain
- Wholesome & nutritious *live-feed* for hatcheries
- Produce *naturally-fed* fishes/ shrimps
 - Use microalgae for producing zooplankton as live-feed!

Typical composition of fresh-wet microalgal slurry

Typical composition of algal biomass (on dry basis) CENTRIFUGED FRESH SLURRY		
COMPONENT	CONTENT	REMARKS
Proteins	55%	Attractive amino acid profiles
Fats	10%	High MUFA & PUFA content, no trans fats
Carbohydrates	20%	Fiber content
Minerals	15%	Mg, Ca etc.
High-value phytochemicals	5%	Antioxidants and pigments
Tremendous potential as a feedstock for Feed/ Fertilizers/ Biochemicals/ Food		

Why microalgae-based biostimulants (MBSTs) are highly effective



Microalgae-based Biostimulants (MBSTs) tested in fields

- ❑ The name of this farmer is Mr. Yashpal Patil, and he is from Nandurbar district in Maharashtra, India.
- ❑ He had applied our microalgae-based Biostimulant as per the following schedule:
 1. 1 Liter/acre on day-4 via drenching
 2. 0.7 Liters/acre on day-12 via foliar sprays
 3. 0.7 Liters/acre on day-28 via foliar sprays
- ❑ On 19th of July, he was able to take his first harvest from the Crop. He typically takes 8-10 harvests over the crop cycle.
- ❑ His observations compared to last year are:
 1. Chilies are dark green and more vibrant in appearance
 2. The size of Chilies is bigger this time.
 3. **Yield has increased by 25% (5 quintals/acre as against 4 quintals/acre) in the first harvest**



Microalgae-based Biostimulants (MBSTs) tested in fields

- ❑ The name of this farmer is Mr. Abhishek Jadhav, and he is from Nashik, Maharashtra (India).
- ❑ He has been applying the MBST in his field since the beginning of his tomato crop this year.
- ❑ He applies about 1-liter of it per acre per month
- ❑ His observations compared to last year are:
 1. Tomato size is bigger. Single tomato weighing ~45 gm, which was 30-35 gm last year.
 2. Tomatoes are very lustrous and are also going for export this time
 3. **The yield have gone up by twice compared to last year, while the pricing has been about 5-10 times of what he received last year because of the superior quality of the tomatoes**
 4. These tomatoes are sweet in taste too.



