



Crop Area estimation in CropWatch Platform

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AIR, CAS

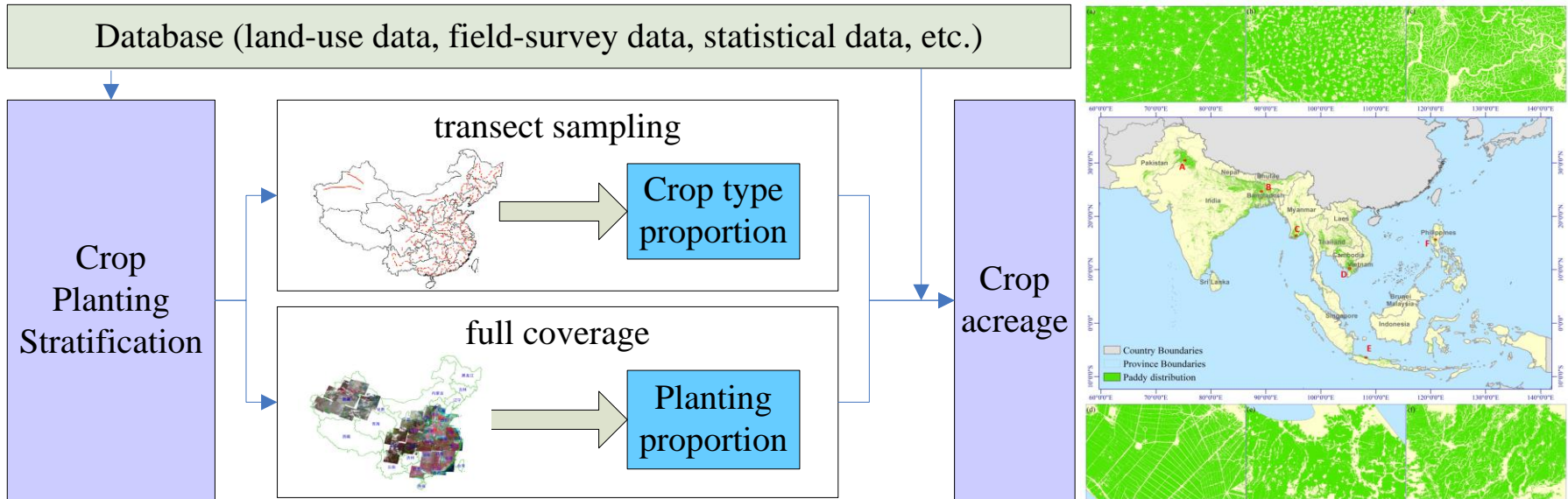
4th July, 2024

Abuja, Nigeria

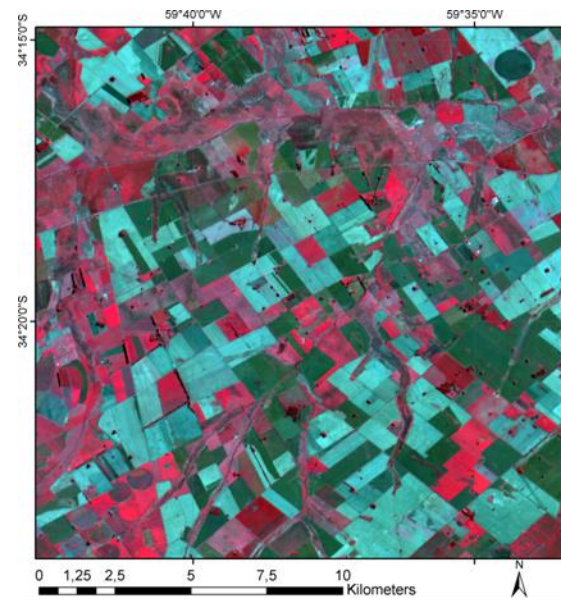
Crop Areas

- Crop area information needs field data
- CropWatch integrates crop area estimation with geo-statistics & crop mapping
 - The CPTP method in complex agricultural landscapes (66%)
 - Crop type mapping methods used for rest 34% regions

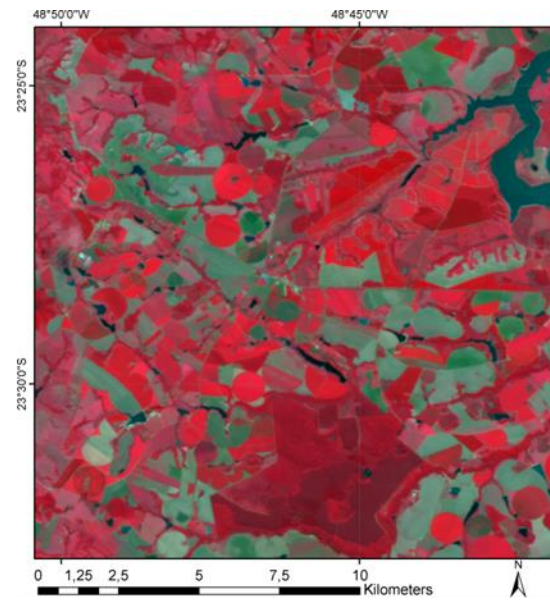
Crop type area = **Cropland area** * **UEC** * **cropping proportion** * **crop type proportion**



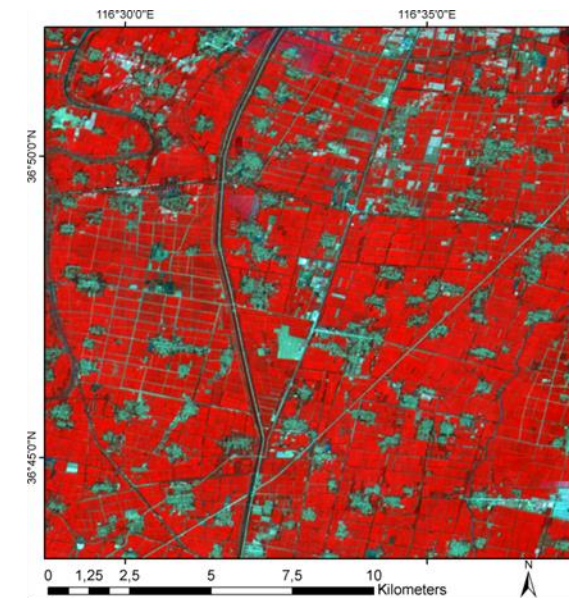
Complicate agricultural landscapes



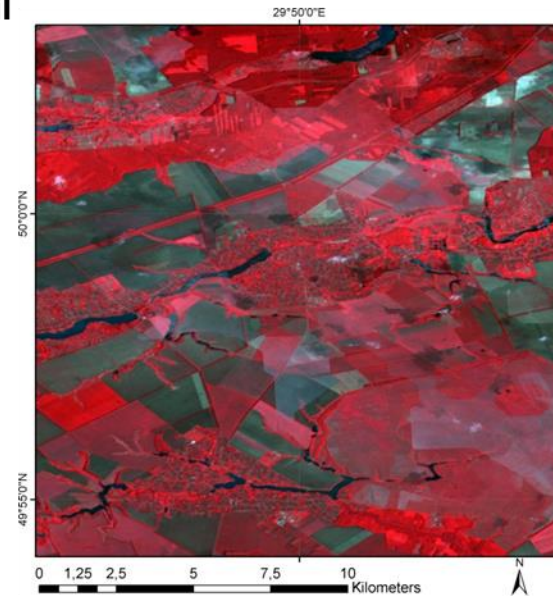
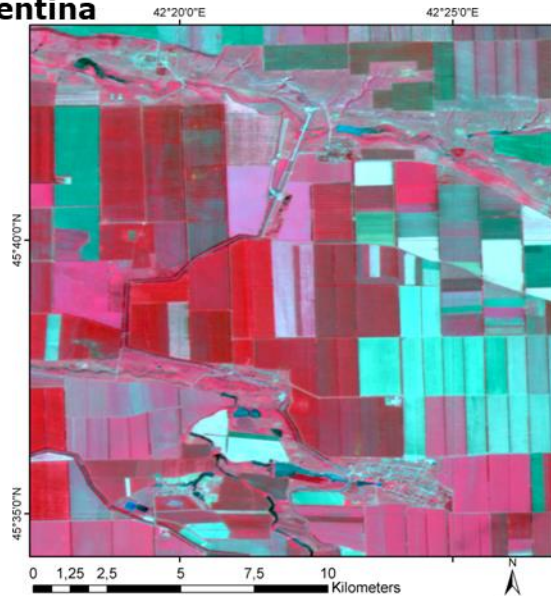
Argentina



