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## Deep soil accumulation of organic carbon under cultivated Kazakh Steppe soils

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The decline in organic carbon (OC) stocks after conversion from grassland to cropland under conventional soil tillage practices was 24-32% for American prairie soils. The respective decreases in OC stocks ranged from 27% to more than 40% for steppe soils of the European part of Russia and was about 31% in semi-arid steppe soils of South Siberia. Here, we present results on the soil OC stocks in steppe soils of Northern Kazakhstan, which partly were converted to arable land over the last 60 to 90 years. We sampled soils by genetic horizons along a north-south transect, where precipitation increased towards north but negligible variation in temperature. Soil samples were analyzed for organic and inorganic carbon as well as bulk density.

Surprisingly, we found along the transect on average only 3.5% smaller OC stocks at 0-10 cm depth in arable than in natural soils. Even more astonishing, all arable soils tested had larger OC stocks in the layers beneath 10 cm depth than the natural steppe soils. On average, the OC stocks in 10-100 cm depth were 34% larger in soils under arable management than in natural steppe soils. We credit the enhanced deep soil accumulation of OC in arable soils of Northern Kazakhstan to colloidal translocation of OC-rich particles along vertical pores. The cause of the increased in colloidal transport under arable management is still under evaluation but appears connected to the clayey soil texture and the large abundance of expandable clay minerals. We conclude that despite of the intense land use and severe climatic conditions accumulation of subsoil carbon is possible even after many decades of cultivation history. Our findings stress the importance of considering whole soil profiles for analyzing the consequences of land use change on the net carbon balance of soils.