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spolupráce ve vědě a vzdělávání

Final report of the Aktion project No. 78p24 in 2017-2018

Name of the project: **Analysis of the influence of tillage, crop rotation and fertilization on soil and plant nutrient status in two long-term field experiments**

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Summary of obtained results:

Within the previous collaboration, a suite of analytical methods was applied to assess the effect of soil tillage and crop rotation systems on the selected characteristics of the soils. This project was concerned on the evaluation and interpretation of the data, and, as a final result, to prepare manuscript for publication in the scientific journal, namely Soil and Tillage Research.

The main findings of the experiment can be summarized (after careful statistical evaluation of the data) as follows: Basic soil chemical properties were assessed in a long-term tillage and crop rotation experiment 15 years after its establishment on a Chernozem in Raasdorf (Austria) with four tillage treatments – mouldboard ploughing (MP), no-till (NT), deep conservation tillage (CTd) and shallow conservation tillage (CTs) – and two crop rotations. The long-term experiment is carried out in Raasdorf (48° 14' N, 16° 33' E; altitude: 153 m a.s.l) in eastern Austria on the experimental farm of BOKU University. Raasdorf is located close to the east of Vienna, Austria, on the edge of the Marchfeld plain, an important crop production region in the north-western part of the Pannonian Basin. The silty loam soil is classified as a Chernozem of alluvial origin and is rich in calcareous sediments. The mean annual temperature is 10.7°C and the mean annual precipitation is 543 mm (1983–2012).

The split-plot design with four replication blocks involves two factors: tillage system is assigned to the main plots (24×40 m) and crop rotation to the subplots (12×40 m). Fertilization is performed crop specific according to good agricultural practice. The experiment was started in August 1996 by establishing a catch crop. Soil sampling was performed with soil probes (Purckhauer type, core diameter: 30 mm) in 5 cm steps in a depths

from 0–30 and in 10 cm steps in a depth of 30–50 cm from 7th to 9th of November, 2011. A mixed sample was composed per plot for each sampled layer consisting of 30 equally sized, discrete sub-samples randomly collected from across the individual plots. Samples were air-dried, homogenized and sieved (2-mm). Crops grown before sampling had been harvested in July (winter wheat) and in October (sugar beet).

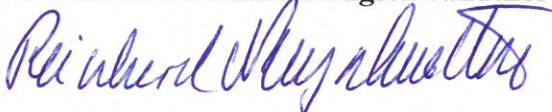
Following parameters were assessed: $\text{pH}_{\text{CaCl}_2}$, $\text{pH}_{\text{H}_2\text{O}}$, electrical conductivity (EC), cation exchange capacity (CEC), total nitrogen (N_t), total organic carbon (TOC) and total carbon (TC); among which $\text{pH}_{\text{CaCl}_2}$, $\text{pH}_{\text{H}_2\text{O}}$, and TC increased with soil depth while EC, CEC, N_t and TOC decreased with soil depth. Differences between tillage treatments occurred after 15 years in the upper soil layer from 0–5 cm with higher values of EC under NT, CTd and CTs than with MP, higher values of CEC and N_t for NT than for MP (with CTd and CTs showing intermediate values) and more TOC for NT and CTd than for MP. In 5–10 cm depth, EC was higher for NT than for MP. Values of $\text{pH}_{\text{CaCl}_2}$ and $\text{pH}_{\text{H}_2\text{O}}$ did not differ between tillage treatments in any soil layer. Correlations were calculated for results of analyses in the complete soil profile (0–50 cm) and in the first soil layer (0–5 cm). In the full profile, $\text{pH}_{\text{CaCl}_2}$ and $\text{pH}_{\text{H}_2\text{O}}$ were significantly correlated with each other and with TC, but showed negative correlations with EC, CEC, N_t and TOC. Further, CEC, EC, N_t and TOC were positively correlated with each other but negatively with TC. Obviously, soil depth had a strong influence on the correlation. In the 0–5 cm soil layer, following parameters did not correlate with each other: $\text{pH}_{\text{CaCl}_2}$ with $\text{pH}_{\text{H}_2\text{O}}$, EC with $\text{pH}_{\text{CaCl}_2}$, $\text{pH}_{\text{H}_2\text{O}}$ with N_t , $\text{pH}_{\text{CaCl}_2}$ and $\text{pH}_{\text{H}_2\text{O}}$ with TOC, and TC with $\text{pH}_{\text{CaCl}_2}$, $\text{pH}_{\text{H}_2\text{O}}$ and N_t . But there was a significant negative correlation of $\text{pH}_{\text{CaCl}_2}$ with CEC and N_t , and of $\text{pH}_{\text{H}_2\text{O}}$ with CEC, and a positive correlation among EC, CEC, N_t and TOC, and of TC with EC, N_t and TOC. In deeper soil layers, tillage did not affect the analyzed parameters. Crop rotation did not affect any of the analysed soil chemical properties.

Stays of Austrian team members in the Czech Republic

Reinhard Neugschwandtner and Pia Euteneuer spent 5 days in Prague in December 2017. The stay was concerned on the evaluation and discussion of the analytical data, especially on the interpretation of the main findings.

The engagement of the Czech team members in the project activities

Jiřina Száková, Pavel Tlustoš, Jindřich Černý and Martin Kulháněk spent 5 days in Vienna/Tulln in December; in this case, the final version of the manuscript was prepared, and the possibilities for further collaboration were discussed.

<p>Czech leader: Prof. Ing. Jiřina Száková, CSc.</p> <p>Prague, March 29 , 2018</p>	<p>Austrian leader: Priv.-Doz. Dr. Reinhard Neugschwandtner</p>  <p>Tulln, March 2018</p>
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