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Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

SWRI Soil and Water Resources Institute
ΙΕΥΠ Ινστιτούτο Εδαφοϋδατικών Πόρων

Utilization of agri-livestock by-products and biomass residues as co-substrates for the biogas production through anaerobic co-digestion in batch mode

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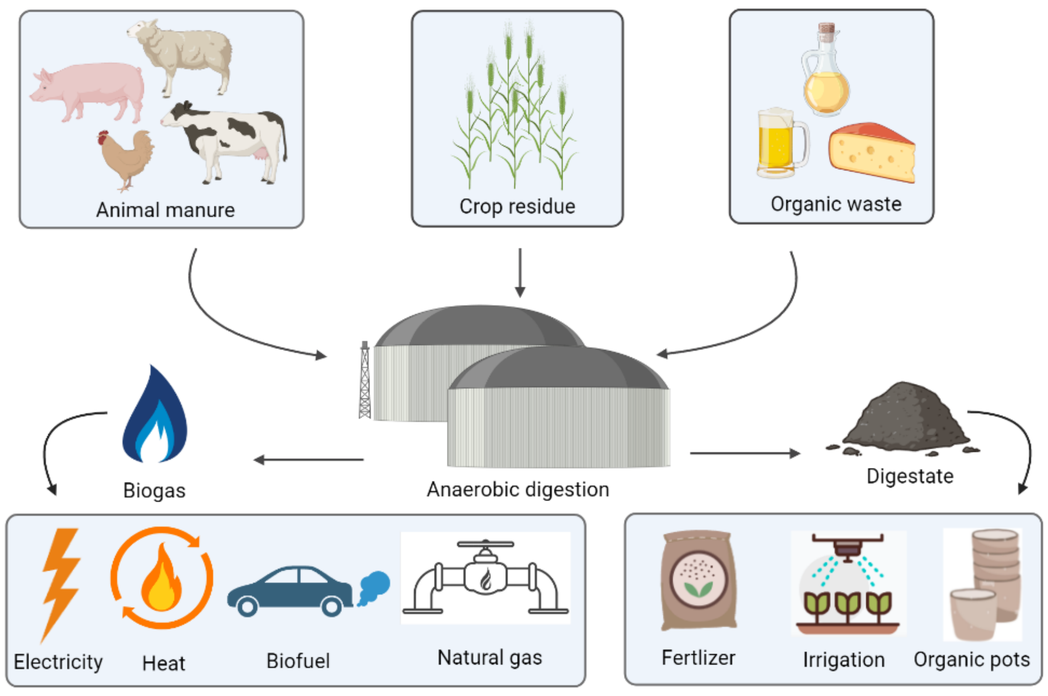
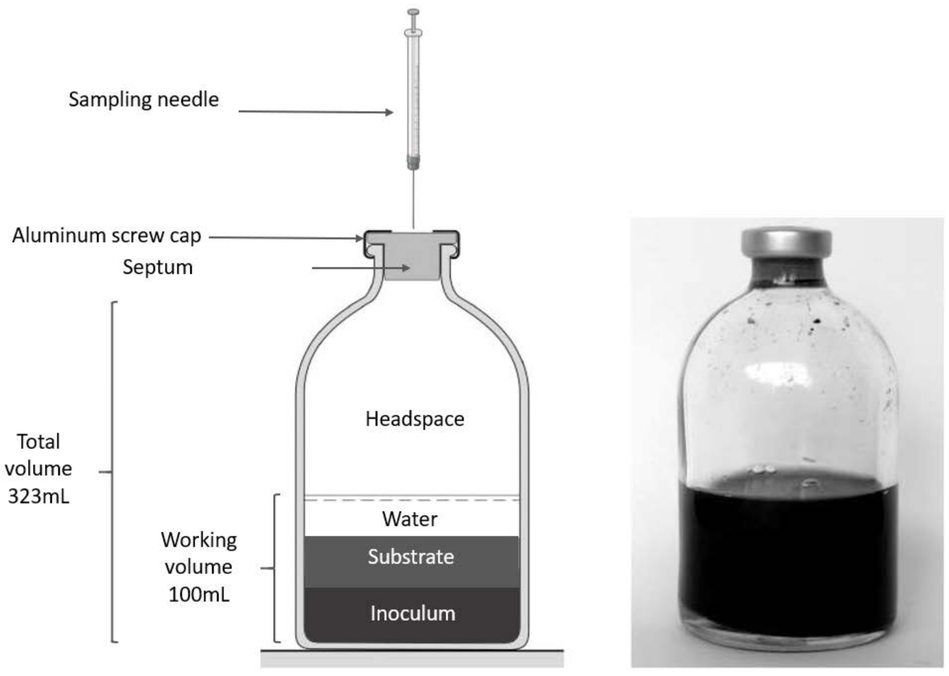
Introduction

- Organic wastes and by-products with no market can be used in anaerobic digesters for the production of biogas and fertilizers.
- Anaerobic co-digestion (AcoD) can lead to higher biogas production, overcoming the limitations of mono-digestion.
- Key point of AcoD: selection of optimal co-substrates and mix ratios to promote synergisms, reduce inhibiting substances and maximize methane production.
- Characterization of complex feedstocks is still lacking.
- Biochemichal Methane Potential (BMP) assay estimates the amount of methane produced during the breakdown of organic substances



