



H.F.R.I.
Hellenic Foundation for
Research & Innovation

Description of the funded research project
1st Call for H.F.R.I. Research Projects to Support Faculty
Members & Researchers and Procure High-Value
Research Equipment

Title of the research project: Assessment of the fertilization capacity and molecular evaluation of the microbial load of sewage sludge treated with minerals(*Safe Ferti-sludge*)

Principal Investigator: Theodora Matsi

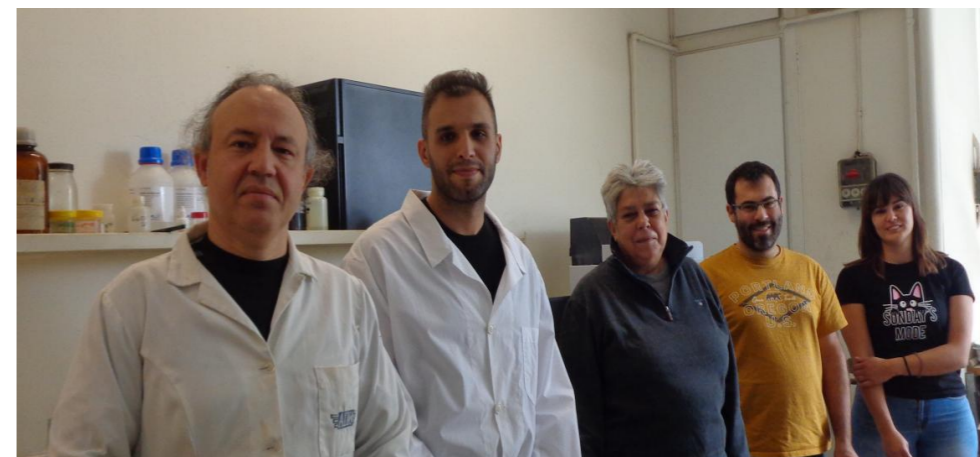
Reader-friendly title: Sewage sludge as a safe bio-fertilizer

Scientific Area: Agricultural Sciences - Food Science and Technology

Institution and Country: Aristotle University of Thessaloniki (A.U.Th.), Greece

Host Institution: Aristotle University of Thessaloniki (A.U.Th.)

Project webpage: <https://safefertisludge.agro.auth.gr>



Budget: 170000 €

Duration: 36 months

Research Project Synopsis

Sewage sludge production in EU exceeds 9 million Mg (DS) each year with an increasing trend. EU policies have set limits on sewage sludge trace metal concentration, promote the application of sewage sludge in agricultural soils, but exclude any microbiological aspects. However, there are serious concerns on public health and nutrient reuse efficiency, when sewage sludge is treated (alkaline or thermal) and disposed (landfill or agricultural) with the most common methods. This poses a crucial societal and scientific challenge in sewage sludge treatment and disposal: i) to find alternative methods to treat sewage sludge and ii) to understand the nutrient transformation during sewage sludge treatment and disposal in a safe, cost effective and environment friendly way. *Safe Ferti-sludge* aims to mitigate the pressing problem of sewage sludge disposal, under the framework of circular economy, by converting a potential biohazard destined for landfill disposal into a pathogen-free, nutritive and safe bio-fertilizer for agricultural production. Therefore, we will assess the efficiency and thresholds of sewage sludge treated with clay minerals on the stabilization (reduction of microbial load, pathogens), fertilization capacity for agronomic crops and the distribution of antibiotic resistant genes in the environment, in laboratory and glasshouse experiments. For the first time, building upon the well-established agronomic and microbiological techniques, we will apply powerful molecular techniques, to understand the intrinsic microbial dynamics in sewage sludge. Our results and detailed datasets will enable the development of innovative bio-fertilizers.

Project Originality

The originality of the project *Safe Ferti-sludge* concerns:

- ✓ The investigation of new methods for sewage sludge stabilization, in the perspective of optimization of the agronomic utilization of treated sludge.
- ✓ The investigation, employing molecular methods, of the microbial community of sewage sludge and its tolerance in antibiotics, in the perspective of produce a safe bio-fertilizer from sewage sludge.

Expected results & Research Project Impact

The project *Safe Ferti-sludge* is expected to:

- ✓ Offer new knowledge regarding the application of clay minerals in processing sewage sludge, and their interactions with nutrients and microbes, and to provide new data considering their sensitivity for NH_3 emissions.
- ✓ Contribute new research data regarding the fertilization capacity of treated sewage sludge.
- ✓ Expand our knowledge regarding the impact of treated sewage sludge on downstream microbial processes in N, providing a holistic perspective of the impact of bio-fertilizer application on agronomic soils.
- ✓ Analyze the spectrum of effects of bio-fertilizers with specific emphasis on microbial bio-hazard and antibiotic resistance genes distribution.

The practical results and high-quality data of *Safe Ferti-sludge* will be to:

- ✓ Set up a rigorous methodology for technical analysis and LCA including all the variables influencing implementation of the technique at practical scale.
- ✓ Elucidate the N transformations at various stages of sewage sludge treatment, storage and application.
- ✓ Establish the optimum rate and thresholds of clay mineral applications to sewage sludge, which achieve sewage sludge stabilization and N preservation at the same time.

The importance of this funding

In the project *Safe Ferti-sludge*, the following persons are working:

- ✓ Dr. George Giannopoulos, who came back from the USA, after his postdoctoral.
- ✓ Mr. Athanasios Balidakis (MSc, Agronomist), who does his PhD thesis, in the context of the project, in the Soil Science Laboratory of the School of Agriculture of A.U.Th., under my supervision.
- ✓ Mrs. Anastasia-Garyfallia Karagianni (Agronomist), who does her MSc thesis, in the context of the project, in the Soil Science Laboratory of the School of Agriculture of A.U.Th., under my supervision.

Moreover, in the context of the project *Safe Ferti-sludge*, a system of Gas Chromatography was bought for the project's needs, but also for the expansion of research interests of the members of the staff of the Soil Science Laboratory of the School of Agriculture of A.U.Th.





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