Reducing the Costs of GHG Estimates in Agriculture to Inform Low Emissions Development,10-12 Nov 2014, Rome Italy

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

The Potential for Crowdsourcing and Using Mobile Phone Technology

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Ecosystems Services and Management Program

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Overview

- Terminology
- Intro to Geo-Wiki
  - Campaigns
  - Hackathon
  - Gaming
- Mobile devices and applications
- Data collection for GHG accounting
- Discussion

Crowdsourcing

- Outsourcing to the crowd (Howe, 2006)
  - E.g. Amazon's Mechanical Turk
- Using the crowd to collect data, solicit ideas, analyze data, do voluminous tasks that could otherwise not be done
- Represents an untapped potential source of data for scientific research
  - Already being harnessed in ecology, conservation, species identification under the umbrella of citizen science

Plethora of Terminology

- Citizen science (+ extreme version)
- PPSR
- Volunteereed Geographic Information
- GeoCollaboration / PPGIS
- GeoWeb
- Neogeography
- Participatory sensing
- Web mapping

citizen cyberscience centre

CSL Citizen Scientists League

citizen cyberLab

project noah

ACT Centenary BioBlitz

Audubon Christmas Bird Count

iSpot your place to share nature

ExCiteS

JAY WATCH A CITIZEN-SCIENCE PROGRAM

FROG WATCH USA

CITIZEN SCIENCE ALLIANCE

eye on earth

ZOONIVERSE REAL SCIENCE ONLINE

d.e.w. DIGITAL EARTH WATCH

socientize citizen science projects

REEF CHECK WORLDWIDE

DOLPHIN WATCH Junior

COBWEB Citizen Observatory Web

GEO-Wiki

EUROPEAN CITIZEN SCIENCE ASSOCIATION

science for citizens .net

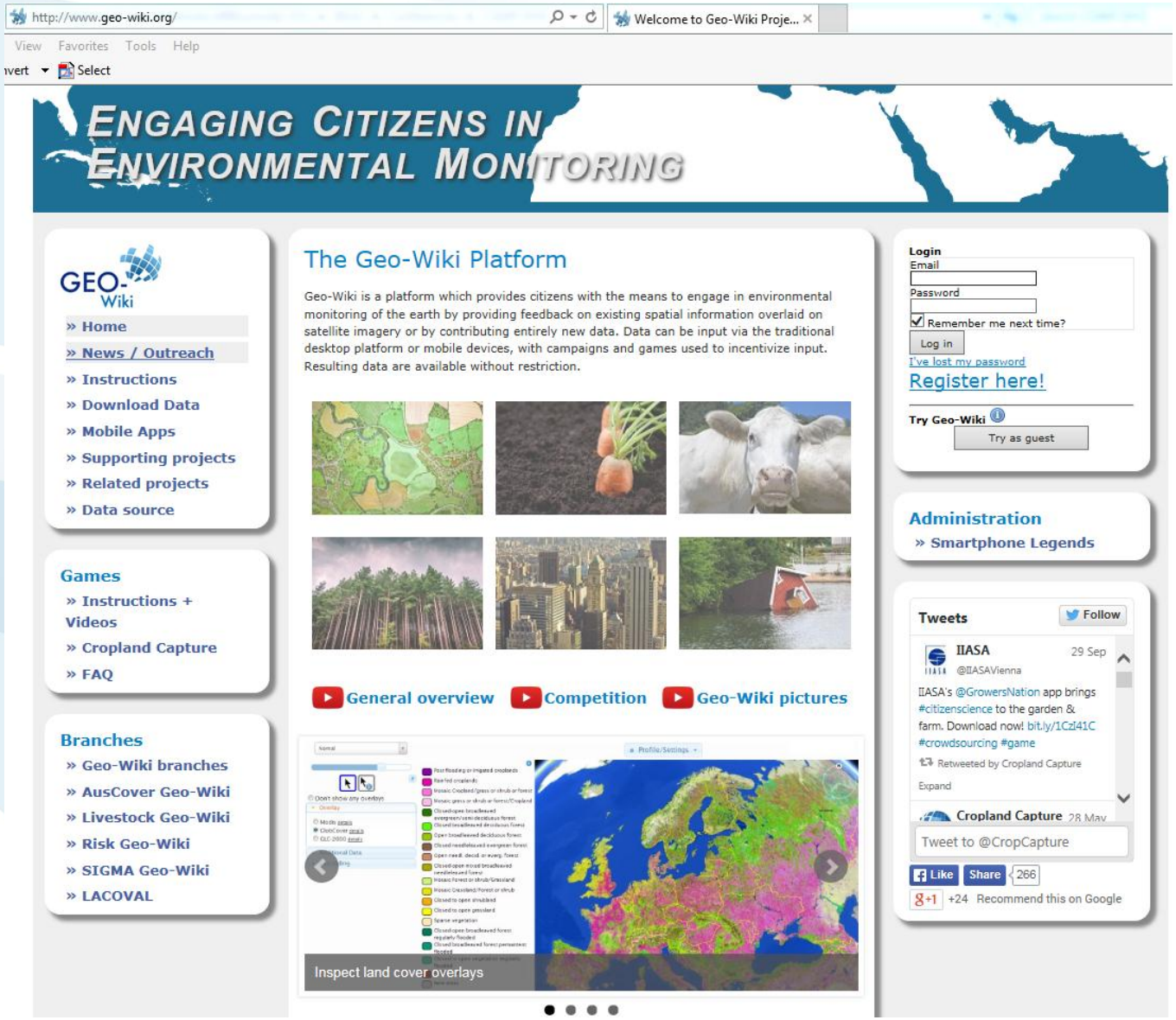
CITIZEN SCIENCE OPT FOUNDATION

fold it Solve Puzzles for Science

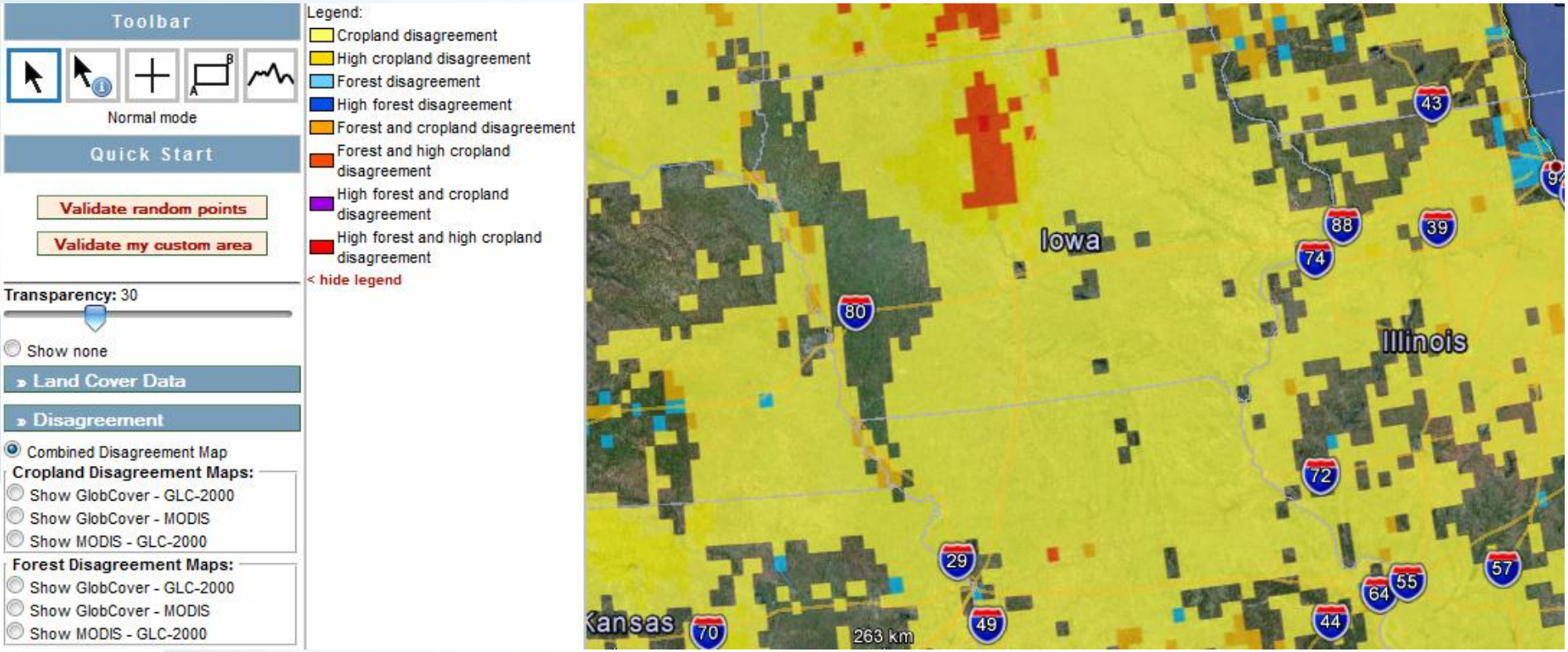
Context: Need for Improved Land Cover

- Crucial baseline information for many applications/integrated assessment models
- Overall and spatial disagreement when different products are compared
- Need for more ground-based validation data
- Confusing for users – Which one is correct? Which is the best product to use?
- A number of studies have shown that the choice of land cover can have a significant affect on the final results

