

# SUSTAFFOR PROJECT

## Innovation in forest restoration

Bridging effectiveness and sustainability in afforestation /reforestation in a climate change context: new technologies for improving soil features and plant performance

FP7-SME-2013-606554



# What is Sustaffor? - Sustainable Tree Planting

Every year millions of Euros are invested on the maintenance (especially weeding and watering) of newly planted trees in landscaping, afforestation, reforestation, gardening, fruit production... This maintenance frequently implies a massive use of herbicides, petrol-based fuels and labour. These trees are often dependent on these tending operations, which are not always foreseeable or implementable by public or private managers, which lead to the partial or total failure of many trees planting projects.

In order to provide new answers to these situations, a consortium of 10 European entities (**6 Small or Medium size Enterprises – SMEs and 4 Research & Development performers – RTDs**) launched **Sustaffor project**.

**SUSTAFFOR has as main objective to develop and validate novel techniques aiming at improving tree planting projects from an environmental, technical and economic point of view**, and to explore the synergies between them. These **novel techniques aim at mitigating the negative effect of temporary water scarcity and competitive vegetation**, which are the two main factors that can result in the failure of a young tree in the current context of irregular water availability and climate change.



*Plantation on former agricultural field*



*Afforestation in a degraded area*

# Sustaffor novel techniques

## INNOVATIVE SOIL CONDITIONER

Soil conditioners are products mixed with the soil aiming at retaining and releasing water available for plants while improving soil structure and fertility. During the project a novel mix of a new high-performance hydro-absorbent polymer combined with fertilizer and growth precursors is developed by **TerraCottem Internacional**. This company is developer and distributor of the TerraCottem® soil conditioning technology, a proprietary mixture of polymers, fertilizers, growth precursors and carrier material that is unique for its synergetic effect.

## INNOVATIVE GROUNDCOVERS

Groundcovers or "mulches" are physical barriers aiming at impeding the establishment of competitive vegetation (thus avoiding the need for weeding) and reducing soil water evaporation in the area of soil occupied by the tree roots. During the project 4 novel groundcovers are developed:

- **A 100% biodegradable frame, based on a new biopolymer formulation**, developed by **DTC**, fused to a commercially available biodegradable film. This company is expert in the fabrication of specialized plastic and bio-plastic products by mould injection.
- **A 100% biodegradable semi-rigid mulch based on a new biopolymer formulation**, developed by **DTC**.
- **A 100% biodegradable mulch made with woven jute cloth treated with furan bio-based resin for increased durability**, developed by **La Zeloise NV**. This company works with natural fibre products, especially recycled jute, treated with innovative finishing techniques for enhanced properties.
- **A long-lasting mulching mat based on recycled rubber**, reusable in successive tree plantation projects, developed by **EcoRub bvba**. This company is experienced in the production of agro-forestry auxiliary products based on recycled rubber, coming from worn-out tyres and conveyor belts.



Soil conditioner  
(TerraCottem  
Internacional)



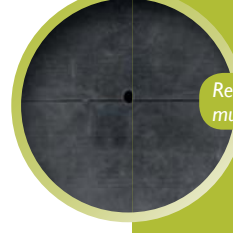
Bioplastic framed  
mulch (DTC)



Bioplastic semi-rigid  
mulch (DTC)



Woven jute mulch  
(La Zeloise)

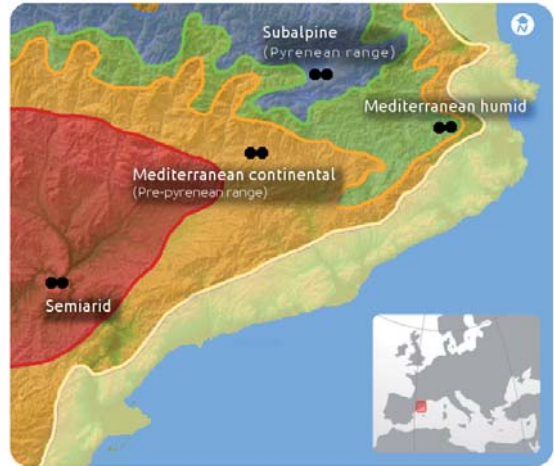


Reusable rubber  
mulch (EcoRub)

# Sustaffor field trials network

For studying the potential of the novel techniques in tree planting projects a network of 8 field trials was installed in March 2014 across a range of 4 strongly contrasted climatic areas in NE Spain, representative of the main climates in Europe and the Mediterranean. The species chosen are the most commonly utilized in each area:

- **Semi-arid:** Aleppo pine (*Pinus halepensis*) in north-facing and south-facing slopes
- **Mediterranean continental:** hybrid walnut (*Juglans x intermedia*) Mj209xRa and holm oak (*Quercus ilex*) mycorrhized with black truffle (*Tuber melanosporum*)
- **Mediterranean humid:** hybrid walnut (*Juglans x intermedia*) Mj209xRa and stone pine (*Pinus pinea*)
- **Subalpine:** mountain ash (*Fraxinus excelsior*) and birch (*Betula pendula*)



Semi-arid



Mediterranean continental



Mediterranean humid




Subalpine




















## Mulch degradation trials

Three mulch degradation trials are installed in Semiarid, Mediterranean humid and Subalpine conditions




## Sustaffor experimental design and monitoring

Each field trial includes 17 treatments, with 30 trees per treatment organized in a split-plot design: 6 blocks of 5 trees. The treatments are combinations of soil conditioners and weeding techniques, indicated with an  at the following table.

Weeding technique	Soil conditioner				
	TerraCottem Universal+ 20g/tree	TerraCottem Universal+ 40g/tree	TerraCottem Universal+ 80g/tree	TerraCottem Universal Standard 40g/tree	Control (no conditioner)
Bioplastic framed mulch (DTC)					
Bioplastic semi-rigid mulch (DTC)					
Jute mulch (La Zeloise)					
Rubber mulch (EcoRub)					
Polyethylene mulch					
Current bio-mulch					
Herbicide application					
Control (no weeding)					

Techniques marked in green are novel techniques while those in blue are reference techniques

 Only in Subalpine conditions

## Field trials monitoring

In order to achieve project aims a thorough monitoring is applied at the field trials. Collected data refers to weather (through weather stations), tree survival, growth and biomass allocation; tree physiology (leaf water status, nutrition status) soil moisture and temperature; fertility-related soil variables (texture, organic matter, total N, carbonates, pH, etc) and variables related to biochemical changes in soil organic matter:



*Measurement of leaf water potential with pressure chamber*



*Measurement of soil moisture with TDR + access tube*



*Weather station*

# Sustaffor consortium

4 SMEs producing novel techniques:



**TERRACOTTEM**  
Leading soil conditioning technology

2 SMEs commercializing novel techniques:



4 Research & Technology Developers:



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[www.sustaffor.eu](http://www.sustaffor.eu)