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Land Suitability Prediction Modelling for Agricultural Crops Using Machine Learning Approach: A Case Study of Khuzestan Province, Iran

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Abstract : The sharp increase in population growth leads to more pressure on agricultural areas to satisfy the food supply. To achieve this, more resources should be consumed and, besides other environmental concerns, highlight sustainable agricultural development. Land-use management is a crucial factor in obtaining optimum productivity. Machine learning is a widely used technique in the agricultural sector, from yield prediction to customer behavior. This method focuses on learning and provides patterns and correlations from our data set. In this study, nine physical control factors, namely, soil classification, electrical conductivity, normalized difference water index (NDWI), groundwater level, elevation, annual precipitation, pH of water, annual mean temperature, and slope in the alluvial plain in Khuzestan (an agricultural hotspot in Iran) are used to decide the best agricultural land use for both rainfed and irrigated agriculture for ten different crops. For this purpose, each variable was imported into Arc GIS, and a raster layer was obtained. In the next level, by using training samples, all layers were imported into the python environment. A random forest model was applied, and the weight of each variable was specified. In the final step, results were visualized using a digital elevation model, and the importance of all factors for each one of the crops was obtained. Our results show that despite 62% of the study area being allocated to agricultural purposes, only 42.9% of these areas can be defined as a suitable class for cultivation purposes.

Keywords : land suitability, machine learning, random forest, sustainable agriculture
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