Abstract

A field experiment was conducted on Alfisols in South-West France to assess the agronomic and environmental impacts of a single application of heat-dried sludge pellets at 11.1 Mg dry matter ha^{-1}. The sludge pellets, with a moisture level of 9.5%, were spread on an irrigated crop of maize (*Zea mays* L.). This treatment was compared with inorganic fertilization (urea and diammonium phosphate mixed with KCl). Soil properties, yield and the composition of maize and the quality of drained water were monitored over 1 year to detect any changes resulting from sludge application. Amongst several determined soil properties, only two were significantly modified by the sludge application: The nitric nitrogen stock of the soil was higher in the inorganic fertilized plot, whereas Olsen-P soil content was higher in the sludge-amended plot. Agronomic recovery rates of N and P added by sludge were high: For the first crop following application, total amounts of N and P supplied by the sludge had the same efficiency as approximately 45% of the N and P amounts supplied by inorganic fertilizer. This ratio was 7% for the N uptake by the second maize crop. The quality and quantity of maize were equally good with both types of fertilization. During the 2 years following sludge spreading, N leaching remained as low in the sludged plot as in the inorganically fertilized one. The Cu, Zn, Cr, Cd, Pb and Ni composition of the drainage water was affected by neither of the types of amendment. From the heavy-metal contents of the soil, water and maize monitored over 1 year in the field experiment and from literature data for cow manure and atmospheric emissions, a theoretical balance between crop soil heavy-metal input and output over one century was drawn up. The long-term impact of cow manure on Zn, Ni and Cr in soil is higher than that of the studied heat-dried sludge. Obviously, sludge tended to cause a strong increase in soil Cu storage, valued for these soils, which are otherwise very Cu deficient.