Interreg Mediterranean GREEN GROWTH
Project co-financed by the European Regional Development Fund

A project labelled by the UfM
Union for the Mediterranean
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European Circular Economy Stakeholder Platform
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RE-LIVE WASTE

Production of organic high-value commercial bio-fertiliser, struvite

Countries:

Spain, Cyprus, Italy and Bosnia and Herzegovina

Target Groups:

Sectoral agencies, business support organisations, enterprises except SMEs, interest groups, European Economic Interest Grouping, farmers, Higher education and research, research institutions and universities, training centres and schools, infrastructure and (public) service providers, international organisations, local public authorities, national public authorities, regional public authorities, the general public

Theme:

Waste management

Key Words:

Livestock waste management, struvite, struvite enriched precipitate (SEP), abatement of recovery of nitrogen and phosphorus, small-scale pilot Struvite Precipitation (SP) plants

Starting and Ending Dates:

February 2018 - January 2021

Agriculture and livestock breeding are key sectors in the Mediterranean region. Regions involved in the project are characterised by intensive cattle and pig farming, thus producing large amounts of waste that have become a major source of pollution, creating both environmental and economic challenges. There is an untapped potential for farmers in the Mediterranean to use innovative technologies to convert livestock waste into a resource. **RE-LIVE WASTE** tests innovative solutions for livestock waste management in selected Mediterranean regions, exploring the technical, environmental, economic, and legal aspects of fertiliser production. Pilot projects transform livestock waste into organic high-value commercial fertilisers (struvite and SEP), contributing to smart and sustainable growth and to the creation of new business and market opportunities. Project outputs include 4 Struvite Precipitation (SP) plants, policy guidelines to stimulate innovative approaches to policy making, and establishment of a common legal framework. This transnational network aims to share innovative technologies that reduce the environmental footprint of livestock farming. A quadruple-helix and beneficiary oriented approach will ensure a tangible impact on the territories involved and the transferability of results to other European countries.

Improving innovation capacities of private and public actors for sustainable and profitable Recycling of LIVEstock WASTE.

RE-LIVE WASTE Pilot Projects

Challenges

RE-LIVE WASTE contributes to the Europe 2020 strategy, addressing challenges in research and development, innovation, energy management, and climate change. This project supports the region's transition to a greener economy, because the organic fertilisers produced from livestock waste are more efficient than energy-intensive mineral fertilisers, and release less GHG emissions during the production cycle.

Solutions

The small-scale pilot Struvite Precipitation (SP) plants will allow the recovery of nitrogen and phosphorus, allowing farmers to comply with the EU Nitrates Directive (1991) as well as improving the 'nutrient use efficiency' of farming, contributing to environmental protection and green growth.

The project will strengthen transnational and regional action strategies in waste management.

RE-LIVE WASTE also contributes to the objectives of the LIFE Programme (2014-2020) concerning the shift towards a resource-efficient economy, reduced GHG emissions, and improving environmental governance at all levels. The project is also in line with regional Mediterranean policies that consider innovation as the key driver for competitiveness and growth, such as the Territorial Agenda 2020.

Lessons learnt and broader recommendations

The lessons learned and the recommendations will be part of a specific deliverable of Activity 3.7. It is important to note that one facility (CY) was able to produce high purity struvite (~90%), which was free of pathogens and carcinogens. This particular struvite was compared with commercially available fertilisers and the results appear to be very promising. Additional methodologies to address different needs (i.e. farmers vs. companies) are currently being tested. This has made it clear that a flexible approach to livestock waste transformation is essential for developing an effective strategy. This stems from the diversity of livestock breeding and feed that results in a variety of waste materials which require fine-tuning of pilot plants according to the quality of the materials to be treated.

Green Growth and the EU Green Deal

RE-LIVE WASTE contributes to Interreg MED Green Growth's priorities by creating tangible options for sustainable development in the Mediterranean region. In particular, **RE-LIVE WASTE** will contribute to the 'Farm to Fork Strategy' for designing a fair, healthy, and environmentally-friendly food system1. By processing waste, the pilot plants will reduce the leaching of nitrates into groundwater and the accumulation of excess nutrients and heavy metals in the soil. Furthermore, the liquid effluent produced at the end of the production process might be used for fertigation, reducing the amount of freshwater used on these farms. From an industrial point of view, livestock waste reutilisation will reduce the use of raw materials. Industrial phosphorus fertilisers are manufactured from non-renewable phosphate rocks which are near depletion. Phosphorus recovery (along with nitrogen) from organic waste has the potential to become common practice, which is what the **RE-LIVE WASTE** project seeks to achieve.

