# APPLYING NEGATIVE EMISSIONS TECHNOLOGIES IN THE 'SUPERFOODS' SECTOR: HOW FAR ARE WE FROM ACHIEVING A CARBON NEUTRAL SPIRULINA PRODUCTION?

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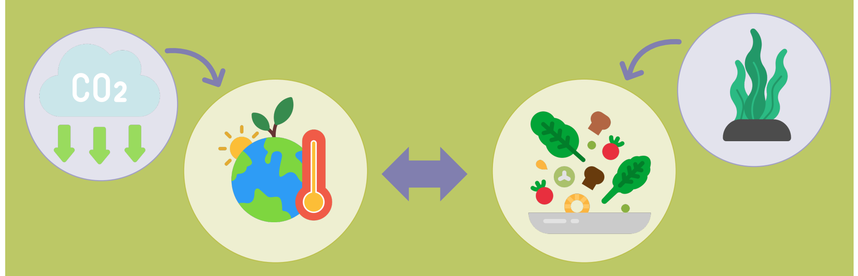
## INTRODUCTION

The expected growing demand for food and the strong interactions of food systems and environment evidence the need for the transformation of the sector.




The development of **novel products** adaptative to climate change and the introduction of **carbon dioxide removal (CDR) technologies** could play a key role in achieving carbon neutrality targets

**Carbon accounting of decarbonization technologies for verifying carbon reductions in the production of spirulina (*Arthrospira platensis*)**

## METHODOLOGY

### Definition of scenarios

**BAU (business-as-usual)**
Current artisanal production of spirulina with synthetic $CO_2$ supply

**BRW**
Production of spirulina using $CO_2$ recovered from beer fermentation

**SDACC**
Production of spirulina using $CO_2$ from a direct air carbon capture (DACC) unit

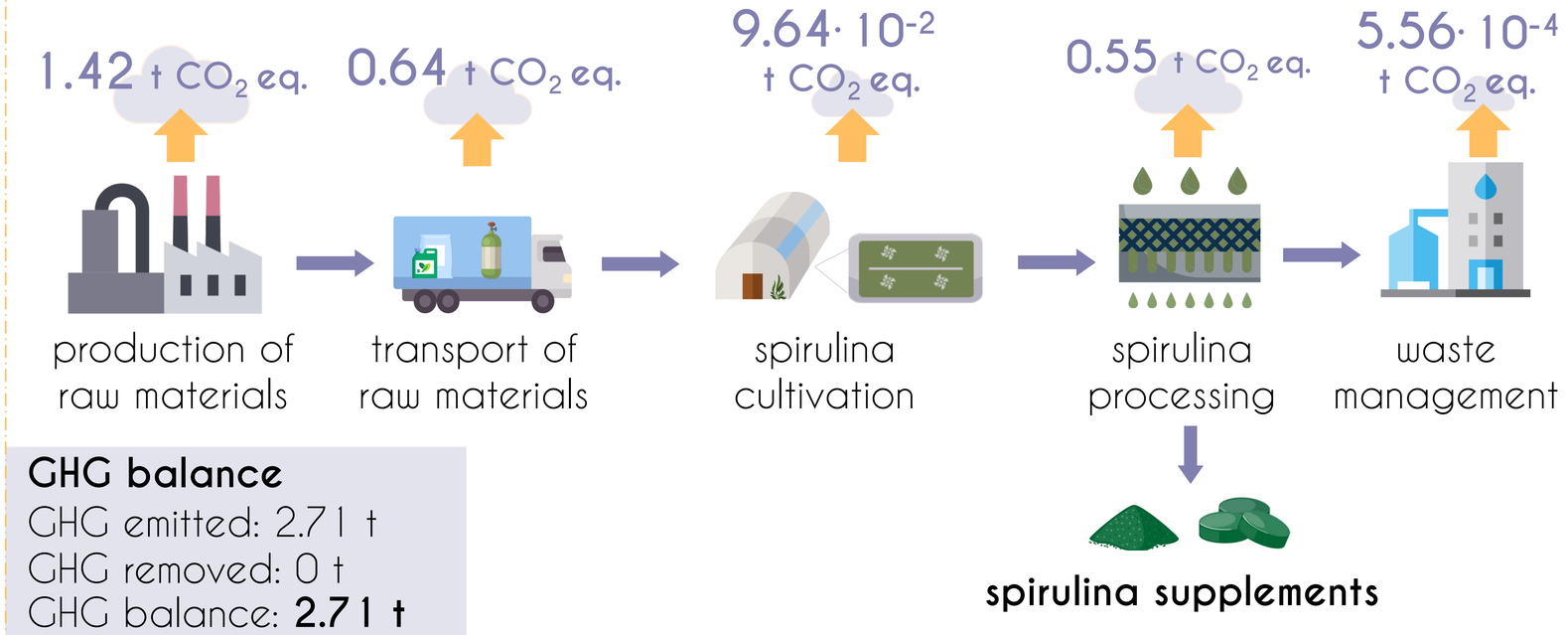
### Life cycle assessment (LCA) methodology

| Boundaries | Reference flow | Software | Method |
|---|---|---|---|
| Cradle to gate | 1 year production | SimaPro v9.3 | IPCC 2019 |

