LIFE REFOREST NEWSLETTER

2022

LIFE REFOREST is a project co-financed by the European Union in the Life Programme Grant Agreement nº. LIFE17 ENV/ES/000248.

INTRODUCTION

LIFE REFOREST is a project co-financed by the LIFE PROGRAMME (Grant Agreement No. LIFE17 ENV/ES/000248), and led by CETIM Technological Center. The general objective of the project is to mitigate the impact caused by erosion and soil loss in areas affected by forest fires, by applying an innovative technosol based in organic waste inoculated with fungal species.

This solution has been implemented in burnt areas of Galicia and the Center-North region of Portugal, two of the Europeans areas most affected by forest fires (in fact, 80% of the area burnt in Europe in located in the south of Europe/Mediterranean region).

In numbers, more than 200 m^2 of burnt forest has been protected with bio degradable tube-shaped mycotechnosol with the aim of achieving a fast restauration of the vegetal cover, and reducing up to 2.5 times the flow of water runoff., minimizing the impact of water over the soil and the speed of the runoff.

OBJECTIVES

- Development of a new post-fire mitigation technique able to reduce soil erosion by 70%.
- Implement a mycotechnosol solution to recover key functional parameters from burnt soil (organic matter content, microbial activity, etc.) to its initial values.
- Promotion of soil water retention.
- Minimising pollution in water bodies downstream the burnt areas.
- Valorisation of organic waste.
- Validation of a cost-effective solution in 3 different locations in Galicia and Portugal.
- Estimation of the LIFE REFOREST Project's environmental, social and economic impact.

LIFE REFOREST Consortium

LIFE REFOREST Consortium is composed by the coordinator CETIM Technological Centre (CETIM), Galicia Forest Association (AFG), Portuguese Forest Association (FORESTIS), Galician SMEs TEN Tecnosuelos, Hifas da Terra and Indutec Engineering, as well as the Environmental and Marine Research Centre (CESAM) of the University of Aveiro.

Aside of its role as leader of the Project, CETIM characterises the runoff effluent in Galicia and Portugal, collaborates with TEN in the formulation of the technosol at the lab-scale, and in the evaluation of its efficacy. CETIM also coordinates the transferability and replicability of the results, as well as the dissemination and monitoring of the project.

AFG and FORESTIS have made an appropriate selection of the burn areas providing technical information on the forest they manage, conducting the sampling and monitoring of the forest fires, as well as the administrative management for the swift and efficient installation of the pilots in Galicia and Portugal.

INDUTEC focuses their efforts in analysing the data provided by the forest associations and the rest of the partners, evaluating the environmental impact of the new solution and conducting the Life Cycle Analysis (LCA) and Life Cycle Costing (LCC).

HdT is in charge of making the study at lab-scale and the selection of the fungal strains, as well as conducting the fungus cultivation for its inclusion in the final mycotechnosol formulation.

TEN is in charge of formulating different technosols and selecting, together with HdT, the mycotechnosols that are applied as part of the solution. Furthermore, they have produced the technosols used in the pilots.

UAVR-CESAM has characterised the burnt areas in the pilot zones and together with TEN, HdT and CETIM they validate the efficacy of the LIFE REFOREST system in relation to soil erosion and water runoff contamination, evaluating its future replicability in other European areas affected by forest fire.

LIFE REFOREST PILOTS

LIFE REFOREST has installed 3 pilots in Galicia and the North of Portugal. After initial tasks of characterisation and system design, in October 2019 the consortium installed two pilot areas of about 200 m^2 , one in the Communal Forest of Nespereira, in the Galician municipality of Pazos de Borbén (Pontevedra) and the forests if Albergaria (Aveiro) in the central region in Portugal.

The selection of this two first locations was done after a monitoring of the forest fires that took place in the summer of 2019, with the aim of selecting areas with risk of erosion, due to the fire intensity, the lack of vegetation and a moderate inclination. These two areas have been monitored continuously by the project partners, since the pilots were installed, evaluating the amount of soil mobilised in the rain periods, as well as the characteristics of the runoff water produced in the rain episodes (solids in suspension, nutrients, metals, etc.).

Both pilot areas are divided in nine plots, randomly positioned. Three of those are equipped with the barriers developed in the LIFE REFOREST project, while other three have been treated with mulching, -currently used technique-, with the objective of comparing the system developed in the project, with other erosion mitigation techniques. Finally, the remaining 3 plots have received no treatment, and they serve as control plots.