Materials & Methods



Mono-digestion: 12 substrates
- physicochemical properties
- BMP assay (maximum methane recovery) with 0.2g organic load

Substrates with highest methane yield were tested as mixtures in various ratios

Co-digestion: 6 mixtures (40 : 35 : 12.5 : 12.5)
- Cattle slurry: Pork slurry: Cheese whey: Oil mill waste
- Cattle slurry: Pork slurry: Oil mill waste: Triticale
- Cattle slurry: Pork slurry: Cheese whey: Pastry cream
- Cattle slurry: Pork slurry: Oil mill waste: Pastry cream
- Cattle slurry: Pork slurry: Pastry cream: Triticale
- Cattle slurry: Pork slurry: Cheese whey: Triticale

Gas Chromatography for methane concentration measurement

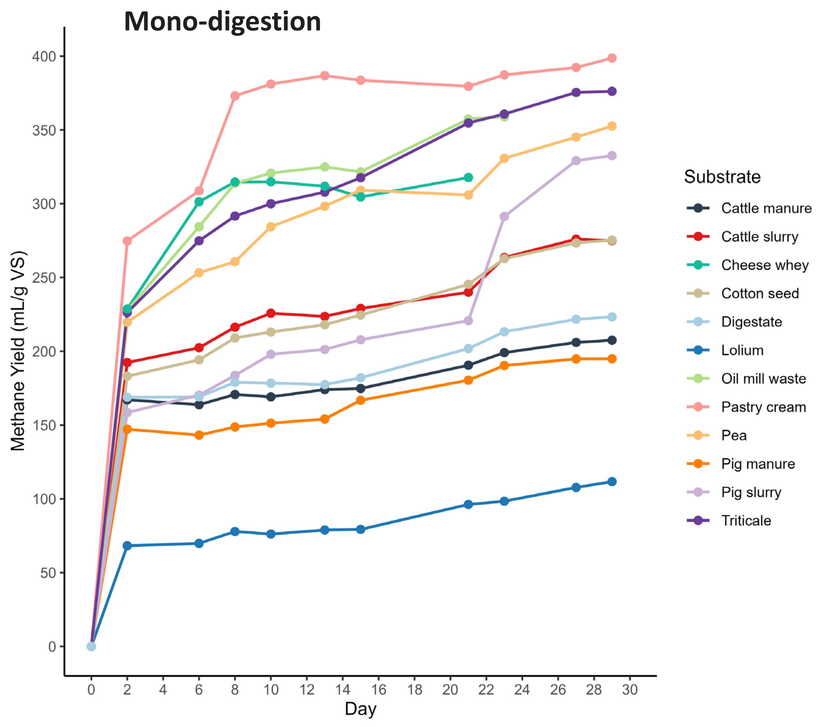
Results & Discussion

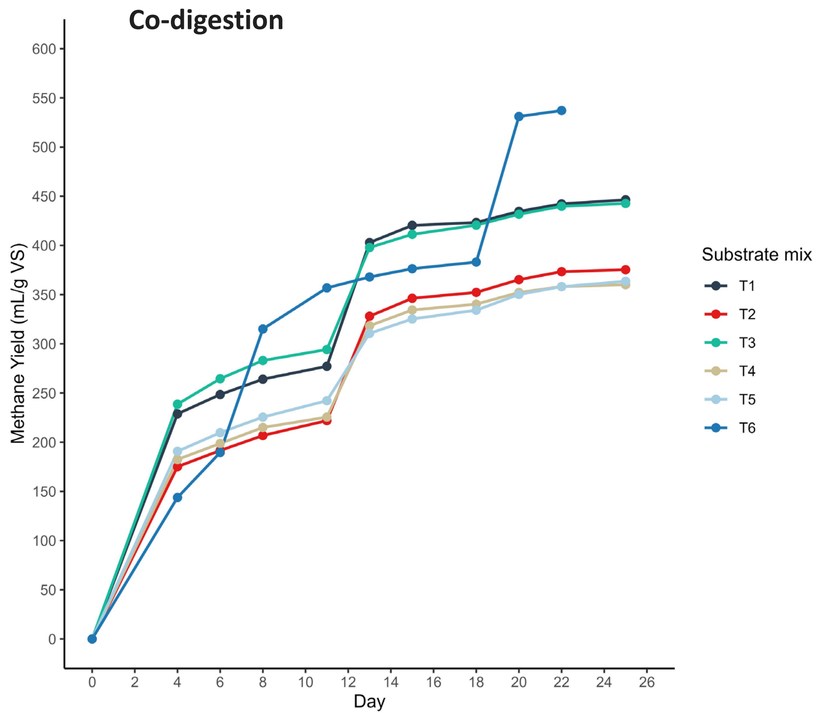
Mono-digestion:
- Highest methane yield: pastry creams, triticale, olive mill waste.

Co-digestion:
- Higher methane yields compared to mono-digestion treatments.
- Most efficient mixture:

cattle slurry: pork slurry: cheese whey: triticale

- Balance of C/N ratio
- Nitrogen-rich cheese whey acted as a supplement to the animal manure mixture (low organic nitrogen content).
- Cheese whey in mono-digestion inhibited methane production due to N accumulation.





Conclusions

- ✓ Expansion of viable energy sources and reduction of fossil fuels exploitation
- ✓ Implementation of co-digestion in local biogas facilities
- ✓ Biomass wastes with high and continuous national availability can support the Greek energy production and enhance the national circular bioeconomy.

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