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Effects on soil water content and productivity of selected crops in a field experiment with rain-out shelter vs. control plot in the Czech Republic

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Field experiments based on the manipulation of the crops' environment are crucial to determine the response of crops to the expected climatic conditions in near future. The number of droughts in Central Europe is expected to increase and it is crucial to investigate how this will affect agriculture. An experimental site in Domaníněk, Czech Republic, is located at 49°31'42 "N, 16°14'13 "E, at an altitude of 560m. The climatic conditions are described as cool and dry, the average annual precipitation was 609.3 mm and the mean annual temperature was 7.2 °C between 1981 and 2010. This area is characterised by low soil quality and the potential risk of late frosts; the soil type is classified as dystric cambisol. The field experiment of rain guards to reduce soil water availability was carried out from 2015 to 2020. The main objective of this study was to evaluate the impact of different water availability (rain-out shelter vs. control) on the performance of selected field crops (spring barley, winter wheat, winter oilseed rape, rye, and silage maize). In addition to a weather station on the experimental field measuring air temperature, relative humidity, global radiation, precipitation and wind, soil moisture was also monitored in the different rain-out shelter and control plots with TDR sensors (0-30 cm). In this way, the reduction in the amount of precipitation during the rain-out shelter treatment could be confirmed by measuring the soil water content. To answer the research question, various descriptive statistical parameters such as mean, percentiles, minimum and maximum were used. For instance, the average yield reduction over the 6 years for maize was 16%, while for rape it reached a value of up to 32%. In addition, an analysis of variance (ANOVA) was applied to the yields of the different crops.

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