Brazil



China

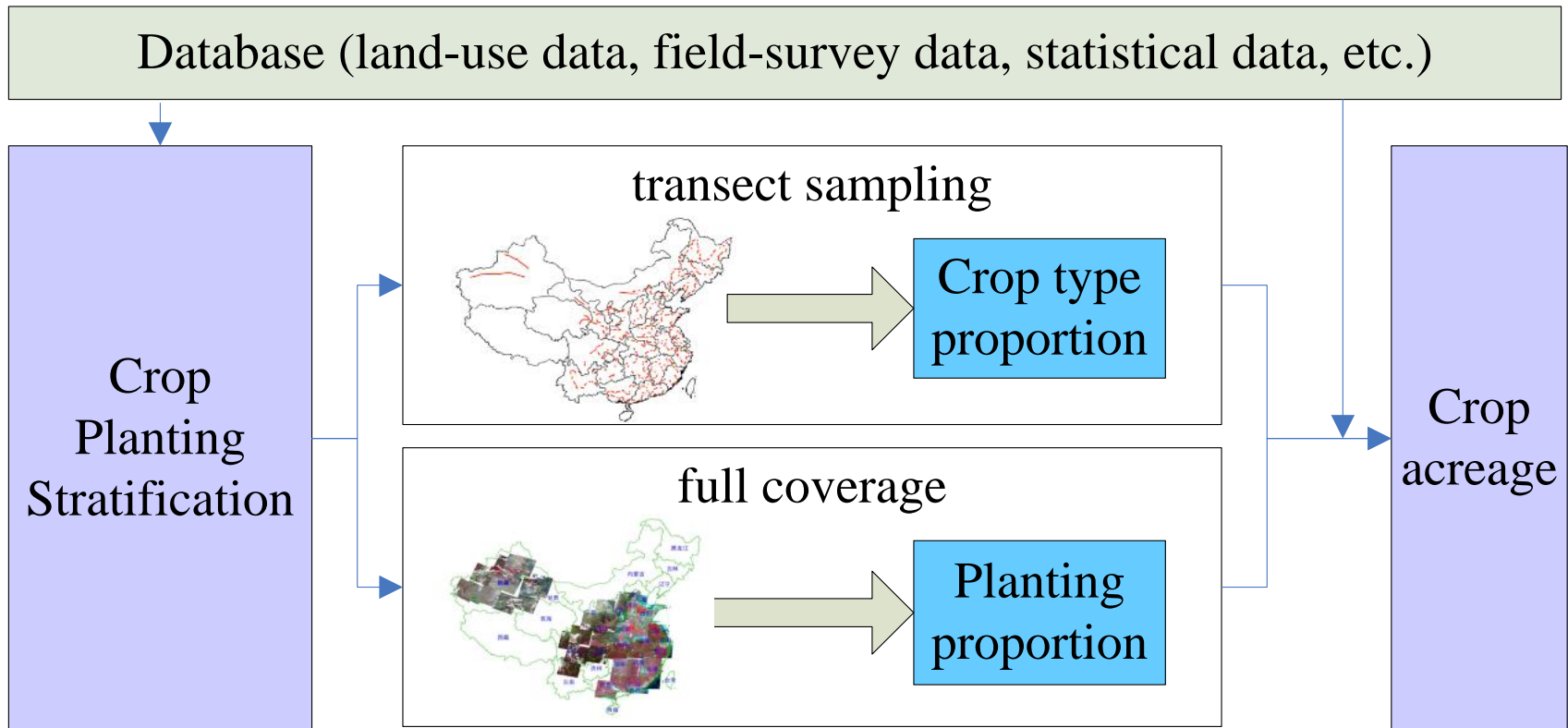


(JECAM, 2016)

Method of crop area estimation

$$\text{Crop area} = \underbrace{\text{Arable land area}}_{\text{Remote Sensing based}} \times \underbrace{\text{CALF}}_{\text{Remote Sensing based}} \times \underbrace{\text{Crop type proportion}}_{\text{GVG field survey}}$$

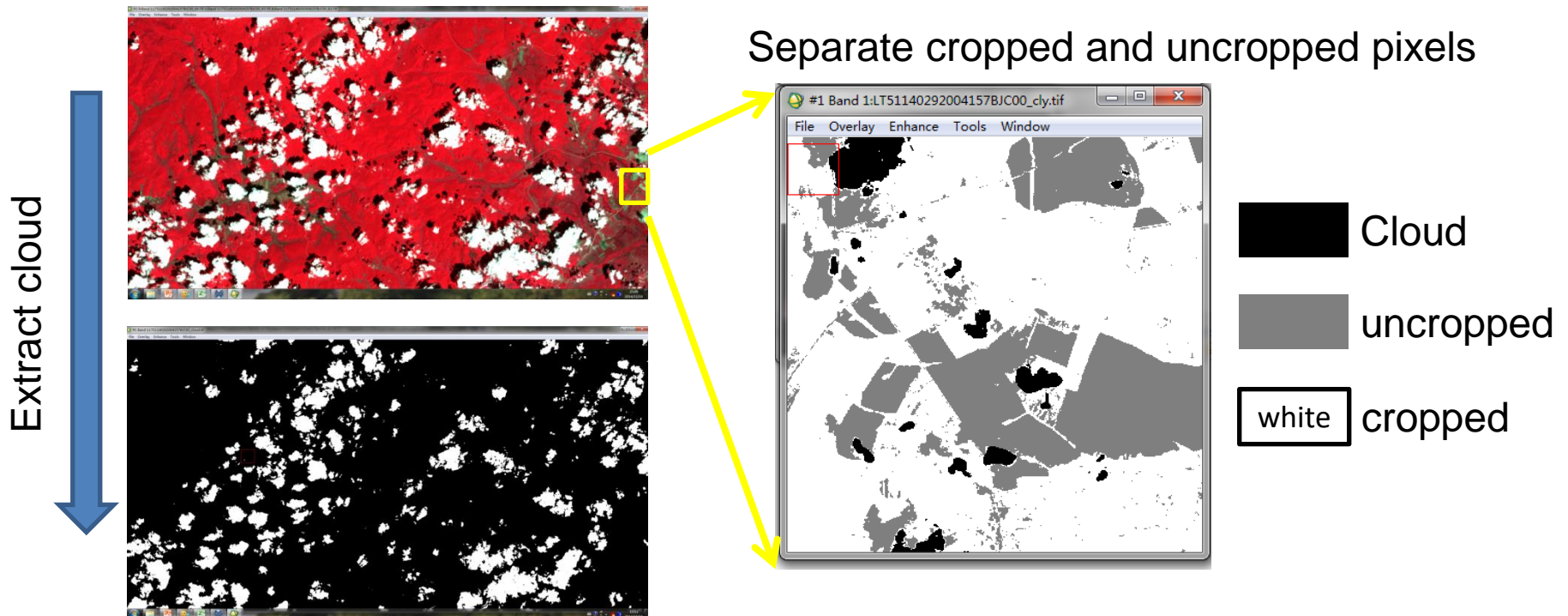
CALF=Cropped Arable Land Fraction



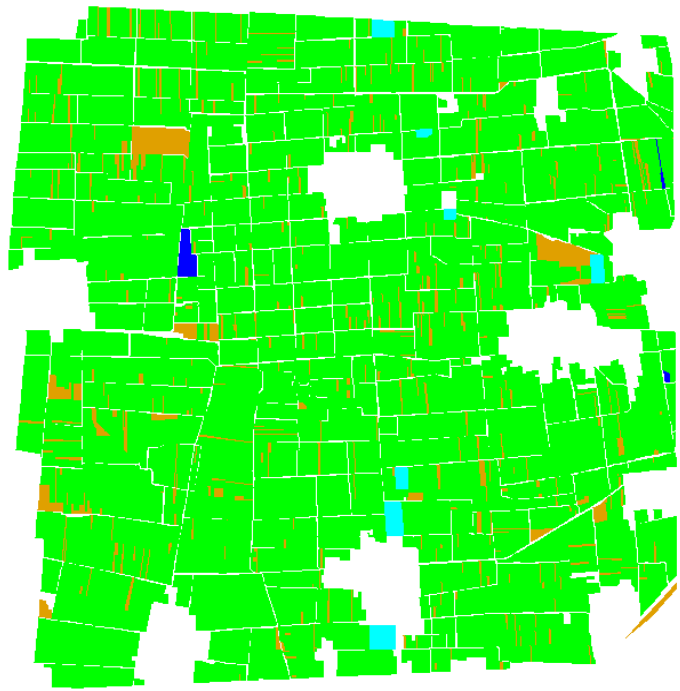
Cropped and uncropped identification

Separation of cropped and uncropped arable land using 30m or higher res. data

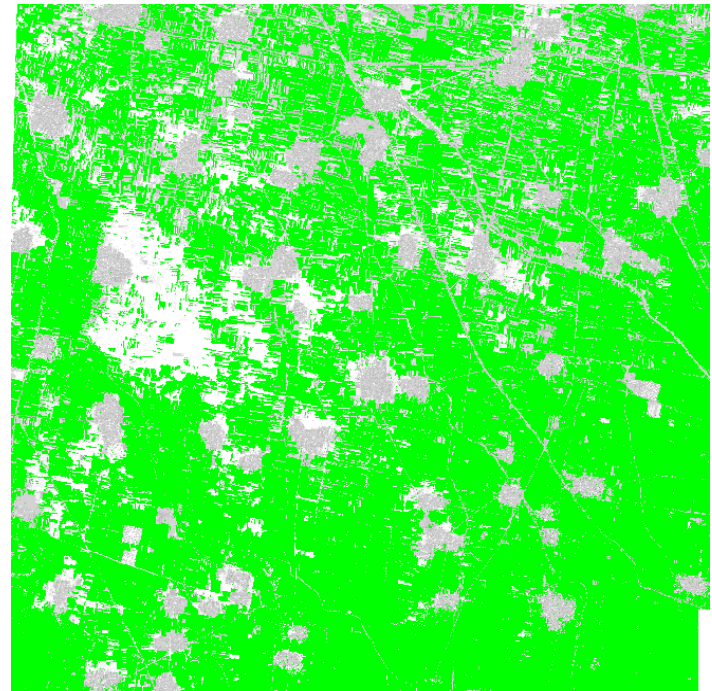
- Cloud extraction using reflectance and temperature
- Vegetation index threshold method to separate cropped and uncropped



Cropland planting proportion estimation— validation



2.5m



4m

Crop area in Taigu (A) and Kaifeng (B)

