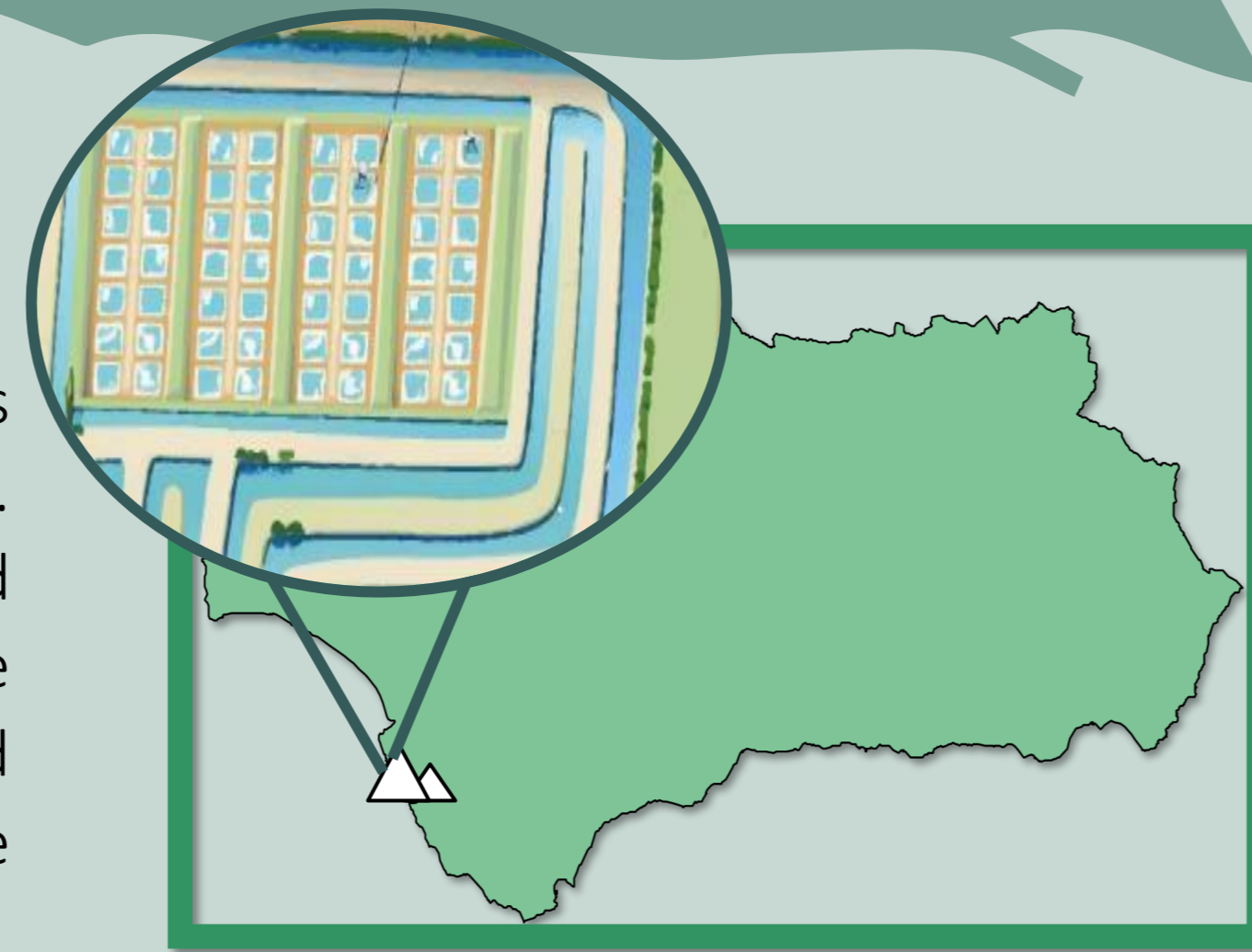


## INTRODUCTION

Microalgae technology has gained popularity for its biotechnological value. Regarding its mass production, the open-field systems are ideal for low-cost microalgae production. However, those systems present some drawbacks, such as the need for extensive land areas or the difficulty in maintaining a monoculture system. In this regard, the abandoned salt marshes in Cadiz are an ideal scenario to address these constraints and to study the economic potential and the feasibility of producing microalgae in these areas.



