



BYPROTVAL

PROTEIN RECOVERY AND RECYCLING FROM ANIMAL
BY-PRODUCTS TO DEVELOP HIGHER
VALUE-ADDED PRODUCTS



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BYPROTVAL

Layman report
February 2024

Project partners:



This project has received funding from the LIFE Programme of the European Union under Grant Agreement LIFE16 ENV/ES/000467.

Total budget: 1,429,463 €

Duration: 01/09/2017 – 28/02/2024

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1 ABOUT LIFE BYPROTVAl PROJECT

MAIN RESULTS OF THE LIFE BYPROTVAl PROJECT

Recovery of approximately 85% of the proteins present in meat and bone meal and rendering process water. The demonstrator has a capacity to produce up to 58.4 tonnes of protein per year.

Introduction of new high value-added bio-products that can meet the current market demand for bio-based products, as well as new business opportunities for the recovery of other organic waste.

Reduction of production costs and waste generation, increasing reliability of raw materials supply and potential savings in water consumption.

PROJECT IN FIGURES



4 Project partners



1 Demonstration plant developed



2 Validated treatment units



2 Validated secondary raw materials: meat-and-bone meal and protein-rich waste water



2 Bio-products analysed: biostimulants and bio-based agents for the chemical and leather sector



7 years |Duration: 01/09/2017-28/02/2024



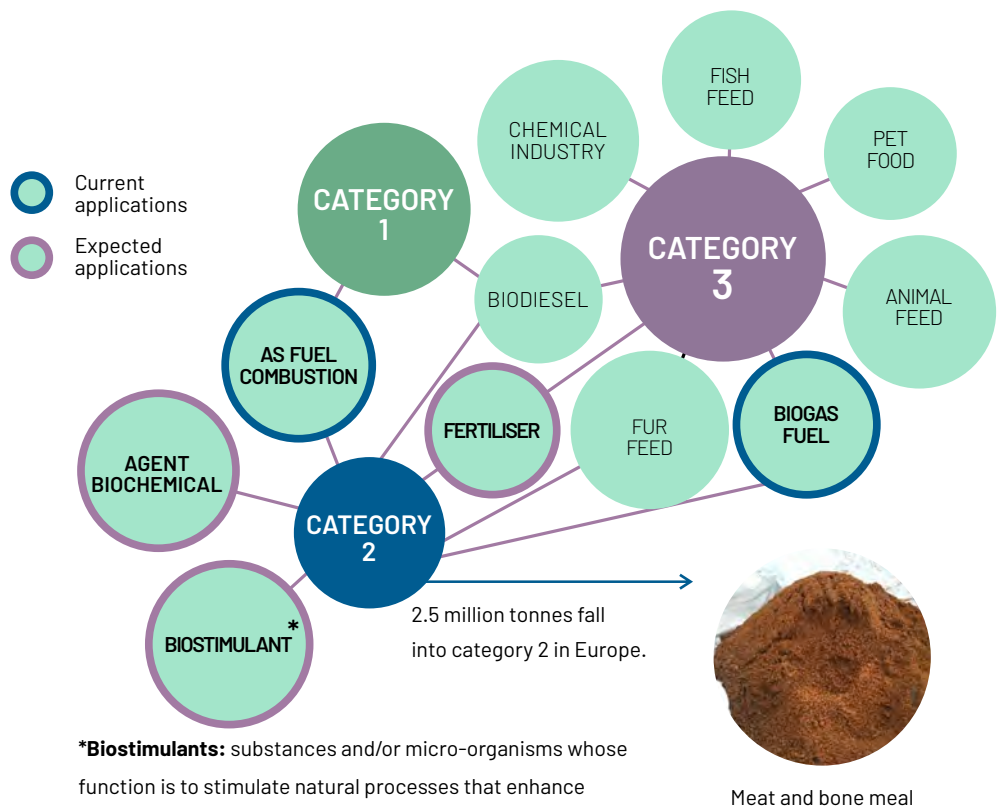
Total budget 1.429.463 €
(EC contribution € 850.895)

3 WASTE MANAGEMENT AND CURRENT USES OF ANIMAL BY-PRODUCTS

In the framework of regulation EC 1069/2009, this research studies the use of category 2 and 3 animal by-products. These organic resources are recovered to be transformed in secondary raw materials to increase their value.

