“Co-composting of sewage sludge with plant residues: The case study of Rethymno WWTP”

T. Manios*, S. Gyparakis*, E. Vryllakis**

* Department of Agriculture, Hellenic Mediterranean University, Heraklion, Crete, 71410, Greece (E-mail: tmanios@hmu.gr)

**Municipal Water and Sewerage Utility of Rethymno, Rethymno, Crete, 74100, Greece

15-18.06.2022

CORFU2022

9th International Conference on Sustainable Solid Waste Management

Professor Thrassyvoulos Manios
Vice Rector of Finance, Planning and Development

Department of Agriculture
School of Agricultural Science
Hellenic Mediterranean University
Heraklion, 71410, Crete, Greece

Introduction

- Co-composting of sewage sludge with plant residues is one the most useful, efficient, reliable and economical method of sludge stabilization.
- Co-composting of urban wastewater treated sludge with plant residues, instead of its disposal at landfills, is an essential issue which solves a major environmental problem.

Main **purposes** of this study:

- ✓ to present the modern solar drying and co- composting of sewage sludge with plant residues unit of **Municipal Water and Sewerage Utility of Rethymno**,
- ✓ to present the quality evaluation of the produced compost.

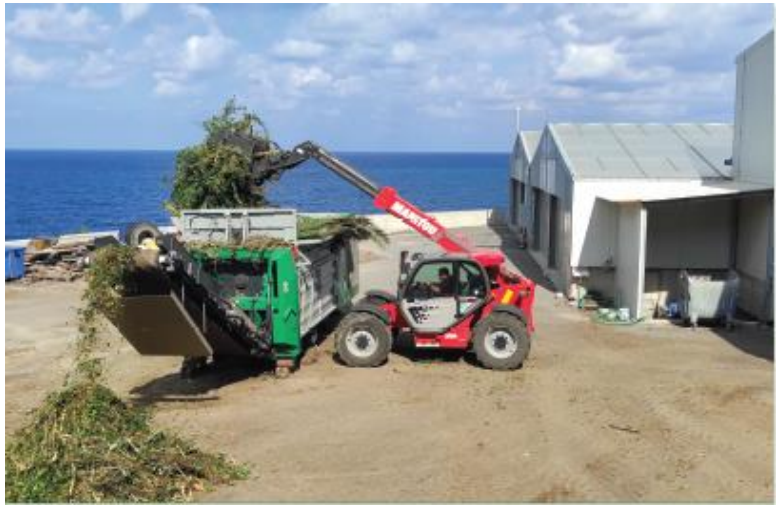
Solar drying and composting unit at Rethymno, Crete

- **Owner**: Municipal Enterprise of Water Supply and Sewerage of Rethymno (DEYA of Rethymno).
- **Place**: constructed at the Wastewater Treatment Plant (WWTP) of Rethymno.
- **Time**: 2015- 2020.
- **Operation period**: January 2021- nowadays.

Groundbreaking in its kind by Greek standards **consists of**:

- ✓ Unit of fragmentation of branches- wood and plant residues (shredder unit).
- ✓ Two solar dryers (2×1000 m2) with agitation systems, air circulation, meteorological station, all automated to maximize water evaporation (Picture 01).
- ✓ Zeolite addition unit to the mixture.
- ✓ Composting reactor in a closed building of 1,500 m2 with three fermentation channels (Picture 02), mechanical stirring and promotion of the mixture, automatic water addition equipment, air blowing aerators into the fermented mixture to maintain aerobic conditions and temperature control automations.
- ✓ Sifting unit of the finished product and removal of impurities.
- ✓ Unit of maturation of the compost, storage and final disposal.

