

'The need for wastewater reuse and its effects on agricultural soil resources'

Irrigation practices in arid and semi-arid regions followed at present are not sustainable. Most regions are experiencing increasing population and development with increasing demands for limited fresh water for municipal, agricultural and industrial use. In arid areas fresh water use is currently in excess of sustainable quantities. In view of the climatic changes and over pumping on the groundwater, intrusion of saline sea water into groundwater aquifers is observed in many regions. As groundwater is used for agricultural irrigation, it can be expected that there will be a salinization of the agricultural land. In some cases sea water infiltrates into sewage collection pipes at areas of low elevation, eventually entering wastewater treatment plants that produce treated wastewater for agricultural use.

Available criteria give guidance as to the safety of degraded water on soils and plants and should be followed when implementing or monitoring a wastewater reuse scheme. A list of internationally accepted criteria collected and formulated by the author will be presented.

Generally, use of degraded waters may either reduce yield or cause additional management expenses. Treated wastewaters have elevated pH, alkalinity, and sodium, relatively low Ca/Mg ratios, high concentrations of dissolved organic matter, all adverse to infiltration and soil structure, as well as ion imbalances and elevated concentrations of potentially toxic elements. Use of these waters may require periodic application of amendments and/or leaching, utilizing new knowledge about factors affecting infiltration and crop production. Environmental concerns about recycled water include plant uptake of toxic elements, pharmaceuticals, endocrine disruptors etc. as well as off-site impacts to discharge areas.

Water quality criteria were developed in the era of abundant fresh water supplies, and their objectives were to avoid problems under most conditions. The criteria do not certainly consider all conditions available in every region, where the crop water requirements can be met by a combination of rain, fresh water and saline water, thereby diminishing the predicted salinity impact when considering the saline water only. It should also be considered that in Mediterranean climates, unlike other regions, winter rain leaches the soil. Thus salinity is low in the early stages of plant growth which are often the most salt sensitive, suggesting that the criteria used may often overestimate salt damage. An overall agro-ecological evaluation however is necessary at all stages of the wastewater reuse scheme and it should be carried by professionals in the area.

New technology monitoring systems are now available and may monitor land quality in terms of salinization of irrigated land.

Various examples of the effects of treated wastewaters on soils in terms of salinity are presented.

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