Processed products, mainly fats and proteins, are divided in three different categories of animal by-products, from 1 to 3, according to their level of risk. They are processed and used in different ways in accordance with this category.

Category 2 products are mainly destined for energy recovery (i.e., the least preferred application recommended by the EU Circular Economy strategy) or disposal in authorised landfills, while category 3 products are mainly intended for use in animal feed.



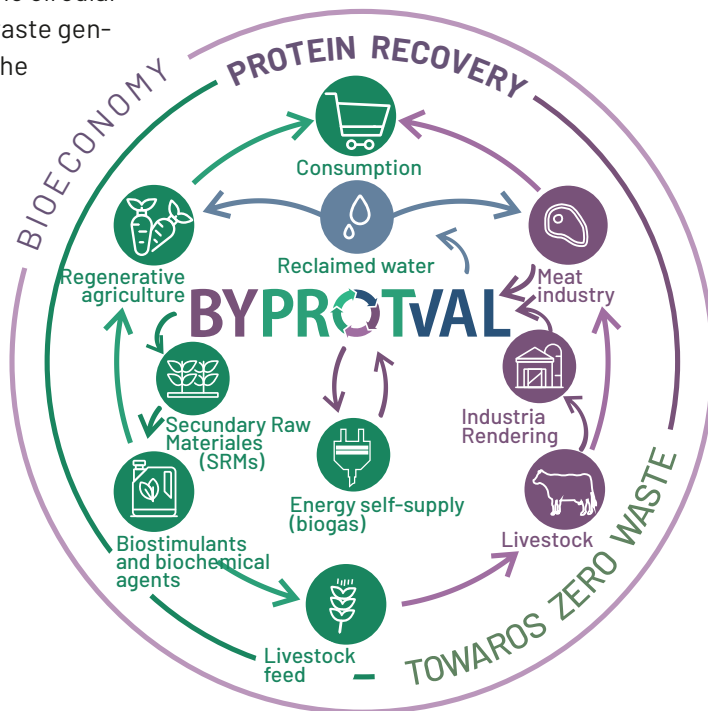
***Biostimulants:** substances and/or micro-organisms whose function is to stimulate natural processes that enhance nutrient uptake and assimilation, treat abiotic stress or improve some agronomic characteristics.

4 LIFE BYPROTVÁL'S CONTRIBUTIONS TO CIRCULAR BIOECONOMY

The process improves the efficiency of water, energy and natural resources by using secondary raw materials, wastewater from the process in the process itself and energy self-sufficiency through biogas from the rendering plant.

LIFE byProtVal is an opportunity to incorporate bioproducts and technological solutions based on the circular bioeconomy.

The main contributions of this project to the circular bioeconomy include the minimisation of waste generation by providing added value through the functionalisation of waste recoveries and resource efficient procedures leading to a more competitive bioeconomy.



CONTRIBUTIONS TO BIOECONOMY



Approximately 60% of each meat-producing animal is transformed into food for human consumption, and the remaining 40% into SANDACH (out of 328 million livestock, EFRA).



Reduction of water consumption through recirculation of reclaimed water in industrial processes.



Improving the quality of the wastewater discharged by rendering companies.



Improving energy efficiency and self-supply (through biogas)

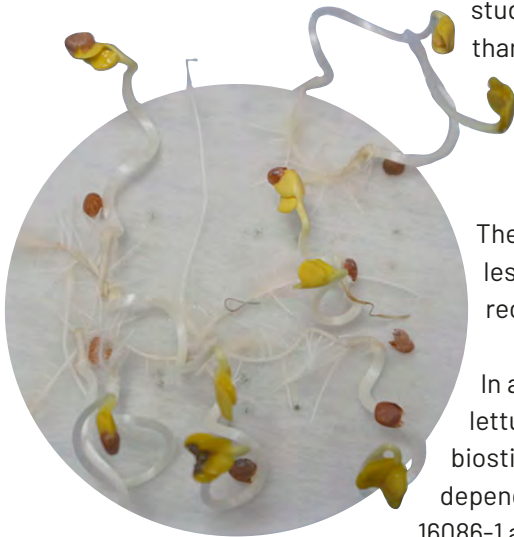


Increased supply of bio-based products that help improve plant efficiency against water stress and complement fertilisation efficiency.

