

## Global land cover uncovered

Citizen scientists help identify arable land to feed the world.

In order to fully understand how land is being used for food production and foresee how land use will change in the future, reliable crop maps are essential. Not only can crop maps help identify yield gaps and monitor crops affected by drought, they can also help tackle environmental issues. As agricultural expansion is a major cause of deforestation, knowing where new crops are grown could assist calculations of additional greenhouse gas emissions, useful for initiatives to reduce emissions from deforestation, or determining the implications of climate change on crop production. But at present, there is no single global land cover product available that accurately displays where crops are grown. Some land cover maps even disagree over vast areas of the Earth's surface.

With the ambition to improve the quality of global land cover maps, a team based at the International Institute for Applied Systems Analysis (IIASA) started the pioneering Geo-Wiki project, a geospatial Wikipedia that uses the growing body of satellite imagery, Google Earth as a platform and crowdsourcing as the mechanism for collecting and verifying data.

### Geo-Wiki: An online platform for improving global land cover maps

Up and running since 2009 the Geo-Wiki project is a global network of online volunteers that want to help improve the quality of global land cover maps. This crowdsourcing activity aims to reverse the usual top-down flow of data by allowing users from all over the world to be part of the process.

#### Partners

The Cropland Capture game was developed with support from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), and the Austrian Research Promotion Agency (FFG) through its space application program ASAP. The Geo-Wiki project was developed by the International Institute for Applied Systems Analysis (IIASA) and financed by the European Commission via framework funding.

Volunteers are asked to review hotspot maps of global land cover where there have been disagreements over what they are showing, and based on what they actually see in Google Earth and their local knowledge determine if the land cover maps are correct or incorrect. Their inputs are recorded in a database, along with uploaded photos, to be used in the future for the creation of a new and improved global land cover map. Once in the system, the Geo-Wiki project collects, analyses and filters the information and shares it with the scientific community.

### Gaming with a purpose

The process of identifying land cover is time consuming and requires a lot of manpower. With the goal to attract larger numbers of participants and to develop a solid map database the Geo-Wiki project turned to gaming.

“There are especially huge gaps in reliable cropland maps over Africa. Therefore, we don't know where to make the best investments to increase production. The first step is to secure a reliable and extensive cropland map over Africa to decrease yield gaps and boost food security.”

Geo-Wiki Project Manager Steffen Fritz.

“Cropland Capture” is a game built on a fairly simple idea: players travel through satellite images of the Earth looking for arable land and collect points. Throughout the process, players are presented with a red rectangle placed on top of satellite imagery. They are asked to determine if there is any evidence of cropland within the rectangle. They can answer yes, no, or maybe, if they are unsure. If gamers are in the location they are analysing they can even upload a photo of the area which will be added to the database. Gamers are awarded points throughout the game and within just a few weeks, this fun and easy-to-use game attracted thousands of gamers helping to map out our global land cover bit by bit.

The gamers help scientists not only find global crop cover, but also improve the available products and verify the maps. The more the players agree on the land cover, the higher scores they achieve and the faster they progress in the game. The data from the game will also be analysed for quality, which will help to better understand how data collected through crowdsourcing can be used for scientific research.

In addition to interactive projects like Cropland Capture, Geo-Wiki also runs crowdsourcing campaigns to collect data to help answer specific research questions such as land availability for biofuels, wilderness mapping and land grabbing.

### Science + Gaming: The new frontier

Involving gamers in research projects like this is a new way of working, with exciting results and multiple benefits. Many researchers today lack time and capacity, and it would require an immense research troop to go through the same amount of satellite imagery that have now been made possible with online support. With outside help maps can be scrutinized while researchers themselves focus on analysing the results.

Future plans include expanding the game to other land cover types, in particular forests, and for classifying pictures. This will make Geo-tagged photos available on the internet and from the Geo-Wiki picture app. Moreover, social media are an untapped source of validation data that can be used to improve land cover.

**To find out more about Geo-Wiki and Cropland Capture please visit: [www.geo-wiki.org](http://www.geo-wiki.org) and [www.geo-wiki.org/games/croplandcapture](http://www.geo-wiki.org/games/croplandcapture)**



Photo: F. Sipalla (CIMMYT)

### About CCAFS

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT). CCAFS brings together the world's best researchers in agricultural science, development research, climate science and earth system science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security. [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)

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