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WASTEWATER TREATMENT WITH RECYCLED CORK STOPPERS AS ABSORBENT MATERIAL IN WETLANDS (ECORKWASTE)

ARTICLE

ABSTRACT

Cork is closely related to the maintenance of biodiversity, the heart of sustainable development, and the reduction of emissions and sequestration of CO₂.

The fact that corks are made of the bark harvested from living trees has lead policy makers to encourage the use of cork over other, less natural, alternatives.

From an environmental point of view, cork oak forests can contribute to climate change mitigation since they can sequester carbon dioxide (CO₂) from the atmosphere and store it in their perennial tissues and in the soil as organic matter.

The recycling of cork stoppers can retain carbon for very long periods. Granulated used cork stoppers were used as adsorbent material in treatment wetlands for the elimination of organic compounds in winery wastewater. With the wastewater treatment plant, we have an ecofriendly and sustainable solution to used cork stoppers in order to contribute to advance towards a circular economy scenario in wineries.

PARTNERS

Codorníu and Catalan Cork Institute Foundation

COMPANY SUMMARY



The essential aim of the Catalan Cork Institute Foundation is to promote and develop the cork sector in its various aspects of production, transformation and commercialization through study, research, assessment and help to organizations, associations, companies and people involved in the cork and wine sector.

<https://www.icsuro.com/>

COMPANY SUMMARY



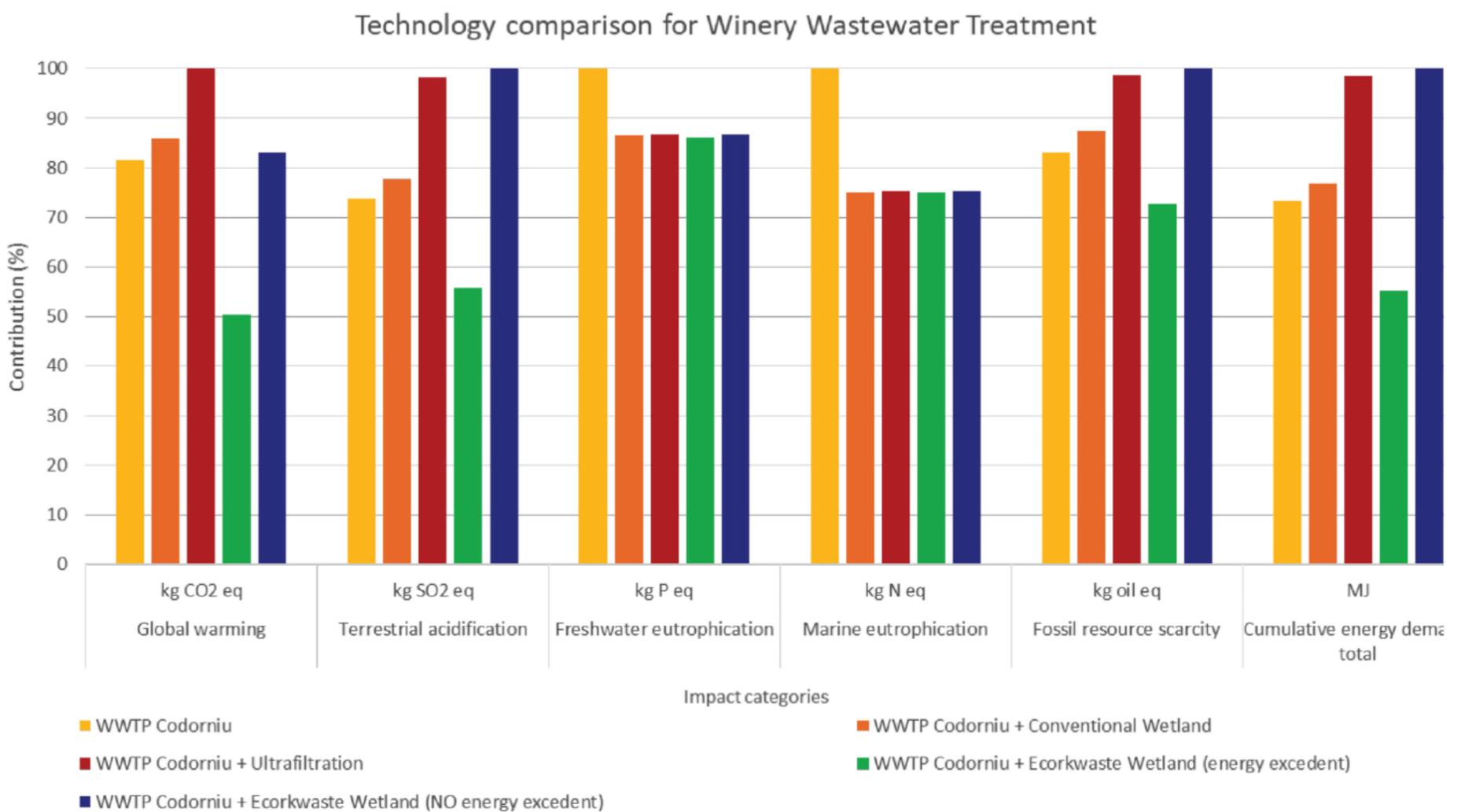
CODORNÍU is Spain's longest-standing producer of wine and cava. It is a symbol of continuity, innovation and loyalty to its origins.