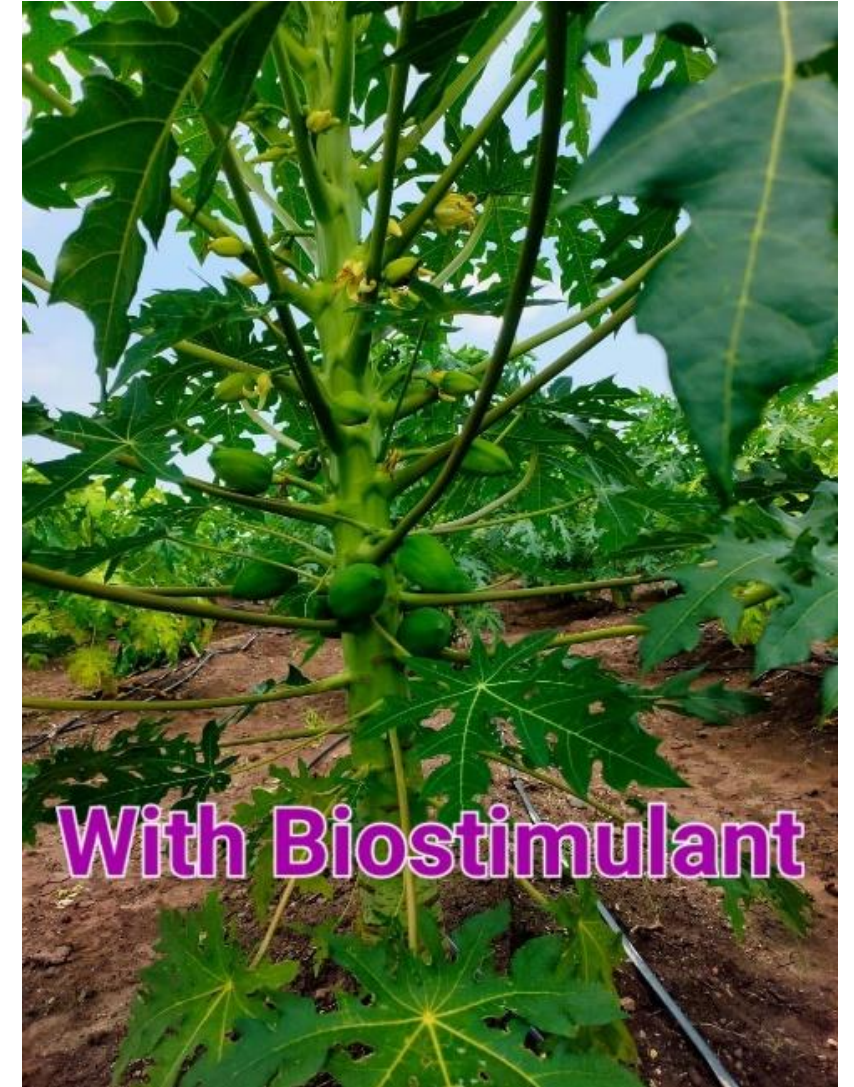
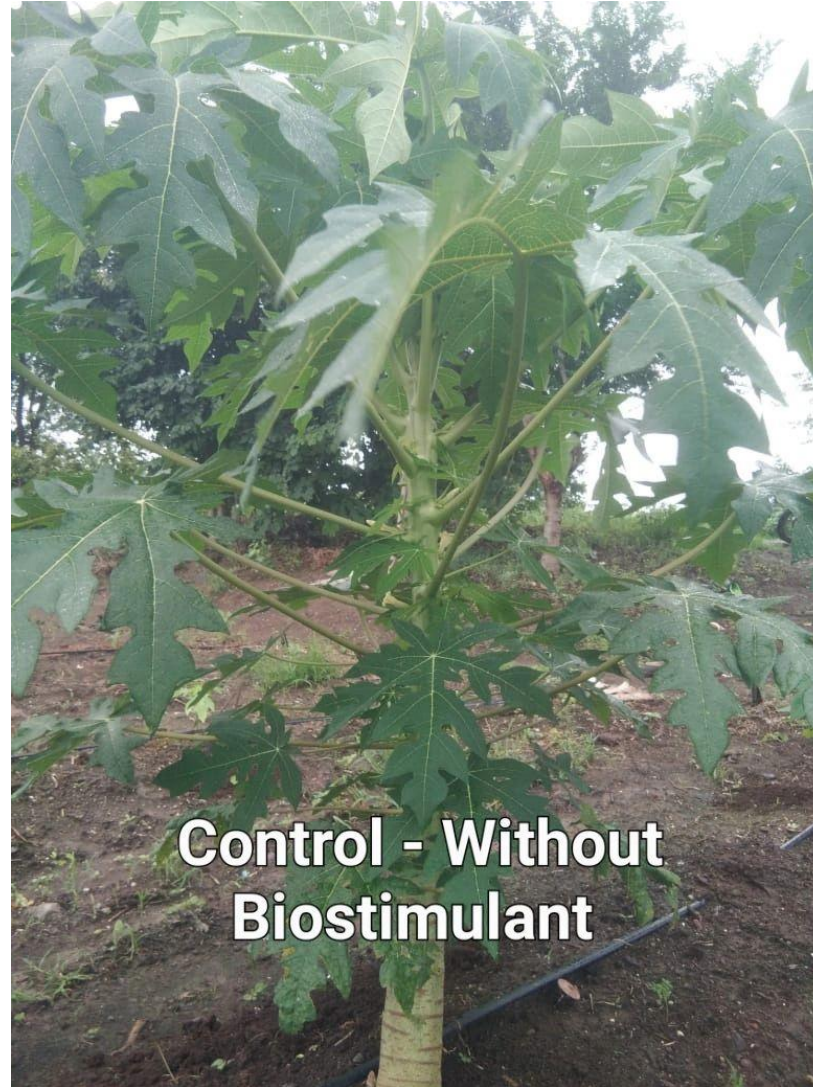
Microalgae-based Biostimulants (MBSTs) tested in fields