Pilot Area Nespereira (Pazos de Borbén, Galicia, Spain)

Piloto Area Albergaria-a-Velha (Aveiro, Portugal)

Pilot Area Penouços, (Server do Vouga, Aveiro Portugal)

To complete the validation of the system under different conditions, on October 2020, a third pilot was installed in Penouços (Sever do Vouga – Aveiro), in an area that suffered a fire on the previous weeks. This area has the particularity of having suffered a previous fire in 2016, and therefore, the pines planted where very young, making it impossible for spontaneous regeneration to happen. Consistently, together with a new density in the geotubes installation, this pilot serves also to evaluate the inclusion of seeds from autochthonous tree species, together with the grass seeds included in the previous pilots, in order to foster the regeneration of the area.

The results obtained until now show a clear reduction of the erosion with the geotube system developed in LIFE REFOREST, with an erosion that is between 70-77% less than in the area without treatment in the areas under study.

In relation to mulching, the validated system presents an erosion slightly higher in the Nespereira pilot, and smaller in Albergaria and Penouços, however these differences are within the deviation observed in the different samplings.

The evaluation of the 3 pilot sites will continue until the end of the project, including monitoring after. During this time, the consortium is also developing guidelines to help replicate and transfer the system to other areas in Europe where forest fires are common. In parallel with the technical validation, the analysis of the Life Cycle is being conducted, to evaluate the environmental impact of the solution, as well as the analysis of the economic costs associated.

The LIFE REFOREST solution is expected to be able to improve the erosion of burn areas with a cost that is 25% lower than the existing solutions, achieving as well an important reduction of the environmental and socioeconomic impact associated to fires, estimated at 50%, given the considerable reduction of the time needed to reestablish forest productivity.

Tasks of pilot installation: delimitation of a study field for sampling and erosion measuring

Pilot plot with geotubes

Pilot plot with mulching

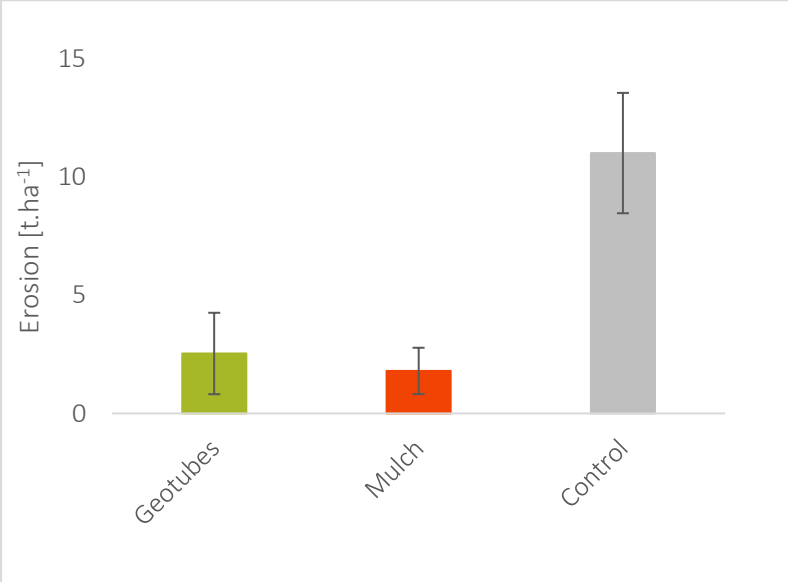
Pilot plot for control

Results from the pilot at Nespereira, Pazos de Borbén, Galicia

A pilot area in a pine plantation was equipped with erosion plots after the fire that took place on the 14th and 15th of September 2019. The selected area was monitored in terms of erosion mitigation and vegetation recovery since the fire.

The mycotechnosol strategy was based in the application of two geotubes, placed in the intermediate and inferior sections of the plot. The mulching was done with pine needles in an application rate of approximately 250 g m^2, which allows for comparison with its potential of erosion reduction in relation to the untreated plots.

In the first year after the fire, the mycotechnosol strategy achieved a reduction of 77%, while needle mulching achieved an 84%.



Average sediment los using the LIFE REFOREST mycotechnolos strategy (Geotubes), pine needles (Mulch) and untreated, a year after the fire in the Nespereira pilot site.

