An integrated methodology for treatment and valorisation of agricultural wastes in Lesvos, Greece

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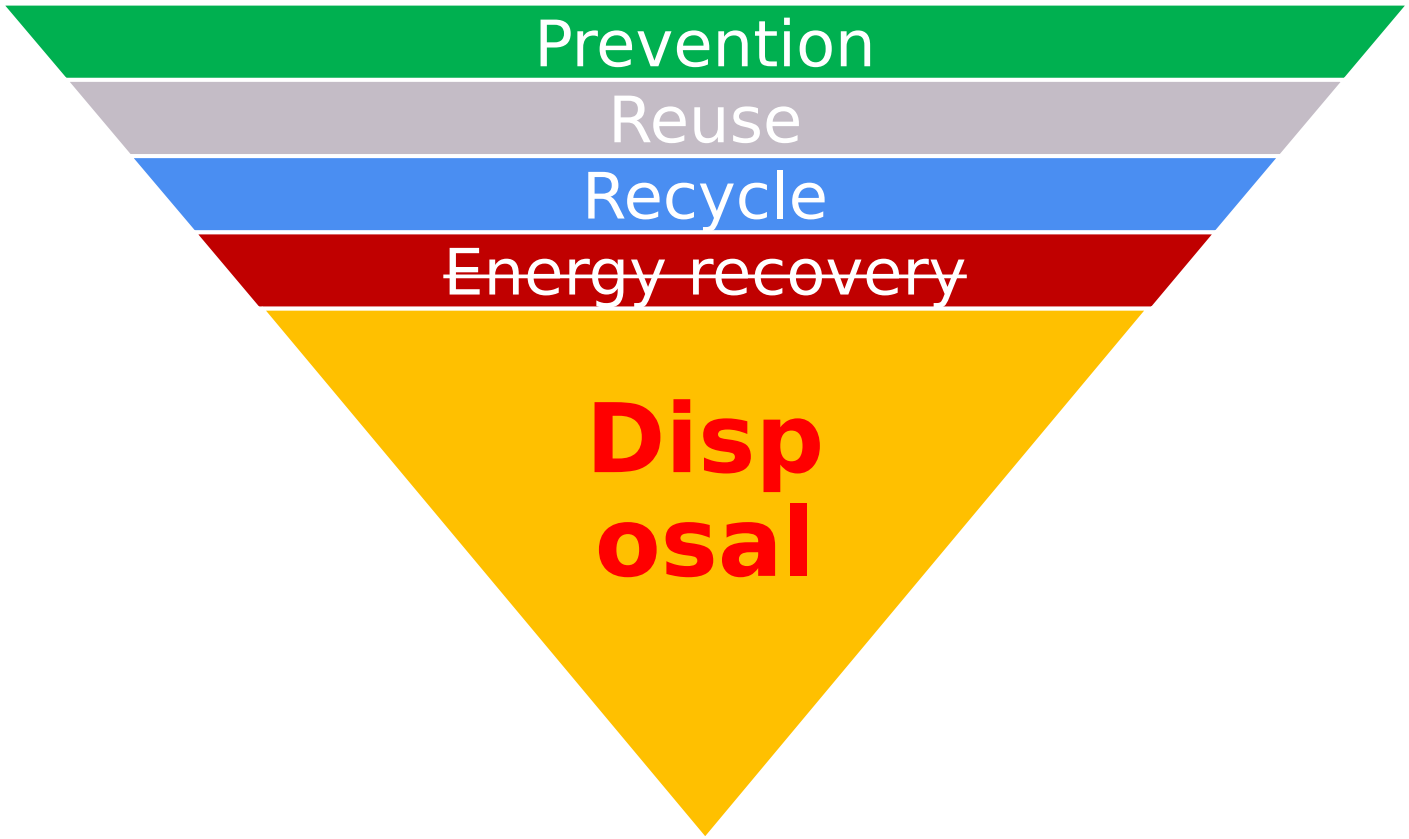
Research projects in Waste Management Laboratory

