Productivity of grasslands in Wielkopolska in conditions of weather variables changes in the last 34 years

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INTRODUCTION

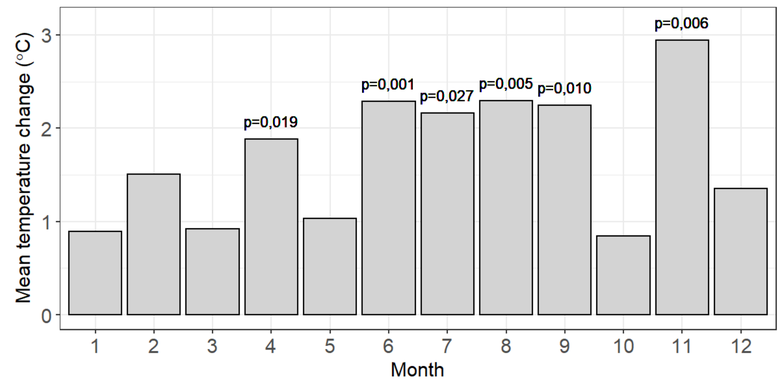
Wielkopolska represents an agro-climatic region in Poland characterized by a high value of reference evapotranspiration during the growing season. The aim of this study was the assessment of the effect of climatic changes from 1985 to 2018 on the productivity of grasslands in Wielkopolska region.

MATERIALS and METHODS

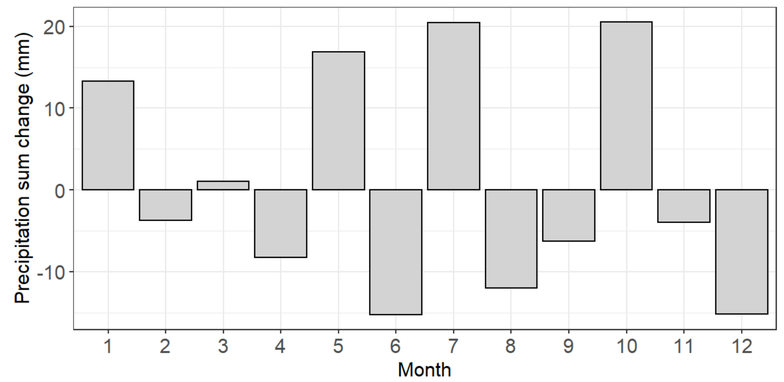
The weather data (precipitation sum, mean, maximum and minimum air temperature, insolation, relative air humidity and wind speed) were collected from 1985 to 2018 at five national weather stations located in the Wielkopolska region. Using this data, trends of Standardized Precipitation Evapotranspiration Index (SPEI) were determined. Grassland productivity was estimated from data collected by the Polish Central Statistical Office. For the analysis of the effects of climatic trends on grassland productivity in Wielkopolska, linear regression was used. All statistical calculations were done in the R software environment.

RESULTS

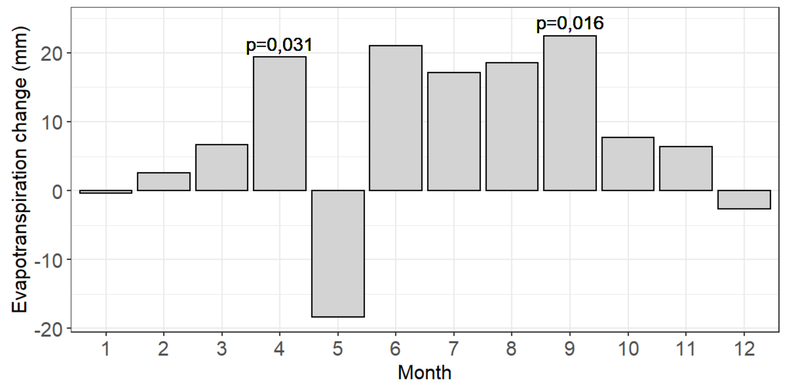
Magnitude of average air temperature change in each month in 1985-2018



Magnitude of precipitation sum change in each month in 1985-2018



Magnitude of the change of reference evapotranspiration (Penman-Monteith equation) in each month in 1985-2018



Effect of selected SPEI trends on grassland productivity for Wielkopolska in 1985-2018

SPEI calculated for selected period:	1st regrowth		2nd regrowth		3rd regrowth		Yearly yield	
	b	p	b	p	b	p	b	p
August – September	-2.750	0.024*	-0.805	0.667	-1.982	0.007**	-0.519	0.850
October – March	-2.631	0.016*	-1.006	0.550	2.216	0.000***	-1.445	0.583
November – March	-2.790	0.011*	-0.484	0.777	2.305	0.000***	-0.974	0.715
November – April	-2.123	0.039*	-0.618	0.694	1.091	0.087	-0.608	0.769
December – March	-2.643	0.015*	-0.418	0.803	2.265	0.000***	-1.049	0.690
January – March	-2.460	0.021*	-0.168	0.917	2.156	0.000***	-1.156	0.650

CONCLUSIONS

The climatic changes in the Wielkopolska region for the last 34 years were expressed as the increase of mean yearly air temperature, precipitation sum, as well as of the Penman-Monteith evapotranspiration (ET). The significant SPEI trends analysed for different periods (from 1 to 12 months) indicate that soil moisture conditions in the region were deteriorating. The significant relationship was found for selected 3-, 4-, 5- and 6-months SPEI in winter which negatively affected hay yield in the first regrowth. The recognition of regionally-specific changing climate trends is an important part of sustainable grassland management. It is therefore necessary to build and maintain monitoring systems of productivity of grasslands with implications of difference among regions.

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