Laboratory of Sustainable Waste Technology Management
Professor Dr. Ioannis K. Kalavrouziotis
Dean of the School of Science and Technology
Director in MSc Programme 'Wastewater Management'
Parodos Aristotelous 18, 26335, Patras
Office tel.: +0030-2610 367546 mobile: +0030-6944726906
Email: ikalabro@eap.gr

Patras, November 04, 2021

Dear Colleagues,

The present letter intends to inform you about the Decision Support System (DSS) for the wastewater and biosolid reuse in agriculture.

The DSS has been recently developed by the research Group of the School of Science and Technology at the Hellenic Open University (HOU), Patras, Hellas (Editors: Prodromos Koukoulakis, Spyridon Kyritsis and Ioannis Kalavrouziotis).

The aim of the DSS is to contribute to the effective exploitation of the huge quantities of wastewater and sludge or its treated form biosolids, produced worldwide. The specific aims of the DSS are summarized below as follows:

- To reuse the wastewater for the irrigation of crops and biosolids minimizing human and environmental risk
- To enrich the soil with organic matter
- To improve soil structure, water holding capacity, and increase its resistance to erosion
- To supply the soil with plant nutrients
- To improve soil fertility
- To optimize the fertilization of crops
- To reduce fertilizer cost
- To prevent soil pollution with heavy metals

- To optimize crop production quantitatively and qualitatively
- To protect the agroecosystem from overload with heavy metals and plant nutrients
- To relieve the environmental stress from the pressure exerted by the huge quantities of wastewater and biosolids produced annually
- To optimize life quality

The DSS is a clever system capable of accomplishing controlled reuse of wastewater and biosolids in agriculture. Its capacity is based on the following possibilities:

- It can calculate the **optimum nutrient dose** for each crop, on the basis of:
  - (i) the nutrient inputs including: soil residual nutrients, wastewater, biosolids, and organic matter, and
  - (ii) the nutrient losses due to leaching, denitrification, fixation and removal via crop harvesting. By co-evaluating all the above sources i.e., the **nutrient inputs** and the **nutrient losses**, the optimum dose of each nutrient that is to be applied to the crop, is determined with accuracy. And as long as the total available nutrient is higher than the requirements of the crop for maximum yield, the nutrient dose will zero, not needing supplementary inorganic fertilizer for the crop. Otherwise, the software may indicate the need for supplementary inorganic fertilizer application, the quantity depending on the extent of the difference between the **total nutrient input** and plant nutrient requirements for maximum yield. It is in this way that significant fertilizer reduction may be accomplished**.**
- It can calculate the value of the **soil pollution index(Elemental Pollution Index or EPI)** and can give quantitative information about the level of soil pollution with heavy metals
- It can determine the quality of the wastewater being used, and it may exclude from reuse if its concentrations in heavy metals are higher than the international standards(FAO)
- It can also calculate the optimum rate of liming material needed to improve a strongly acid soil to the desired pH level, for the normal growth of crops.

- It also informs the user about the level of soil salinity, a very useful information related directly to the plant growth. The treated wastewater can easily increase the soil salinity. and its timely forecasting is necessary.

The DSS is also friendly to the environment and can effectively contribute to the control of the wastewater and biosolids reuse in the agroecosystem, and it can function either with only wastewater or only biosolids or with both of them.

The current version, utilizing modern web technologies, provides a simple, light and easy to use web interface even for a novice PC user. Its core engine is modular and flexible enough to accept and incorporate future changes new technologies or upgrades, so that its function can be continuous towards realization of the aims for which it has been developed.

Access to the system is provided as a hosted service. The cost of this DSS is 1500 euro (for Universities 800 euros). For those prospective users who are interested in acquiring an idea as to how the DSS functions and what it can accomplish, they can try a working demo of the current version (v 1.5), at the following URL:http://wdss.eap.gr

Thank you very much for your interest

Yours sincerely

Ioannis

Professor Dr. Ioannis K. Kalavrouziotis
Dean of the School of Science and Technology
Member of Management Committee of IWA Special Group 'Water in Ancient Civilizations'
Member of IWA Special Group 'Water Reuse'