- AgroWaste Lab: A research infrastructure for treatment and valorization of agricultural wastes and residues for the production of alternative products and energy (Funded by North Aegean Region) *(ongoing)*
- Sustainable infrastructures for the use of biogenic residues on the example of the islands Lesbos and Chios - SusNisia. Funded by Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany (FKZ 16EXI2228A) *(completed in 2019)*
- Projects associated with Municipal Solid Waste Management in Greece (funded by Greek municipalities) *(ongoing)*
- Research Infrastructure «ENIRISST: Intelligent Research Infrastructure for Shipping, Supply chain, Transport and Logistics" (funded by Greek General Secretariat for Research and Technology) *(ongoing)*
- Geo-Ergon Paideia" «Start Up Farm: Skills for future eco-farmers». European programme Erasmus+, through the Greek State Scholarship Foundation *(completed in 2018)*

Organic residues: energy or material recovery?

Waste Management Hierarchy vs Greek Reality



Agricultural waste management in North Aegean

- Involves the management of olive oil mill wastes, dairies, wineries, slaughterhouse residues, livestock residues and residues from fruit treatment
- **Problems to be solved:**
  - **Seasonal variation**
  - **Specific characteristics**

Data Analysis Lesvos: Identified Organic Residues

Usable biogenic residues	Source	Total Wastes	Pyrolysis	AD dry	AD wet	Compost	CHP*	MBT**
		Quantities in t FM/y						
2-Phase Pomace	2-Phase Olive Mills	6.762	6.762			6.762		
Sieving Residues - Leaves		173		173		173		
3-phase pomace	3-Phase Olive Mills	18.907	18.907			18.907		
Sieving Residues - Leaves		840		840		840		
Whey	Dairy Plants	26.387			26.387			
Sewage sludge		1.471	1.471	1.471	1.471			
Sewage sludge for landfill	Slaugther House	128	128	128	128			
Anis residues	Ouzo Distilleries	54		54				
Manure and Bedding Material	Poultry Farm	316	316	316		316		
Sewage sludge	Municipal WWTP	558	558	558	558			
MSW (50% biowastes)	MSW Collection	17.496		17.496				17.496
Pruning from greencut	Municipal Pruning	8.000	8.000	8.000			8.000	
	Total tons/y	**81.093**	**36.142**	**29.036**	**28.544**	**26.998**	**8.000**	**17.496**

The research question

- Agrifood sector has been the key pillar for economic growth since ages
- Biowaste production is larger comparing to other regions
- There is no standardized procedure for their treatment
- Low efficiency of the applied methods or uncontrolled disposal
- Agrifood waste and residues are often discarded in reservoirs resulting in negative impacts on water quality and greenhouse gases emissions

Biowaste Treatment in North Aegean

Critical points taken under consideration:

- Valorisation of agro-waste and related by-products
- studding the implementation of several technologies (integrated)
- Investigate issues related to the realization on commercial level
- Circular economy transition

