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Carbon dynamics in an almond orchard soil amended with raw and treated pig slurry

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In SE Spain, intensive farming is very common which supposes the generation of great amounts of pig slurries. These residues cause many storage problems due to their pollution capacity. A good management of them is necessary to avoid damages to the environment. The use of this effluent as fertilizer is a usual practice that in the correct dose is a good amend and important for sustainable development, but in excess can be a risk of polluting and damaging soil, water and crop conditions. Pig slurry is a source of many nutrients and specially rich in organic matter.

The main objective of this study is to determine changes in soil organic carbon dynamics resulting from raw and treated slurry amendments applied in different doses.

The experimental area is an almond orchard located in Cartagena (SE Spain). The climate of the area is semiarid Mediterranean with mean annual temperature of 18ºC and mean annual rainfall of 275 mm. A total of 10 plots (12 m x 30 m) were designed, one of them being the control without fertilizer. Surface soil samples (0-25 cm) were collected in September 2009. Three different treatments were applied, raw slurry, the effluent obtained after solid-liquid separation and solid manure, all of them in three doses being the first one of 170 kg N/ha, (maximum permitted in nitrates directive 91/676/CEE), and the others two and three times the first one. Soil biochemical parameters are rapid indicators of changes in soil quality. According to this, total organic carbon, soil microbial biomass carbon, soluble carbon, and -glucosidase, -galactosidase and arylesterase activities were measured in order to assess some soil biochemical conditions and carbon dynamics in terms of the different treatments.

As we expected, the use of these organic fertilizers rich in organic matter, had an effect on soil carbon and soil microbial activity resulting in an increase in most of the parameters; total organic carbon and -galactosidase activity showed the biggest increment comparing to control. No pattern was observed among fertilizer doses, without big differences among them in most properties.

We can conclude that the use of pig slurry as organic fertilizer incorporates great amounts of organic matter to the soil in its different forms, including soluble and microorganisms biomass, which has a positive effect encouraging the application of this agricultural management so that soil can act as C sink, in order to mitigate global warming. Thus, this procedure can be included in the strategies to increase the soil carbon sequestration. According to carbon dynamics, doses are not important, without risks of soluble carbon leaching.