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USE OF SATELLITE IMAGE FOR CROP CLASSIFICATION IN ANGOLA

Abstract

Agriculture is a critical economic sector for the socioeconomic development of Angola and is aligned with the United Nations' second sustainable development goal, SDG "Zero Hunger and Sustainable Agriculture." According to the Angolan Ministry of Agriculture, Angola has almost 58 million hectares available for agricultural development, including 35 million hectares of arable land, of which only 15

Sentinel-2 multispectral imagery, SPOT-6/7 panchromatic multispectral imagery, as well as in situ agricultural information were acquired for the three crop seasons. In order to develop a crop mask, the satellite imagery was used to extract 17 features, 5 spectral and 12 temporal (derived from time series analysis) to use as predictor variables. The selected features were used for pixel-based classification using four different ML algorithms (the k-nearest neighbors (KNN) algorithm, the Support Vector Machines (SVM), the Maximum Likelihood Estimation (MLE) and the Random Forest (RF) algorithm) to obtain the crop masks.

To validate the crop masks obtained through these ML algorithms, we obtained the accuracy assessment with a stratified random sampling to derive the overall accuracy and the kappa coefficients. Over the three crop seasons, the crop masks obtained through the RF algorithm consistently offered a high overall accuracy over 0,96, as well as an average kappa coefficient of 0.91, showing a substantial to almost perfect agreement. To further validate the crop mask obtained, we compared the cultivated acreage reported by the in situ data to the acreage measured using the crop mask to obtain the acreage estimation Completeness. The Completeness values of 0.97, 0.91 and 0.94 obtained for the first three growing seasons show a high agreement between the measured and reported acreage, further validating the generated crop masks using the RF algorithm.

This project combines remote sensing, GIS and ML to study and improve Angola's agricultural practices, decision-making and help reduce production costs, which is critical for Angola's socioeconomic

development.