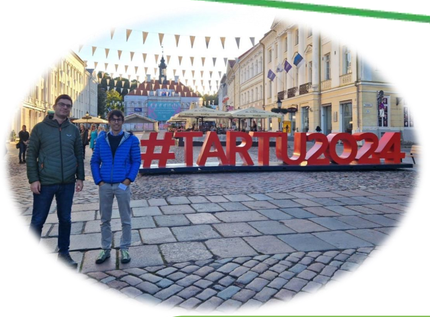

ONEforest

UNIVERSITÀ DI TRENTO
Dipartimento di Ingegneria Industriale

WP5: Perspectives of forest operations and revitalization of degraded forest
Task 5.3 Topsoil cover engineering & Task 5.4 Planting with topsoil cover

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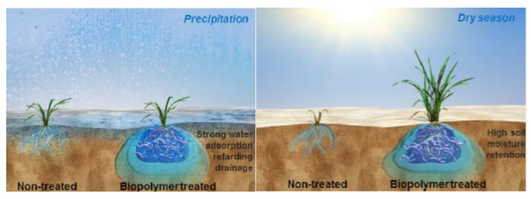
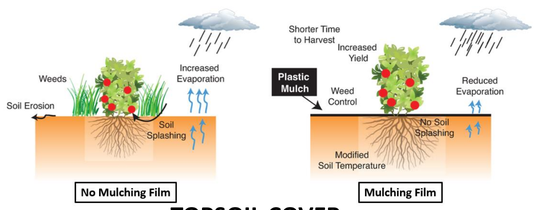
Introduction

AIM: Top-soil cover (TSC) and Soil Conditioner (SC) engineering and planting to promote plant growth



SOIL CONDITIONER



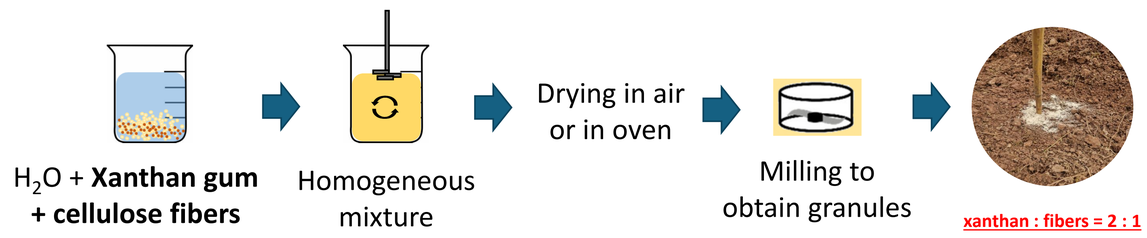
TOPSOIL COVER

UNITN developed:

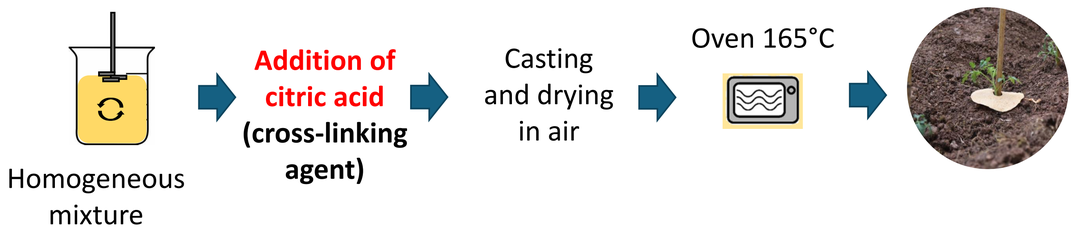
- **SC** as **hydrogels** based on biopolymer **xanthan gum (X)** dissolved in water and mixed with **cellulose pulp** (**W**).
- **TSC** as **films** based on **cross-linked** xanthan gum and wood fibers.

Methodology

Production of xanthan gum hydrogels (for SC)



Production of xanthan gum cross-linked hydrogels (for TSC)



Results

Grass growth evaluation with SC

Soil + SC: Increases grass survival under drought conditions

Tomato Planting trial with TSC and SC

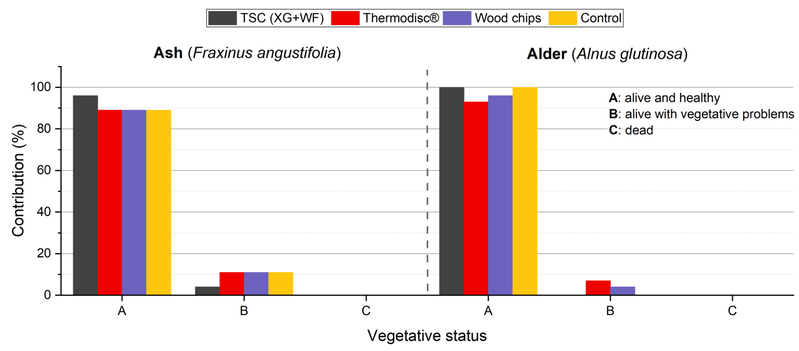
Department of Industrial Engineering, University of Trento, **Italy**
3 rows of 24 *Solanum lycopersicum var. cerasiforme* plants each

Fruit yield compared to the untreated plants

Treatment	Yield I row (%)	Yield II and III row (%)
SC	+33.9	-44.2
TSC	+5.2	-28.9

Forest planting trial

Central Nursey of Forestal Catalana, Girona, **Spain**
Narrow-leaved ash (*Fraxinus angustifolia)* and alder (*Alnus glutinosa*)



TSC promotes plant growth

Dataset of costs and environmental impacts

	Our products	Commercial product
SC	19.7 €/kg	5 - 25 €/kg
TSC	0.41 €/unit => UTR (16 cm diameter)	0.5 - 6 €/unit (25-45 cm diameter)

Parameter	Unit	SC (1kg)	TSC-UTR (1 unit)
Abiotic depletion (fossil fuels)	MJ	1.17E+02	2.27E+00
Global warming (GWP100a)	**kg CO_2 eq**	**9.91E+00**	**1.84E-01**
Ozone layer depletion (ODP)	kg CFC-11 eq	5.21E-07	2.02E-08
Fresh water aquatic ecotox.	kg 1,4-DB eq	9.89E+00	1.63E-01
Photochemical oxidation	kg C_2H_4 eq	2.44E-03	4.12E-05
Acidification	kg SO_2 eq	4.74E-02	8.99E-04
Eutrophication	kg PO_4^{---} eq	2.93E-02	4.34E-04
Water scarcity footprint	m^3 eq.	3.49E+00	1.17E-01

The Polymer & Composites laboratory

Research activities:

- Materials for Thermal Energy Storage (TES) applications
- Materials for the the thermal insulation and management
- Recycled materials at low environmental impact
- Biobased and biodegradable materials
- Life Cycle Assessment of industrial products
- Self sensing/self healing structural composites
- Multifunctional 3D printed materials

POLYMERS & COMPOSITES LABORATORY

Facilities:

- **Processing machines** (extruders, melt compounder, hot pressing, fused deposition modeling, filament winding)
- **Mechanical properties** (Dynamical mechanical analysis, Viscosimeters, Electro-mechanical and servohydraulic testing machines, impact properties, VICAT/HDT)
- **Thermal properties** (Differential scanning calorimetry (DSC), Thermogravimetric analysis (TGA), Determination of the Limiting Oxygen Index (LOI), Thermal diffusivity (LFA), thermal conductivity (HFM)
- **Electrical properties** (Resistivity)
- **Others** (Gas permeability, Light-, electronic microscopy, pycnometer, infrared spectroscopy, rheology, ageing/conditioning tests at controlled T, H)

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