Cropland planting proportion estimation— validation

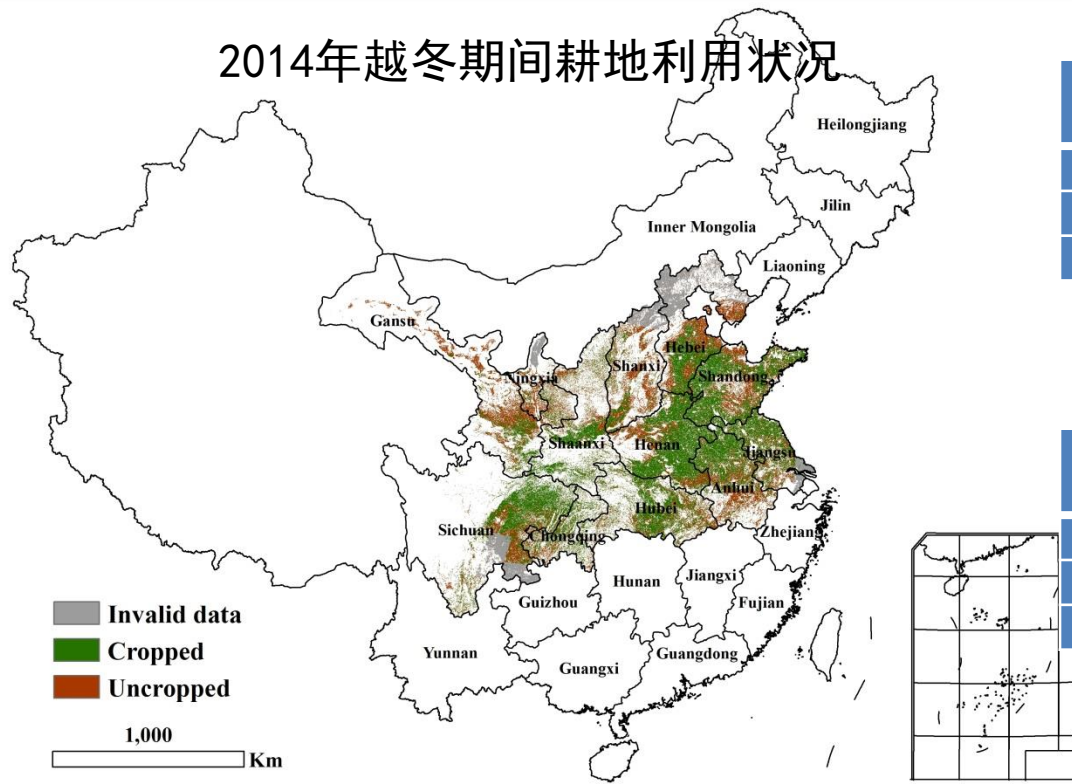
Cropland proportion accuracy assessment for the two test areas

Items	kaifeng	Taigu
Planting area with Landsat TM	101272	25062
Arable land from landuse map (1:100000)	142613	28214
Planting proportion from Landsat TM	0.7101	0.8883
Planting area with IKONOS/Quickbird	122052	23508
Arable land from IKONOS/Quickbird	169880	27067
Planting proportion from IKONOS/Quickbird	0.7185	0.8685
Error	-0.43%	2.28%

Cropland planting proportion estimation— validation

Overall accuracy is 98% using multi-temporal 30m resolution HJ-1 and 16m resolution GF-1 images

2014年越冬期间耕地利用状况



Confusion metrics in 2013

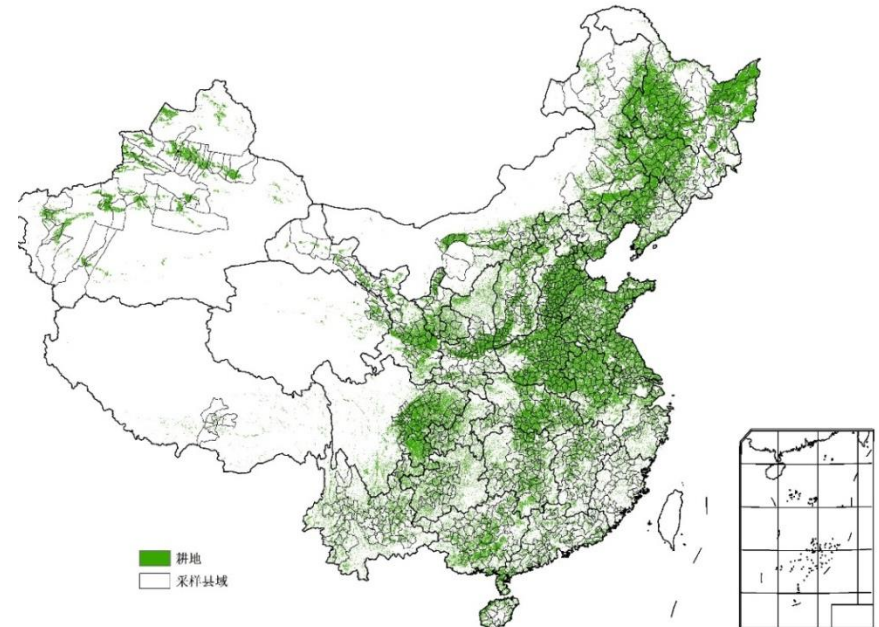
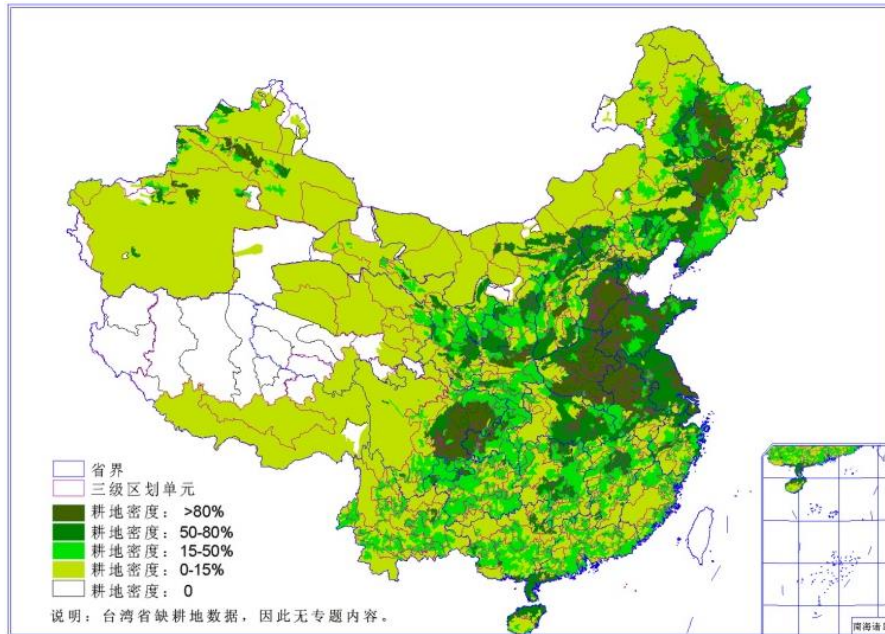
实际类别 (像元个数)	分类类别 (像元个数)		生产者精度
	未种植耕地	作物种植区	
未种植耕地	47638	1341	97.26%
作物种植区	116	17577	99.34%
用户精度	99.76%	92.91%	

Confusion metrics in 2014

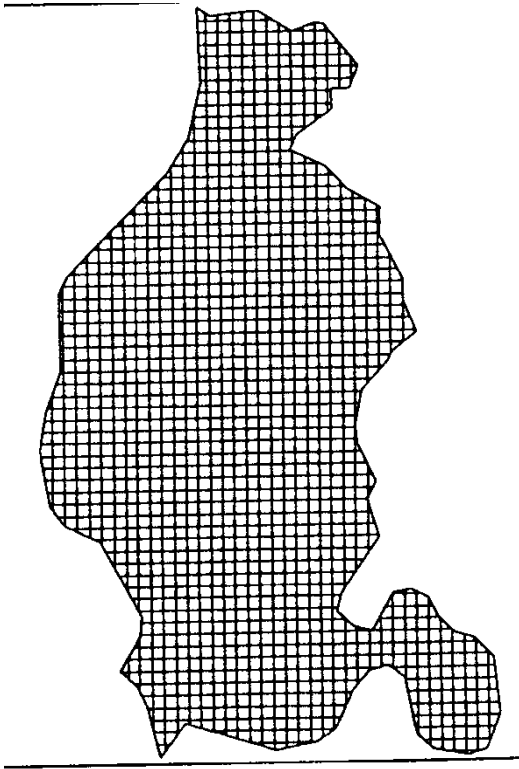
实际类别 (像元个数)	分类类别 (像元个数)		生产者精度
	未种植耕地	作物种植区	
未种植耕地	47832	389	99.19%
作物种植区	73	16067	99.55%
用户精度	99.85%	97.64%	

Stratification

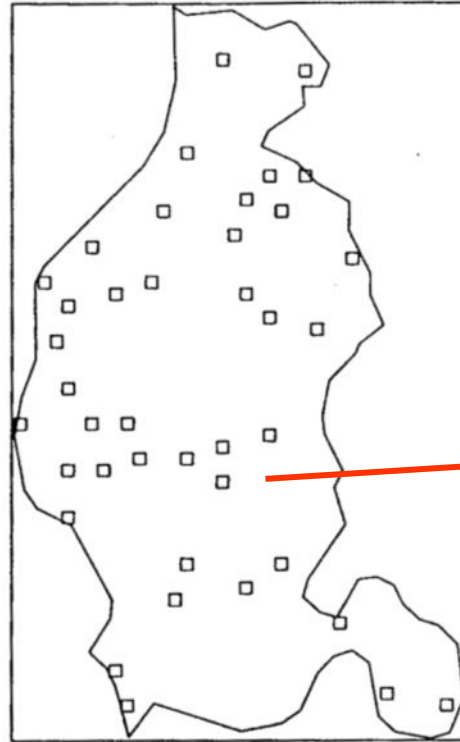
- First : climate zoning (11 areas)
- Second: Planting Structure (44 regions)
- Third: Farming density(102 polygons)
- Field survey will cover 1304 major agricultural counties



