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Earth Observation Applications, Societal Challenges and Economic Benefits (5)

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ASSESSMENT OF THE CLIMATE CHANGE EFFECTS ON CROP YIELDS USING
GEOINFORMATION TECHNOLOGIES

Abstract

In the potential challenges posed by global warming, the risks to global agriculture stand out the particularly significant. Agriculture is one of the most important industries, represented in almost all countries of the world, and it plays a key role in the economy and food security of the Republic of Azerbaijan. The agricultural lands experience notable effects of climate change through various influences. For instance, rising temperatures and altered precipitation patterns increase the frequency of agricultural droughts. Today, there is various methods are being taken to monitor such disasters and minimize the climate effects, as well as to improve the condition and increase crop production. One of the innovative technologies, which helps to quickly provide the necessary information, especially for large and inaccessible territories is Earth Observation data. The main purpose of this research is to provide early warning detection of climate-related risks to crop growth and yields using satellite imagery and geoinformation systems. The methodology of this research presents a method of automated calculation vegetation indices for modeling the relationship climate effects with crop yield. During the primary stages of the study long-term assessment of agricultural drought for the full territory of the country using satellite images was carried out and the crops types affected by drought were identified. Based on the results, over 15% of Azerbaijani territory has been detected as drought-affected areas, and 2021 was mostly drought year among the last 21 years. These results have been used as essence data for selecting test fields to provide local monitoring. Test fields were on irrigated and non-irrigated lands with main crop type wheat due to their different adaptation to changing environmental conditions. For comparative analysis assessment of crop growth and prediction of crop yield have been done in various scenarios regarding climate change implications. Thereby, dynamics of crop condition change and forecasted yields during growing seasons have been revealed by developing maps and getting statistical data. As a result of this study, for assessing climate change effects on crop yields a model was created. The results obtained in this research can be a useful basis for quick and more efficient planning climate adaptation and mitigation strategies for crop production.