CropRef: Reference Datasets and techniques to improve global cropland mapping[*]

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ABSTRACT:

Global timely, accurate, and cost-effective cropland mapping is a prerequisite for agriculture monitoring and application. Recently, the world's first global 30-m cropland product was produced through the NASA Making Earth System Data Records for Use in Research Environments (MEaSUREs) supported global food security-support analysis data (GFSAD) project (https://croplands.org/app/map). However, on average, in over 50 discrete segments of the world errors of omissions and commissions of GFSAD cropland extent product was around 20%. One of the major reasons for these errors is due to lack of sufficient, spatially well distributed *in-situ* data for the development of these products. To address this issue, we built a web application (CropRef) to help collect crowdsourced geoTagged cropland samples (https://croplands.org/app/data/search). The system allows users to interactively query and browse the geo-referenced statistical data in the form of maps and to subsequently download them for the regions of interest from any place in the world. Our system (CropRef) also integrates online and mobile applications, very high spatial resolution satellite imagery (sub-meter to 5-m) available from Google Earth, as well as various forms of data collected through crowdsourcing as a mechanism for validating and improving globally relevant spatial information on agriculture. Through its growing network of volunteers and a number of successful data collection campaigns, over 100,000 samples of croplands *versus* non-croplands have been collected around the globe. This paper provides an overview of the main features of CropRef, and then using a series of examples, illustrates how the crowdsourced data collected through CropRef have been used to improve information on knowledge extraction and consequential global cropland mapping. Validating land-cover maps at the global scale is a significant challenge. We also built a global reference dataset for validating 30 m-resolution global land-cover maps in the GFSAD30 project. The dataset has been carefully improved through several rounds of interpretation and verification by different image interpreters, and checked by an expert quality controller. Certainty in interpretation was measured by majority of interpreters agreeing on a class that is also accepted by expert quality controller. The tool and dataset are located at croplands.org.

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