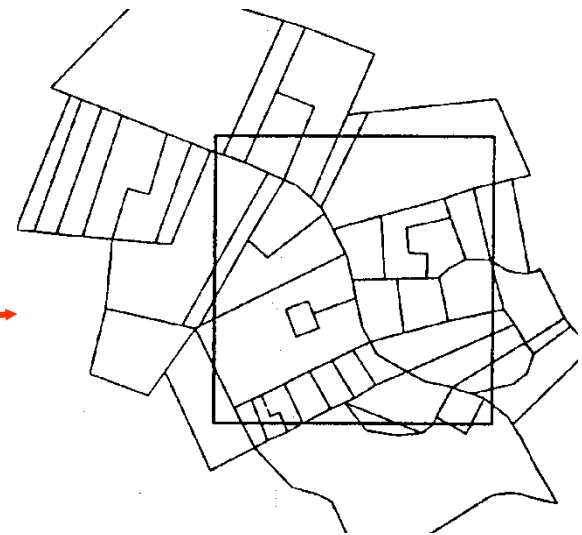
Transect sampling frame



grid

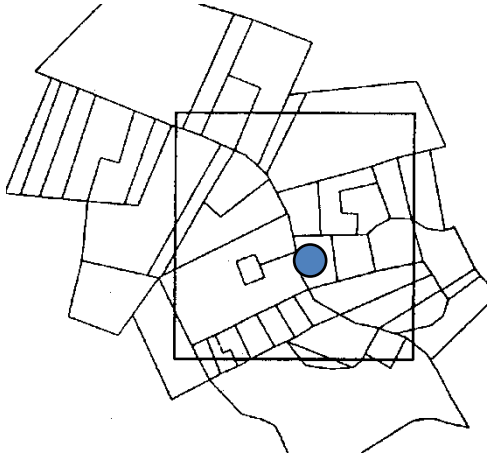


random sampling

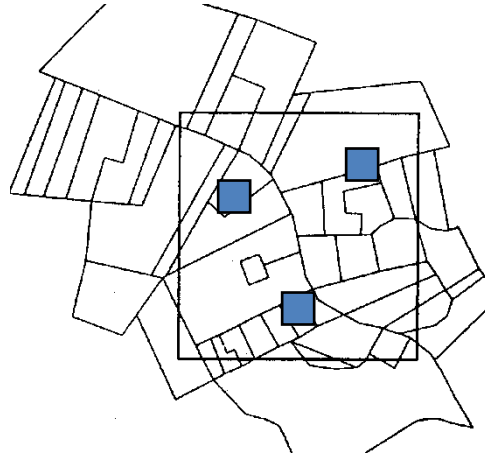


Sampling square

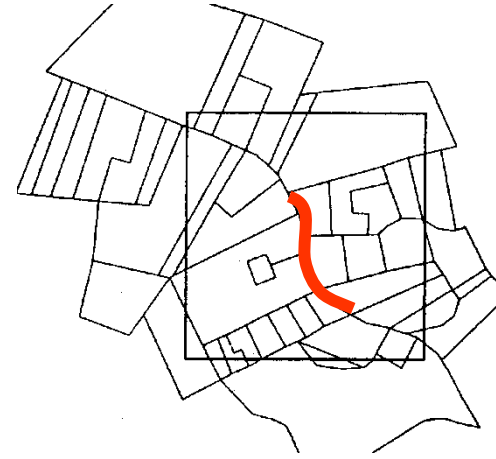
Transect sampling frame



plot (America)



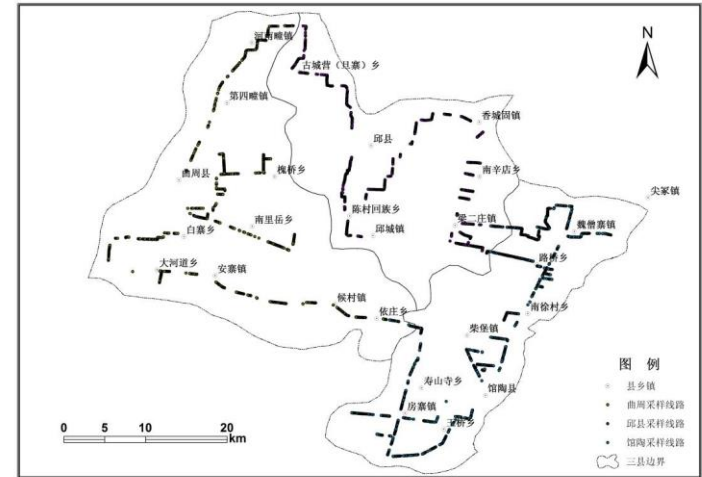
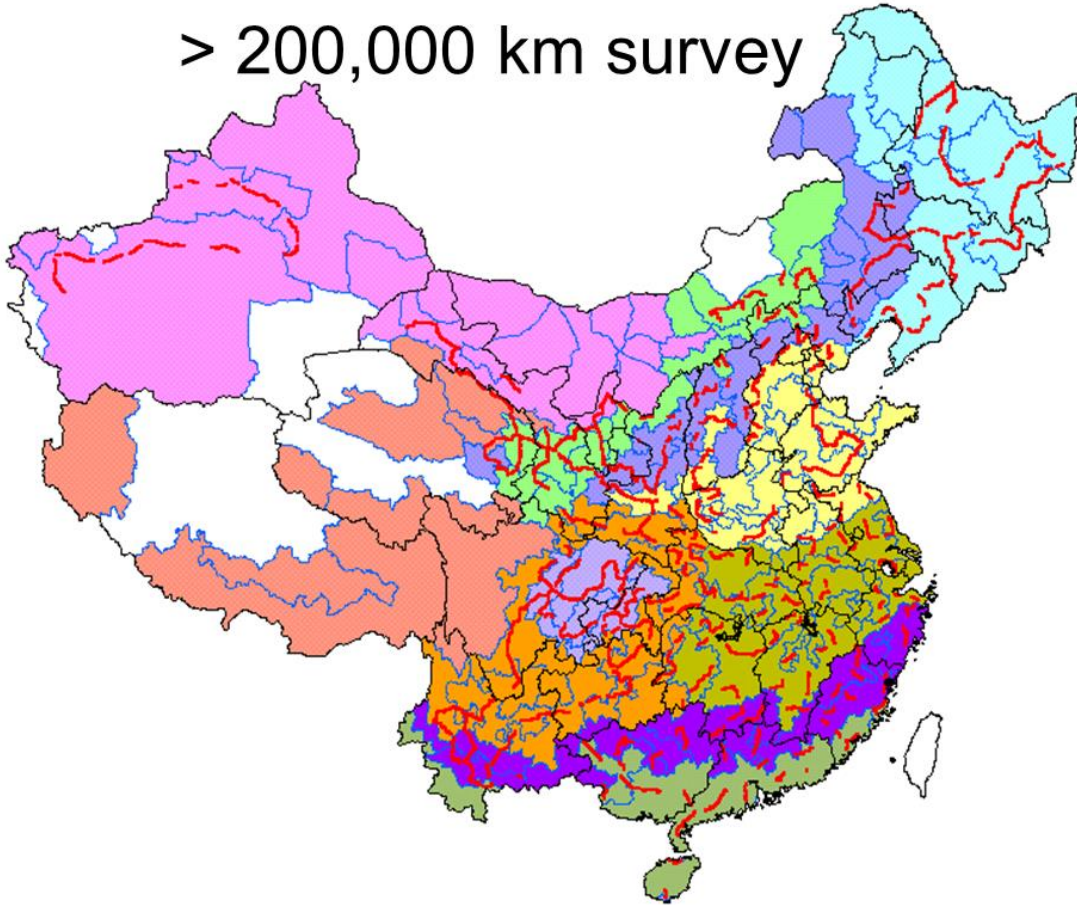
spot (Europe)



line (China)