Life cycle inventory:
- Real spirulina production data
- Hipothetical CDR technologies
- -1/+1 approach for biogenic C
- Ecoinvent v3.8 database

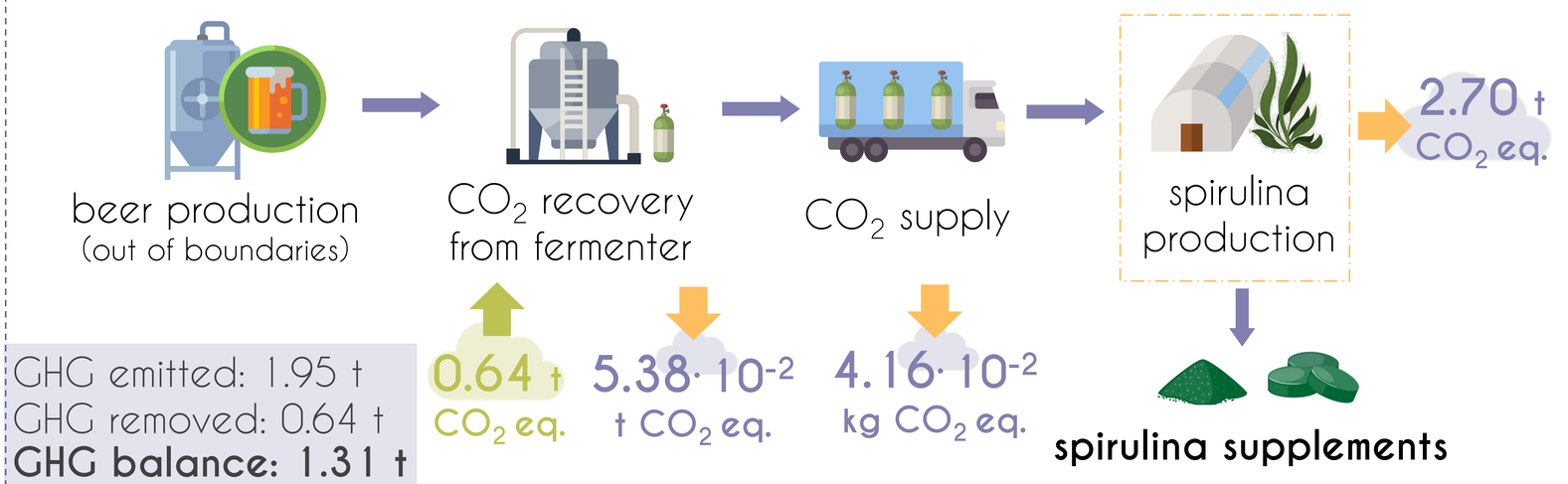
## RESULTS

### BAU



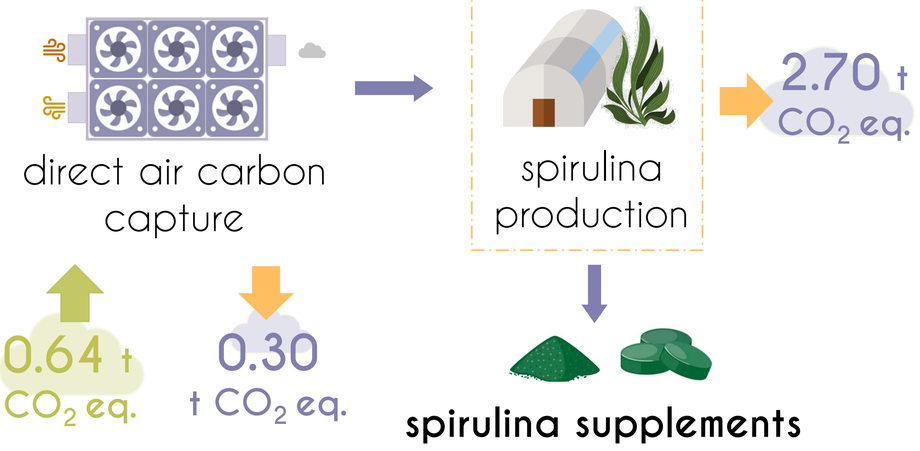

**GHG balance**
GHG emitted: 2.71 t
GHG removed: 0 t
GHG balance: **2.71 t**

### BRW




GHG emitted: 1.95 t
GHG removed: 0.64 t
**GHG balance: 1.31 t**

### SDACC




GHG emitted: 2.08 t
GHG removed: 0.64 t
**GHG balance: 1.44 t**

### Potential of carbon capture and storage for neutral production

- **DACC capacity** increase up to **2.9 t/yr** ($CO_2$ pipelines) or **3.9 t/yr** (trucks)
- **Geological storage** capacity of **2.25 t/yr** (pipelines) or **3.21 t/yr** (trucks)




### TAKE-HOME MESSAGE

$CO_2$ recovery from breweries: best for **climate change mitigation**

$CO_2$ from DACC: best for **carbon removal** in the medium to long term

## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support of the project KAIROS-BIOCIR (PID2019-104925RB (AEO/FEDER, UE))

Ana Fernández thanks the Spanish Ministry of Science and Innovation for the financial support through the research fellowship RE2020-094029