- ❑ The name of the farmer is Mr. Ritesh Patel from Akola, Maharashtra (India). He has tried our MBST on his soybean crop
- ❑ He had applied our microalgae-based Biostimulant on the 7th of August at about 1 Liter/acre
- ❑ His observations upon spraying of the Biostimulant as seen on the 12th of August are:
 1. Extensive vegetative growth
 2. Increased leaf size
 3. Flowering



Microalgae-based Biostimulants (MBSTs) tested in fields

- ❑ This was tested by a Farmer at Nandurbar, Maharashtra (India)
- ❑ Over a span of four months, he had applied our microalgae-based Biostimulant twice, once at 1-L per acre and the next time at ½-L per acre.
- ❑ Compared to a neighboring farm, his observations are:
 - a. Darker and larger leaves
 - b. Greater leaf coverage
 - c. Greater girth of stem
 - d. Early flowering and Early fruiting



Microalgae-based Biostimulants (MBSTs) tested in fields

- ❑ Mr. Abhishek Patil from Nashik has also tested the MBST for other vegetable crops such as: Beans, Okra, Coriander, Spinach, Fenugreek etc. with equally good results



- ❑ Key observations
 - Shorter crop cycles
 - Darker leaves
 - Higher yields
 - Thicker grains
 - Ability to grow well in extreme summer conditions
 - Extended shelf-lives after harvest



About Environalgae

- ❑ Company website - <https://environalgae.com>
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- ❑ We have now commissioned what is one of the largest microalgae-based end-to-end effluent treatment plants ever built. Its a novel, microalgae-based process that converts nutrients present in effluent from their agro-processing unit to high-value algal biomass for use as high-value feed for the aquaculture industry. Treated water generated from this plant meet the discharge specifications of the pollution control board.
- ❑ Links to videos on our lab, pilot plants and full-scale plant set-up by us:

Content	Google Drive Links
Environalgae lab	➤ https://drive.google.com/file/d/1I5MLLbTSestZk6fXQrWyot9uCabjPdsl/view?usp=drive_link
Environalgae pilot-test-bed facility	➤ https://drive.google.com/file/d/1-wR0E2DOfM1Ti8gyzxQIUGA8X3_yiwdt/view?usp=drive_link
Pilot-process set-up at customer site	➤ https://drive.google.com/file/d/1vl2Ghuwv4R5BaQ3N-yigcR3ddtpuh40t/view?usp=drive_link
Full-scale process set-up at customer site	➤ https://drive.google.com/file/d/1PHArZ1_oXJr2etdRPC1DAG7KLKlIPqQP/view?usp=drive_link ➤ https://drive.google.com/file/d/1Uf2zO3YMF24cR0UpHgOyKvWNVjkS_VYO/view?usp=drive_link

Environalgae

About Environalgaе

Team with an ideal of youth and experience

- **Ninad Gujarathi, PhD (Proprietor and Founder)**
 - Leadership experience in R&D, Techno-commercial, Manufacturing and Business roles, with proven track record of evaluating, conceptualizing, innovating, developing, scaling-up, delivering process & business solutions, and business growth.
 - Experience in conceptualizing, designing, executing, commissioning and operating some of the world's first and largest algae-based carbon capture and process effluent treatment plants.
- **Rahul Patel, PhD (Chief Technologist)**
 - Experience in developing cultivation biology process schemes, executing, commissioning and operating one of the world's first and largest algae-based carbon capture and process effluent treatment plants.
- **A team of FIVE Biologists and ONE supervisor** to help our customers with research, development, designing, executing, and commissioning this emerging technology



Best Technology Solutions Provider
at the Annual IGCW Awards 2023

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