11. Summary

The aim of the research was to develop a model for predicting changes in soil retention on the surface of urban green areas such as ornamental shrubs, lawn and old trees. The test stands were located in the Botanical Garden of the Adam Mickiewicz University in Poznań.

The measurements of the current soil moisture and basic meteorological data were used to build the model. The universal character of the model makes it possible to use it to optimize water management in local, plant and soil conditions. The method based on the water balance was used to estimate the need of water in the studied areas. On the test stand of the lawn and ornamental shrubs diversified the frequency of irrigations and disposable doses of water. As a result, not all single-use doses of water applied, maintained the optimal soil moisture content of the studied soil profiles. In the case of a lawn, the required moisture was guaranteed by a dose of 3mm, while at the position of ornamental shrubs a dose of 6,6 and 9,9mm. When it comes to smaller doses on the lawn and at the position of ornamental shrubs, the soil water content dropped sharply, reaching refill point.

The model was built and based on field research results from 2009-2011, while the research from 2009-2015 was the basis for verification. To assess the relationship between water balance components, a multiple linear regression model was used. The analysis took into account the influence of many independent variables on the selected dependent variable. For this purpose, the influence of temperature, air saturation deficit, initial retention in the balancing layer, one-time irrigation and natural rainfall on soil water content in profiles were investigated. In addition, an analysis using artificial neural networks was used to determine the relationship between the decade change in retention and the elements selected above. Based on the obtained results, it was found that only poor air saturation deficit as an indicator of the possibility of field evaporation did not have a significant impact on the course of real evapotranspiration on all test stands. Comparing the Pearson correlation coefficients for the verification of multiple regression and neural network, it was found that both models with similar accuracy evaluate soil retention. In comparison to the results of field surveys from 2009-2011, the verification carried out in 2009-2015 showed that additional measurement data did not contribute to a more accurate fit of the model at all positions. This is evidenced by the decrease in determination coefficients (R^2) from 0,79 to 0,68 in the case of old trees, from 0,77 to 0,65 on the lawn and from 0,69 to 0,60 in the case of ornamental shrubs and the

increase in normalized mean square errors (*NRMSE*) from 11,6 to 12,6% and 13,2 to 13,5% in the old trees stand and on the lawn.

The assessment of irrigation system operation for the whole period of operation was carried out on the basis of irrigation adequacy and scheduling efficiency. The value of the irrigation adequacy index ranged from 12% to 46% for the lawn and was close to 100% at the position of ornamental shrubs. The values of the second scheduling efficiency index were more similar and ranged from 90% on the lawn to 100% both at the position of ornamental shrubs and on the lawn.

Attention was given to the practical aspect of forecasting the amount of water needed for the proper functioning in urban green areas. It has been proved that with the use of commonly available meteorological data, the water demand can be calculated to maintain well-watered soil profiles. As a result of the conducted analyzes, it was established that the developed methodology for optimizing water management allows to estimate the water requirements necessary to maintain ornamental shrubs, lawn and old trees in a suitable condition, located in the urban agglomeration.

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