# TUC solution for UWWS valorisation from WaysTUP!

Utilisation of sewage sludge from wastewater treatment plant as agricultural product – Biochar production

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# **Pilot for Biochar production**

Place	Chania, Crete, Greece
Responsible partner for process & end- product development	Technical University of Crete
Type of feedstock	Sewage sludge
Responsible partner for feedstock provision	Municipal Enterprise for Water and Sewage of Chania
Alternative feedstocks	olive mill wastewater, compost, sawdust
Process	Slow pyrolysis
End-product	Biochar

Treatment Capacity 600-800 kg/month









# Feedstocks supply and sampling





Feedstock	Feedstock provider
Sewage sludge (SS)	Municipal wastewater treatment plant of Chania, Greece
Olive Oil mill by- product (O)	Local olive mill, Akrotiri, Chania, Greece
Sawdust (S)	Local Carpenter, Chania, Greece
Compost (C)	Inter-Municipal Solid Waste Management Company of Chania (DEDISA)







#### **Pilot for Biochar production**



## **Pilot for Biochar production**



VALUE CHAINS FOR DISRUPTIVE TRANSFORMATION OF URBAN

BIOWASTE INTO BIOBASED PRODUCTS IN THE CITY CONTEXT

## **Objective of the field applications**



- ✓ Use of biochar from sewage sludge in field scale demonstration experiments (and greenhouse) that will be carried out in Greece and in Spain.
- Evaluate the efficiency of biochar as soil improver, bio stimulant and fertilizer
- ✓ Optimization of the process (biochar properties and doses)





## 1<sup>st</sup> field testing (Oct 2020- April 2021) at TUC campus **Greenhouse tomato cultivation in pots**

✓ Evaluation of biochar efficiency in agriculture as soil improver and bio stimulant



- 8 tomatoes/treatment
- 30 L pot (20 kg soil/ pot)
- Biochar was mixed with soil at the top of 10 kg of soil









#### Irrigation and fertilization





about 15 g /plant every week of water soluble fertilizer



Total Fertilization /plant: 49 g N, 19 g P and 61 g K

Total irrigation/plant: 205 L







about 1,5 - 2 L/ time / pot

#### **Analyses and Experiments**



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#### **Analyses and Experiments**



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WSA procedure & sand correction Bulk density, porosity TOC, TN **SPLP** TP, Olsen P NO<sub>3</sub>, NH<sub>3</sub> K, bioavailable **Total metals** C **Phenols** SO<sub>4</sub> pН EC Dry Matter/ (TS %) Moisture **Volatile Solids** Ash С Η Ν S **Volatile Matter** Char







## Results of the 1<sup>st</sup> field testing Productivity











## **Results of the 1st field testing** Soil fertility and structure



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## 2nd field testing (May 2021- September 2021) Field tomato cultivation

✓ Evaluation of biochar efficiency in agriculture **as soil improver and bio stimulant** 



- 6 tomatoes/treatment
- 4 m<sup>2</sup>/treatment
- Biochar was mixed with soil at the top 20 cm



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WALUE CHAINS FOR DISRUPTIVE TRANSFORMATION OF URBAN BIOWASTE INTO BIOBASED PRODUCTS IN THE CITY CONTEXT









## 3<sup>rd</sup> field testing (October 2021- April 2022) at TUC campus Greenhouse tomato cultivation in pots

✓ Evaluation of biochar efficiency in agriculture as soil improver, bio stimulant **and fertilizer** 





The off-gases of the furnace produces a concentrate that is rich in N and P. This concentrate will be used as fertilizer (nutrient addition) to plants together with irrigation.







# Thank you