Location of "La Esperanza" saline (36°30'43.39"N; 6° 9'10.32"O)

## AIMS

The following work is intended to design culture strategies to optimise the production of *Dunaliella salina* in salt marshes and evaluate the possible future applications for the produced biomass.

## MATERIAL AND METHODS

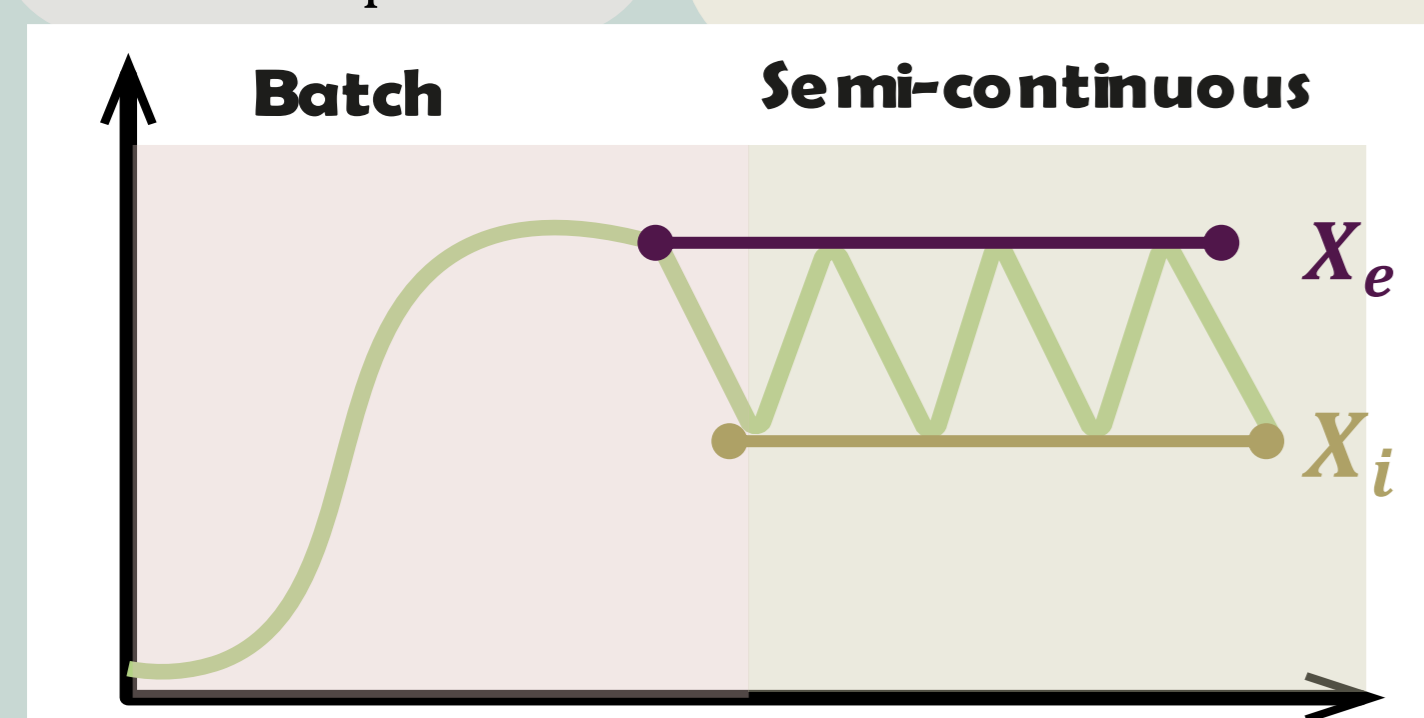
### Kinetic characterization

$$X = \frac{X_m * X_0 * e^{\mu * t}}{X_m - X_0 + X_0 * e^{\mu * t}}$$

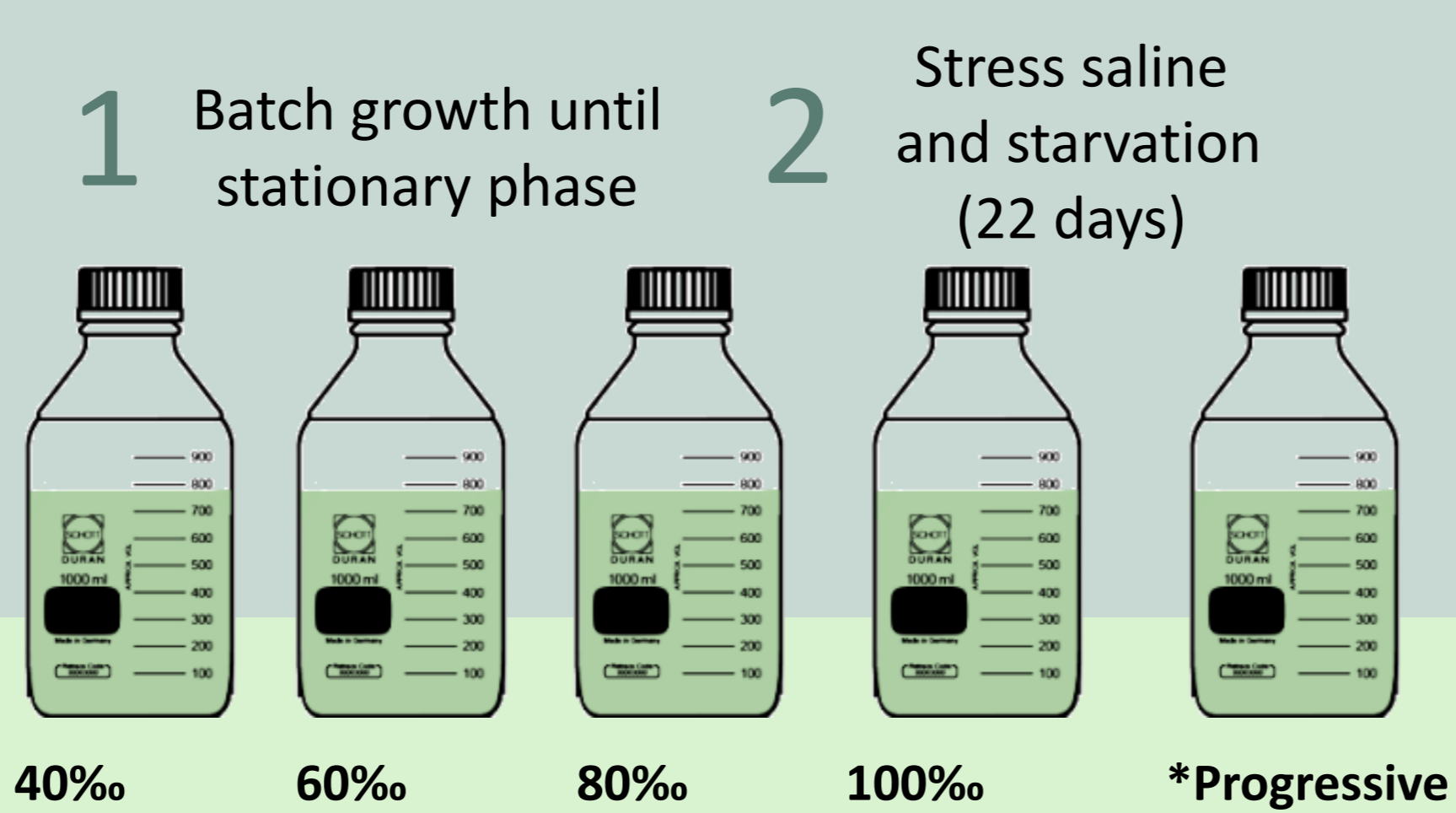
$$P_{max} = \frac{\mu * X_{max}}{4}$$

$$X_e = \frac{X_m * e^{\mu * 0.5 * t}}{(1 + e^{\mu * 0.5 * t})}$$