Results from the pilot at Albergaria-a-Velha, Aveiro, Portugal

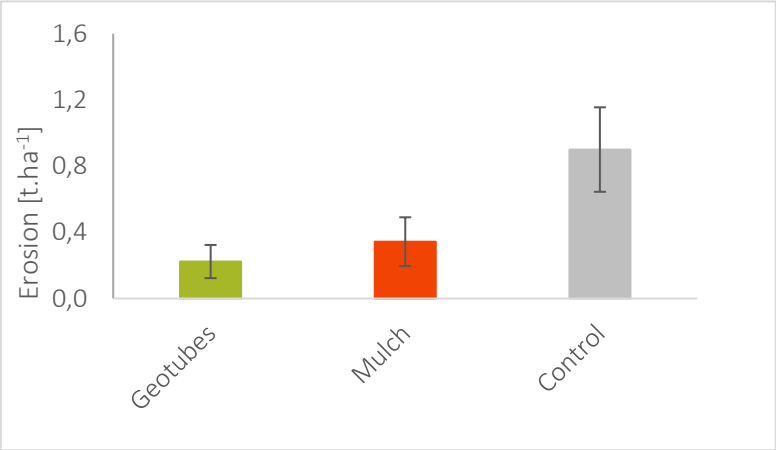
After the fire on the 5th and 7th of September 2019, that burnt 1,492 ha, a slope of eucalyptus plantation was used for the erosion and control plots during the first year after the fire.

The mycotechnosol strategy with two geotubes placed in the intermediate and inferior sections of the plot and a mulching treatment made of eucalyptus bark, with an application rate of approximately 250 g m², were compared with an untreated control plot, in terms of erosion mitigation.

After this period, the mycotechnosol strategy achieved a reduction of the erosion of 75%, while mulching achieved 62%.

Albergaria-a-Velha October 2019

Albergaria-a-Velha February 2020



Average sediments los using the LIFE REFOREST strategy with mycotechnosols (Geotubes), Eucalyptus bark mulching (Mulch) and untreated (Control), a year after the fire in the Albergaria-a-Velha pilot.

Penouços October 2020

Penouços March 2021

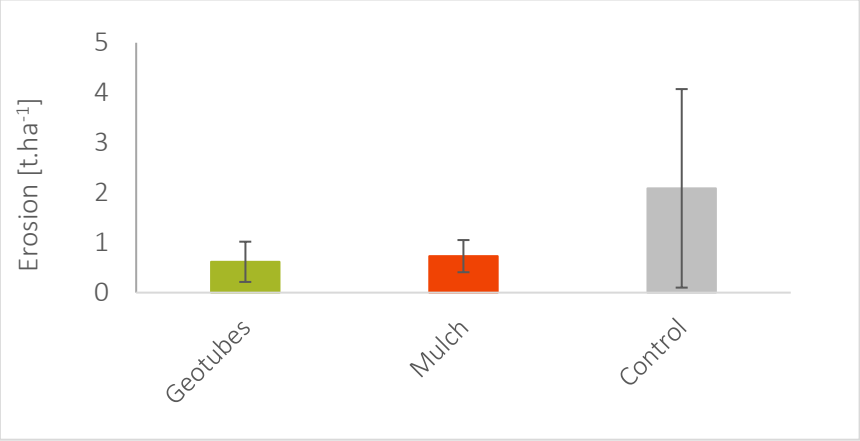
Results from the pilot at Penouços, Sever do Vouga, Portugal

Between the 7th and 15th of September 2020, a forest fire burnt 2149 ha, of which 87.5% were forests. In a slope dominated by Maritime Pines, a new pilot site was installed, with an experimental design similar to the one from the previous sites.

The three blocks with 3 erosion plots each were distributed in the slope (high, intermediate and inferior sections). The mycotechnosol treatment plots were positioned only at the bottom of the plots, with 2 geotubes. The mulch treatment was made out of acacia, with an application rate of approximately 250 g m^2.

Since October 2020, treatments have been compared in terms of erosion mitigation with the untreated plots. Additionally, LIFE REFOREST strategy is being evaluated in relation to its potential to promote the post-fire vegetation recovery, through the growth of trees and bush species planted (Quercus robur, Pinos Marítimos, Arbutus unedo y Prunus avium).

Average sediment los using the Mycotechnosol strategy of LIFE REFOREST (Geotubes), acacia mulching (Mulch) and untreated (Control), in the first 4 months after the fire in the Penouços site.



Next steps

The evaluation of the three pilots will continue until the end of the project.

During this time the consortium will finalize different guidelines to help replicability and transferability of the system to other geographical areas in Europe with forest fires problems.

In parallel to the technical validation, a Life Cycle Analysis will be finished, to evaluate the environmental impact, as well as the associated costs.

LIFE REFOREST
RECOVERING ECOSYSTEMS

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