Codorníu reflects the history, tradition, passion and expertise of a family winery with more than 450 years of history, which today continues to maintain its leading position in the production of quality wines and cavas.



SUSTAINABLE TARGET

During the project, the environmental, economic and social impact of the proposed solutions, covering the three aspects of sustainability were addressed for both wetland and gasification technologies.



THE SPECIFIC OBJECTIVES ARE:

- To minimize landfilling of used cork stoppers and other cork byproducts by means of turning it into value.
- To demonstrate, at a pilot scale, an innovative hybrid treatment wetland based on the use of cork byproduct as granular media, for the treatment of agro-industrial wastewater (winery wastewater).
- Reduce water consumption in the winery industry, fostering potential re-use within the production system, while achieving higher effluent quality due to treatment wetlands implementation.
- Compare the innovative and sustainable treatment wetland against alternative current practices using the same indicators.



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REASON WHY/ MOTIVATION

To ultimately help with excess water and prevent soil erosion. Bio-filters are easy to install, as the winery already has the underdrainage to catch the water.

The natural preservation of the woodland initiative was a smart, easy and efficient way to help reduce the amount of pests affecting a successful harvest season.

DESCRIPTION AND STRATEGIES

Granulated used cork stoppers with a certain particle size were used as adsorbent material in treatment wetlands for the elimination of organic compounds in winery wastewater. Cork stopper granulates can be used for wastewater treatment, considering its biosorbent properties. The ECORKWASTE project built a 14 m² pilot aerated saturated treatment wetland filled with 5 mm Ø cork granulates as a filter medium, and was adapted to operate as a tertiary treatment for winery wastewater. The plant was built as a compact, modular and mobile system, using 20 ft. shipping container.

The monitoring and remote operation of the pilot treatment wetland plant started in March 13, 2017, including hydraulic, electrical and automation systems. The water treated per operation cycle was 2.5 m³.

Sensors in the wetland bed allowed a 24 h-monitoring of the internal conditions of the bed to provide real-time information for DO, Temperature and pH. These measures allowed decision making regarding operation to extend its lifetime, to increase its efficiency and to reduce operational costs, like energy consumption in aerated periods, and reduce carbon footprint.

The aerated saturated vertical treatment wetland, with cork byproduct granulates used as granular media, was effective for pollutants (suspended solids, organic nitrogen, nitrates) and metals removal (nickel and copper) from winery wastewater. The pesticides studied have not been detected in the cork samples, so the cork byproduct granulate in the wetland has not go over its useful life.

The micrographs of the cork granulates used as filter media in the treatment wetland, after 1.5 years of operation, showed that cork byproduct maintained its original and internal structure and therefore has not yet reached the end of its useful life.



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ACHIEVEMENTS SO FAR

The main achievements have been the decline of used cork stoppers landfill disposal, achievement of higher rates of cork byproduct reuse and valorization, also the increase in water savings in the winery as well as minimizing the effects of landfilling on human health and the environment.

The proposed solution shows an environmental impact reduction between 13 and 40 % depending on the impact category studied. The technology used show a reduction between 13 and 34% in eutrophication category.

LESSONS LEARNED

The aerated saturated vertical treatment wetland, with cork granulates used as granular media, was effective for pollutants (suspended solids, organic nitrogen, nitrates), pesticides (Metalaxyl, Chlorpyrifos and Tebuconazole) and metals removal (nickel and copper) from winery wastewater. The pesticides studied have not been detected in the cork samples, so the cork byproduct granulate in the wetland has not go over its useful life. The micrographs of the cork granulates used as filter media in the treatment wetland, after 1.5 years of operation, showed that cork byproduct maintained its original and internal structure and therefore has not yet reached the end of its useful life.

NEXT STEPS

Results demonstrated the potential gains in comparison of the current treatment practices, being attractive technologies for the long-term sustainability of wine sector. The next steps are the diffusion of the solution and its application in different wineries that may be interested in recycling cork stoppers.

POTENTIAL FOR REPLICATION

The wetland can be applied in any winery.

CONTACT

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