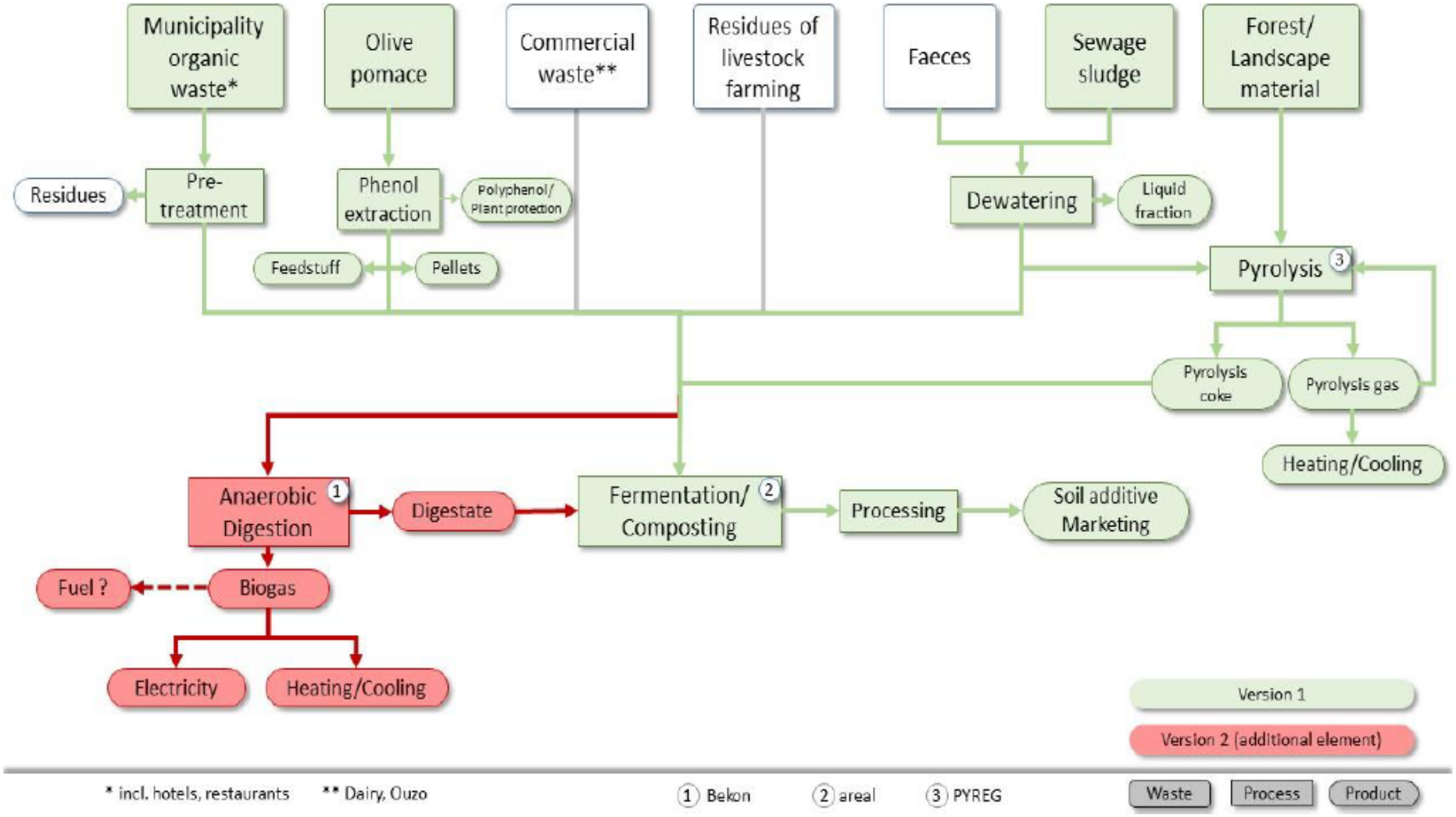
Additional benefits to North Aegean Region

Provide specific know-how. Innovative techniques could be adopted and embedded in agricultural enterprises based in North Aegean

