Geophysical Research Abstracts
Vol. 18, EGU2016-7223, 2016
EGU General Assembly 2016

How do soil quality indicators (SOC and nutrients) change with long-term different crop residue management?

Heide Spiegel, Taru Lehtinen, Georg Dersch, and Andreas Baumgarten

Austrian Agency for Health and Food Safety, Institute for Sustainable Plant Production, Department for Soil Health and Plant Nutrition, Vienna, Austria (adelheid.spiegel@ages.at)

Leaving the crop residues (cereal grain straw, maize stover, sugar beet leaves) on the field may enhance SOC and soil nutrient contents (e.g. P, K, Mg). In contrast, harvesting crop residues for livestock bedding or energy production are often connected with a loss of soil fertility (Lehtinen et al., 2014). We have evaluated the effects of different management of crop residues on selected soil parameters of the upper soil (0-25 cm) in two long-term field experiments in Austria focused on P-dynamics (Marchfeld, since 1982 and Alpenvorland, since 1986). In four P-fertilisation stages (0, 75, 150, 300 kg P_2O_5 $ha^{-1}y^{-1}$) all crop residues were incorporated in one treatment and all removed in the other one, respectively. The results show that the effects are different at the two investigated sites.

At the site Marchfeld, a medium textured soil, on average SOC was significantly higher with the incorporation of crop residues (21.6 g kg^{-1}) compared to the removal (19.9 g kg^{-1}) after 32 years. In the long run, SOC levels could be maintained, if crop residues remained at the field, whereas the constant removal of crop residues resulted in a SOC decline. At the site Alpenvorland, SOC was only slightly higher with the incorporation of the crop residues after 28 years. In this case, in the long run, even with this management practice and, moreover, with the residue removal, SOC tended to decrease generally.

At the Marchfeld, crop residue incorporation resulted in a significant increase of “plant available” phosphorus (P-CAL) only with very high P fertilization. However, “plant available” Mg (according to Schachtschabel) and potassium (K-CAL) were significantly higher in all P fertilisation stages compared to the residue removal treatments. At the site Alpenvorland, the soils are rich in silt and clay and with long-term incorporation of crop residues a significant increase only of „plant available” K of about 50% occurred. This indicates the necessity of taking into account the site specific effects of crop residue management on nutrient contents for the fertilisation strategy.

Lehtinen, T., Schlatter, N., Baumgarten, A., Bechini, L., Krüger, J., Grignani, C., Zavattaro, L., Costamagna, C., Spiegel, H. 2014. Effect of crop residue incorporation on soil organic carbon and greenhouse gas emissions in European agricultural soils. Soil Use and Management, 30, 524-538. DOI: 10.1111/sum.12151.