Solar drying and composting unit at Rethymno, Crete



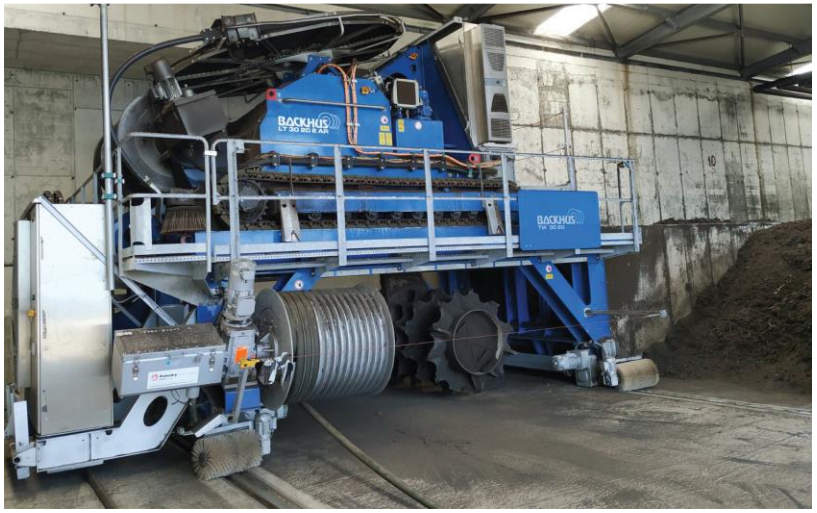
Picture 01: Shredder unit

Picture 02: Solar drying unit 01

Picture 03: Solar drying unit 02

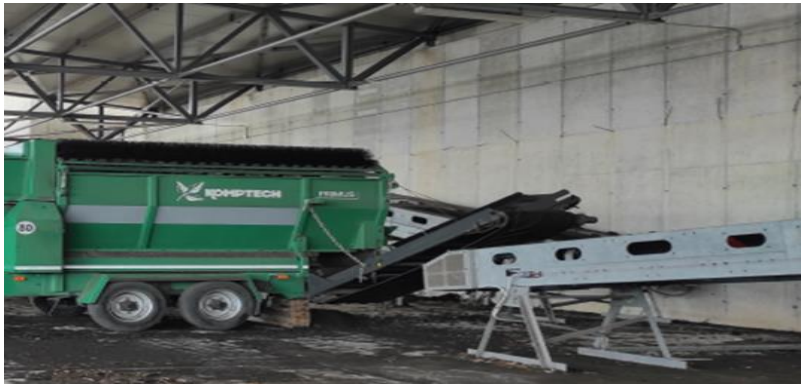
Picture 04: Fermentation channels

Solar drying and composting unit at Rethymno, Crete



Picture 05: Mechanical stirring and promotion of the mixture

Picture 06: Fermentation channels of Composting reactor



Picture 07: Sifting unit

Picture 08: Compost of Rethymno

Compost of Rethymno

- **Compost of Rethymno**: an organic, soil improver and compost produced by tree prunings, vegetable garden residues, biological sludge, natural zeolite and seaweed.

Compost of Rethymno: Quality Evalution

Table 01. Physico-chemical compost characteristics.

Parameter	Unit
Organic Matter	55- 57%
pH	7.4- 7.8
Humidity	30- 35%
Conductivity	4000- 5000 μS/cm
Specific gravity	0.60- 0.65 kg/L

Table 02. Compost Macronutrients.

