Abstract

Wheat is a strategic agricultural crop for each country, so it is important the predicting wheat yield and studying the factors affecting it by using modern modeling methods. The present study was done to compare the ability of predicting wheat yield by regression, artificial neural network and random forest methods at the research field of University of Zabol. For this purpose, the topsoil (0-30 cm) and plant were sampled from 100 plots completely random. Soil particle size distribution, soil reaction (pH), electrical conductivity, adsorbed phosphorus, potassium, organic matter, nitrogen and soil apparent electrical conductivity were measured and grain weight, 1000 grain weight and total yield as yield components were measured. Then, wheat yield was modeled using regression, MLP type of artificial neural network and random forest methods. It is noteworthy that in addition to the soil parameters mentioned above, the remote sensing data were used from Sentinel 2 satellite for estimating environmental variables in random forest method. The results showed that the MLP neural network model with 16 neurons in the hidden layer had the best estimation of wheat yield with R^2 and RMSE of 0.76 and 0.46 respectively, versus the regression ($R^2 = 0.4$ and RMSE = 1.62) and random forest methods ($R^2 = 0.095$ and RMSE = 921.48). Also, sensitivity analysis results showed that nitrogen, clay, organic matter and silt were the most important factors affecting wheat yield, respectively, and soil apparent electrical conductivity as a factor measured by soil proximal sensing techniques (EM38-MK2) is the fifth most important factor in predicting wheat yield in the study area.

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The Thesis Submitted for the Degree of MSc

Modeling of wheat yield and soil fertility characteristics using learning machines

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