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## **Similar mineralization rates of soil organic carbon and nitrogen in different alternative arable cropping systems**

Benedicte Autret (1), Helene Guiller (2), Valerie Pouteau (2), Bruno Mary (1), and Claire Chenu (2)

(2) AgroParisTech, UMR Ecosys, Grignon, France (claire.chenu@inra.fr), (1) INRA, UR AgroImpact, Barenton-Bugny, France

No tillage is thought to mitigate greenhouse gas emissions from agricultural activities by increasing soil carbon stocks, because of a limited mineralization of soil organic carbon (SOC) and nitrogen (SON). Regrettably, the impact of cropping practices on SOC and SON mineralization rates is often confined to superficial soil layer and disrupted soil. We compared SOC and SON mineralization rates at the long term experiment of La Cage (France) in four different cropping systems, under conventional, low input, conservation agriculture and organic management. Disturbed soil samples from the 0-27 cm soil layer were incubated in laboratory for four months to record C and N mineralization in all treatments, while undisturbed soil samples from conventional and conservation agriculture systems were incubated to account for soil tillage effect. Physical disturbance and sieving of soil samples decreased the soil C and N mineralization rates. Model fitting showed that the size of the labile pool contributing to C mineralization was much larger in undisturbed soil cores than in disturbed samples, related to a higher abundance of coarse plant residues and fine roots in undisturbed soil cylinders. No differences were found between the four cropping systems in their specific rate of mineralization, expressed vs SOC, SON or microbial biomass C. For undisturbed soil cores, similar mineralization in conventional and conservation agriculture may results from the balance between higher amount of coarse labile OM and less favourable soil structure for decomposition in conservation agriculture. For disturbed soil samples, similar mineralization rates suggested that the OM decomposability and the environmental conditions for decomposers were similar between cropping systems. Overall, these results confirmed the equivalent SOC mineralization rate regardless the cropping treatments as previously estimated *in silico* (Autret et al., 2016), validating the hypothesis of unmodified mineralization rates according to alternative cropping practices, including no-tillage. Hence, our results together with the increased SOC stocks observed in conservation and organic agriculture treatments suggest that increased biomass returns to soil or changes in microbial physiology may be the main drivers of SOC storage.