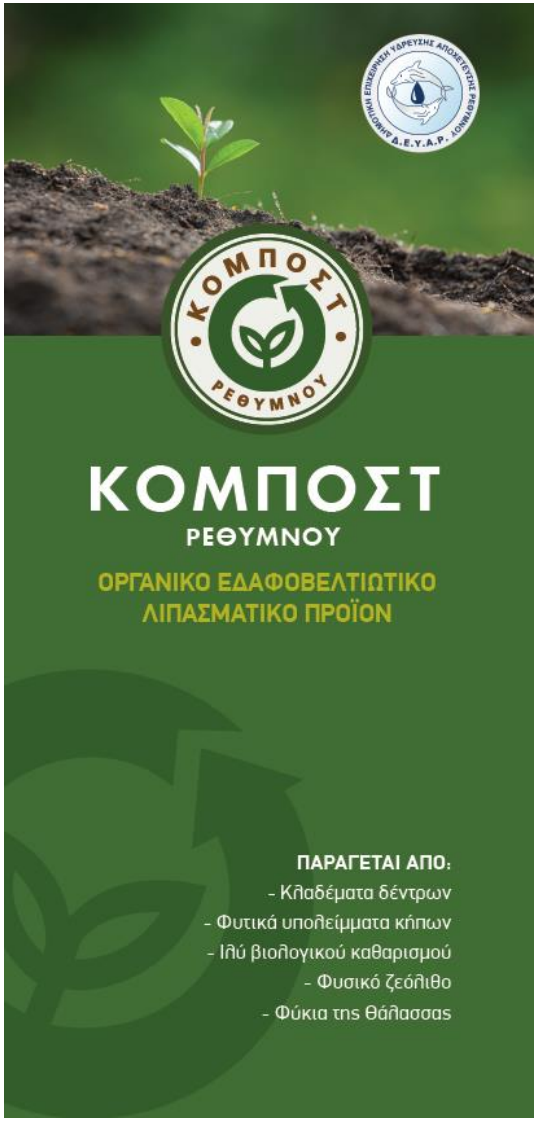
Parameter	Unit
Total Nitrogen (TN)	2.4- 3.0 %
Phosphorus (P_2O_5)	2.4- 3.0 %
Potassium (K_2O)	1.0- 1.2%
Calcium (CaO)	5%
Magnesium (MgO)	1.3 %
Sulfur (SO_3)	2.0 %

Table 03. Compost Micronutrients trace elements

Parameter	Unit
Iron (Fe)	5000 mg/kg
Zinc (Zn)	450 mg/kg
Copper (Cu)	200 mg/kg
Manganese (Mn)	100 mg/kg
Boron (B)	70 mg/kg

Compost of Rethymno: Free from contaminants

- Absence of pathogenic micro-organisms (*Esherichia Coli O157*, *Salmonella spp*.)
- Very low concentrations in heavy metals: 3-15 times smaller than legislation limits.
- Almost zero values in organic micropollutants (PCB, PAH, PCDD) .
- Absence of hexavalent Chromium (Cr^{6+}), and Arsenic (As).
- Low Cadmium (Cd) content compared to phosphorous chemicals fertilizers.
- Low Cl content compared to the chemical potassium fertilizers
- Free from weed seeds, and phytopathogenics.



Benefits of compost

- Very rich in nutrients: reduces the need for continuous use of large quantities chemical fertilizers.
- Reduces problems from parasites and nematodes, helps plants to be more resistant with results in the reduced use of pesticides.
- Rich in beneficial microorganisms: protects crops from diseases.
- Improves physical - biological characteristics of the soil the porosity (better aeration), soil structure, decompression, biological decompression activity, availability of nutrients.
- Protects to a significant extent the soils from erosion and desertification.
- Improves the quality of the products, increases soil fertility and productivity of crops.
- Due to the high fermentation temperatures (60 ^{o}C for 60 days) is seed-free weeds and phytopathogenics.
- Releases gradually and over time the nutrients and minimizes losses chemical fats in the atmosphere (degassing) and in groundwater (rinsing).
- Improves draining on soils and increases water capacity on dry and sandy soils.

“Co-composting of sewage sludge with plant residues: The case study of Rethymno WWTP”

Thank you very much for your attention!

T. Manios

E-mail: tmanios@hmu.gr

15-18.06.2022

CORFU2022

9th International Conference on Sustainable Solid Waste Management

Professor Thrassyvoulos Manios
Vice Rector of Finance, Planning and Development

Department of Agriculture
School of Agricultural Science
Hellenic Mediterranean University
Heraklion, 71410, Crete, Greece