# Turning wastes into valuable materials
# Valorization of pistachio wastes in agricultural sector

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# AgroStrat http://www.agrostrat.gr

## Sustainable strategies for the improvement of seriously degraded agricultural areas: The example of *Pistachia vera* L.

1/10/2012-30/9/2016

Budget : 1,026,509 €

**LIFE11 ENV/GR/951**

# Among other objectives….

*Valorization of pistachio wastes by composting and recycling in agricultural sector*

- Literature is poor on the subject
- The management of pistachio wastes in unclear
- Wastes very rich in organic matter
- Wastes with high electrical conductivity
- Polyphenols are constituents of pistachio wastes

## Pistachio Wastes

**Two parts : Solid and Liquid**

**Disposal on soil, in wells, in streams, sometimes in ponds**

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| Parameter | Pistachio Waste |
|---|---|
| Organic Matter, % | 88.7 |
| Total N, % | 1.56 |
| C/N | 31.6 |
| Moisture, % | 77.9 |
| pH | 7.40 |
| Electrical Conductivity, mS/cm | 6.0 |
| Total Polyphenols, g/Kg | 2.2 |
| Total K, % | 2.8 |
| Total P, % | 0.4 |
| Total Ca, % | 3.1 |
| Total Mg, % | 0.4 |
| Total Na, % | 0.5 |
| Total Cu, mg/Kg | 31 |
| Total Fe, % | 0.1 |
| Total Zn, mg/Kg | 34 |
| Total Mn, mg/Kg | 104 |
| Total B, % | 0.26 |

**Three composts**

**Feedstock for Composting**

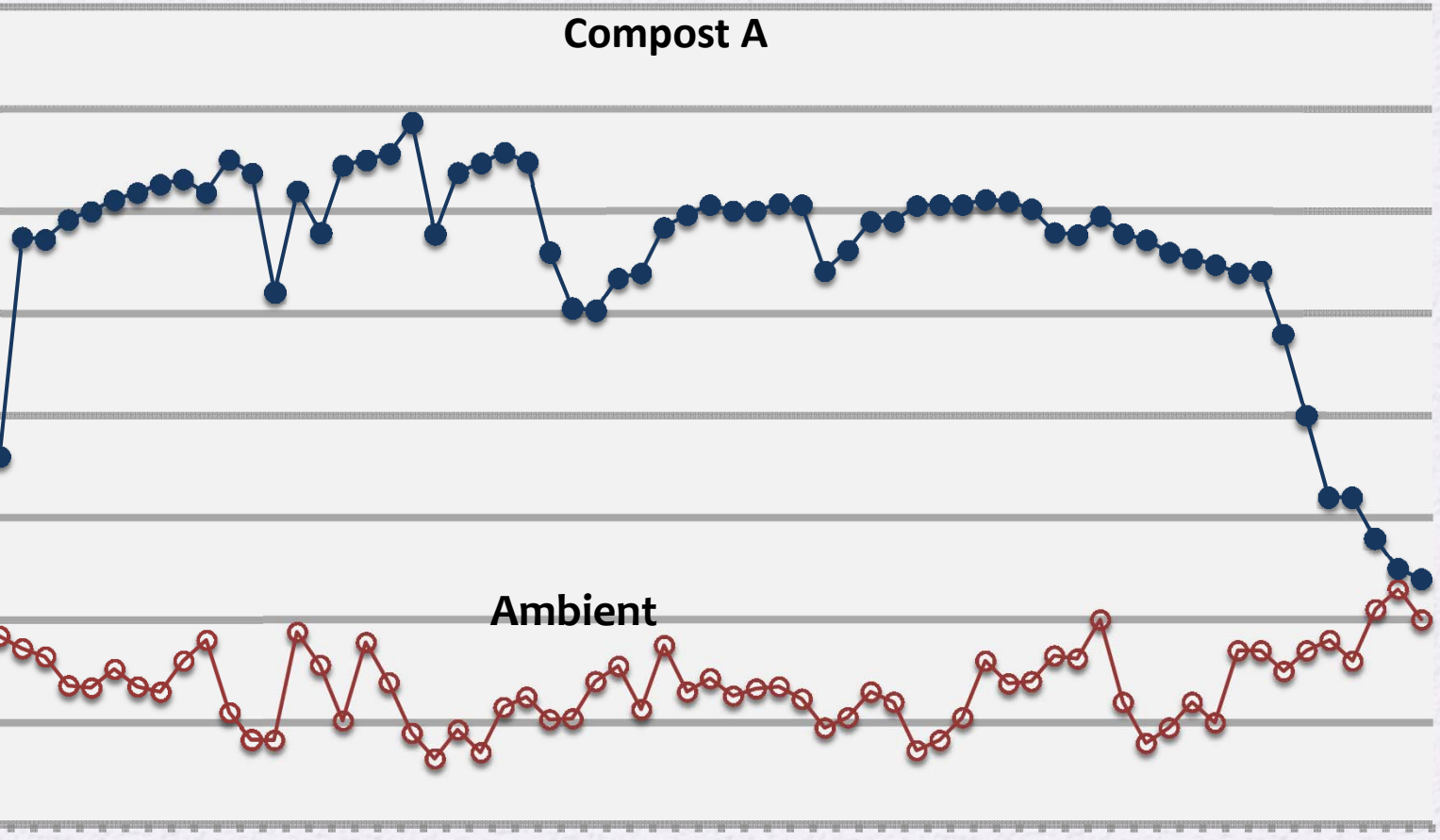
* Goat manure
* Sheep manure
* Straw
* Clinoptilolite in dust form (up to 70% in the tuff)