Sampling line in China

> 200,000 km survey

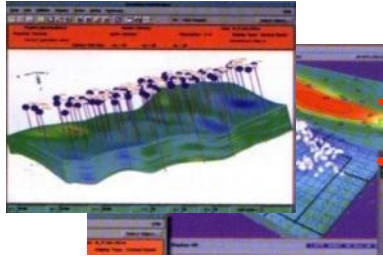


>100km survey in small, homogeneous counties



>100km survey in large or heterogeneous counties

GVG field sampling system



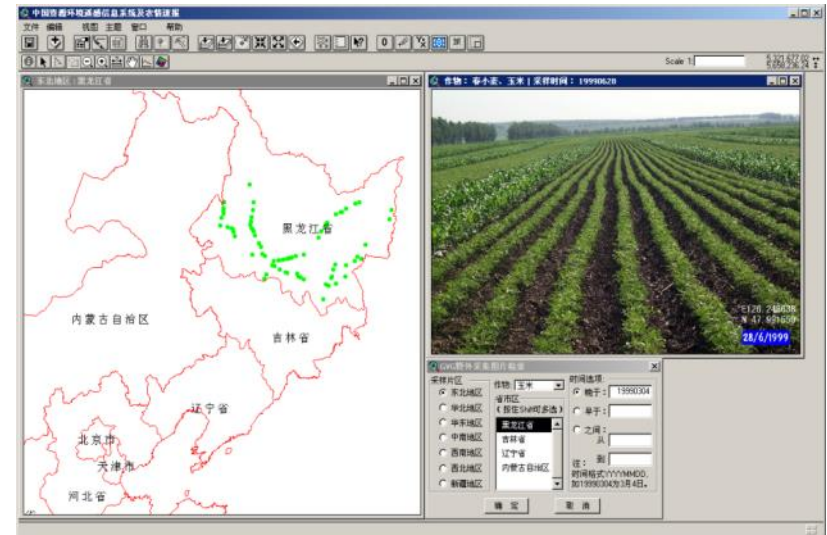
GIS



GPS



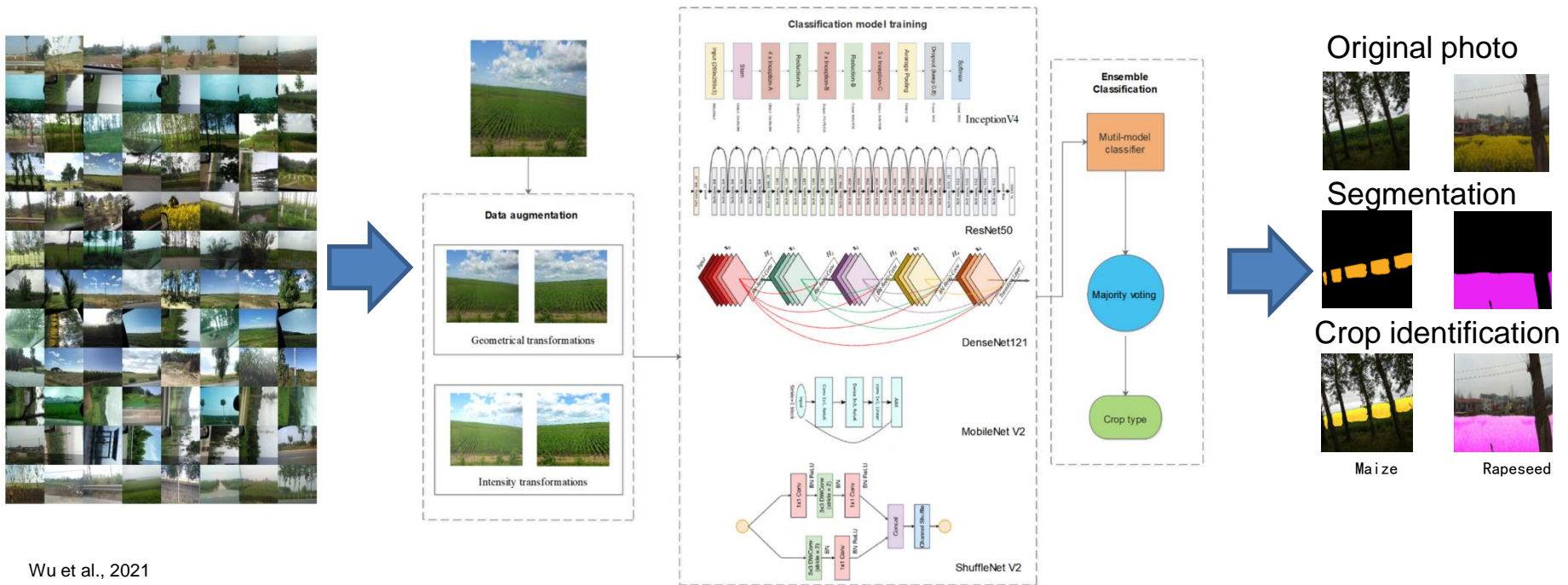
VIDEO



For acquiring the real-time
crop types proportion

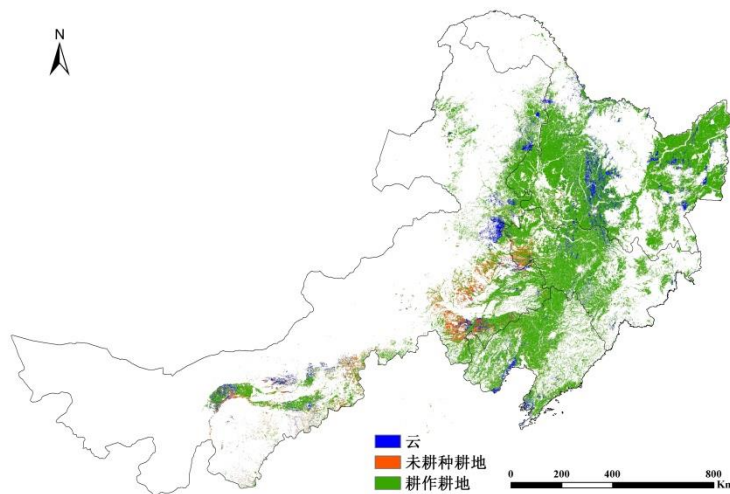
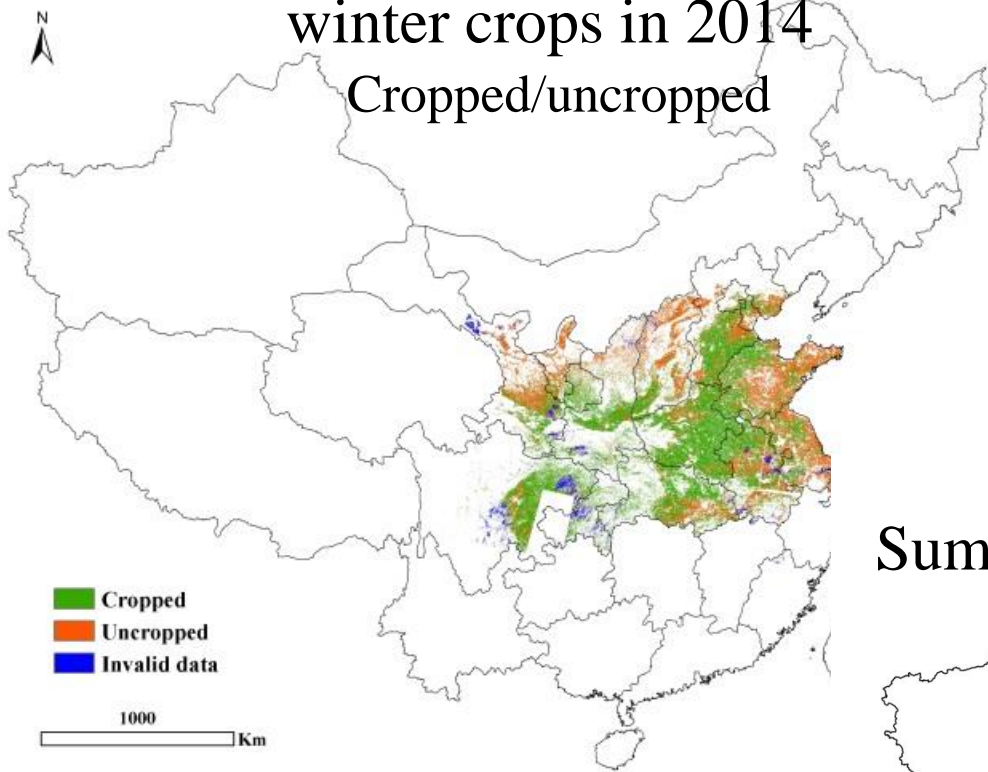
Artificial intelligence to automatic processing of in situ photos

- Fully automated objects identification from massive photos by integration of multiple deep learning networks
- Currently major crops such as wheat, soybean, rice, maize, rapeseed could be precisely identified