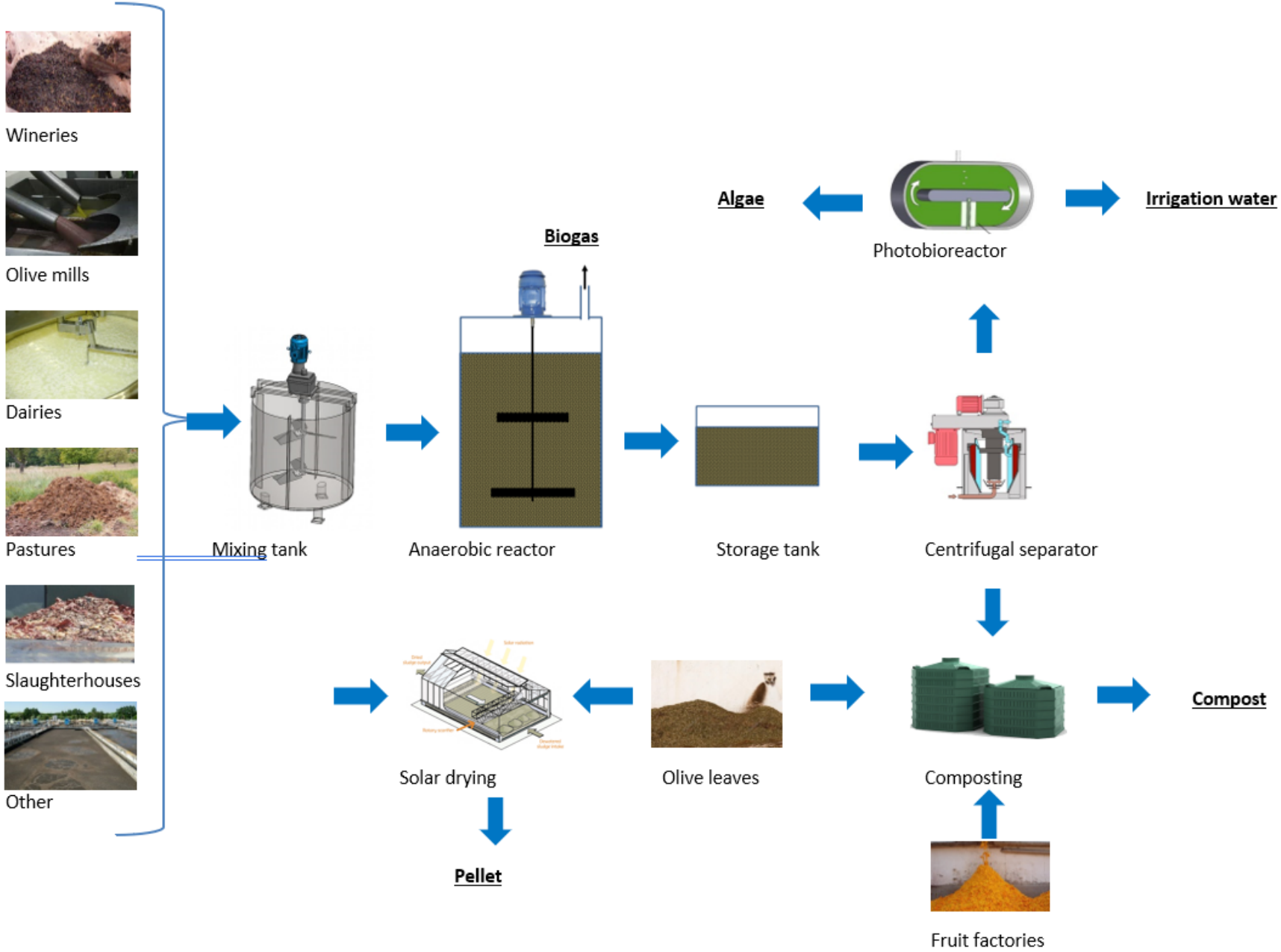
Support and growth of agricultural sector and scientific and research excellence

