Co-funded by the Eco-innovation Initiative of the European Union

# EXECUTIVE SUMMARY

## DESCRIPTION

Although biogas production is efficient at reducing agricultural emission by converting the biomass into electricity and thermal energy (cogeneration), or biomethane, its major weakness is that it produces a **digestate** with **high a concentration of nutrients** (N, P, K) and the **volume is around 90-95% of what was fed into the digester**. This means that large agricultural areas are required for the application of the fermentation residues (because of nitrates regulation), which often results in long transport routes.

**In this project** we set out to bring together all stakeholders for the installation of a new process to **minimize spreading digestate flows** and to **economically valorize the minerals** (nitrogen, phosphorus and potassium, among others). By using digestate instead of synthetic fertilizers, it is possible to save energy, limit consumption of fossil fuels and reduce our carbon footprint.

**DETRICON**, a Belgian SME, is proposing **innovative low-cost solutions to produce green fertilizers with stripping technology and an optional module of solar drying**. These nutrient recovery technologies will allow for solutions adapted to the farmers needs in terms of capacity, available spreading surface and treatment costs.

In the current context of worrying pollution of water and soil in many parts of Europe, the DIGESMART project will allow farmers to transform their waste into energy and fertilizer. DIGESMART solution aims to reduce the environmental impact of European farms by facilitating the market uptake of innovative solutions for the treatment, recycling and valorization of digestate.

## OBJECTIVES

The general objective of the project is the complete valorization of agricultural waste through recycling digestate into green fertilizers.

The **general objectives** of the project are summarized below.

1. Reduction of the volume of liquid digestate fraction (concentration of nutrients), hence leading to a reduction of storage, transportation costs and pollutant emissions.
2. Reduction of energy consumption of the digestate treatment process by a reutilisation of the energy produced by cogeneration and solar power
3. Development of a digestate treatment solution adapted to the size of small/middle farms and to the geographical and environmental situation.
4. Development of a low-cost digestate treatment solution, with lower costs than other solutions available on the market.
5. Development of green fertilizers with low carbon footprint and high agronomic value.

The **specific objectives** of the project are summarized below.

1. To evaluate the regulatory context and energy costs relevant to the DIGESMART solution.
2. To test the digestate treatment solution at farm level.
3. To evaluate and compare the green fertilizer production system with existing technologies.
4. To develop the Life Cycle Analysis of the whole process.
5. To validate the solution developed and replicate it.
6. To facilitate the transfer of the results to European farmers.

## RESULTS

The DIGESMART project offers the solution of digestate valorization, contributing to reduce inorganic fertilizer amounts through recycling of nutrients (N-P-K) of digestate in an environmentally friendly way.

The main **expected results** are:

1. To bring to light the relevant issues from the regulatory context and costs that could influence the uptake of the DIGESMART solution in participating and targeted countries: Belgium, Denmark, France, Germany, Italy, Netherlands and Spain.
2. First market implementation through installation, testing and validation at farm level of the DIGESMART solution (pilot plant of digestate treatment): a low-cost solution to produce green fertilizers with technologies for nutrient recovery from digestate (centrifuge, stripping and solar drying).
3. Field trials results from green fertilizers application: agronomic value (N, P, K, among others), crop yield response and optimal use of green fertilizers adapted to geographical and meteorological differences between northern and southern countries.
4. Life Cycle Analysis study of the DIGESMART solution
5. Development of a business plan to replicate the DIGESMART solution in the participating and targeted countries.

## BENEFITS

### Environmental benefits

Currently, the digestate produced by biogas plants is usually spread by farmers on agricultural lands. The digestate has a high concentration of NPK but in some European regions the amount of digestate is too important and contributes to soil and water pollution. Indeed an overdose of ammonium nitrate produces an excess of non-use by plants and thus the leaching of it and subsequent environmental consequences such as eutrophication.

The DIGESMART solution consists of treating and recycling the digestate to produce green NPK fertilizers, hence reducing the environmental impact of agricultural sector.

The environmental benefits include:

- A reduction in the use of water resources and soil pollution.
- A reduction in the environmental impact notably CO2 and CH4 emissions associated with the manufacturing of organic fertilizers and to the treatment of agricultural wastes.
- The preservation of natural resources through nutrient recovery (N, P, K, among others) from organic renewable sources.

- A reduction of fossil fuel consumption and transport emissions (due to the concentration of the effluents and volume to be transported).
- An improvement in energy efficiency of biogas plants.

**Economical benefits**

- Lower needs of digestate capacity storage, hence lower costs of storage facilities.
- An increase in the economic sustainability of small/middle size biogas plants due to the reduction of digestate treatment costs and, in some countries, additional income from the use of the heat generated by biogas production.
- The valorization of digestate into green fertilizers will lead to marketable products with a high value on the market.

## PARTNERS

**DETRICON** (www.detricon.eu) is a Belgian SME constructing environmental technologies for the valorisation of organic waste streams. The focus lies on the nutrient recovery out of manure and digestate, producing biobased or green fertilizers for local use.

**AINIA** (www.ainia.es) is a Spanish non-profit technological centre formed by companies in the food manufacturing sector and related industries, whose objective is the promotion of innovation and technological development.

**BIOGAS-E** (www.biogas-e.be) is a non-profit organization and the platform for anaerobic digestion in Flanders. As main activities, Biogas-E works on knowledge transfer, policy support, education, advice centre, networking and sector development.

**UNITO**, Universita degli Studio di Torino. University of Turin (Dept. Disafa) (www.disafa.unito.it) is organized in four sections: Economy, Hydraulics, Mechanics and Topography and Rural Buildings. Sixty people work in the department that is among the two leading agricultural engineering institutions in Italy.

**SATA** (www.satasrl.it) was established in 1986 as Studio Agronomico Tecnico Associato then went on to become a company of agronomists, whose mission is to meet the growing demand for services in the vegetable supply chain, from production in the countryside to distribution right through to the consumer.