

Soil quality for food safety

Opinion

The contamination of natural resources, mainly due to human activities, is one of the most important concerns to face nowadays not only for the environment itself, but for the negative consequences that it could have on human health. Since 1962, with the publication of the science book “*Silent Spring*” by Rachel Carson,¹ the awareness of the detrimental effects of some chemical substances, in this case pesticides, on animals has spread. All the chemical substances that usually are used, from the fossil fuel combustion to use of pesticides, from wastes to antibiotics, lead particles and molecules in the environment, contaminating natural resources. If water and air deterioration have been described and studied for decades, soil contamination has become a priority only by late 1990s. Only in the last fifteen years, the importance of soil has been recognized as it represents the most important element for supporting life on Earth.² Indeed, soil supports terrestrial ecosystems and human constructions, it regulates water cycle and carbon dynamics, decomposition takes place into the soil and the nutrients become available again. Soil provides food for human nutrition, and its quality represents a fundamental requirement for food safety, and therefore for animal and human health, even though not always this relationship is stressed enough. Soil quality can be described as “the continued capacity of a soil to function as a vital living system”.^{3,4} Many functions that take place in the soil are mediated by the complex communities of edaphic organisms.⁵ Soil fauna contribute to decompose organic matter, they affect porosity and aeration, regulating water infiltration, and they distribute the organic matter within the horizons.⁶ The great diversity of soil organisms cooperates with complementary rules, each of them essential to fertility of soils.⁷ In case of pollution, the soil fauna could be affected in several ways, depending on chemical characteristics of the substance, on doses and exposition, with consequences on the services they provide. In these cases, soils can't afford efficiently to its rules, it suffers due to different shift in the soil communities and we can affirm that its health it is compromised. For example, the effects of herbicides, fungicides, pesticides, fertilizers, antibiotics used in agriculture and in farming could have heavy impacts on soil quality and then on the characteristics of food and its safety for animal and human consumption. Organic (e.g. polycyclic aromatic hydrocarbons -PAHs-, polychlorinated biphenyls -PCBs-) and inorganic (e.g. heavy metals, inorganic acids, radionuclides) compounds are carried in agricultural soils by using chemicals and amendments (sewage sludge, compost, biochar) or by other processes such as wind and rain deposition. The not water soluble substances remain into the soil and could be accumulated increasingly towards the food chain^{8,9} with potential threat at different stage level. Soil conditions are, thus, fundamental for the soil capacity in agricultural production.¹⁰ A soil characterized by rich edaphic communities is a healthy soil which continues to function through the time, contributing to biodiversity, to quality agriculture and to sustainable development.

To determine the safety of food, it is necessary monitor the quality of food of course. However, it is important to understand we have to control the quality of agricultural soils. Soil quality is a holistic method to understand soil systems¹¹ and it can be measured using a set of indicators, each related to a single aspect of the environment

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to maximise the information,¹² combining chemical, physical and biological methods. Among the bio indicators, some approaches have been proposed and successfully provided, even though some problems to their application rely on the lower standardization, the limited spatial scale where they can be applied,^{13,14} and the difficulties in determining the organisms. In any case, in my opinion, it would be better employing much more resources in the characterization and monitoring of soils than having to face to urgency in case of contamination. The World Health Organization (WHO) estimates that a quarter of diseases today occurs are caused by prolonged exposure to environmental pollution. Considering that point, a more extensive monitoring activity on quality and well-being of natural resources, including soil, could reduce risks to animal and human health.

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Conflict of interest

The author declares no conflict of interest.

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