

Climate and surface and ground-water in the Baltic region – variability, trends, and impacts



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Long-term monitoring of runoff from agricultural areas in Latvia

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Monitoring activities are essential to access long-term patterns in the quantity and quality of the agricultural runoff. The monitoring data on runoff in the Berze, Mellupite, and Vienziemite monitoring sites, were obtained within the Agricultural Runoff Monitoring Programme, which is determined by The Environmental Protection Strategy and carried out by the Department of Environmental Engineering and Water Management of Latvia University of Life Sciences and Technologies.

In order to assess long-term variability in runoff, the data collected in two spatial scales - drainage field and small catchment scale, were used in the study. Hydrological measurements were carried out using data loggers and measurement structures (V-notch weir, Crump weir, modified Crump weir). The time frame of the study is from 1995 to 2021.

The monitoring sites are located in different parts of Latvia: the Berze monitoring site is located in the central part, the Mellupite monitoring site in the western part and the Vienziemite site in eastern part of Latvia.

In the drainage field scale, the annual runoff in the Berze monitoring site ranges from 56.6 to 331.8 mm, with the average value of 172.9 mm, while in the small catchment scale the range is from 39.9 to 305.7 mm, with the average value of 162.1 mm. In the drainage field scale of the Mellupite monitoring site the annual runoff data range is from 97.5 to 449.8 mm, with the average value of 239.9 mm and in the small catchment scale data range is from 119.5 to 458.6 mm, with the average value of 241.4 mm. In the Vienziemite monitoring site, at the drainage field scale the annual runoff data range is from 110.9 to 516.8 mm, with the average value of 268.6 mm and in the small catchment scale data range is from 106.2 to 467.5 mm, with the average value of 272.0 mm.

Differences in the spatial scales and the overall range of runoff can be explained by different precipitation distribution in the area, as the relationship between annual precipitation and runoff at the Berze, Mellupite, and Vienziemite study sites can be described as positive and close or positive and moderate. For the Berze, Mellupite and Vienziemite monitoring sites drainage field scale, correlation coefficients of 0.72, 0.78, and 0.46 between annual precipitation and runoff were determined. For the Berze, Mellupite and Vienziemite monitoring sites subsurface drainage field scale correlation coefficients of 0.80, 0.74, and 0.48 were detected, respectively.

The long-term variability of runoff indicates climate change and can increase the risks of nitrogen and phosphorus losses from agricultural catchments and should be considered when it comes to fulfilling the water quality requirements set in the Water Framework Directive (2000/60/EC).

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