# Three Composts

| Compost | Pistachio wastes | Goat manure | Sheep manure | Straw | Clinoptilolite |
|---|---|---|---|---|---|
| A | 57% | | 29% | 14% | |
| B | 53% | 37% | | 5% | 5% |
| C X | 43% | 31% | | 26% | |

*Doula, Kouloumbis, Elaiopoulos*. SYMBIOSIS 2014, Athens.

# Temperature



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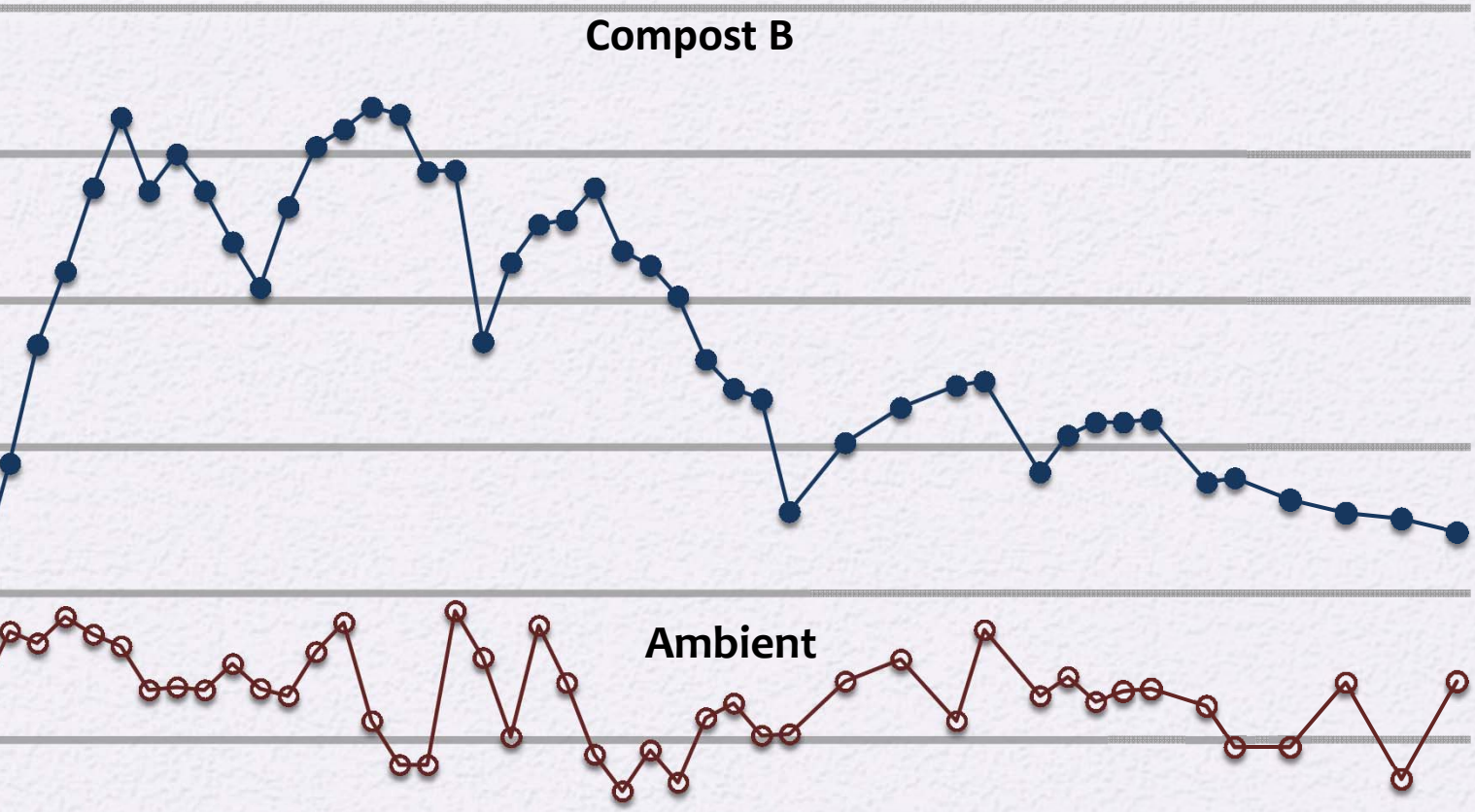
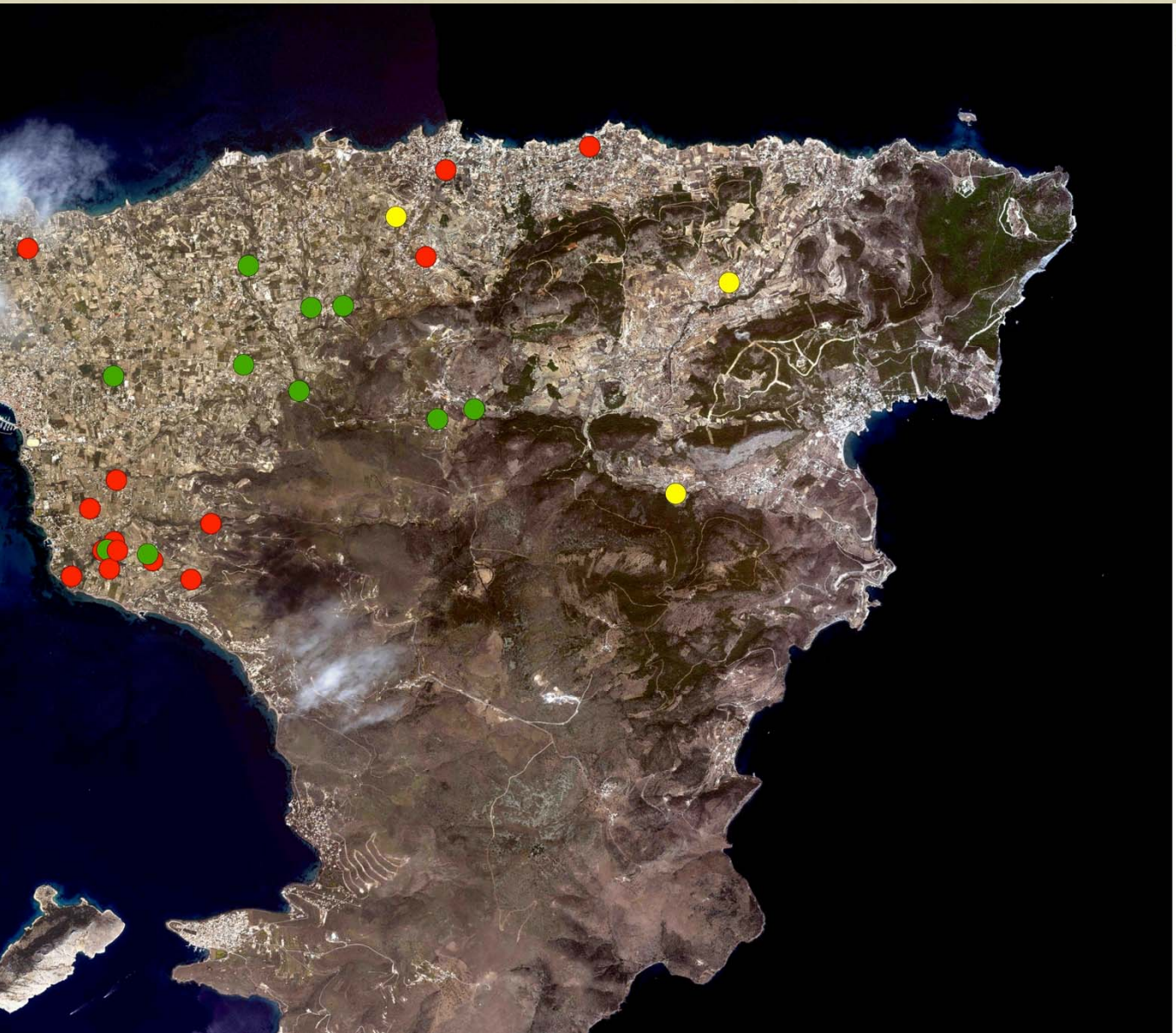