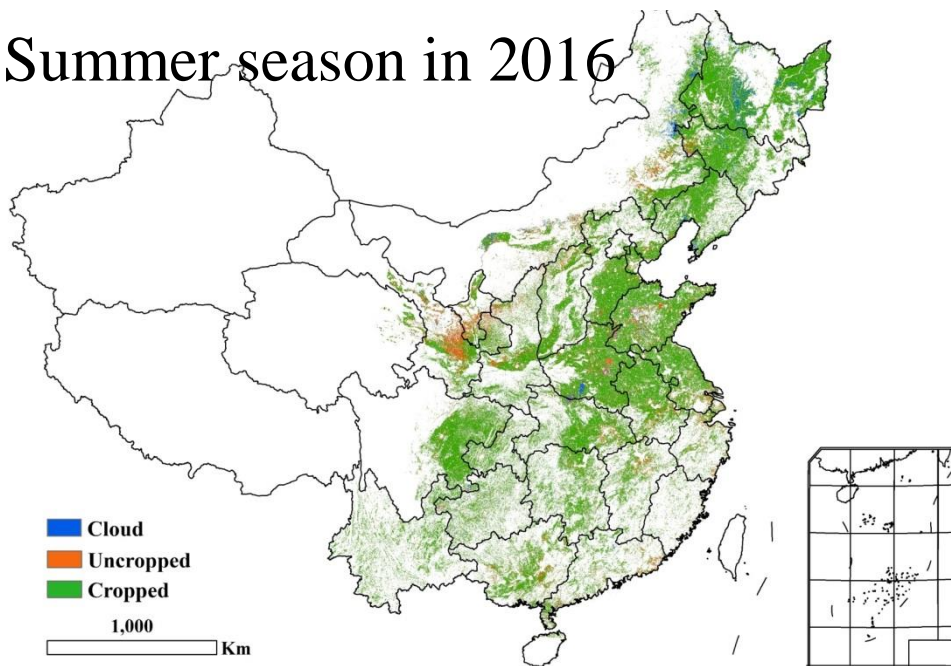


Cropped and uncropped map

winter crops in 2014
Cropped/uncropped



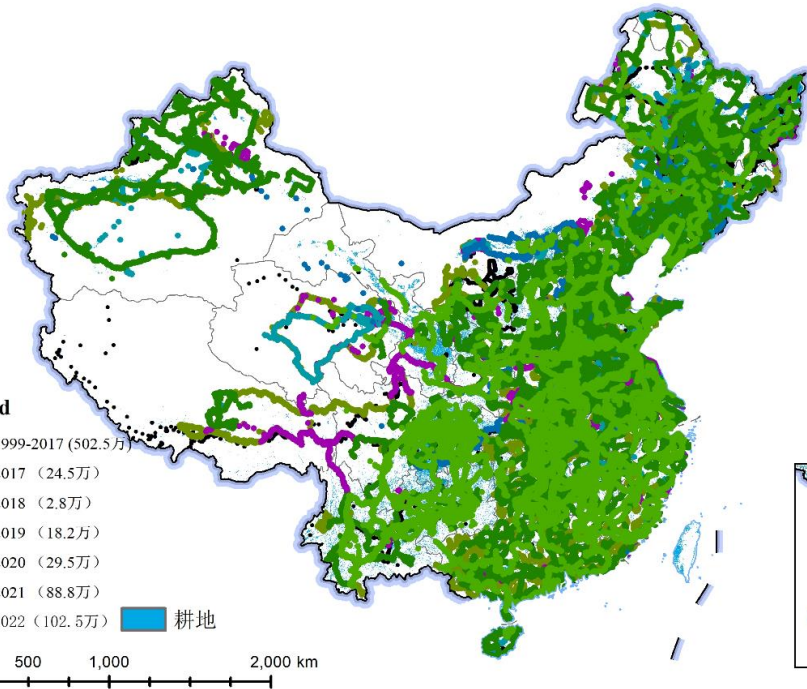
Summer season in 2016



Crop type proportion sampling

China: Millions of samples collected every year

Global application: More than 20 countries already adopted the tools and sampling



UNCTAD Innovation @UNCT... · 20h ·
#Kenya completed the first field study on crop growth monitoring and yield prediction, under the #UNCTAD-#China Academy of Science #CropWatch Innovative Cooperation Programme. unctad.org/project/cropwa...

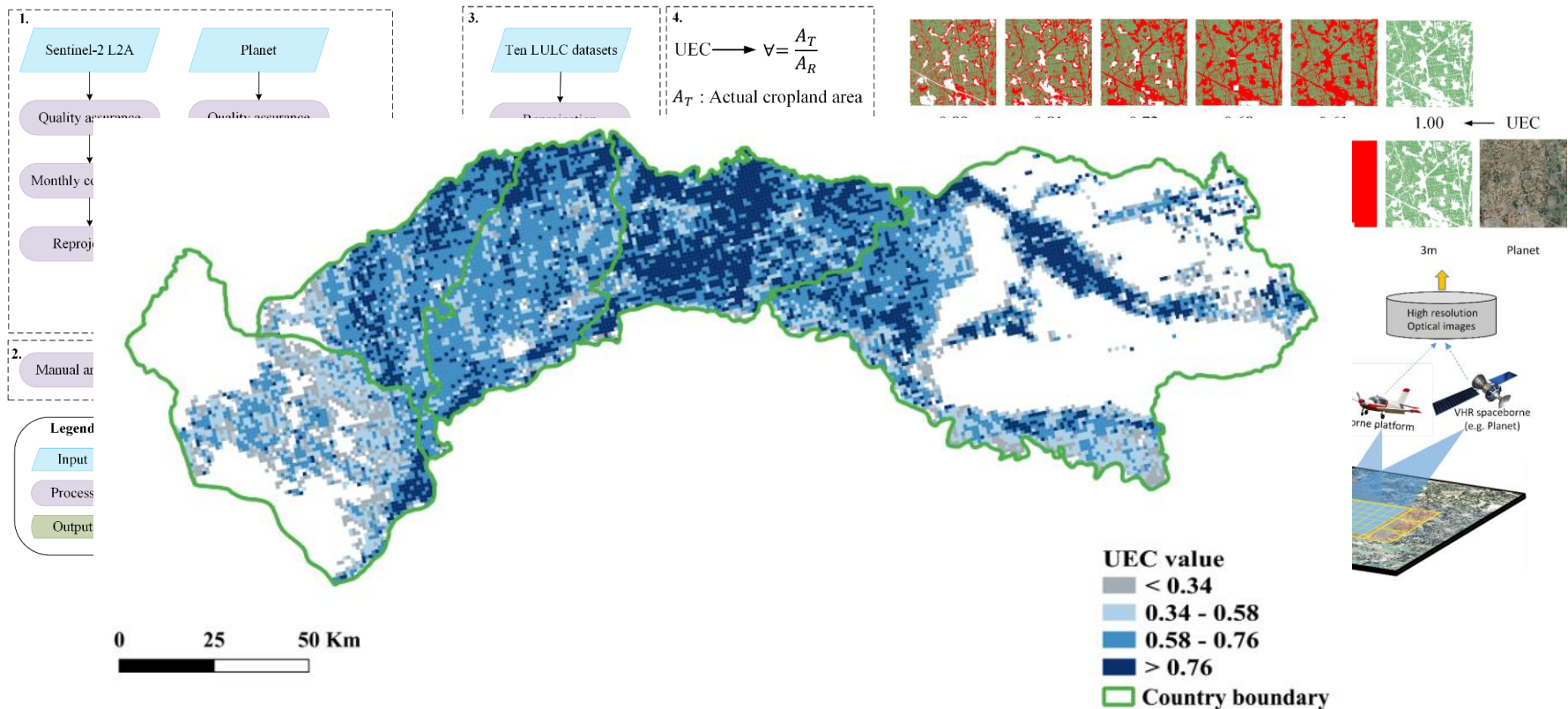


1 38

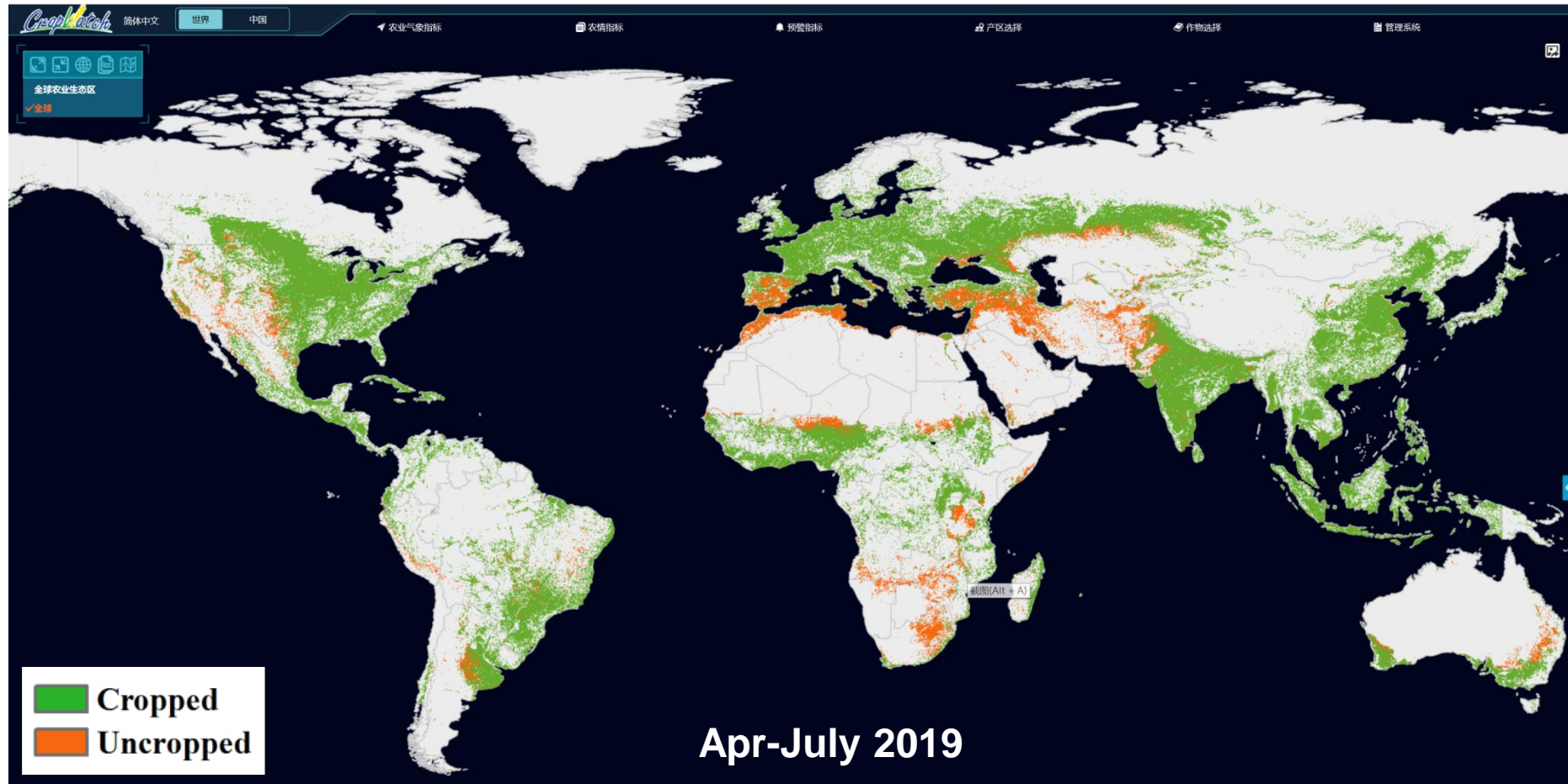
全球推广应用

Unbiased estimating coefficient for existing cropland datasets

Due to both scaling effect and classification errors, we propose a method for accurately estimating cropland area using the unbiased estimating coefficient (UEC) from existing cropland datasets



Global cropped and uncropped land map



Practice 1: produce CALF map in
CropWatch system

Step 1



May 2024 CropWatch Bulletin

May 2024 CropWatch Bulletin is based mainly on current remote sensing inputs in addition to detailed and spatially accurate reference data about crops and their management. Focusing on the months of January to April 2024, chapters cover global, national, and regional level agroclimatic conditions and the condition of crops that were growing during this time. For China, the bulletin presents crop conditions for each of seven key agro-ecological zones. The focus section reports on the global crop production index, the estimate by CropWatch for maize, rice, wheat and soybeans production in 2024, recent conflicts and disaster events with an impact on agriculture, the possibility of an El Niño conditions event and the impact of drought on world food supply.