Geo-Wiki: Visualization, Crowdsourcing and Validation Tool

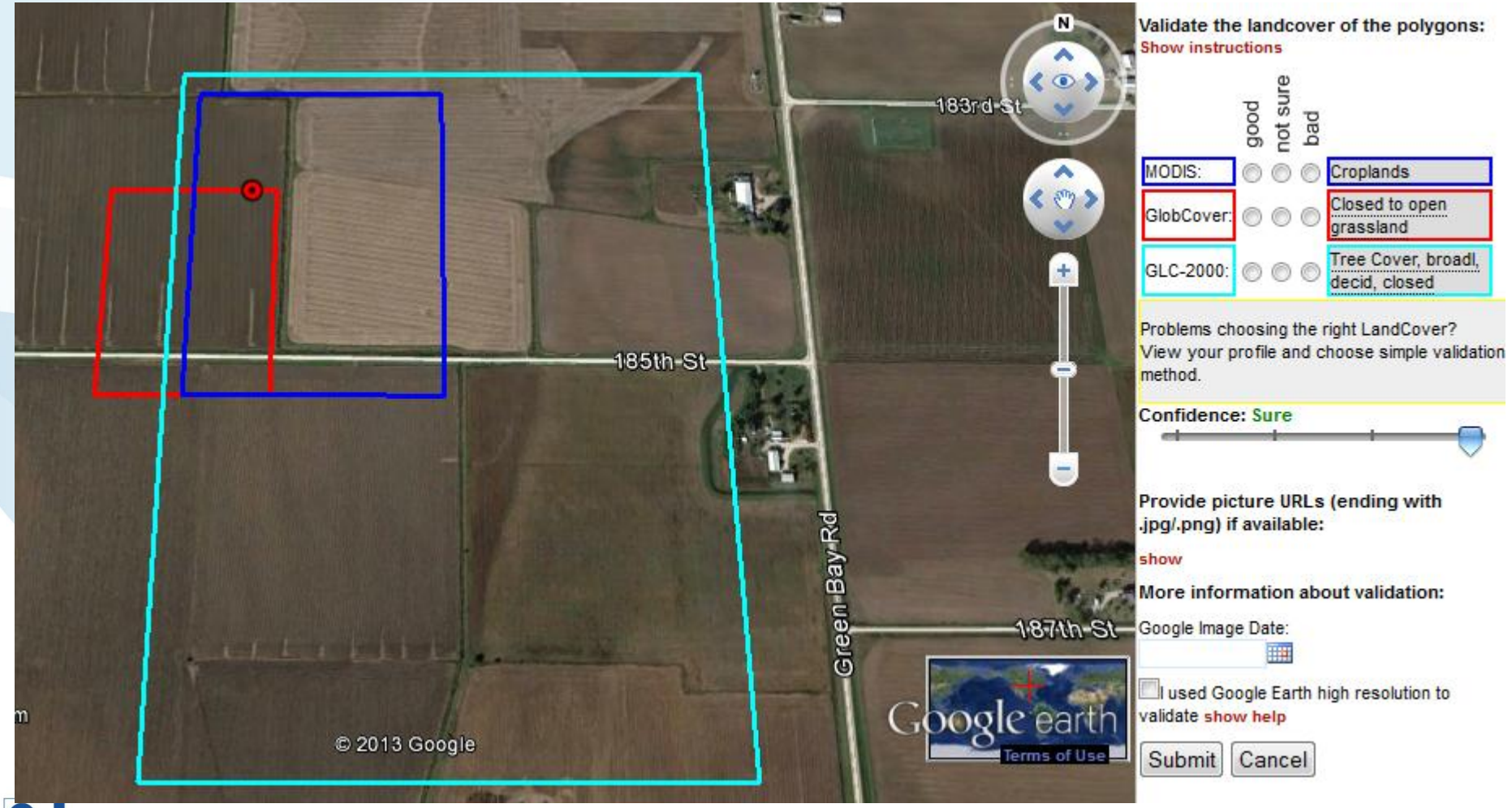


Large Disagreements in Cropland



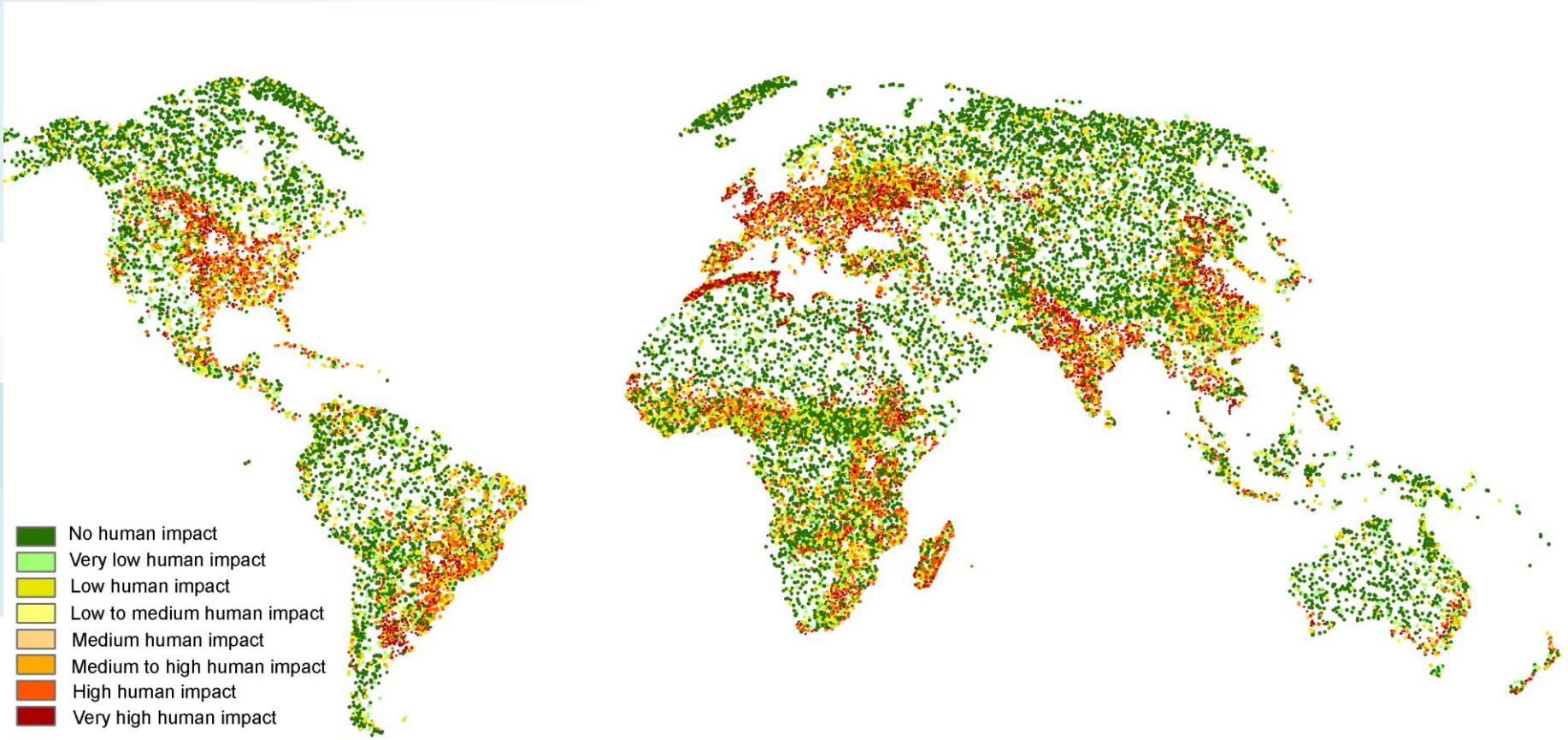
Can view these on: http://www.geo-wiki.org

Showing Disagreement on Google Earth



Example from a Competition (Humanimpact.geo-wiki.org)

Data from Human Impact Competition



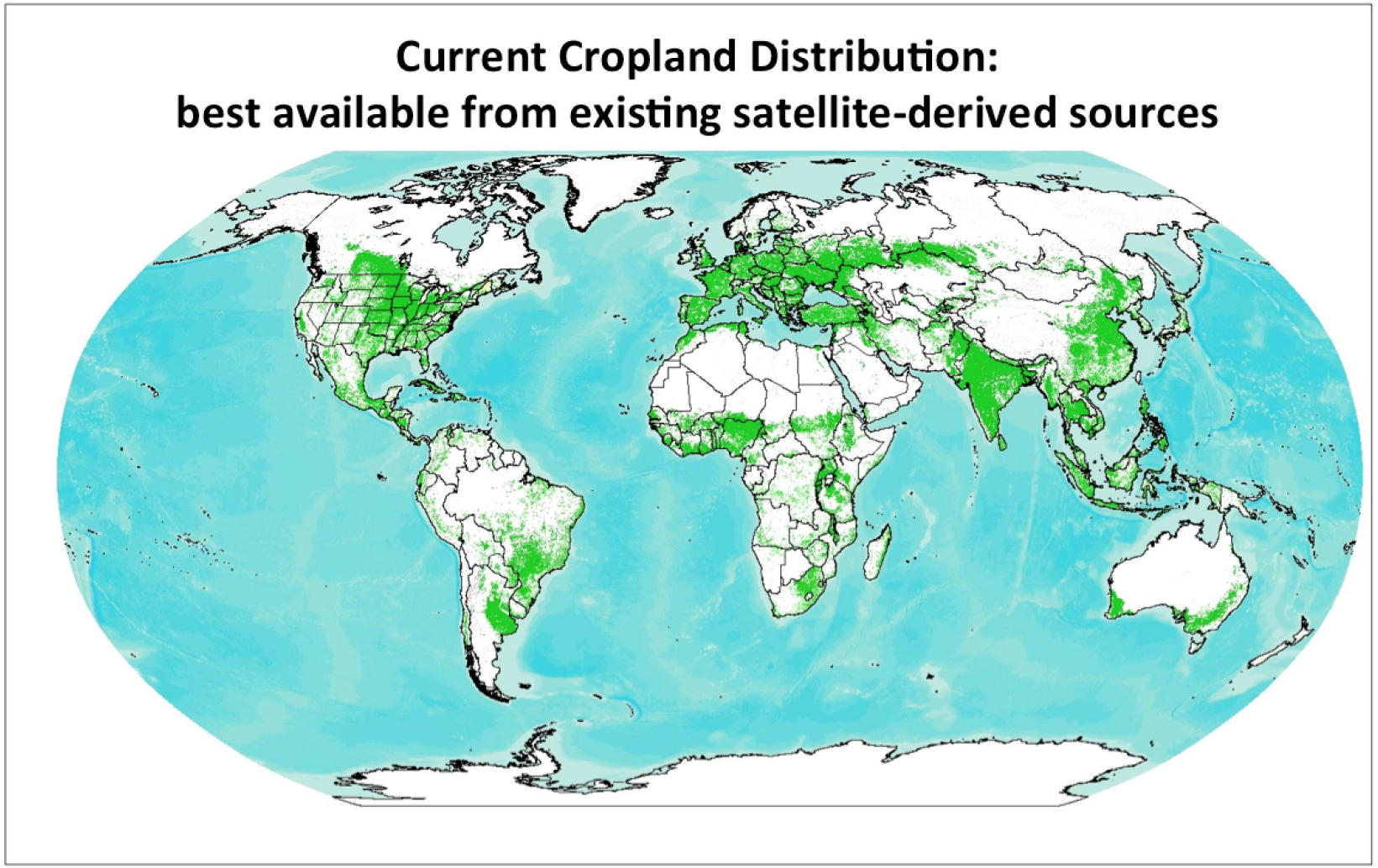
Crowdsourcing Validation Data

Number	Competition	Purpose of the Competition
1	Human Impact	To validate a map of land availability for biofuel production
2	Hotspots of Map Disagreement	To collect validation points in the areas were the GLC2000, MODIS and GlobCover disagree with one another
3	Wilderness	To collect land cover and human impact in order to determine the amount of global wilderness. The locations used were the same as that of the Chinese 30 m land cover map
4	Global Validation Dataset	To collect data at the same locations as the validation data assembled for the Chinese 30 m land cover map
5 & 6	Hackathon and IIASA Competition	To collect data on the degree of cultivation and the degree of human settlement in Ethiopia in the context of land grabbing

