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Do aggregate stability and soil organic matter content increase following organic inputs?

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Agriculture is facing several challenges such as loss of soil organic matter (SOM); thus, sustainable farming management practices are needed. Organic farming is growing as an alternative to conventional farming; in Iceland approximately 1% and in Austria 16% of utilized agricultural area is under organic farming practice.

We analyzed the effect of different farming practices (organic, and conventional) on soil physicochemical and microbiological properties in grassland soils in Iceland and cropland soils in Austria. Organic farms differed from conventional farms by absence of chemical fertilizers and pesticide use. At these farms, we investigated soil physicochemical (e.g. soil texture, pH, CAL-extractable P and K) and microbiological properties (fungal and bacterial biomass and activity). The effects of farming practices on soil macroaggregate stability and SOM quantity, quality and distribution between different fractions were studied following a density fractionation. In Iceland, we sampled six grassland sites on Brown (BA) and Histic (HA) Andosols; two sites on extensively managed grasslands, two sites under organic and two sites under conventional farming practice. In Austria, we sampled four cropland sites on Haplic Chernozems; two sites under organic and two sites under conventional farming practice.

We found significantly higher macroaggregate stability in the organic compared to the conventional grasslands in Iceland. In contrast, slightly higher macroaggregation in conventional compared to the organic farming practice was found in croplands in Austria, although the difference was not significant. Macroaggregates were positively correlated with fungal biomass in Iceland, and with Feo and fungal activity in Austria. In Austria, SOM content and nutrient status (except for lower CAL-extractable P at one site) were similar between organic and conventional farms. Our results show that the organic inputs may have enhanced macroaggregation in organic farming practice compared to conventional in the permanent grassland soils in Iceland but were only enough to maintain the SOM content and macroaggregation in the cropland soils in Austria.