$$X_i = \frac{X_m * P_{max}}{(1 + e^{\mu * 0.5 * t})}$$

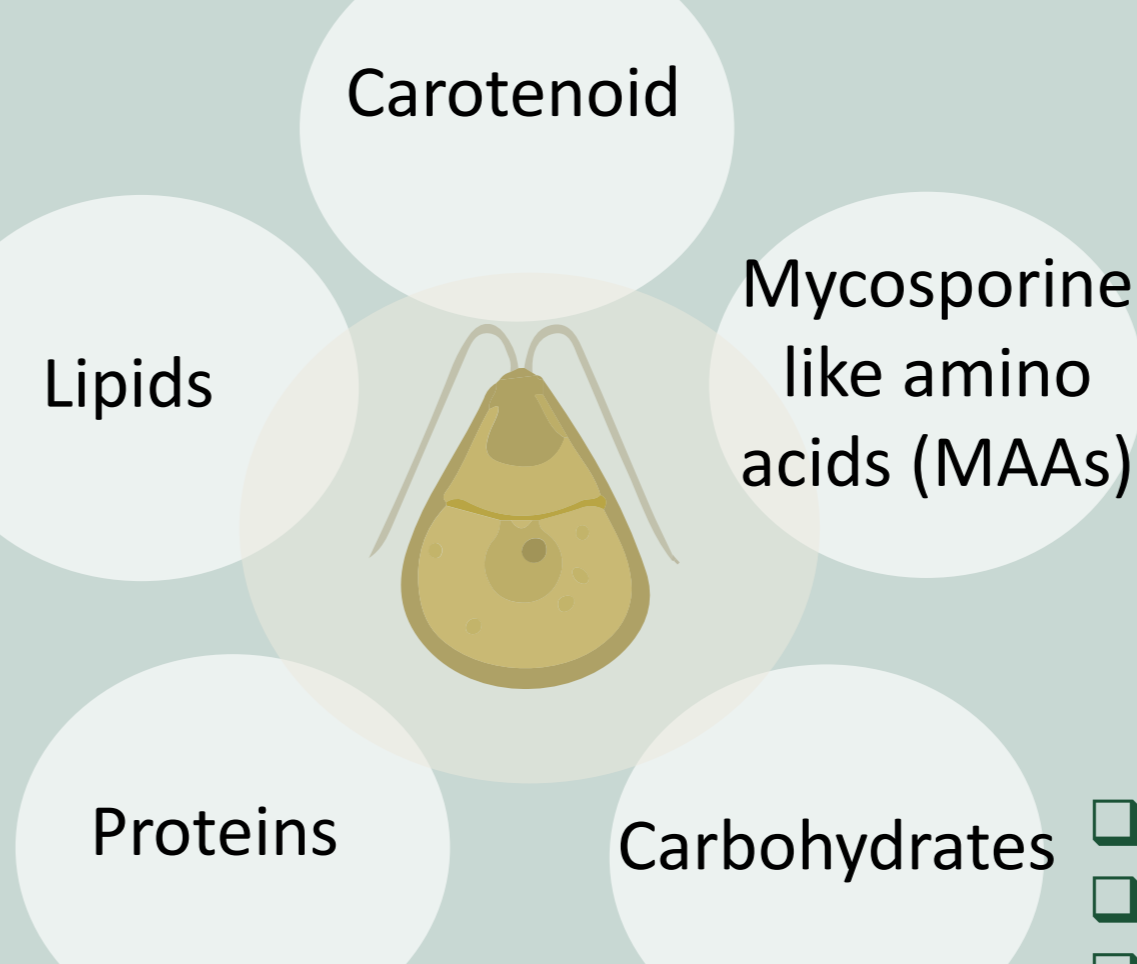


### Stress strategies

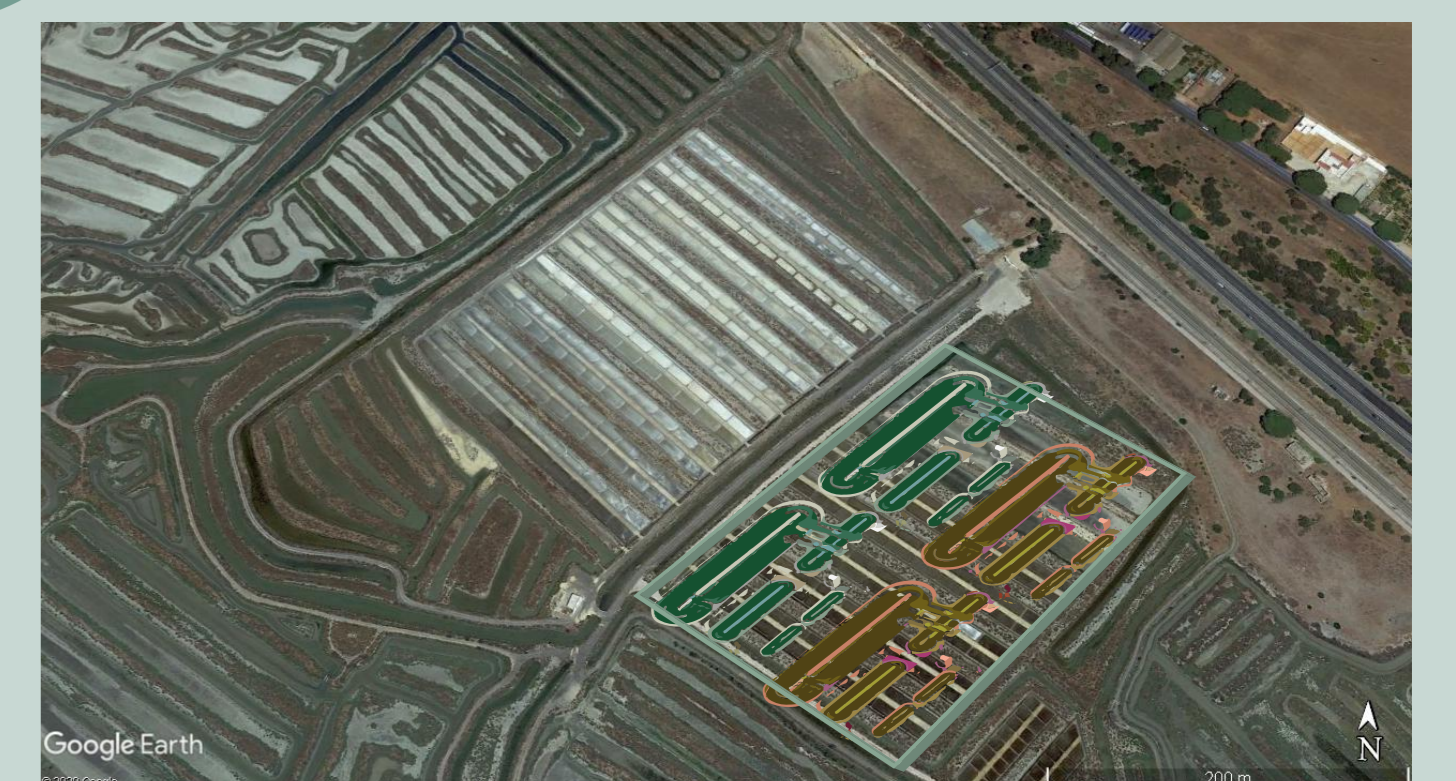


\*Increase the salinity by 20 g/L every two days until reaching a salinity of 100 g/L

