

What is your idea?

The [Food Security Portal](#) (FSP) project is managed by the Market, Trade and Institutions Division at IFPRI and supported by the European Commission, USAID, and SDC. The Global FSP and its regional FSPs ([Africa south of the Sahara](#), [India](#), and [Central America and the Caribbean](#)) compile useful data on food systems for producers and policymakers, including price and production data. GEOGLAM runs the [Crop Monitor](#), which monitors crop production and weather forecasting using global satellite data.

In addition to IFPRI and GEOGLAM, several other groups have been making progress at the intersection between satellite and ground-collected data. For example, the [Food Security](#) team at Stanford has shown that a new wave of high-resolution satellite imagery can make reasonably accurate predictions of maize productivity at the plot scale. However, the main challenge in scaling up these satellite-based estimates is the ability to distinguish the location of crops; more observations for additional plots and crop types are needed.

In addition to measurement of production, there is also interest in measuring loss. Losses occur all along the food value chain, and understanding exactly where these losses occur for specific commodities and in specific geographic locations can help researchers and policymakers design interventions to reduce them. Such a reduction in food loss is an important part of the Sustainable Development Goals, specifically SDG12.

Under the revealing food systems call, we propose to merge the use of satellite and mobile-collected data to estimate crop areas, production, and crop losses. We will match satellite data with ground-level data using data from mobile surveys and potentially [drones](#) to understand production and losses, as well as the reasons for those losses. This will provide important information for policymakers in order to identify ongoing challenges and opportunities. This proposal is a creative approach since the use of both satellite and ground-based data in a cost-effective manner to provide timely information on food security-related questions to policymakers is not well-established.

How will you pilot it?

IFPRI plans to work with GEOGLAM to understand crop conditions using GEOGLAM's 0.1 degree, 0.05 degree, and 30-meter resolution bimonthly data on soil moisture, precipitation, and pest infestations, relatively, in very particular conditions in Africa. Using these conditions, IFPRI plans to link this data to mobile surveys to verify crop growth and conditions, especially those linked to drought and related loss. In addition, the project plans to pilot drone or physical data collection on indicators of biomass and will build upon work by Stanford University to verify cropped areas from satellite information merged with field-based analysis.

During 2017, IFPRI is piloting a small survey using mobile phone surveys implemented by GeoPoll in the Dodoma region of Tanzania. This survey will collect information at the farm and market level on crop loss from disease, technology constraints, and weather shocks, as well as price transmission for a range of crops. Using the results and challenges faced in this small survey will inform our scale-up with support of the INSPIRE program and will inform further ground data collection through drones or field-based surveys.

To evaluate the use of this technology and its accuracy in multiple settings, we will need to drastically scale up the methodology and perhaps consider collecting data through additional

methods: additional mobile surveys, drones, discussions with producer organizations or extension agents, and/or field-level interviews. GeoGLAM (UMD) has piloted the use of drones in another region of Tanzania, and we will build upon the lessons learned from that pilot.

All data collected from our pilot would be processed in Cloud-based [server-less computing](#). The processed data would be visualized through [Tableau software](#) and [D3 plus JavaScript library](#), and the lessons learned shared on the Food Security Portals, FSP [APIs](#) for developers, and mobile apps. In addition, novel methodologies and analytics used in the pilot could be taught to public users via the [Food Security Portal E-learning](#) site.

Explain how the work will be performed within the budget (USD\$100,000) and time (12 months) allowed?

Given that the mobile data collection will begin in September 2017 and will be funded by the FSP, we will first take advantage of this funding. Moving beyond a mobile phone survey and sending enumerators in the field to verify the crop production and loss data observed by satellite will be more accurate but also more costly, and the INSPIRE funding will be used to support those activities. Based on the results of our mobile survey, we may create a short survey to pilot with enumerators and a local partner. The use of drones to collect data on biomass and crop conditions will also be explored to understand the challenges to estimating crops grown, plot size, productivity, and loss from satellite data.

The project will be piloted in Dodoma, Tanzania during the main growing season (March-June). Results of data collection should be finalized by July and comparison can be made with the mobile data collection, with analysis and reporting finished in September 2018. Field surveys or drone work will be done by a local collaborator over 4 months (est. \$40,000 based on extent). Travel and equipment is expected to be around \$20,000, with the remaining funds planned for labor from IFPRI and GeoGLAM staff (total approx. \$40,000), with preference given to a larger sample over labor costs for IFPRI/UMD.

What essential data will be generated during this pilot?

The pilot will generate information on the accuracy of satellite images for understanding crop locations and plot size, production, and crop loss in Tanzania. The mobile data collection and field-based surveys with drones or trained enumerators will also be compared to the satellite data to best understand how accurate these types of data collection are and to understand the particular challenges that each survey faces.

If the pilot is successful, what are the next steps?

If the pilot is successful, we will better understand how to measure crop growth and conditions using satellite data, as well as the most effective way to verify these observations for 1-2 major food commodities in a particular region. Expanding this to other commodities and other regions will be the next step, as crops with more complicated growth patterns or relatively unknown pest infestations will require additional analysis and research. If these models are successful, the study could eventually change how agencies are able to respond to weather or other conditions that will greatly impact food security and increase resilience for producers in developing countries.