proceedings

MDPI

Abstract

Long Term Impact of Sludge Application in Maize Farm †

Adelcia Veiga *, Carla Ferreira, Luís Pinto, Anne-Karine Boulet, Eunice Louro, Rosinda L. Pato and António Ferreira

CERNAS, Coimbra Polytechnic Institute of Coimbra, Agrarian Technical School, 3045-601 Coimbra, Portugal; carla.ssf@gmail.com (C.F.); lmpinto@esac.pt (L.P.); anne.karine@esac.pt (A.-K.B.); eunicefonsecalouro@gmail.com (E.L.); rlsp@esac.pt (R.L.P.); aferreira@esac.pt (A.F.)

* Correspondence: athellcia@hotmail.com

† Presented at TERRAenVISION 2019, Barcelona, 2–7 September 2019.

Published: 21 May 2020

Abstract: Intensification of agriculture worldwide has led to a growing awareness on their environmental impacts, namely on soil quality and long term impact on crop productivity. As a consequence, there is an increasing concern regarding best agricultural management practices and their impact on physical, chemical and biological soil properties. In the Centre region of Portugal, maize is one of the most important arable crops and represents more than 32% of the cultivated area. Maize fields have been intensively managed under conventional practices, but increasing land degradation is leading farmers to adopt improved management practices, such as the application of composted sludge from urban wastewater treatment plants. This study aims to assess the long term impact of composted sludge application as soil amendment in maize cropping fields. The study was performed in Baixo Mondego, in central region of Portugal, largely devoted to agriculture and where maize is one of the most relevant crops. The study was performed in two study sites with similar soil and weather characteristics - one managed under conventional practices, with intensive application of fertilizers, and another field where a significant part of mineral fertilizers is replaced by composted sludge. Both sites use these agricultural management practices for more than 5 years. In 2018, two soil sampling campaigns were performed to assess the physical (texture and bulk density) and chemical soil properties (organic matter content, total nitrogen, total and extractable phosphorus, exchangeable cation (K^+, Ca^{2+}, Na^+, Mg^{2+}) and heavy metals (Cd, Cr, Pb, Zn and Ni)). Results show that composted sludge improves soil organic matter content (1.2% vs. 2.2%), total (2747 mg kg^{-1} vs. 1134 mg kg^{-1}) and available phosphorous (821.85 mg kg^{-1} vs. 98.44 mg kg^{-1}) comparing with conventional management practices. Higher contents of heavy metals, specifically Cu, Zn, Cd and Cr, were found in the field with sludge application than in the conventional one, which may represent a long term risk for soil contamination. Information regarding the long term impacts of best management practices on soil quality is relevant and should guide farmers and policy makers to attain agricultural sustainability.

Keywords: soil quality; agricultural management practices; sludge