Contributes to development of circular economy in North Aegean

A Vision: Interlinkage and development of possible options



Aegean AgroWaste Lab



A first attempt … warming up

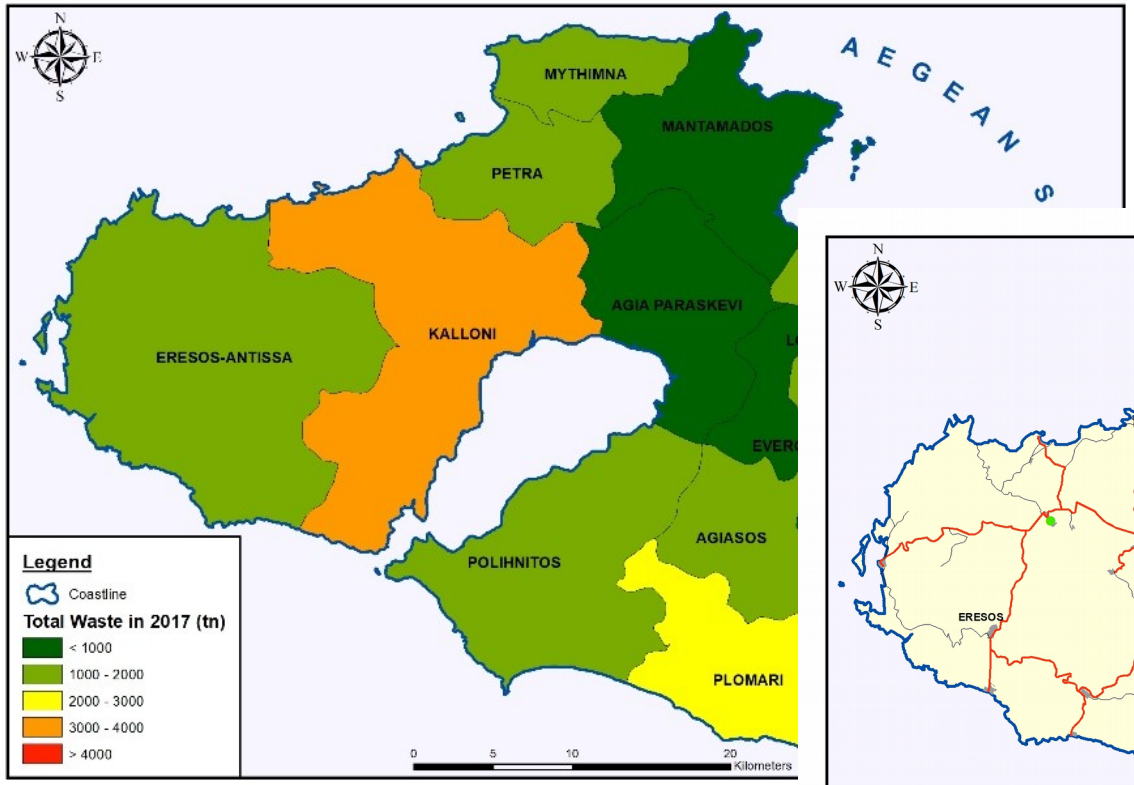
<u>Aim of study</u>

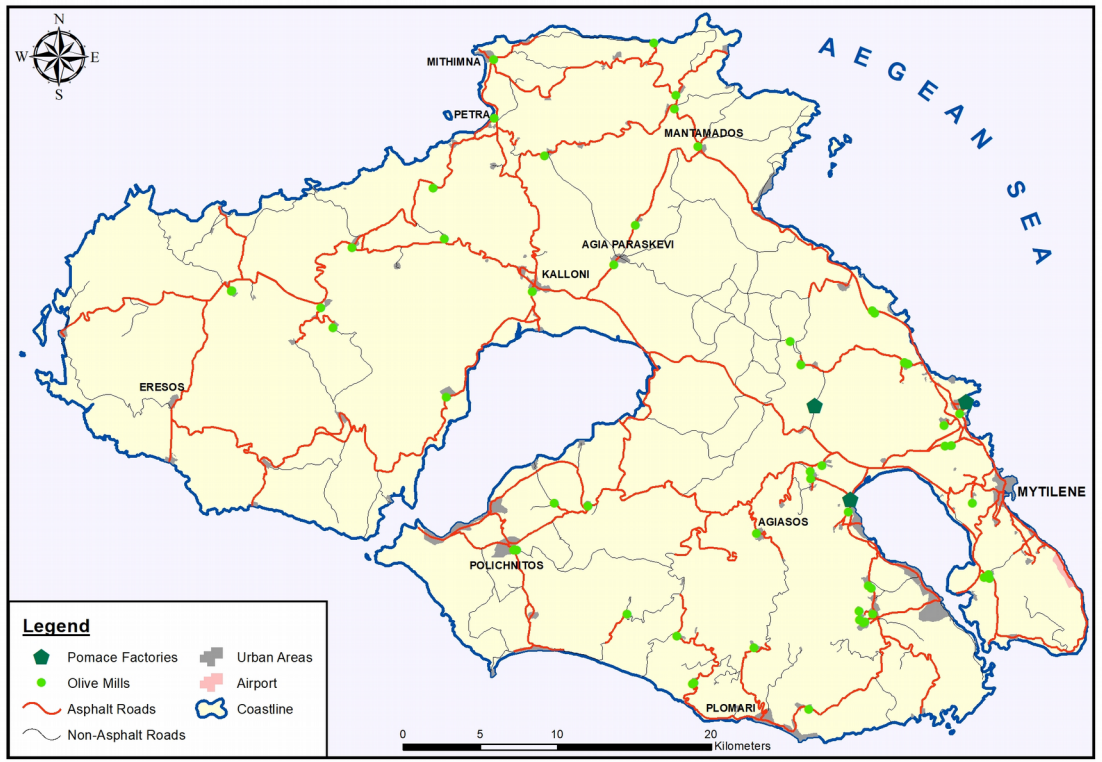
Produce of high quality compost

<u>Individual objectives</u>

- Successful co-composting of the selective materials
- Ascertainment of possible difficulties

Spatial Analysis of Quantities and Distribution on Island





Composition of piles

F

- Meal residues

FOL

- Meal residues
- Three phase olive mill wastewater
- Two phase olive mill waste
- Olive tree leaves

FOS

- Meal residues
- Three phase olive mill wastewater
- Two phase olive mill waste
- Olive tree shavings

Methodology

- Construction of three piles
- Composting duration : 23 - 25 weeks
- Parameters of the process
  - ✓ Oxygen
  - ✓ Temperature
  - ✓ Moisture
  - ✓ pH
  - ✓ C/N Ratio