# Properties

| meter | Compost A | Compost B | Optimum value/range |
|---|---|---|---|
| nic C, % | 34.4 | 27.8 | Field application : 16-38%<br>Nursery application: > 19.4% |
| N, % | 3.2 | 4.3 | >2% |
| | 10.8 | 6.46 | |
| ture, % | 48.5 | 58.3 | 40-50 |
| | 8.10 | 7.90 | 7.2-8.5 |
| rical Conductivity, m | 6.3 | 2.6 | <4.0 |
| Polyphenols, g/kg | 0.24 | 0.34 | Soil content : <40 mg/kg |
| rity level (Solvita) | 7 | 7 | 7 or 8 |



SOIL SCIENCE INSTITUTE OF ATHENS

# WATER CONDUCTIVITY THEMATIC MAP OF AEGINA ISLAND

## LEGEND

**Electrical Conductivity**

**µS/cm**

- 250 - 2000 Low to medium hazard
- 2000 - 3000 Medium to high hazard
- > 3000 High hazard

**Sampling: scientific group**
**S. Theocharopoulos, V. Kavvadias, M. Doula**

**Analysis: M. Doula, SSIA Laboratory**

**Result Evaluation: M. Doula, V Kavvadias**

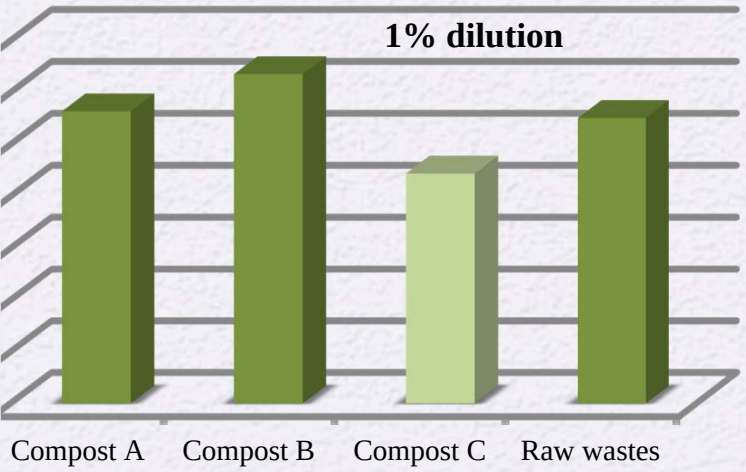
**Cartosynthesis:**
**S. Theocharopoulos, Ch. Kolovos**

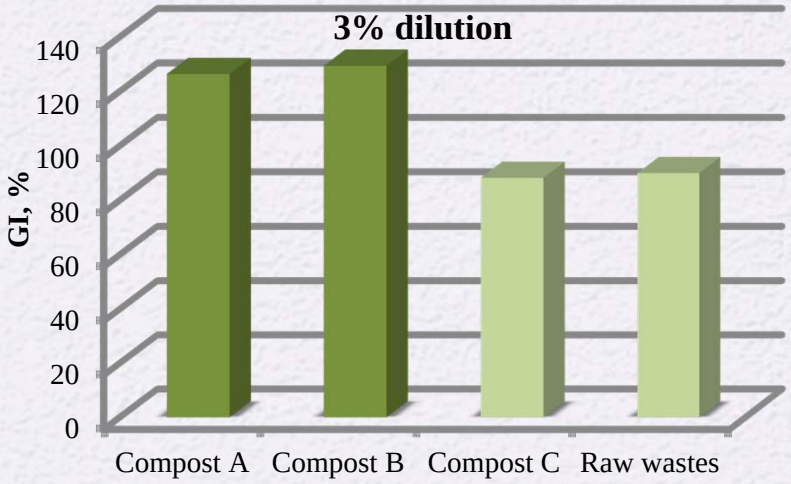
# Composts' extracts

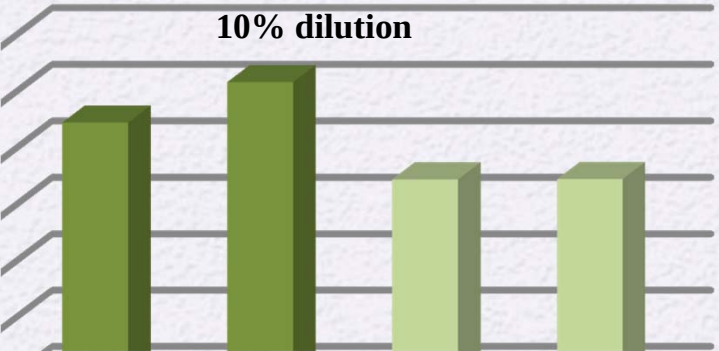
## (50g composts+100ml $H_2O$)