5 PROTEIN RECOVERY VALIDATION AND TECHNICAL APPLICATIONS

MAJOR INNOVATION IN PROTEIN RECOVERY

A biostimulant based on a more sustainable high-efficiency enzymatic hydrolysis process has been obtained. This hydrolysed product is capable of recovering more than 85% of the proteins present in the animal by-products studied, with a content of 60% of total amino acids and more than 5% of free amino acids in solution (according to ISO 13903:2005). Therefore, it can be remarkably suitable as a raw material for the development of biostimulant products.



Evaluation of the germination growth of radish seeds in a petri dish.

The developed process is more sustainable as it consumes less water, reagents and energy than conventional protein recovery processes.

In addition, germination tests were carried out on cabbage, lettuce and radish, evaluating the potential for application as a biostimulant, and showing an improvement in growth of 17-30%, depending on the variety of seed studied (according to UNE-EN 16086-1 and 2:2012).

The product has been produced in an environmentally friendly way, based on a recovered biogenic source that provides greater sustainability and meets the demand for new bio-based products as a source of nutrients for organic farming.

LIFE CYCLE ASSESSMENT

Significant reduction of CO₂ emissions during production (from cradle to gate according to ISO 14040 and ISO 14044):



Biostimulant and retanning agent developed by the project.

6 VALIDACIÓN DEL BIOPROCESO Y LA TECNOLOGÍA

An improved and adapted pre-industrial prototype was developed capable of demonstrating technical and economic feasibility.

The process and technology developed in LIFE byProtVal consists of two treatment units to hydrolyse a meat and bone meal raw material.

Unit 1 consists of a reactor with a 5 m³ capacity and unit 2 is a 2 m³ concentrator with a production capacity of 200 litres per hour.

The results of enzymatic hydrolysis showed a solids content of 12% and mass yields of 40-45%.

Concentration results were 42% solids content, 47.5% dry protein and 18.02% free amino acids.



The validation of the enzymatic hydrolysis bioprocess and scaling with category 2 by-products allows the industry to diversify into other types of raw materials, recovering up to 58.4 tonnes of dry protein per year with these applications.

With this demonstration plant, an effective validation of the bioprocess and technology has been conducted, as they improve conventional systems in the animal waste processing industries by avoiding the disposal of by-products in landfills or incineration, offering a bioproduct with greater added value for the biochemical industry, with potentially positive environmental impacts, and avoiding significant economic losses in the management of SANDACH by-products.

Unit 2 of 2 m³ concentration.



7 ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACT OF THE PROJECT

A promising approach to reducing environmental pollution and making agriculture more sustainable.

DIRECT IMPACT:



Added value through the functionalisation of waste from the rendering industry and resource-efficient procedures thanks to the recovery of protein derivatives up to 85%, which allows the circularity of currently undervalued by-products.



Diversification of the chemical and agri-food industry supplies by substituting other types of organic materials that help to close the loop and reduce the carbon footprint.



Improvement of wastewater quality and reduction of water and chemicals consumption in the production process.



Promotion of cross-sectoral collaboration, innovation and industrial symbiosis.

INDIRECT IMPACT:



Self-supply of energy through the plant's biogas.



Increased employment, competitiveness and regional collaboration.



Reduction of waste in the rendering industry and costs associated with its management.



Reduced use of imported mineral raw materials to complement the use of mineral fertilisers, as well as correct precision in applications on the plant, thus avoiding leaching.



Applying byProtVal biostimulants helps to improve plant growth by up to 30%, with a potential increase in plant biodiversity and soil carbon sink.

For more information

Watch the following video:

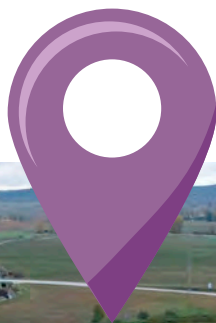
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Location of the demonstration plant:
Carretera de Gómara, Km 2.8
Almazán, Soria, 42200 Spain



A DEMONSTRATION BIOPROCESS TO RECOVER HIGH ADDED VALUE PROTEIN

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