Climate Changes in Albania and Their Effect on Cereal Yield

Authors : Lule Basha, Eralda Gjika

Abstract : This study is focused on analyzing climate change in Albania and its potential effects on cereal yields. Initially, monthly temperature and rainfalls in Albania were studied for the period 1960-2021. Climacteric variables are important variables when trying to model cereal yield behavior, especially when significant changes in weather conditions are observed. For this purpose, in the second part of the study, linear and nonlinear models explaining cereal yield are constructed for the same period, 1960-2021. The multiple linear regression analysis and lasso regression method are applied to the data between cereal yield and each independent variable: average temperature, average rainfall, fertilizer consumption, arable land, land under cereal production, and nitrous oxide emissions. In our regression model, heteroscedasticity is not observed, data follow a normal distribution, and there is a low correlation between factors, so we do not have the problem of multicollinearity. Machine-learning methods, such as random forest, are used to predict cereal yield responses to climacteric and other variables. Random Forest showed high accuracy compared to the other statistical models in the prediction of cereal yield. We found that changes in average temperature negatively affect cereal yield. The coefficients of fertilizer consumption, arable land, and land under cereal production are positively affecting production. Our results show that the Random Forest method is an effective and versatile machine-learning method for cereal yield prediction compared to the other two methods.
Keywords : cereal yield, climate change, machine learning, multiple regression model, random forest
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