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Improving the understanding of surface soil wetness in Poland through remote sensing and field experiments

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There is a worldwide trend to increase crop yields driven by the growing global demand for agricultural products for food and energy. Poland is a major agricultural exporter and revenues from agriculture constitute a significant part of Polish economy. Up to about 50% of Polish soils are however developed from sands of low fertility and water holding capacity leading to water deficit during the growing season. Soil water retention varies across time and space as shown by surface soil moisture data obtained from the Soil Moisture Ocean Salinity (SMOS) satellite and there is uncontested need to recognize this heterogeneity to improve the growth conditions and crop productivity. Soil water content depends on the soil water holding capacity, total rainfall amount and its temporal distribution consequently impacting on crop yields. This is particularly visible in crops with large water and nutrient requirements e.g. maize of which growing area and productivity has steadily been increasing over the last years driven by consumer demands. In this study, we show the usefulness of SMOS soil moisture data to indicate areas with different soil wetness levels. We want to correlate them with soil texture, organic matter content, surface area, water capacity in the field and acidity. The ultimate goal is to identify appropriate soil-improving cropping systems. We also perform field experiments looking into capacity of biochar to improve soil water regime on dissimilar low-fertility soils. Biochar application along with other management practices and type of land use can improve rainfall storage in soil, alleviate soil organic matter decline and increase the resistance and resilience of soil to degradation. Increasing number of local biochar production facilities, as currently observed in Poland, may help in biochar's wider and more efficient application.

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