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ACCURATE CROP YIELD PREDICTION THROUGH REMOTE SENSING AND MACHINE LEARNING TECHNIQUES

Abstract

The global population is expected to reach 9.7 billion by 2050, which calls for a significant increase in food production to meet the growing demand. Climate change, land degradation, and water scarcity are some of the major challenges that the agricultural sector is facing, making it difficult to meet the increasing demand for food. Therefore, developing sustainable agricultural methods may improve crop productivity and ensure food security as an outcome. Remote Sensing and GIS have become crucial elements in agricultural practices and management by identifying various cropping patterns. As a result, extensive research has been conducted in this area. Accurate crop yield prediction using remote sensing and machine learning algorithms is one method for achieving sustainable agriculture. Remote sensing techniques enable the collection of vast amounts of data on crop growth and development, while machine learning algorithms can be used to extract useful information and patterns from these datasets. In this research, our objective to use machine learning based regression techniques such support vector machine (SVM) and random forest (RF) that predicts wheat crop yield using satellite images and ground data. In the case study, the use of remote sensing datasets coupled with machine learning techniques to estimate crop yield in the Shaki region of Azerbaijan, where rainfed agriculture is prevalent and crop yields are heavily affected by climate changes. The dataset includes satellite images such Sentinel-2 and Azersky, which will be used to calculate vegetation indices for the wheat crop type, as well as ground data on crop yield for 2019. The significance of this study consists in its potential to minimize the harmful effects of agricultural drought, climate change, and other environmental circumstances that have an impact on crop yields. The results of this study can serve as a foundation for further research in this field and provide valuable perspectives on the effectiveness of remote sensing and machine learning techniques for predicting crop yields. The findings of this study could contribute towards encouraging sustainable agricultural practices and mitigating the impact of climate change on food security. In summary, this study will demonstrate the potential of precision agriculture to enhance both agricultural yield and sustainability, through the utilization of innovative crop management techniques while minimizing their negative effects on the environment.