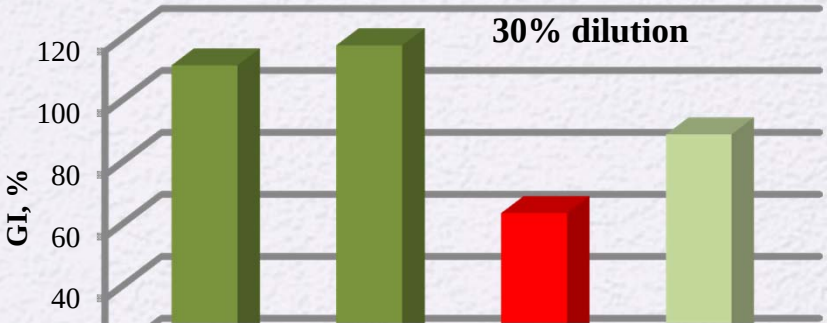
| meter | Compost A | Compost B | Raw wastes |
|---|---|---|---|
| | 7.82 | 7.76 | 7.31 |
| rical Conductivity, m | 8.4 | 4.2 | 6.0 |
| Polyphenols,mg/l | 77.7 | 35.8 | 282 |
| g/l | 1,300 | 800 | 546 |
| ng/l | 190 | 250 | 280 |
| mg/l | 80 | 54 | 150 |
| ng/l | 120 | 130 | 300 |
| ng/l | 0.31 | n.d. | n.d. |
| ng/l | 0.69 | 0.10 | 0.78 |
| ng/l | 0.24 | 0.08 | 0.09 |

# Germination Index



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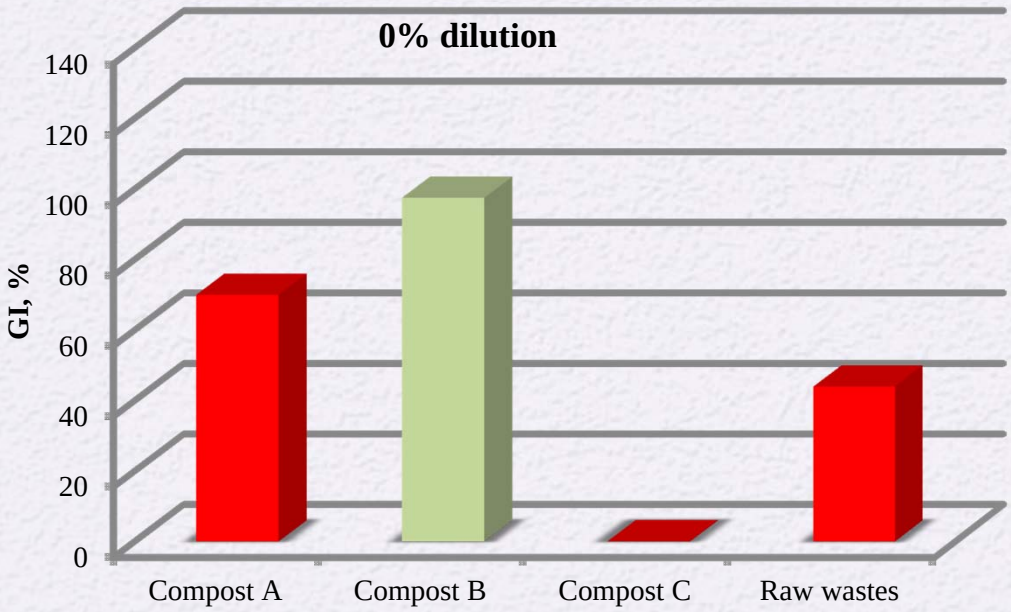

# Conclusions

ood quality compost can be produced by pistachio wastes

ectrical conductivity is a restricted factor

inoptilolite addition of 5% in the compostable mixture
sults in compost with very low EC, low polyphenols
ontent and very high Germination Index (non phytotoxic,
hancement of germination and radical growth)

aw pistachio wastes could be used as soil additives,
owever, under specific limitations

Thank you

Dr. Maria Doula

Coordinator of AGROSTRAT project