~200,000 validation samples collected

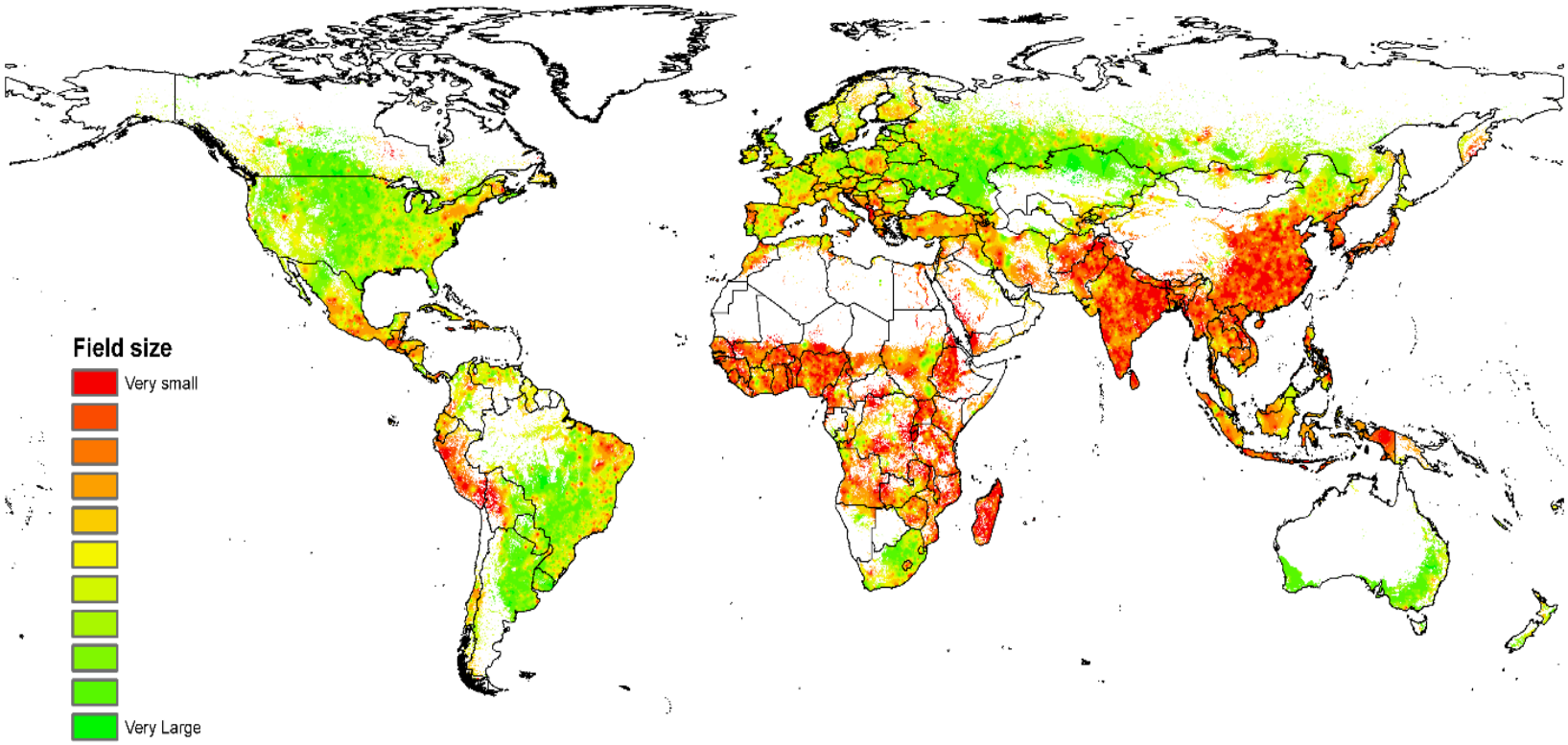
Outputs from Geo-Wiki: Cropland Map

GEOGLAM
Global Agricultural Monitoring

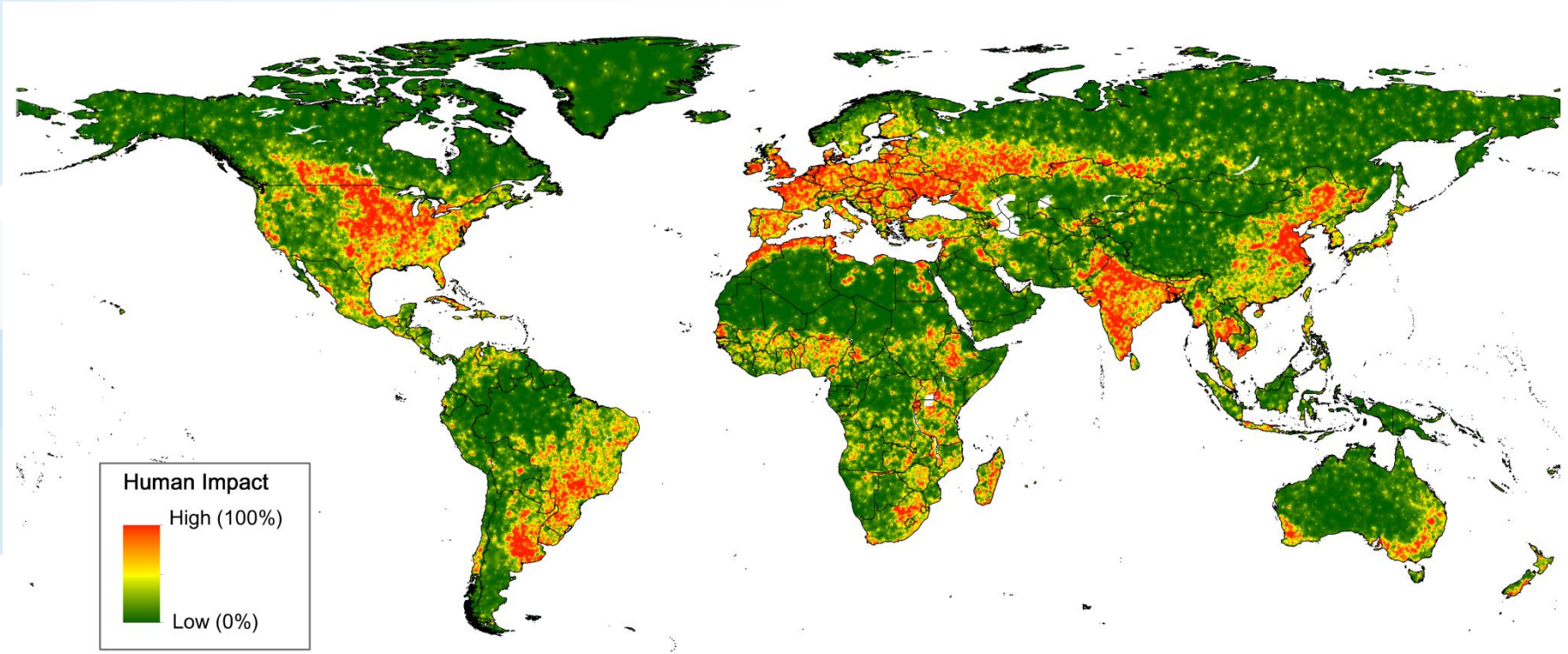


IIASA

Outputs from Geo-Wiki: Map of Field Size



Geo-Wiki Output: Global Map of Human Impact / Wilderness



Outputs from Geo-Wiki: Downgrading of Land Availability for Biofuels

Scenario	Original figures (million ha)	Adjusted for land cover (million ha)	Adjusted for field size (millon ha)	Adjusted for human impact (million ha)
S1	320	98	42	34
S2	702	467	201	84
S3	1411	998	N/A	409
S4	1107	786	N/A	264

Fritz, S., See, L., van der Velde, M., Nalepa, R.A., Perger, C., Schill, C., McCallum, I., Schepaschenko, D., Kraxner, F., Cai, X., Zhang, X., **Ortner, S., Hazarika, R., Cipriani, A., Di Bella, C., Rabia, A.H., Garcia, A., Vakolyuk, M., Singha, K., Beget, M.E., Erasmi, S.**, Albrecht, F., Shaw, B., Obersteiner, M. 2013. Downgrading recent estimates of land available for biofuel production. *Environmental Science & Technology*, 47(3), 1688-1694.

