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## Soil structure quality and biodiversity across a range of different practices and tillage intensities

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Soil structure degradation is considered a major threat to soil fertility in many regions, including the Swiss Jura. In order to investigate the extent of this degradation and the means to improve soil structure quality (SSQ) with different farming practices, a large scale project “Terres Vivantes” was launched in 2019 by the canton of Jura and Bern and is followed by a group of scientists.

90 farms, covering 3'000 ha of arable land with clay contents ranging from 16% to 60% are involved in the project. Two fields per farm were selected for closer investigation and monitoring. SSQ indicators included VESS and CoreVESS (visual evaluation on sample) scores, bulk density, water and air capacity at -100 hPa and soil organic carbon (SOC):clay ratio. Five VESS observations per field were made by the farmers via the VESS app for Smartphones/iPhones. Physical properties were analyzed on five undisturbed samples (150 cm<sup>3</sup>) per field at 5-10 cm depth. Texture, SOC, pH and CEC were determined on a composite sample. Earthworm abundance, biomass and diversity were measured after onion solution extraction and earthworm surface casts were collected and weighed. The farming practices of the past 5-10 years were documented and soil tillage intensity indicators were assessed (number of tillage and stubble operations, tillage depth, and STIR (soil tillage intensity rating)).

Our results show that the soils are carbon depleted as the SOC:clay ratio is in average below 0.10 threshold (0.08). VESS scores were in average Sq3, denoting a medium SSQ with a lack of aeration and of readily available water. Among a variety of farming practice descriptions, the temporary pasture duration and the number of tillage and stubble operations were significantly correlated to the following SSQ indicators: SOC:clay, bulk density and water content. Earthworm biomass was better correlated to the number of tillage and stubble operations than to the temporary pasture duration. These two farming practice descriptions also correspond to two of the three well-known pillars of conservation agriculture, namely maximum vegetal intensity and minimal mechanical soil disturbance.

In conclusion, the soils in the Jura region have medium SSQ and are carbon depleted. The effect of

current farming practices can be observed on a series of biological and physical indicators and reveal conservation agriculture pillars as “best practices”. Future investigations from the project should reveal whether farmers will be able to adapt some farming practices and improve SSQ despite time and resource constraints.