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Effect of stubble burning on soil organic matter studied at a longterm experimental site

E. Normand (1), C. Rumpel (1), and B. Mary ()
(1) CNRS, BIOEMCO, Thiverval-Grignon, France , (2) Unité Agronomie, Reims-Laon-Mons

Stubble burning is a common agricultural practice in many regions of the world. It was frequently used in former times and is less applied nowerdays due to legal restrictions. Despite the importance of this practice, few studies were carried out to study its influence on soil organic matter. In general, the influence of fire on the global carbon cycle is not well understood. Using a longterm agricultural experiment to model C turnover, we discovered high amounts of stable carbon in the soil after 30 years of stubble burning. The aim of this study was to assess changes occurring in SOM composition following stubble burning.

Soils were sampled from the longterm experiment “brûlage des pailles” at Issoudun en Champagne Berrichonne, which was carried out from 1962 to 1994. We sampled with three replicates soil which underwent continous stubble burning for 30 years, as well as a control soil, which did not receive this treatment. The samples were analysed for elemental and isotopic composition, acid dichromate resistant OC and acid hydrolysis resistant OC.

After 30 years of stubble burning no significant change of the carbon content could be noticed in the carbon stock, whereas N-stocks were significantly depleted. After 30 years, stubble burning led to a reduction of mineral bound organic matter. This reduction is most enhanced for carbon compared to nitrogen and could indicate, that fire in the long-term affects SOM stabilisation mechanisms.