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DEVELOPING AN ALERT SYSTEM FOR THE DETECTION OF POST-HARVEST ARSON IN
AGRICULTURAL LANDS

Abstract

The use of satellite imagery data as part of Earth observation systems provides broad opportunities for the monitoring of present changes that are sensitive to humans and the environment. Such use of imagery data in observing environmental changes can be quite important for managing those changes. In particular, the agricultural sector has an impact on societal welfare on two fronts, one each in ecological and economic directions. This research aimed to determine the effects of post-harvest land arson on agricultural lands during the summer period and develop mechanism to mitigate environmental damage. As a research area, we chose the Tashkent region as its close to the most populated city, in which imagery data were used to identify and assess the impact of burning on the environment. For this purpose, we developed an automatic alarm system that takes into free-to-use data for the sake of data availability and broad implementation. Using the Fire Information for Resource Management System (FIRMS) platform, the system determines areas with hot spots of potential burn-off. Such areas are then given into our verification step which calculates differences like index stack between alarm date Sentinel image with others (the last five historical images of the same area) to validate the burning date and area. Once the verification step is done, the system calculates the ecological damages based on the norms given to the system. By exploiting this mechanism, we were able to detect 693 fire points or 7432 hectares of land with a high probability of burning. Data processing and analysis revealed a significant environmental impact on the burning of land, in particular non-observance of environmental and air quality legislation. Quantification of the environmental damage throughout the entire burning period in the summer of 2023 from identified arson sites revealed: emitted 1.5 tons of ash, 10 tons of CO^2, 250 kg of NO^2, and 189 kg of hydrocarbons. All of these gases lead to a decrease in the quality of air and present a risk to human and environmental health. This research analysis shows the urgency to actively monitor agricultural land, and inform landowners about the burning and post-release of toxic gases into the atmosphere to lower the detrimental effects on the environment and people. The delivery of these results to authorized organizations will help to impact and inspire more sustainable agricultural practices.