[Bulletin →](#)

CROPWATCH SUBSYSTEM



CropWatch Pro

[Click To Enter →](#)



CropWatch Explorer

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CropWatch Analysis

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CropWatch Bulletin

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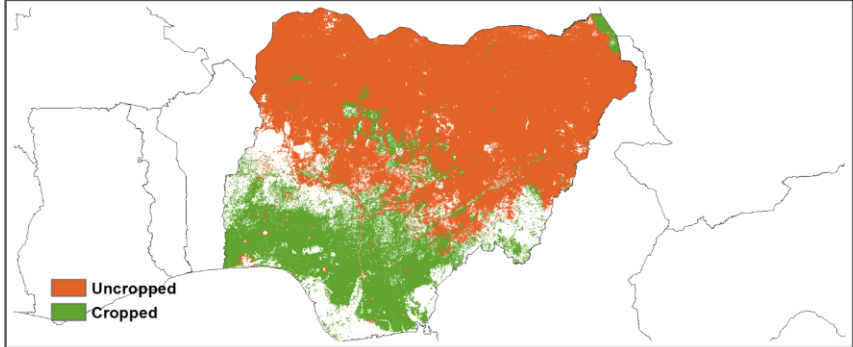
Step 3

CropWatch ☰ 🔔 1 **CropWatch for Tian Fuyou** 🇺🇸

Produce Thematic Map

Settings

Types of map to be produced	Raster
Type	Cropped arable land classific
Region Type	Countries
Region Name	Nigeria
Sub Regions of Key Countries	Whole country
Year	2024
Bulletin	2



Uncropped
Cropped

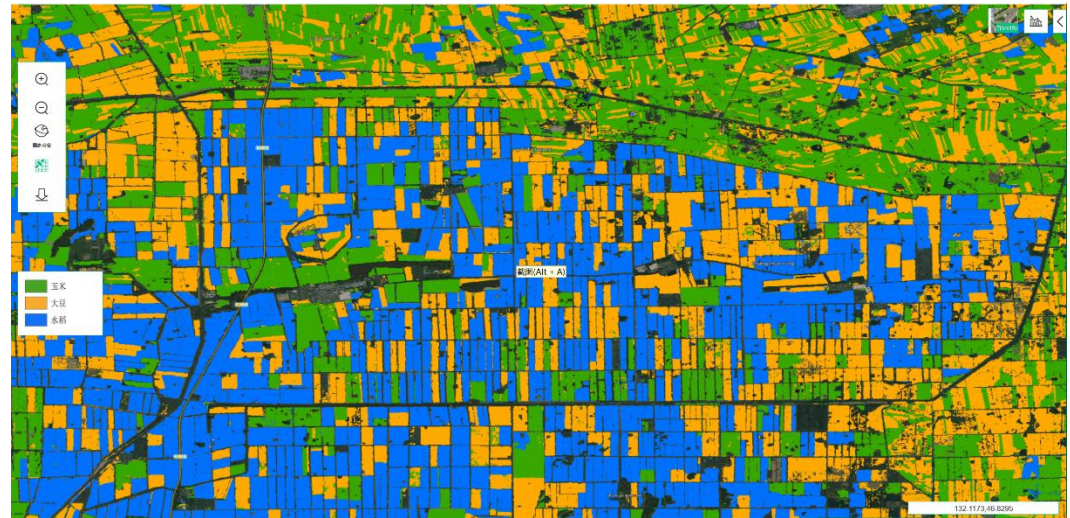
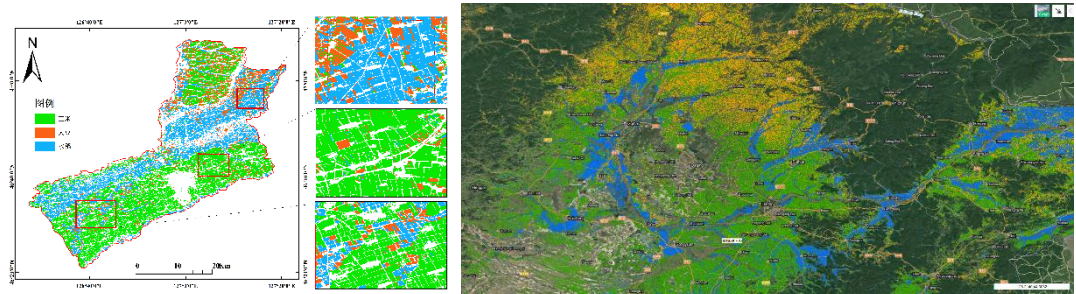
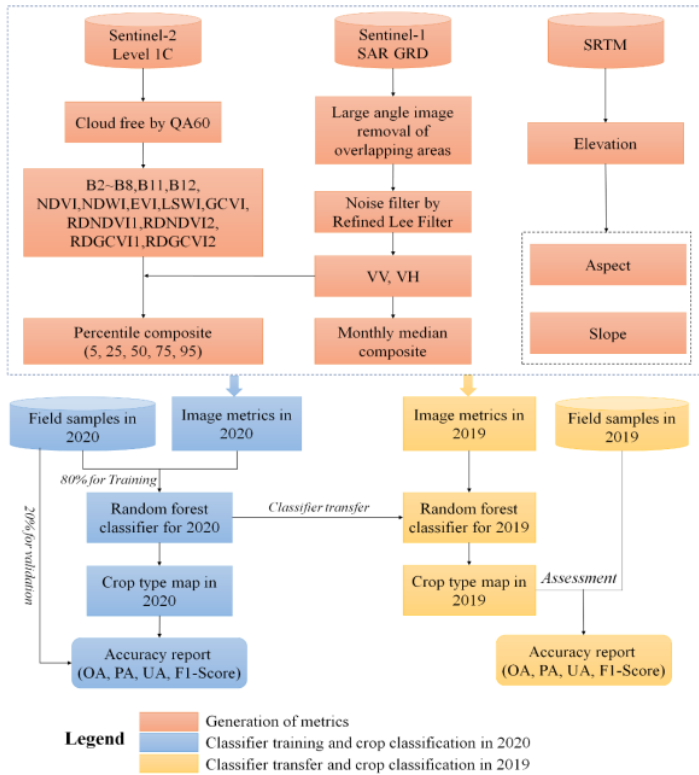
[Run](#) [Reset](#)

[Details](#)

Server Status (Details)
CPU Usage **0%**
Memory Usage **0%**

- Data Preparation
- Agro-climatic Index
- Agronomic Indicators
- Warning Indicators
- Crop Condition Monitoring
- Zonal Statistics
- Thematic Map**
- Task Center
- System Management