### Biomass composition

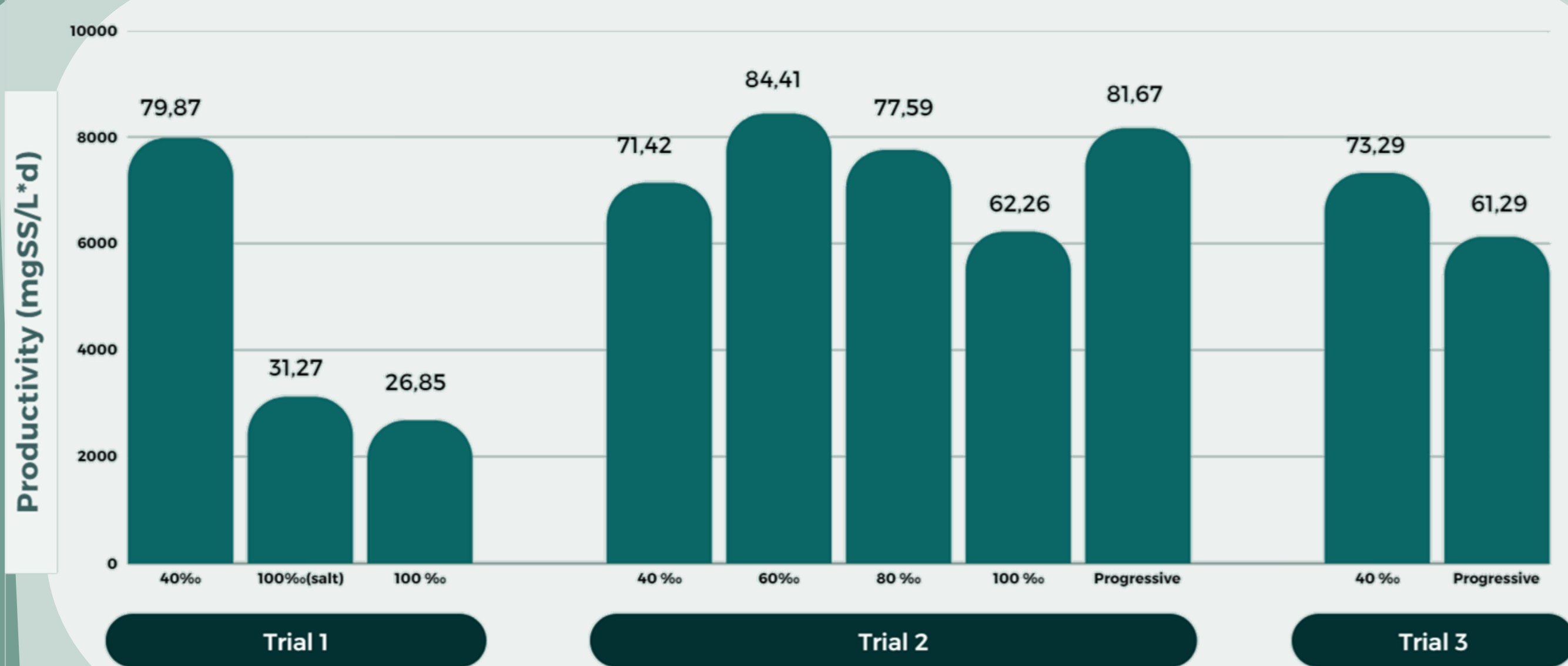


### Techo-economic analysis



- Surface area of 5 hectares
- Raceway-type reactor in semi-continuous operation mode
- Prior conditioning of biomass by coagulation-flocculation
- Harvesting to biomass paste (80 % water, 20 % biomass)
- The harvested volume is determined from the growth kinetics

