



**LIFE11 ENV/GR/951**

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

**AgroStrat**

**“Integrated Management Plan (IMaS)”**

Deliverable of Action B1: Development and implementation of an integrated management scenario for pistachio cultivation-Pilot field activities.

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**AgroStrat**  
**Strategies**



The project

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

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## SUMMARY

The Integrated Management Scenario (IMaS) is the overall deliverable of LIFE AgroStrat project, which includes all project's achievements and integrates them into a strategy for pistachio cultivation, soil management, waste exploitation, reuse, management and treatment. The IMaS includes specific practices for the cultivation of *P. vera* L. under Mediterranean climatic conditions and at areas under degradation/desertification risk, which consider sustainable soil and water monitoring and management, nutrients use, proper management of pistachio wastes (recycling, proper disposal, composting and use in agricultural sector, potential use of wastewater for irrigation, production of biochar for wastewater treatment) as well as, practices for minimizing soil salinization risk while promoting soil protection.

Overall, the IMaS aims to ensure improvement of agricultural environmental quality as well as of farmers' income and quality of life. It is important to mention that the IMaS, although conformed to pistachios cultivation, however the most of the measures and guidelines included can be aborted to other Mediterranean countries and conformed to other type of cultivations and other type of agricultural wastes (i.e. the two tools developed; the Cultivation Management Software (CMS) and the Central Management-Monitoring Tool (CMMT), the guidelines for soil protection against erosion and desertification, the reuse of organic wastes to produce biochars).

This study consists of four chapters:

### *Chapter A: Management and use of pistachio wastes*

The first chapter of the IMaS deals with the management and use of pistachio wastes. After summarizing the main restriction and the guidelines of the European legislative framework, the study provides knowledge regarding the impacts on soil of the uncontrolled disposal or reuse of agricultural wastes. Focusing on pistachio wastes (solid and wastewater) and considering their composition as defined during AgroStrat project, the study develops and explains a 4-steps strategy for the sustainable reuse of pistachio wastes on soil (for disposal or agricultural purposes):

#### Step 1: Development of a Land Suitability Evaluation system

The methodology of FAO for land evaluation however, conformed to the particularities of the pilot areas and the issues of interest (i.e. pistachio wastes and their management at Mediterranean agricultural areas), is presented. All soil parameters that have been considered for land evaluation are discussed and rated in order the evaluation system to be developed. Two systems for land evaluation are proposed, one for the reuse of solid pistachio wastes and one for the reuse of wastewater.

#### Step 2: Development of Land Suitability Maps

The methodology to rate and evaluate a multi parameter land system and to develop the respective GIS Land Suitability Maps for pistachio wastes is provided and discussed in this step. The respective two GIS-Maps for the disposal of solid waste and wastewater that have been developed during the project are presented as well as Land Suitability GIS-Maps for all soil parameters that have been found to be affected by the disposal of pistachio wastes (nitrogen, phosphorus, potassium, copper and zinc).

#### Step 3: Waste characterization

This step provides explanation on how to evaluate the appropriateness of waste for landspreading in terms of legislative restrictions. The legislative framework of the Mediterranean countries as well as the EU framework are considered to assess heavy metals content of waste and assess the preconditions of the landspreading.

Step 4: Estimation of waste doses for landspreading.

Having fulfilled all the above steps, this one guides the stakeholders on how to estimate the appropriate dosage of waste to be spread on soil annually.

Finally, all four steps are integrated into a quantified strategy for reuse of pistachio wastes for agronomic purposes. The use of the Cultivation Management Software of AgroStrat as well as of a tool for soil monitoring developed during the LIFE-Prosodol project as tools for the implementation of this strategy are proposed.

*Chapter B: Integrated fertilization practices for pistachio (*Pistachia vera* L.)*

The chapter provides guidance on sustainable cultivation of *Pistachia vera* L. cultivation under Mediterranean climatic conditions. All relevant issues are discussed and presented in a easy and understandable way in order to be easily adopted by the farmers. Guidance on soil and leaf sampling, analysis and fertility assess in relation to pistachio trees needs are provided together with detailed description of nutrients application at field.

*Chapter C: Soil degradation and desertification in Aegina island, Greece*

Soil degradation and desertification is one of the major issues of concern in Mediterranean area. AgroStrat seriously considers this threat and for this reason, all deliverables and recommendations are focusing on protecting and improving soil quality especially at intensively cultivated areas, as the pilot area of the project. This chapter begins with a description of soil and land degradation processes in Aegina island and a determination of the threatened areas and their extend. In the following, technical and scientific measures in a form of a strategy to mitigate degradation and desertification and to promote sustainable land and water use, are provided and explained.

*Chapter D: Innovative management of pistachio waste. Anticipated benefits for soil quality.*

This chapter aims to characterize the morphology as well as to assess the quality of the biochar produced from pyrolysis of pistachio (*Pistachia vera* L.) shells obtained from Aegina island, Greece. Pecan (*Carya illinoensis*) shells and wood sawdust, obtained from Chania, were also used for the production of biochar and their quality was compared to the biochar prepared from pistachio shells. Results have shown that all three feedstock, can be effectively pyrolysed for the production of biochar with beneficial properties. This study was carried out to:

- (i) indicate the potential of valorizing agricultural wastes, produced in Aegina island and other parts of Greece, at farm level
- (ii) propose complete agricultural waste (solid and liquid) valorization options, which is one of the most important outcomes of Agrostrat
- (iii) maximize the reliability, impact and validity of the LCA studies
- (iv) maximize the impact of Agrostrat project not only in Greece but also in most Mediterranean countries and elsewhere, where such agricultural wastes are produced
- (v) develop best agricultural practices, as for example minimizing the potential toxicity of the compost produced from similar agricultural wastes
- (vi) improve sustainability of agriculture by considering the principles of “zero waste” and “circular economy” which are European pillars in FP7 and especially H2020