

ENVIRONMENTAL RECYCLING OF CO-COMPOSTED SEDIMENTS
“LIFE AGRISED LIFE17 ENV/IT/000269”

Macci Cristina¹, Doni Serena¹, Peruzzi Eleonora¹, Francesca Vannucchi¹, Manfredi Paolo², Francesco Paolo Nicese³, Karel Waska⁴, Stefano Lucchetti⁵, Masciandaro Grazia¹

¹ CNR-IRET, via Moruzzi 1, 56124, Pisa, Italy

² m.c.m Ecosistemi Località Faggiola - 29027 Gariga di Podenzano, Piacenza, Italy

³ University of Florence, DAGRI, Viale delle Dee 30, 50019, Sesto Fiorentino, Italy

⁴ EPS biotechnology s.r.o. V Pastouškách 205,68604, Kunovice, Czech Republic

⁵ Agri Vivai s.r.l. Via Vecchia Casalina, 118/G, 51100 Pistoia, Italia

Abstract

Agricultural and industrial activities, very rapidly result in the loss of soil fertility, compaction, organic matter and biodiversity decrease, and soil contamination. Land degradation and contamination have a strong impact on environmental sustainability and resources availability.

In this context, the nursery industry has a strong environmental impact mainly due to the large use of non-renewable materials, such as peat, and soil as plant substrates for container and in-ground production.

Yearly, one million tons of river sediments is dredged and disposed of in confined facilities in Europe; at present, less than 1% is recycled. European policy and International Conventions encourage valorization of dredging sediments, providing a technological challenge in the near future.

Among the remediation methods for dredged sediment recycling, co-composting could be considered a feasible, effective and low-cost technique able to turn the sediment from a valueless waste into a valuable raw material, with characteristics different from originating matrix, suitable for different environmental applications.

In this regard, the LIFE AGRISED project is focuses on the study of a new technology based on the recycling of dredged sediments co-composted with green wastes for the production of: 1) a growing media for nursery sector and 2) a reconstituted soil (Technosol) for degraded soil rehabilitation.

The co-composting process will be carried out in Italy and Czech Republic with sediments from the Navicelli canal (Pisa) and from a small stream located in an urban area (Čejkovice), respectively. The sediments will be dewatered until a moisture level of about 40-50% and mixed with green waste biomass at different ratios: 1:1, 3:1 and 1:3 (w:w). The co-composting process will be monitored in terms of temperature, humidity, bulk density, organic matter, pollutant contents, and microbial communities and activity, until full maturation and stabilization (6-8 months).

The soil reconstitution is a chemical-mechanical treatment applied to degraded soil mixed with waste matrices, such as sludges. The mixture is crushed, producing a breakdown of the lignocellulosic components and incorporating the matrices organic fraction into the mineral particles of the Technosol. The actual reconstitution phase is performed by a targeted mechanical compression that gives rise to the formation of the new reconstituted soil aggregates. Several lysimeters will be prepared by mixing the degraded soil with different rates of sludge, sediments and co-composted sediments, and monitored for 12 months in order to describe the evolution of soil solution, soil temperature, soil electrical conductivity and soil volumetric water content.

For nursery sector, the demonstration trials will be conducted growing plants with high added value for the European market: *Photinia x fraseri Red Robin* and *Viburnum tinus*.

The performance of the innovative sediment-based growing media and of reconstituted soil will be compared with traditional growing media utilization to produce ornamental plants and with traditional land reclamation approaches, respectively.

Despite it is possible to declare the co-composting process as suitable alternative management strategy for dredged sediments, at the moment, the EU regulations do not allow the use of dredged sludge for growing media production (REGULATION (EU) 2019/1009).