Hackathon.geo-wiki.org

- Organized by USAID
- Challenge:
  - Collect information about cropland and settlement for Ethiopia
  - Overlay with location of land acquisitions
  - Look for evidence of effects on local populations
- Extended to a competition for 3 weeks

Help To Validate Global Land Cover

GEO-Wiki

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- » Related projects
- » Data sources
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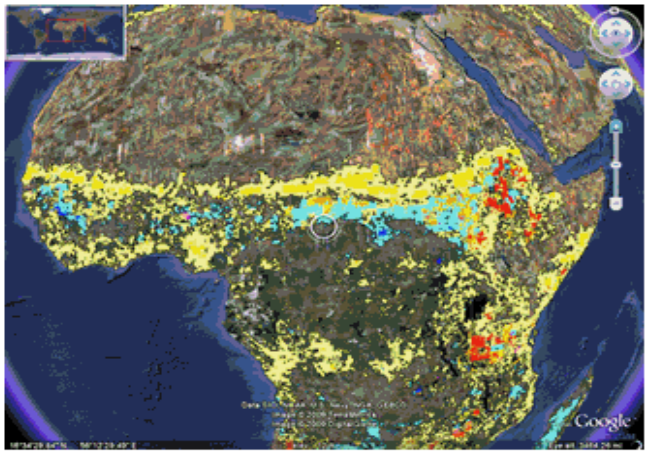
The Geo-Wiki Project

Tweet 0

The **Geo-Wiki Project** is a global network of volunteers who wish to help improve the quality of global land cover maps. Since large differences occur between existing global land cover maps, current ecosystem and land-use science lacks crucial accurate data (e.g. to determine the potential of additional agricultural land available to grow crops in Africa). **Volunteers** are asked to review hotspot maps of global land cover disagreement and determine, based on what they actually see in Google Earth and their local knowledge, if the land cover maps are correct or incorrect. Their input is 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**.

Participate in our USAID Hackathon Challenge

View publication | Watch the tutorial video online | Download Data



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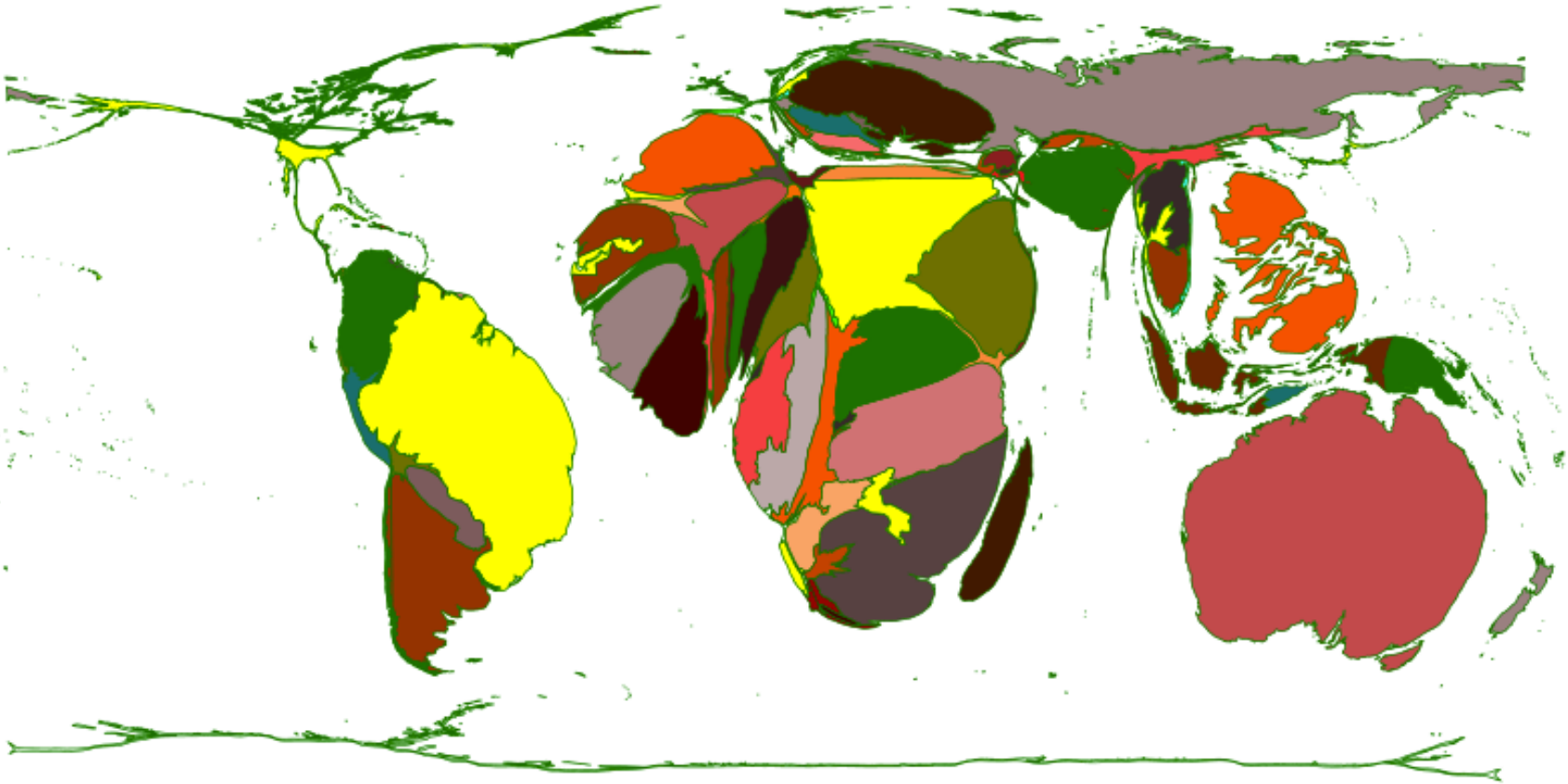
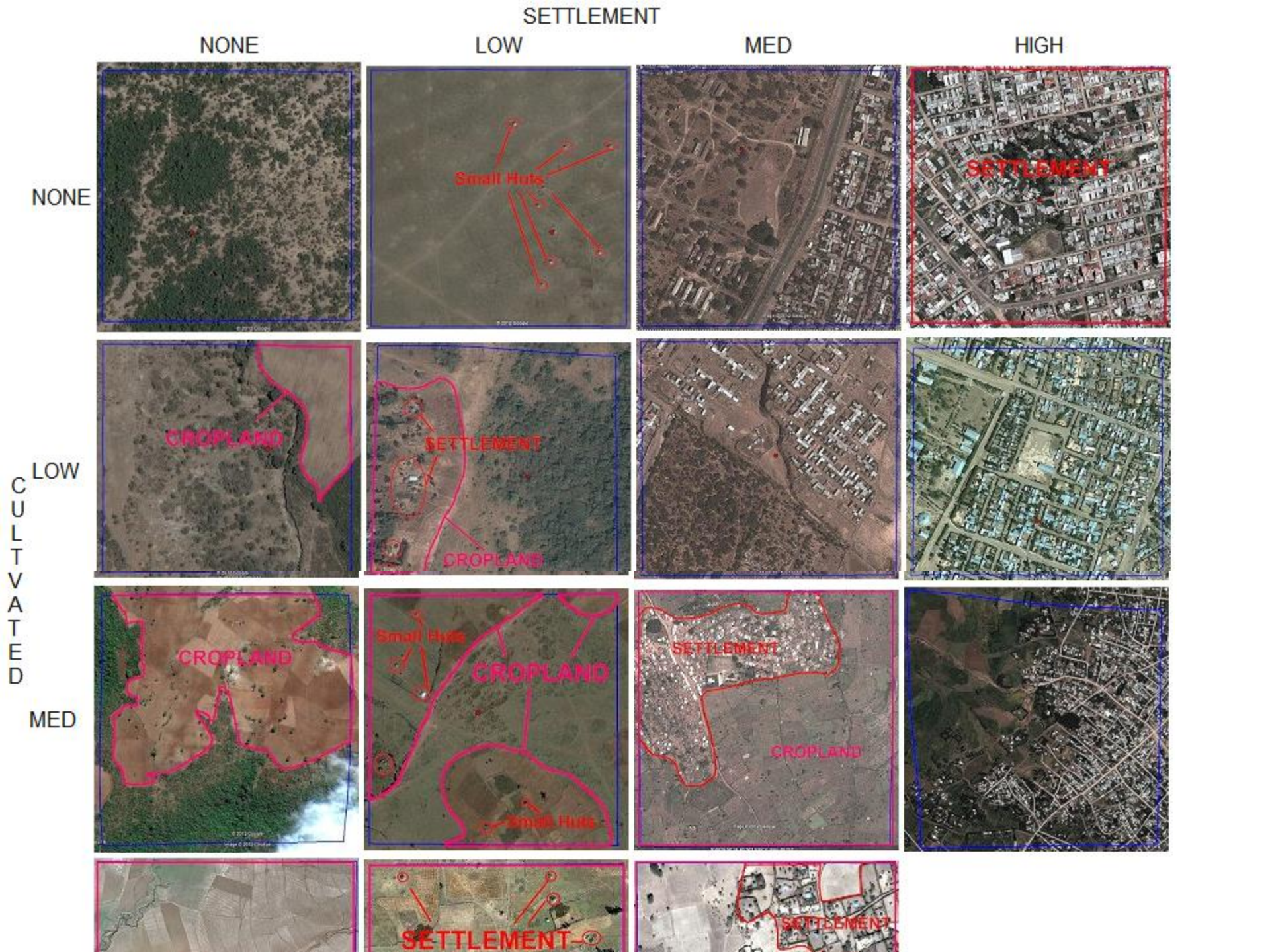
Land Grabbing



