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Changes in soil organic matter features upon replacement of crops by secondary pine stands: an example from Catalonia (NE Spain)

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Here we present a dataset about the changes in soil C stocks and soil organic matter features upon crop abandonment and replacement by secondary pine stands. The study was carried out in Cardona (near Barcelona, NE Spain), on a set of 12 plots selected through the systematic comparison of aerial photographs taken in 1956 and in 2009, covering four situations: (i) crops in 1956 and also in 2009; (ii) new forests I: crops abandoned after 1956, replaced by secondary pine stands; (iii) new forests II: crops abandoned much before 1956 (i.e. already covered by forest in the 1956 aerial photograph), covered by secondary pine stands; and (iv) old forests: forest in 1956 and also in 2009, placed in never cropped areas. Soils were sampled (5 cores per plot in forests, 4 in crops) and studied by depth increases (0-5 cm, 5-15, 15-30); in forest plots the litter horizons (L, F, H) were sampled too. Overall the replacement of crops by secondary pine stands results in a net sequestration of C in soil, but the increase in C stock occurs mainly at the soil surface: below the 5 cm treshhold, a decrease is observed. The highest soil C stocks occur in the old forest (plots iv); even in the crops abandoned long time ago (before 1956) the C stock is lower than in the old forests, particularly at deep layers, thus evidencing the slowness of the C sequestration process and also that these forest may continue sequestering C for a long time. In comparison with crop stands, C in forest stands is more recalcitrant, as shown by the increased resistance to acid hydrolysis, but also less protected, as shown by the increased percentage of total C found in particulate organic matter (POM). As a result, the soil C stock is overall less stable in forest stands, as shown by the higher C losses by microbial respiration when the soils are incubated under standard conditions.