## RESULTS



### Trial 1 : Batch growth

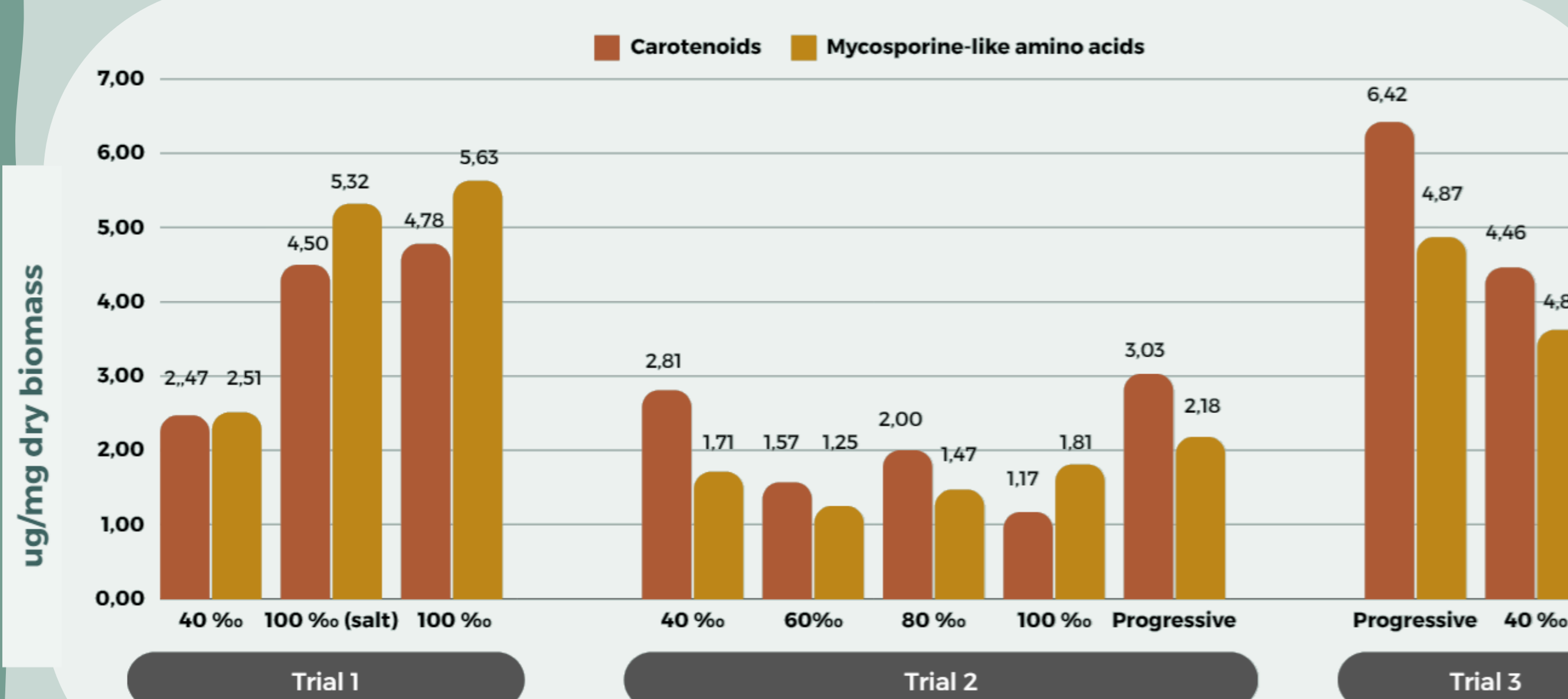
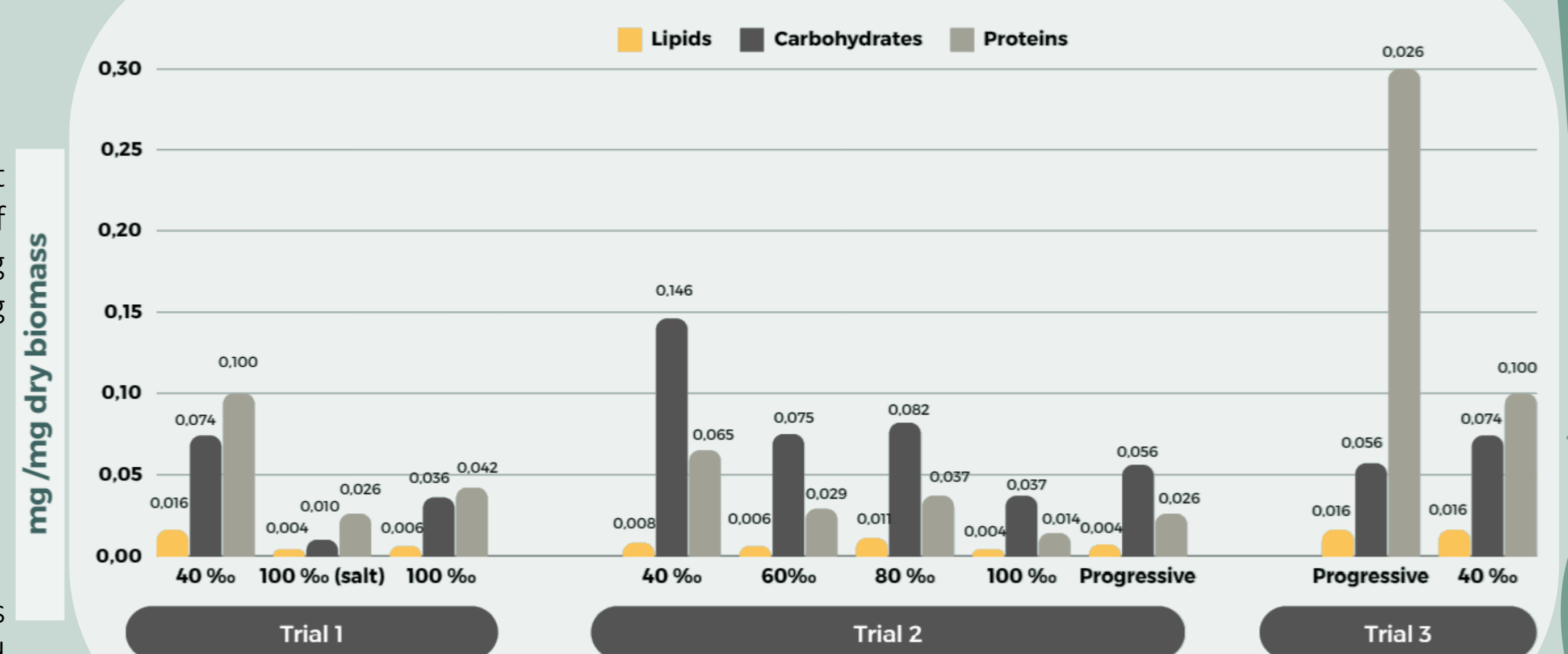
Salinity reduces productivity, yet it stimulates the synthesis of carotenoids and MAAs, yielding superior outcomes when using matured water from the salt marsh