More Outputs from a Hackathon


SETTLEMENT
NONE
LOW
MED
HIGH
CULTVATED
NONE
LOW
MED
Small Huts
SETTLEMENT
CROPLAND
SETTLEMENT
CROPLAND
CROPLAND
Small Huts
CROPLAND
Small Huts
SETTLEMENT
CROPLAND
SETTLEMENT

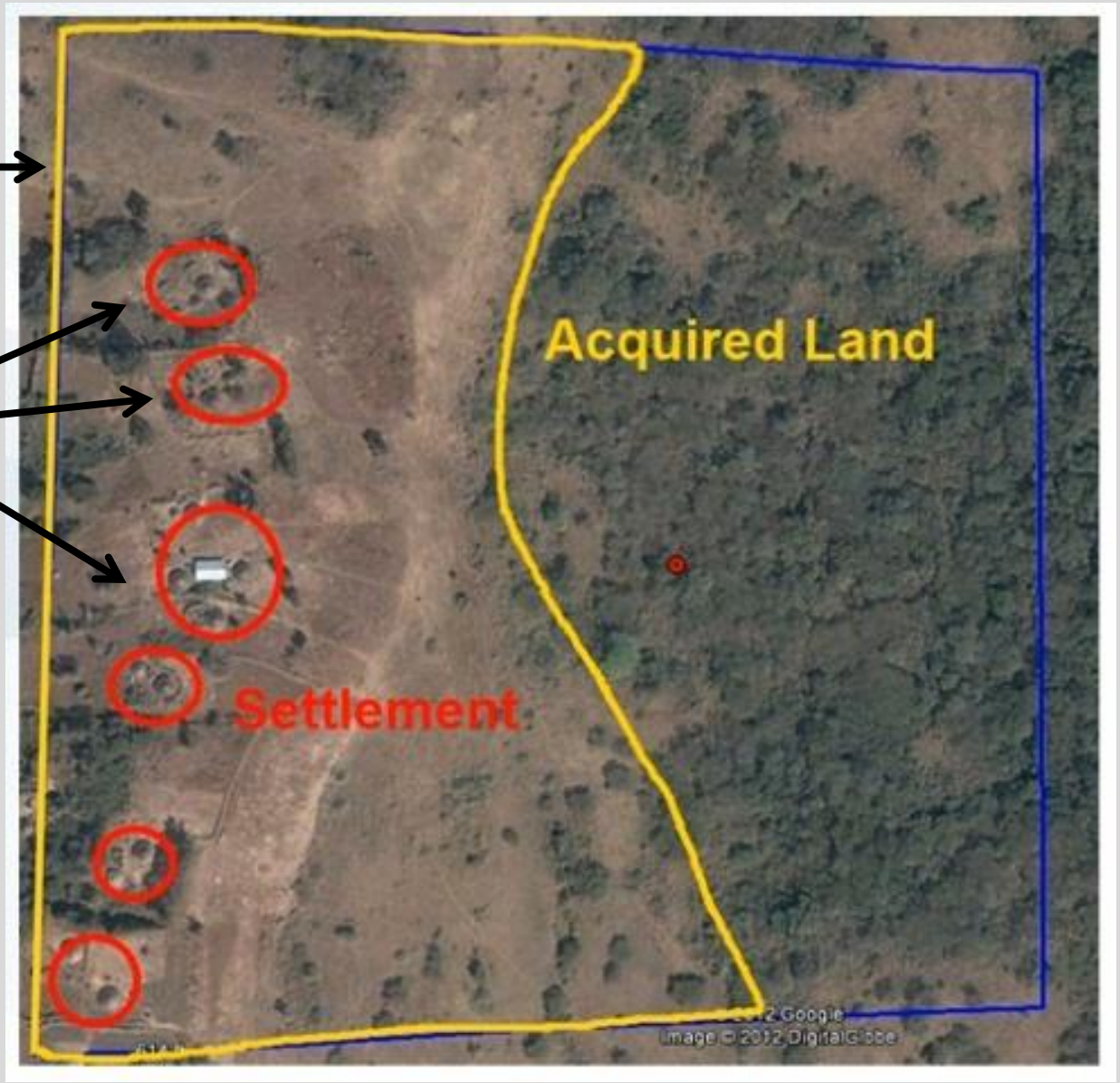
Land Acquisition Area (from Land Matrix Database)

