

## **ProFuture**

Microalgae Protein  
Ingredients for the Food  
and Feed of the Future



# **Micro-algae proteins for food and feed? Yes, but how? A Decision Support framework for the assessment of their sustainable production.**

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# Poster Abstract

The use of algae presents a remarkable and innovative approach to addressing the global economy's shift towards sustainability and circularity. Simultaneously, the question of whether algae can feasibly serve as substitutes for conventional resources needs to be addressed. Despite the challenges in thoroughly exploring this field, it is astonishing that significant efforts have yielded an extensive compilation of techniques for cultivating, processing, and utilizing various alternative types of algae. Following, valuable algae-based intermediates give rise to a diverse range of final products with applications in markets such as food, feed, pharmaceuticals, cosmetics, and even energy.

In the **Profuture** project the focus relies on the implementation of innovative, sustainable and cost-effective technologies to produce microalgal-based protein directed towards the food and feed markets. Profuture strives to strengthen the collaboration among various key stakeholders in the microalgae value chain. Its core focus lays on the increment of the efficient microalgal cultivation, the optimization of the workflows for the production of protein-rich ingredients derived from microalgal biomass, and the development of innovative, nutritious, and high-quality food and feed products. The objective is to lead the developments in market by scaling up these processing techniques to an industrial level.

In a complex technological landscape, the availability of data, and the multitude of possibilities for integrating various processes, there lies the challenge of formulating a beneficial value chain pathway based on microalgae. The simultaneous consideration of critical factors such as cost, efficiency, energy use, and environmental footprints poses significant obstacles in identifying the most promising solutions. Furthermore, the absence of a specific framework that facilitates the assessment of these factors simultaneously within a single computational environment adds another layer of complexity.

To facilitate the assessment of alternative production routes using microalgae as raw materials for food and feed production, a Decision Support Tool has been developed. This tool aims to evaluate the sustainability, circularity, and feasibility of different value chains, offering guidance towards optimal solutions based on specific scenarios. To ensure widespread adoption by stakeholders, a User-Friendly Interface is being created as a web-based platform where users can access and visualize results. The Decision Support Platform, **AlgaVantage**, acts as a host for optimization models and includes a back-end administration system and a customized database design. This database design enables the representation of all stages of the value chain, managed through a back-office system for database input. The tool has an "Open" design, allowing for customization of studies and the incorporation of additional data beyond the scope of the Profuture project. The framework operates in two modes: a) Step-by-Step Wizard approach: Users can gradually build value chains by following a guided process. b) Results-

driven optimal paths: Users have the flexibility to adjust variables and perform optimizations subjected to single or multiple criteria (eg. cost, GHG emissions, energy use etc.). The tool provides as an outcome the most beneficial configuration of different processes based on the optimization results.

By employing AlgaVantage, stakeholders can navigate the complex landscape of microalgae-based value chains, evaluate different options, conduct what-if studies and identify the most advantageous value chain paths for their specific needs.



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# AlgaVantage Your Gateway to micro-algae Excellence!



**ALGAVANTAGE**  
OPTIMIZE INNOVATE ALGAVATE



SCAN ME

## MICRO-ALGAE PROTEINS FOR FOOD AND FEED? YES, BUT HOW? A **DECISION SUPPORT FRAMEWORK** FOR THE ASSESSMENT OF THEIR SUSTAINABLE PRODUCTION.

### • THE CHALLENGE

#### #1 Complex Technological Landscape

Merging processes and data complicates creating efficient microalgae value chains.



#### #2 Varied Priorities

Balancing cost, efficiency, energy, and eco impact makes optimal solutions challenging

#### #3 Lacking Unified Framework

Absence of a single computational environment for evaluating these factors

### • THE SOLUTION

#### 1 DEFINITION OF THE BUILDING BLOCKS OF THE VALUE CHAINS

Method to structure building blocks in algal-based value chains.

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#### SUPERSTRUCTURE NETWORK DEVELOPMENT

Structural connections of the different processing involved in the superstructure network of the value chains.

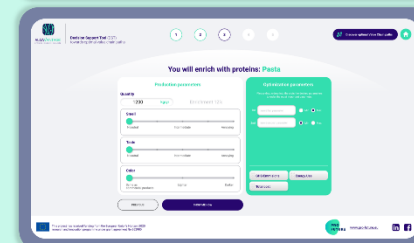
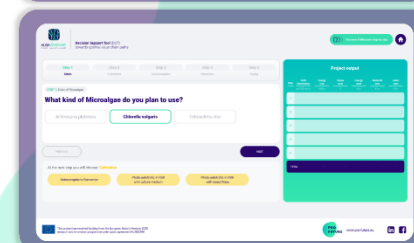
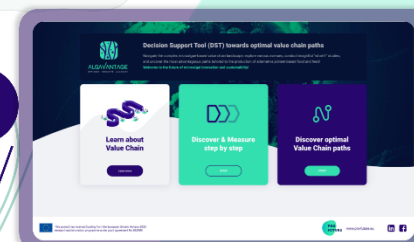
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#### DATA REPOSITORY & OPTIMIZATION CODE DEVELOPMENT

Data collection procedure and the formulation of the Data Repository. Optimization model structure ensuring the adaption of data from the data repository and the result availability on it.

#### 4 DECISION SUPPORT TOOL DESIGN

The **Decision Support Tool (DST)** hosts optimization models, utilizes a back-end administration system with custom database design. This open design allows customization and data integration operating in two modes: Step-by-Step Wizard for guided creation and optimal path selection.




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# ALGAVANTAGE

OPTIMIZE INNOVATE ALGAVATE



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