

## After three years ongoing, the ALEHOOP project shows promising results for the potential final products

ALEHOOP (Biorefineries for the valorisation of macroalgal residual biomass and legume processing by-products to obtain new protein value-chains for high-value food and feed applications) aims to **provide a pilot-scale demonstration focused on the recovery of low-cost alternative proteins in biorefineries**. Sustainability and low-cost processes are pursued through all performed methodologies, which are based under the pillar of **processing wastes from green macroalgae blooms, brown seaweed and legumes by-products**. The objective is covering an ever-increasing market demand of consumers who are asking for protein formulations of biological origin, produced at low-cost and with better sustainability performance than conventional ones, as well as reducing Europe's dependency on plant-based proteins like soy. The resulting **proteins are meant to be used within the food and animal feed sectors**.

A lot has been going on since ALEHOOP started. The first key task to perform during the first stage of the project was to **guarantee the year-round supply of safety feedstock** and, then, **optimising the extraction processes** of all the raw materials. With these processes clear and optimised, it was easier to create a **protein extraction protocol** for legume by-products, as well as **scaling-up (at pilot-scale) this extraction**.

The protein extraction of lentil, bean, lupin and pea by-products was optimised on lab-scale and validated on pilot-scale. The extracts were characterized in terms of their **biochemical** (moisture, protein, sugar and fat content, mineral analysis, and amino acid composition), and **techno functional properties** (solubility, water and fat holding capacities, gelling, emulsifying and foaming capacity), as well as **antioxidant activity** and **antinutritional factors**. After this characterization, **in vivo studies of bioavailability** and **product development trials with the end-users** are currently running. Among the ALEHOOP legume proteins obtained, **lupin and lentil** were selected as the best nutrient-profile powders for *in vivo* studies in metabolic cages.

Regarding the algae, some challenges appeared on the way, for example, when dealing with **green seaweed**. This feedstock often presents impurities like shells or sand, which need to be removed before the extraction process begins, and that is why **a prototype for the cutting and cleaning was developed**. Algae **proteins from green and brown seaweed were, too, characterised and extracted**. About **brown algae**, a new process to produce alternative proteins was developed. The **protein content was increased up to 40%**, through a set of consecutive filtrations and washing steps. For both brown and green algae, the **up-scaling processes are ongoing**.

All these processes are always closely monitored with **life cycle approaches**. Data from the partners is collected to build the LCA (Life Cycle Assessment), LCC (Life Cycle Costing) and S-LCA (Social Life Cycle Assessment) of the processes, assess their sustainability performance and provide information to eco-design the processes using an artificial intelligence algorithm. Also, **legal and market requirements** have been taken into account for the potential final products and different **tests were performed to ensure food security**.

Despite the difficult pandemic times, after the worst part of the COVID crisis was over, partners were able to attend events, congresses and conferences to **promote the project and disseminate its results**. From now until the end of the project, the partners will scale-up the processes and work on the final ALEHOOP products: products in the **food/beverage** sector (healthy snack bars, smooth food, meat analogues, sports drinks, meal replacement shakes and marmalades) that meet current market requirements and also **products in the animal feed sector**.



About the project: **ALEHOOP** is an EU-funded project, which started in June 2020 and which counts on a consortium of 16 partners from 6 different countries: Spain, Germany, Belgium, Norway, Ireland and Czechia. It is an Innovation Action that **received funding from the BBI-JU**. The project will last until May 2024

About **BBI-JU**: the Bio-Based Industries Joint Undertaking (BBI-JU), now known as **Circular Bio-Based Europe Joint Undertaking (CBE-JU)**, is a **partnership between the European Union and the Bio-Based Industries Consortium (BIC)** to fund projects advancing competitive circular bio-based industries in Europe.

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