+

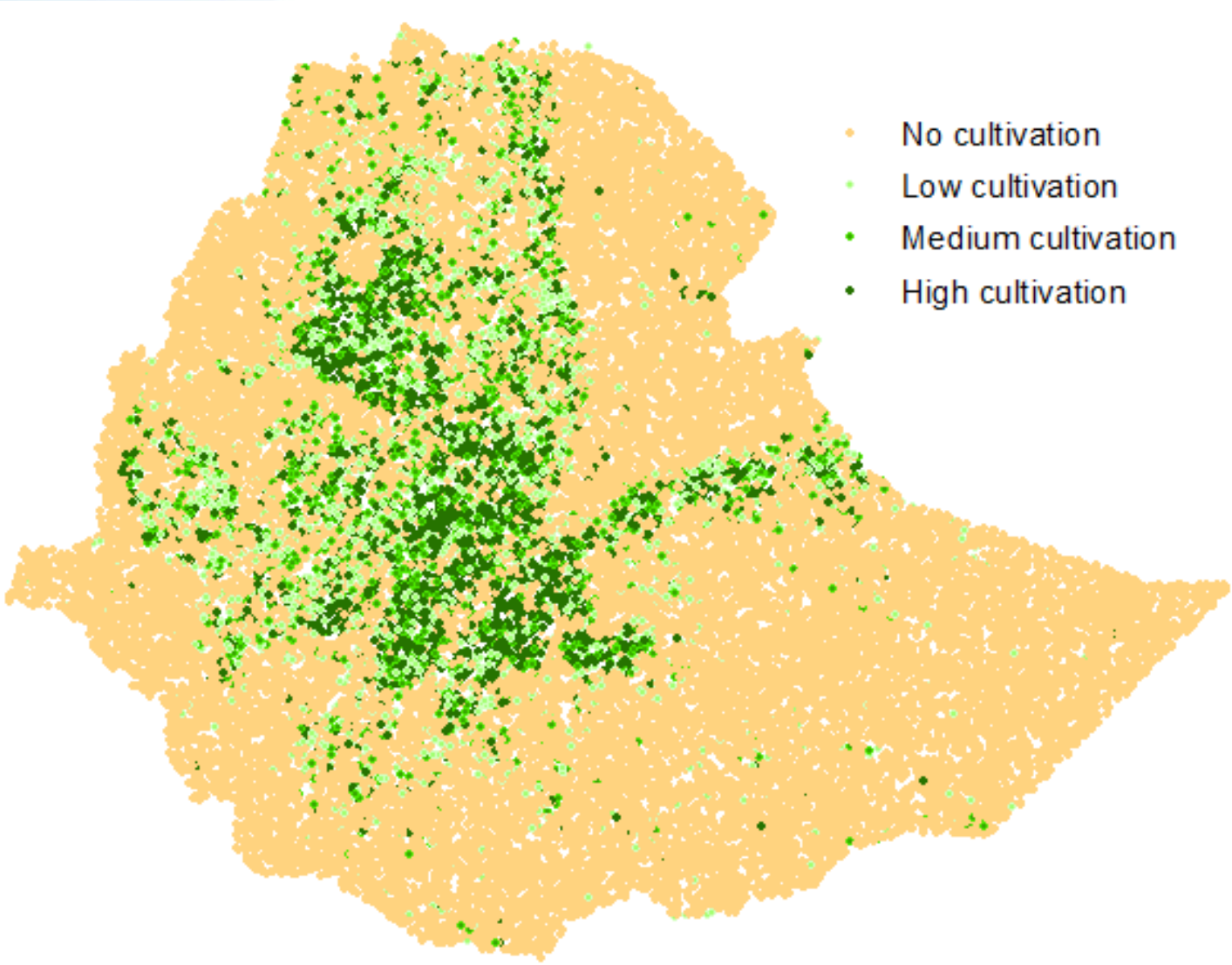
Clear Evidence of Settlements (from Geo-Wiki Hackathon)

