

CONVERTING THE EARTH'S CO₂ EMISSIONS TO HIGH VALUE ORGANIC PRODUCTS USING GREEN MICROBES

Joan Mutale CHANDA Ph.D

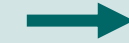
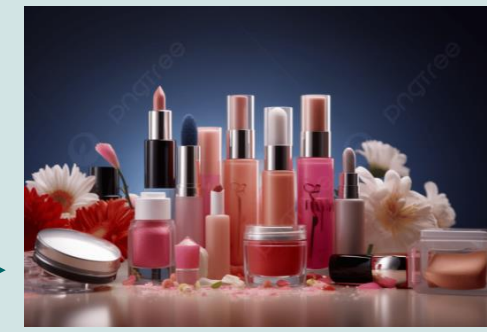
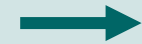
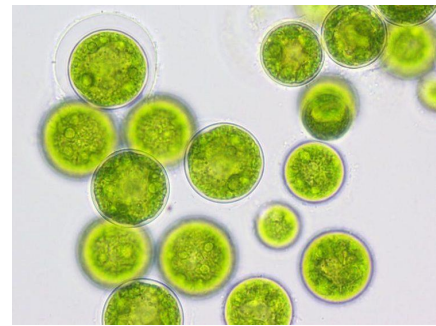
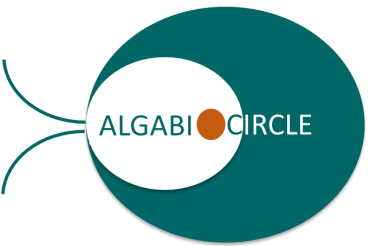
Wessal OUEDRHIRI Ph.D

Hicham EL ARROUSSI Ph.D

Mohamed Hachimi ALAOUI

Hassan LAMADEN





PROBLEM

- High carbon emissions
- Negative environmental impact of carbon emissions
- Rising demand for organic materials

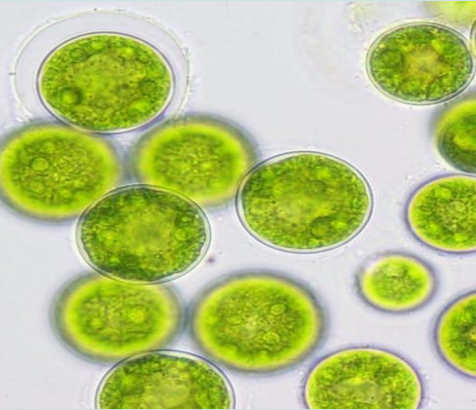
SOLUTION

Utilize the potential of green microbes (microalgae) to produce organic materials from CO2 emissions.

Valorize the algal biomass for cosmetic products and repurpose the residues in agriculture (bioactive seedling pots)

ALTERNATIVES SOLUTIONS TO THE PROBLEM

- **Carbon Farming:** Agricultural practices that sequester carbon in soils through techniques like cover cropping, rotational grazing, and agroforestry.
- **Blue Carbon:** Conservation and restoration of coastal ecosystems like mangroves, seagrasses, and salt marshes that naturally sequester and store carbon.
- **Carbon Capture and Storage in Industry:** Specific technologies designed to capture CO₂ emissions from industrial processes, such as cement production or steel manufacturing, and store it underground.



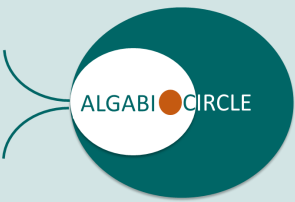
UNIQUE VALUE PROPOSITION

- Green microbes offer high resource efficiency, requiring less land, water, and nutrients for cultivation compared to traditional crops.
- Valuable outputs, particularly carotenoids, which have diverse applications and market value in industries like food, cosmetics, and nutraceuticals.
- Repurposes algal biomass residues, following circular economy principles, reducing waste and boosting agriculture.

KEY METRICS

- Production Cost, Product Quality
- Productivity of the culture system (biomass and carotenoid yield)
- Batch-to-Batch Consistency
- Cost growth vs revenue growth/ Return on Investment





REVENUE STREAMS

- Short-term
 - Grant from the explorer program
- Long-term
 - Carotenoid production and sales

The project aims to produce 10 Kg of carotenoid rich biomass from a pilot-scale culture system.

- This project aims to form partnerships with Moroccan pharmaceuticals, nutraceuticals and cosmetics as producers and distributors of the primary active materials and formulator products.

Current carotenoid rich extract powder (20% Beta-Carotene) from green microbes (*Dunaliella salina*) goes for \$199.00/ 1KG at Amazon

Other carotenoids such as Astaxanthin, derived from the green microbe, *H.pluvialis*, sells at \$24.95/ 50 grams at Amazon



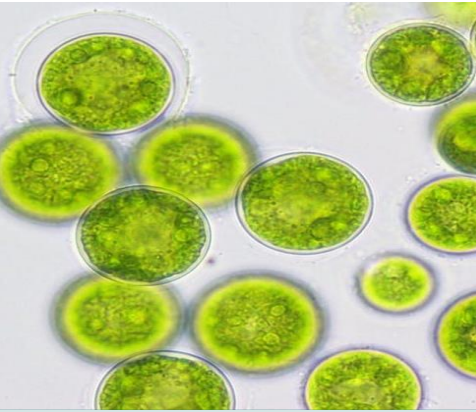
Cost Structure:

- Photobioreactors
- Lighting and maintenance of the culture system
- Products for culture medium Nutrients
- CO₂ supplies
- Control of parameters of culture system
- Purchasing the Microalgal species and their maintenance
- Photo-incubator
- Extraction of carotenoids from microalgae biomass using appropriate techniques, such as solvent extraction or supercritical fluid extraction.
- Purification and concentration of carotenoids to obtain high-quality extracts.
- Quality control and testing of the carotenoid extracts to ensure compliance with safety and efficacy standards.
- Sales teams
- Centrifugation system for biomass harvest
- Lyophilization system



Channels: - How to reach the customer

- Participate at nutraceutical conferences and exhibitions in Morocco, such as the Morocco Nutraceuticals Forum, to showcase our algal
- Contact potential buyers of raw carotenoid rich material
- Speak to certified cosmetic formulators such as Prodigia & Yazine, to develop new product formulations that incorporate your algal carotenoids.



ADVANTAGE

This carotenoid production project is poised for success and is well-positioned to thrive in the market for several reasons. Firstly, there is a growing global demand for natural-based ingredients in industries such as nutraceuticals, pharmaceuticals, and cosmetics, driven by consumer preferences for sustainable and healthier options. Carotenoids, known for their numerous health benefits and applications, are in high demand, creating a lucrative market opportunity. Sustainability is a key differentiator, as the project emphasizes resource efficiency and environmental impact reduction, aligning with the increasing focus on eco-friendly practices. Furthermore, the project's market research aims to identify specific customer needs and applications, enabling tailored solutions that meet industry requirements.

With a solid business model, a growing market, advanced technology, and a commitment to sustainability, this carotenoid production project is well-positioned to capture market share, generate substantial revenue, and thrive in the competitive landscape.