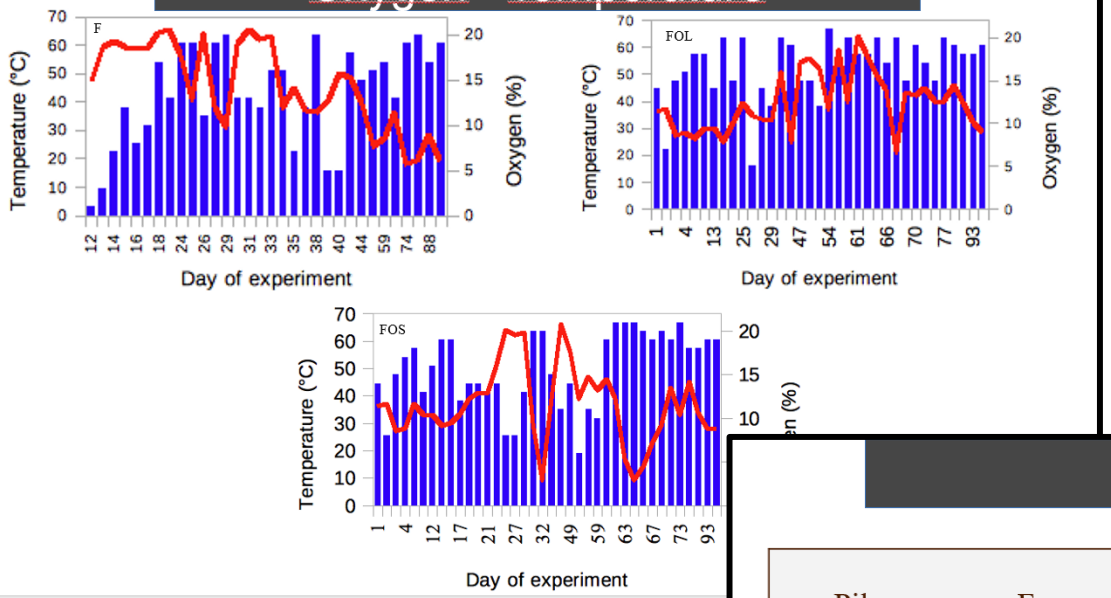
Daily in the beggining

Regularly

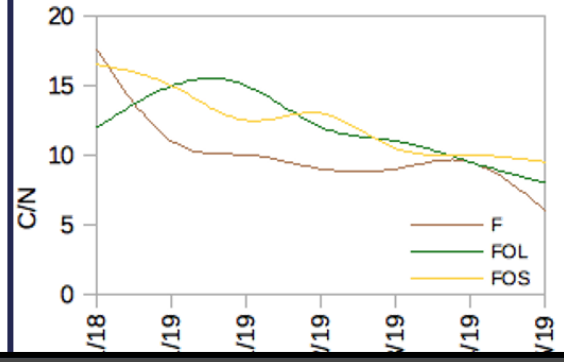
- Final product assessing (Compost)
  - ✓ Stability
  - ✓ Maturity

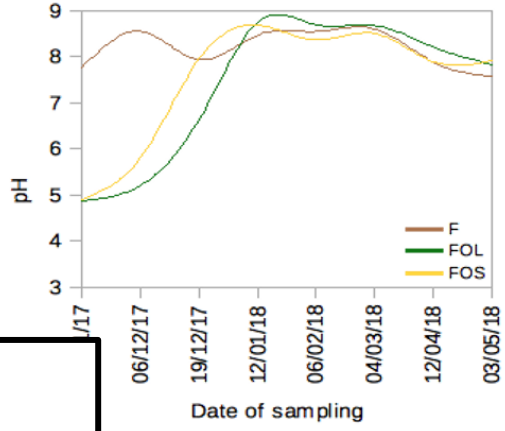
Results

Oxygen - Temperature



C/N Ratio & pH

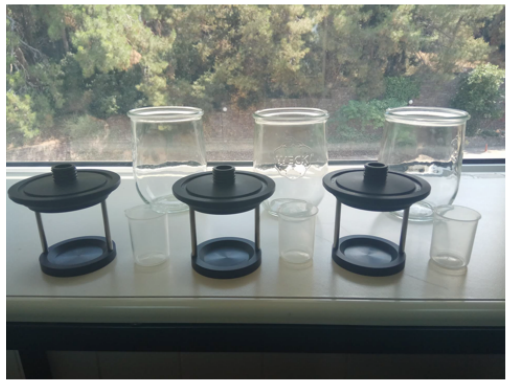


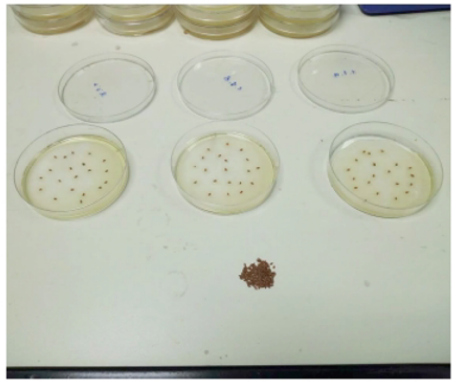


Stability & Maturity

Piles	F	FOL	FOS
CRI (g O2/Kg dm)	6.2	9.9	6.7

Piles	F	FOL	FOS
GI (%)	58	72	68





Conclusions

- ✓ Successful composting procedure
- ✓ Olive mill wastes impeded the normal progress of the procedure
- ✓ The addition of the bulking agent neutralized the effect of the olive mill wastes
- ✓ Olive mill wastes enhance maturity
- ▪ Low quality final product (compost)

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