### Trial 2: Salinity gradient + starvation

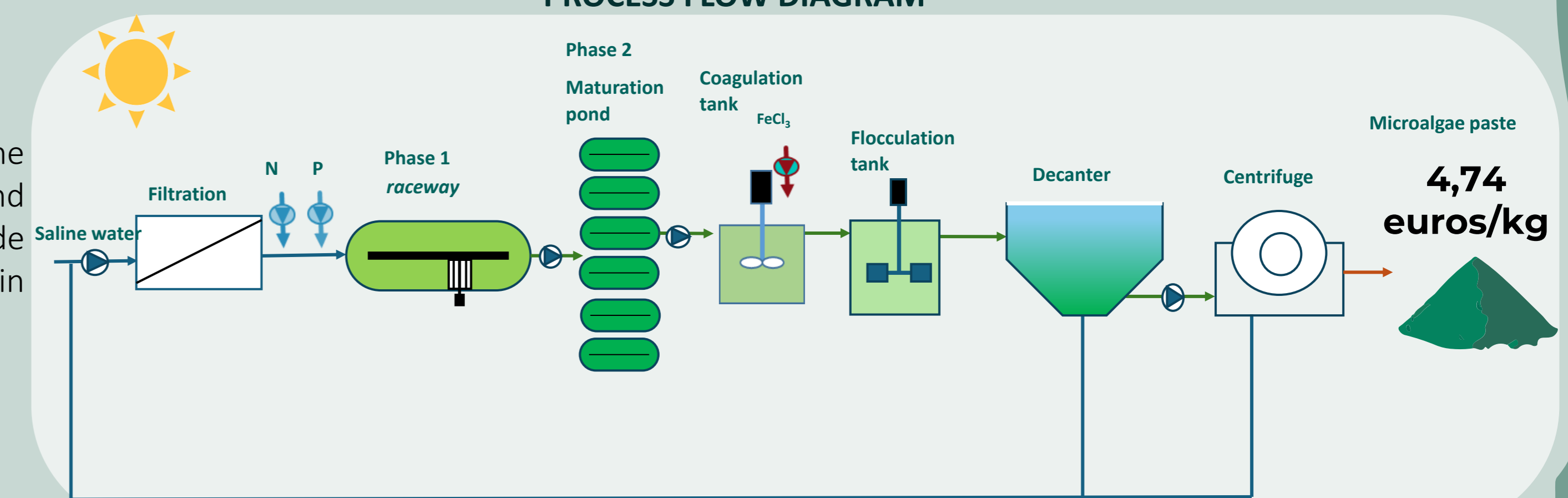
The gradual increase in salinity favors the production of carotenoids and MAAs, obtaining the second highest productivity value in "progressive" treatment

### Trial 3: Semi-continuous growth

At the "progressive" level, the highest values of MAAs and carotenoids are achieved alongside the highest values in protein production



### PROCESS FLOW DIAGRAM



Based on the experimental results, our preliminary cost assessment of the cultivation of *Dunaliella salina* in lands of the Bay of Cadiz shows a production and harvesting cost of 4,78 €/kg.

## CONCLUSIONS

- Better results in terms of growth and production of compounds of interest are obtained with saline-matured water than by adding solid saline salt to increase the salinity of the culture.
- It has been determined that the best strategy to induce salt stress is to expose the culture to progressive stress versus acute stress and in combination with nutrient starvation.
- Operational strategy and salinity of the medium have been found to influence the percentage composition of the biomass..

