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# Digging deeper in the soil-based drivers of primary productivity from long-term agricultural field experiments in Austria

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Primary productivity is the foundation of prosperous farming communities. Therefore, much effort is invested in understanding the underlying factors that influence the primary productivity capacity of different soils. Connecting data from different long-term agricultural field experiments (LTEs) enables valuable comparisons of data in understanding environmental and management changes in time. In this study, we investigate four Austrian agricultural cropland long-term field experiments. The focus is on the influence of different management practices (tillage, crop residue incorporation and compost amendments) on primary productivity. Data mining analyses of the experimental data based on decision trees were carried out in order to investigate trends in the productivity data. Data from all sampled years since the beginning of the experiments (starting years being 1988, 1982, 1986, and 1991 for tillage LTE, two crop residue incorporation LTEs and compost LTE, respectively) were used. This resulted in 18 years of data for tillage LTE, five years for both crop residue incorporation LTEs and eight years of sampling for compost amendment LTE. We generated predictive models that identify the influential factors that govern primary productivity. The data mining models generated achieved very high predictive performance for each of the sites. Preceding crop and crop of the current year were crucial for primary productivity in the tillage LTE and compost LTE, respectively. For compost amendment LTE, the treatment applied on the field was another major driver of primary productivity. For both crop residue incorporation LTEs, plant-available Mg affected productivity the most, followed by soil properties such as soil pH, soil organic matter as well as the crop residue management. Our results are in line with previous studies, which make them very suitable and reliable for predicting the primary productivity at these long-term agricultural field experimental sites in the future. The applicability of the models could be further increased by obtaining more data from other long-term field experiments in Austria and collecting data on a regional basis would improve regional modelling efforts.