=

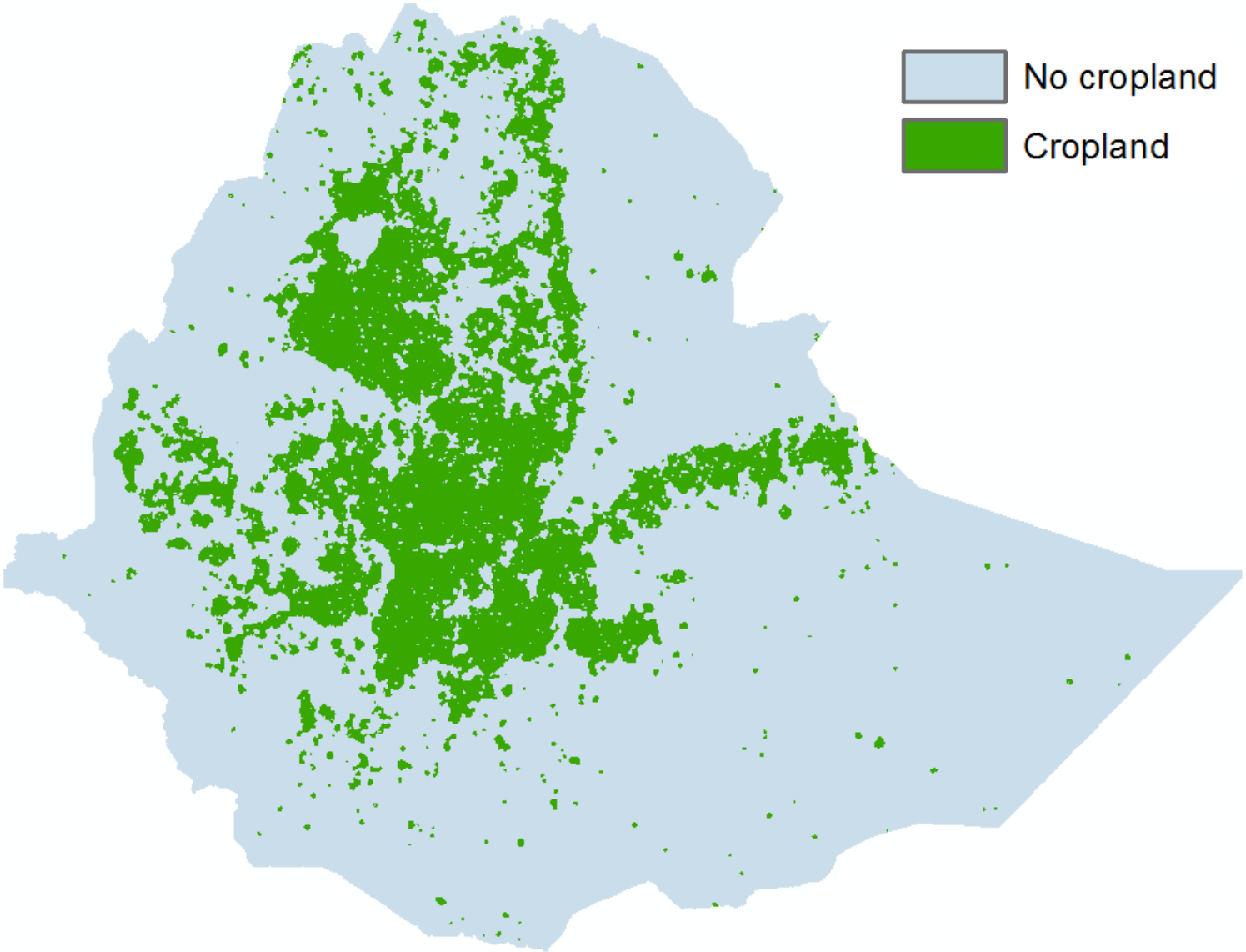
Areas of Conflict



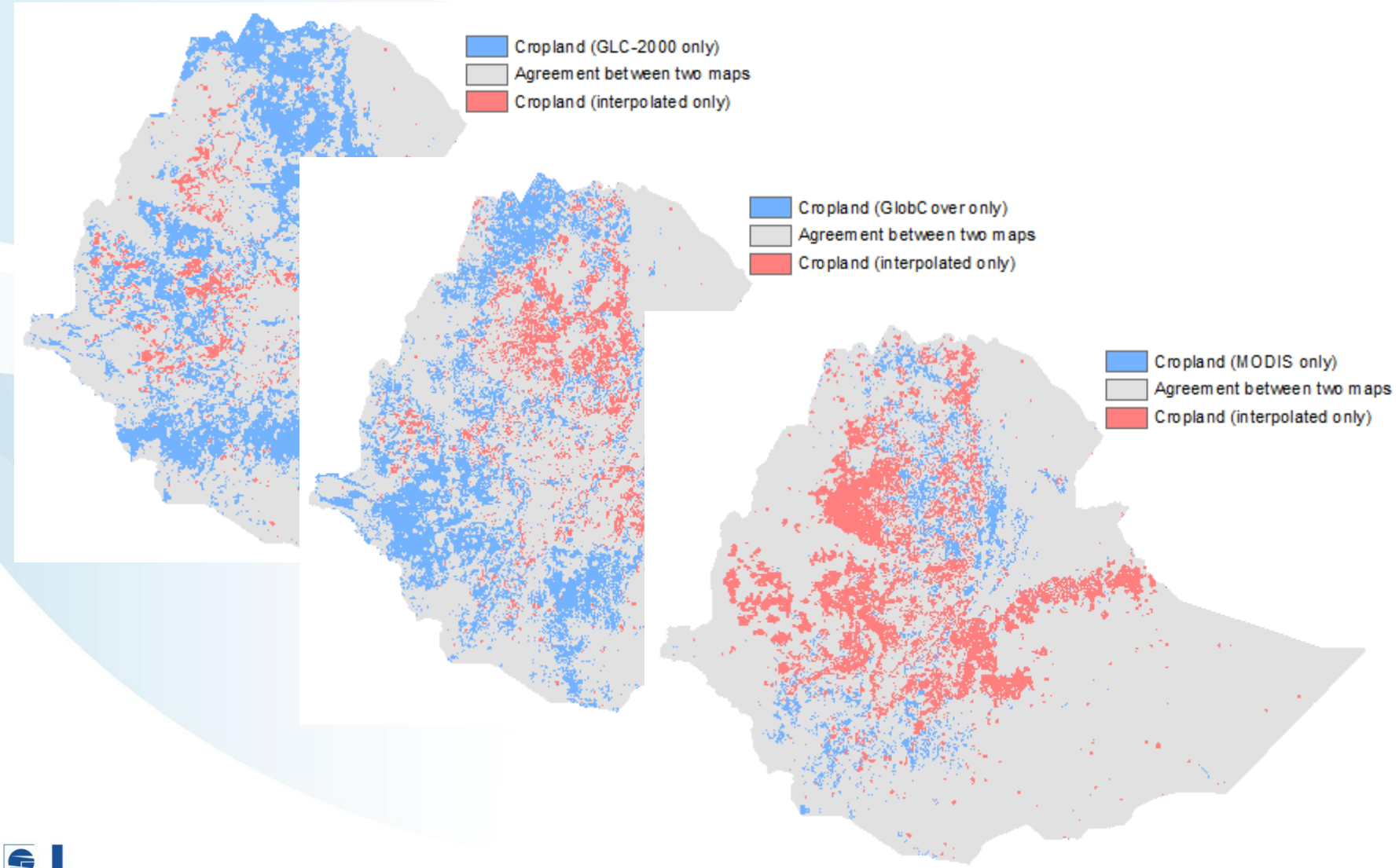
Data Collected over Three Weeks



Geo-Wiki Output: Interpolated Cropland Map



Comparison through Differencing

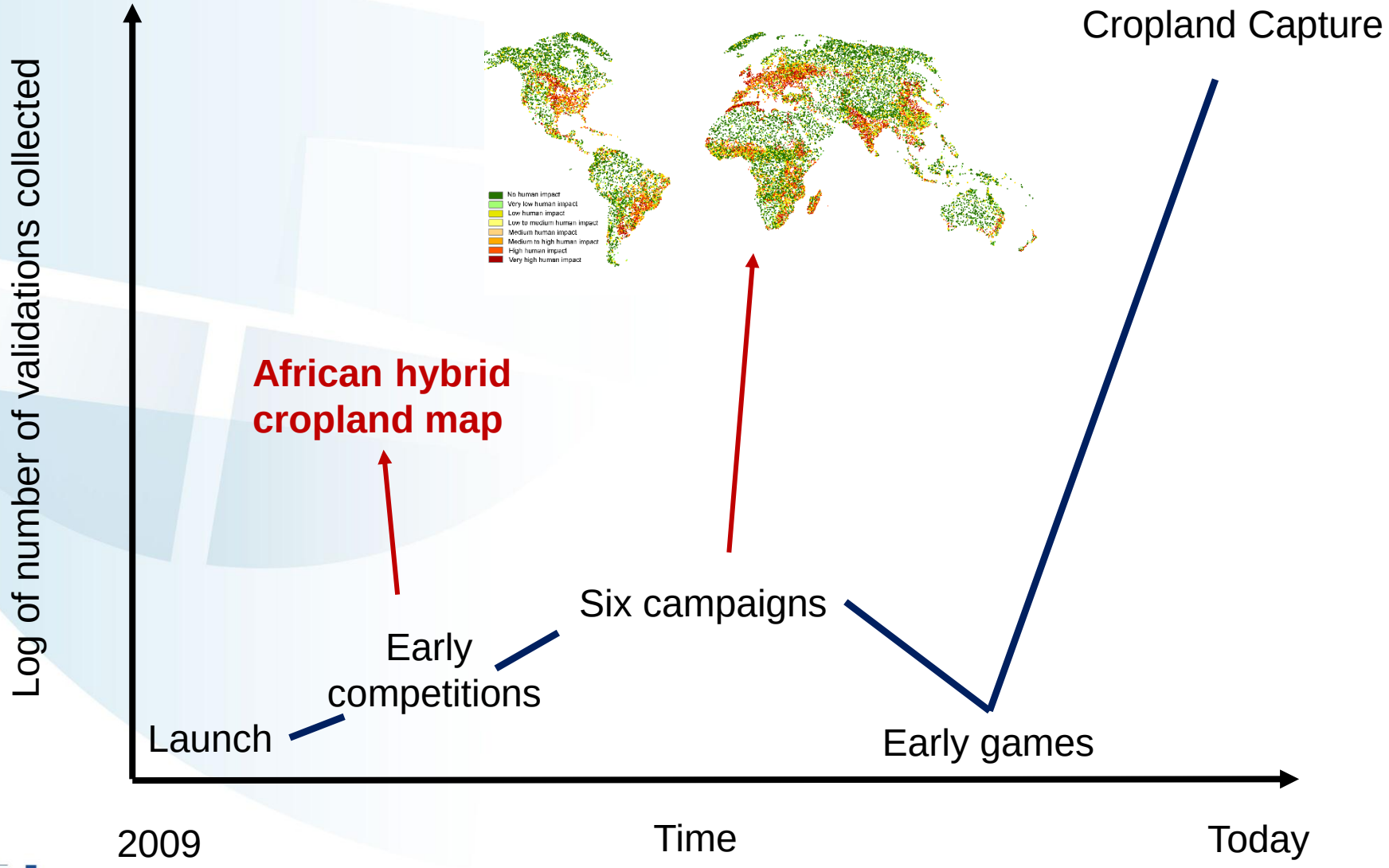


Accuracy Assessment

Maps	Accuracy measures (%)				
	Overall accuracy	User's accuracy		Producer's accuracy	
	All	No Crop	Crop	No Crop	Crop
GLC-2000	77.3	90.5	48.1	79.5	69.6
MODIS	81.8	83.2	67.5	96.1	29.3
GlobCover	74.5	89.3	43.9	76.8	66.3
Crowdsourced cropland map	89.3	91.7	78.8	94.9	68.5

See, L., McCallum, I., Fritz, S., Perger, C., Kraxner, F., Obersteiner, M., **Deka Baruah, U., Mili, N. and Ram Kalita, N.** In press. Mapping Cropland in Ethiopia using Crowdsourcing. International Journal of Geosciences.

Evolution of Crowdsourcing



Multi-Platform Game

Cropland Capture

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