The InterregMED Green Growth Community

Green Growth is a thematic community that promotes sustainable development in the Mediterranean within the framework of the Interreg Med Programme. It supports the sound management of natural resources by enhancing cross-sectoral innovation practices through an integrated, territorially-based cooperation approach.

The community supports its projects in communicating and capitalising on their results to increase their impact at the policy level and ensure their potential transfer into other territories.

Visit our website:
green-growth.interreg-med.eu

Join the Green Growth Capitalisation Platform:
interregmedgreengrowth.eu

Further Information:

RE-LIVE WASTE Website:
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RE-LIVE WASTE

Type of the result:

· Methodology
· Guidelines
· Policy recommendations

Language(s) in which the result is developed:

· English
· Spanish
· Italian
· Serbo-Croatian
· Greek

What is the most appropriate level for its use/ implementation?

Local, regional, national and international

DESCRIPTION OF THE RESULTS

Improper livestock waste management pollutes surface water (eutrophication and the addition of micropollutants) and accelerates climate change, through the emission of greenhouse gases. During the **Re-Live Waste** project, livestock waste was used to produce high-value bio-fertilisers by recovering nutrients from heavily polluted streams. To do so, four pilot plants (of which one was upgraded) were installed to incorporate innovative techniques in Italy, Cyprus, Spain, and Bosnia and Herzegovina, using treated and untreated slurries as raw materials to produce bio-fertilisers.

The processes involved the crystallisation of an organo-mineral fertiliser with isomolar ratios of magnesium, ammonium, and phosphate and chemical formula $NH_4MgPO_4 \cdot 6H_2O$, called struvite. Struvite is a slow nutrient releaser, allowing it to fertilise crops more efficiently than conventional formulas, while creating fewer pollution streams.

It is produced by adding excess amounts of Mg^{+2} compared to ammonium and phosphate which cause supersaturation of the solution and result in struvite precipitation. In this case, raw slurries and anaerobically treated effluents were used to produce struvite.

PROJECT IMPLEMENTATION AND EVALUATION BY END-USERS

The results have been tested in Cyprus, where the SCR was successfully operated and produced high-quality struvite in terms of physical-chemical characteristics and purity, absent from pathogens and carcinogens.

The product also underwent agronomic evaluation and was compared with fertilizers commonly used for growing lettuce, radishes, and Lepidium sativum L. in greenhouses, with promising results.

WHAT IS THE TRANSFER POTENTIAL?

Transferability of this outcome relies on improving the innovation capacities of the public and private actors involved in livestock waste management and farming, and we are aiming to strengthen the cooperation between the quadruple helix actors. In parallel to the technological aspects, several actions have been put in place to ensure the project's transferability. Public events (such as open days, technical visits, workshops and round tables) are effective mechanisms to reach stakeholders across the value chain. Simple communication tools such as exhibition panels or informational documents (easy guides for complex issues) have been combined with more elaborate documents such as the policy guidelines, to achieve maximum transferability from laymen to decision makers.

WHAT IS THE PROJECT REPLICABILITY?

The quality of the struvite produced depends on the treatment process. Each pilot case had different feed characteristics, budget, type of reactor, etc., so each partner produced struvite of different quality. However, each solution is solid and replicable. This was proven by the pilot site in Cyprus – the most advanced of the pilot sites – where five experiments have been carried out, with the quality of struvite produced consistently above 70.5% (considerably high based on the starting material). If the model is transferred to other regions as it is, and all parameters remain the same, then the plan will perform the same way.

This project tests different scenarios for struvite production. In all the cases, there was a solution for struvite production and a more sustainable waste management, despite differences in raw material, farm structures, plant managers, etc.

The struvite produced can be used for agriculture, as well as for fertilising private home gardens. The process of struvite production can be applied in small- or large-scale farms as a step towards meeting EU regulations and reducing fines for private use.

WHAT CHALLENGES MAY ARISE?

The biggest challenge that in struvite production is the level of investment. The higher the investment, the greater the quality of struvite will be. It is possible to keep the initial investment cost low and 'polish' the wastewater effluents produced from a farm, but the struvite enriched precipitate (SEP) produced will be most appropriate for domestic use. The important thing is for investors to choose their business model and set the minimum viable product (MVP). When it comes to accessing the data of large-scale applications, a PLC and SCADA system must be installed for automatic operation and remote monitoring respectively, but personnel are still needed for maintenance. There is no one solution for farm-level struvite production, but there are a variety of solutions based on the same principle. The challenge is to understand the value chain (substrate, volume, farm structure, legal support, local grants, etc.) and to adapt the plant to its context.