High resolution crop type Mapping services



Practice 2: Crop type mapping in CropWatch system



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CROPWATCH SUBSYSTEM



CropWatch Pro

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CropWatch Bulletin

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High resolution components

➤ Cropping intensity ➤ Rice mapping ➤ Crop classification

CropWatch

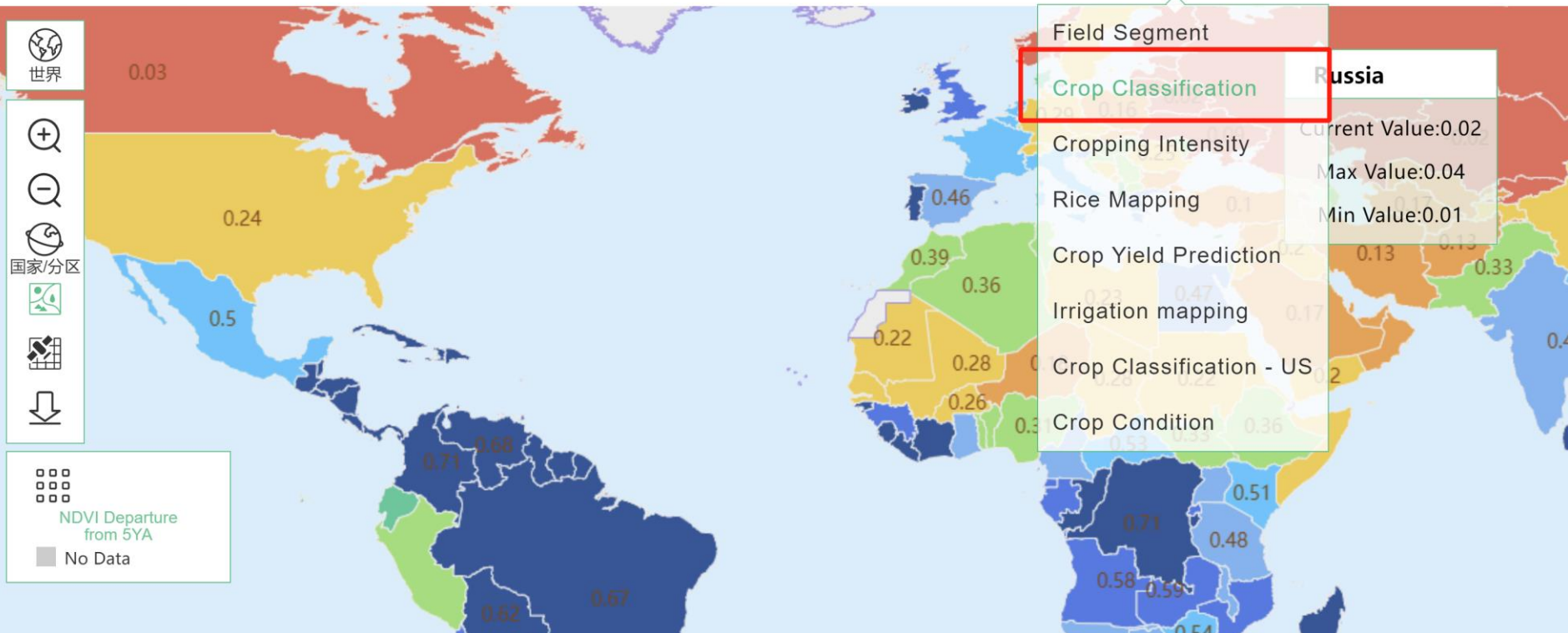
Agro-climatic Indicators

Agronomic Indicators

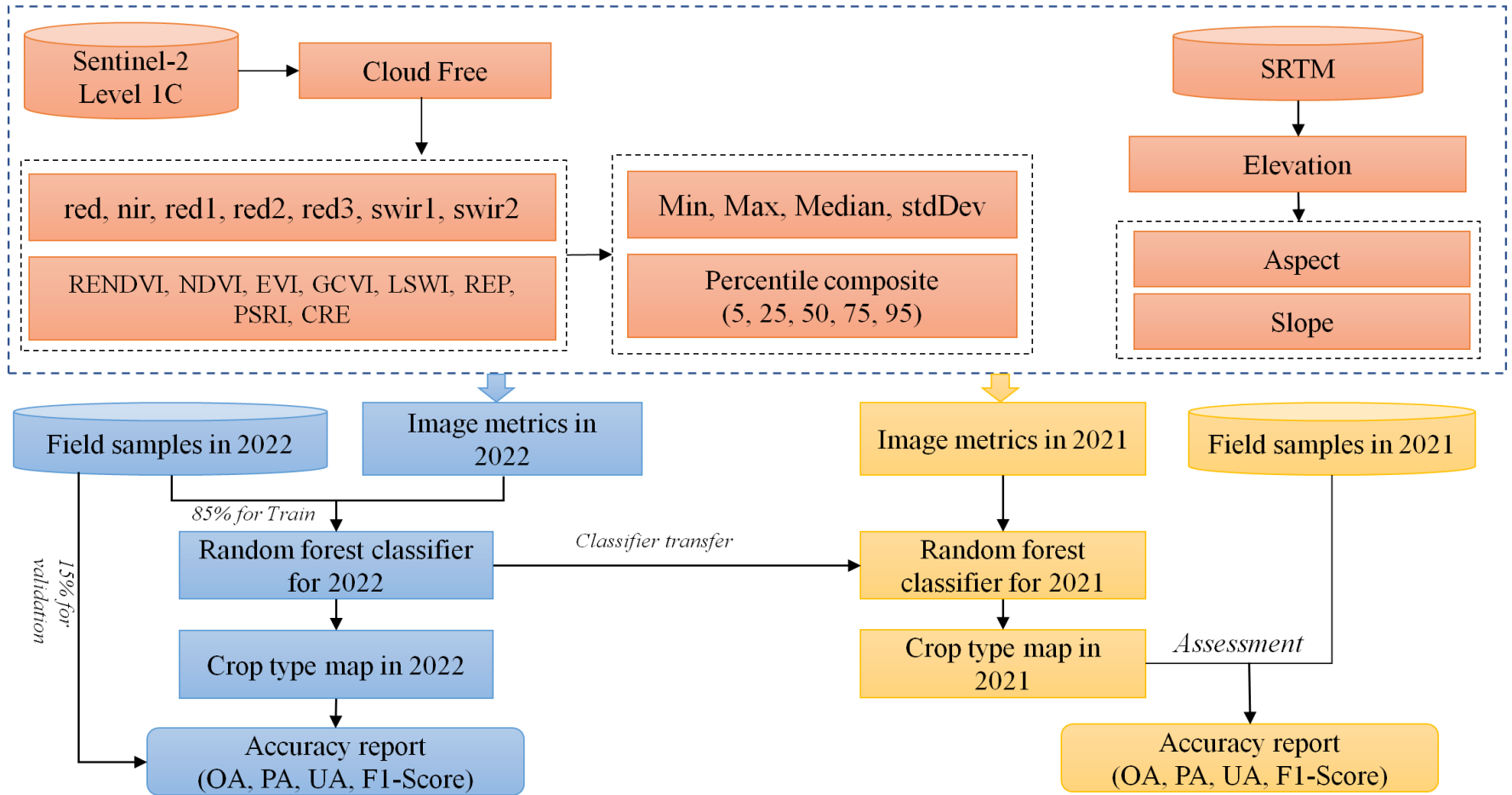
Production Early Warning

High-Resolution Modules

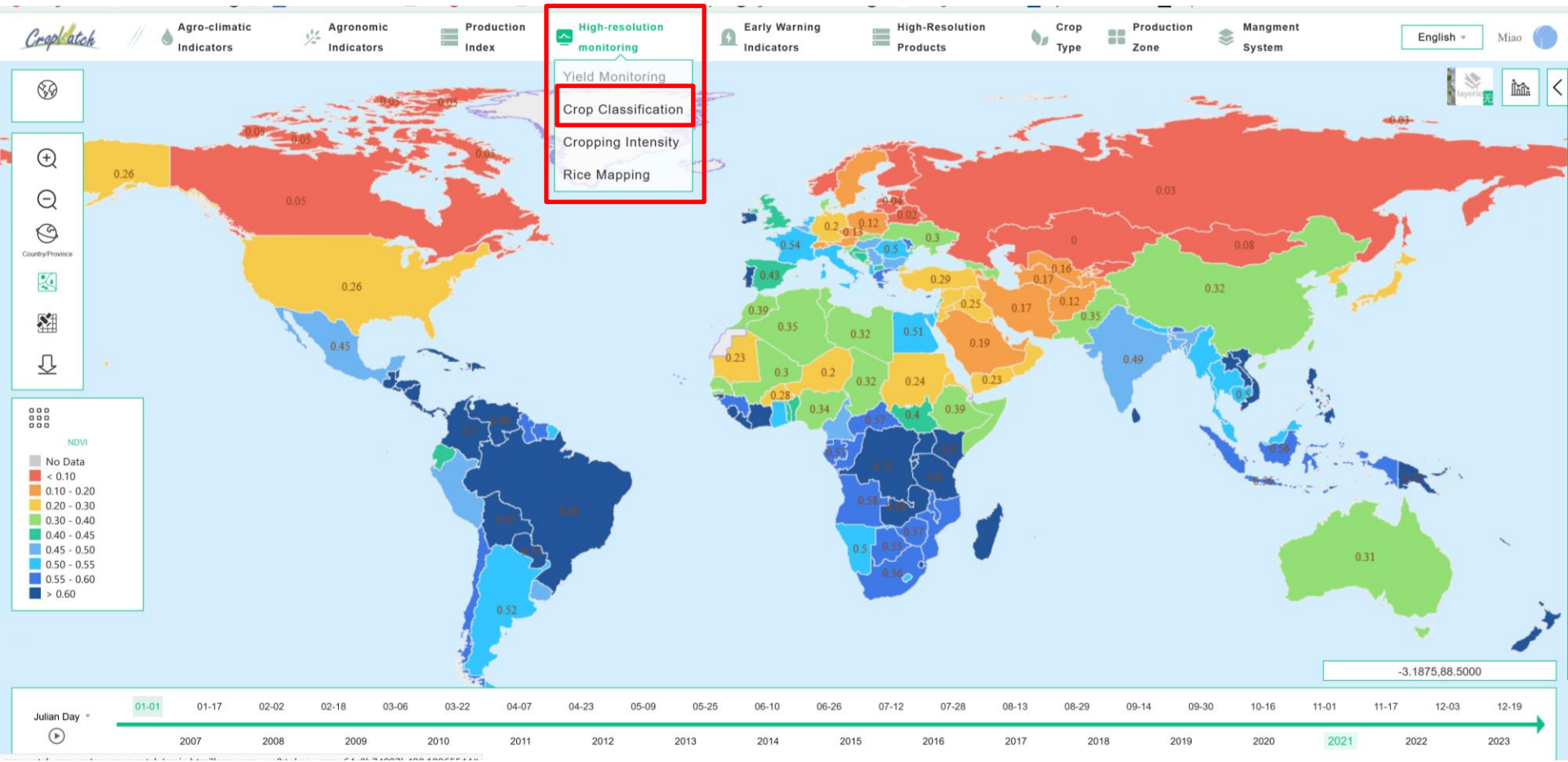
High-Resolution Products



2. Crop type classification



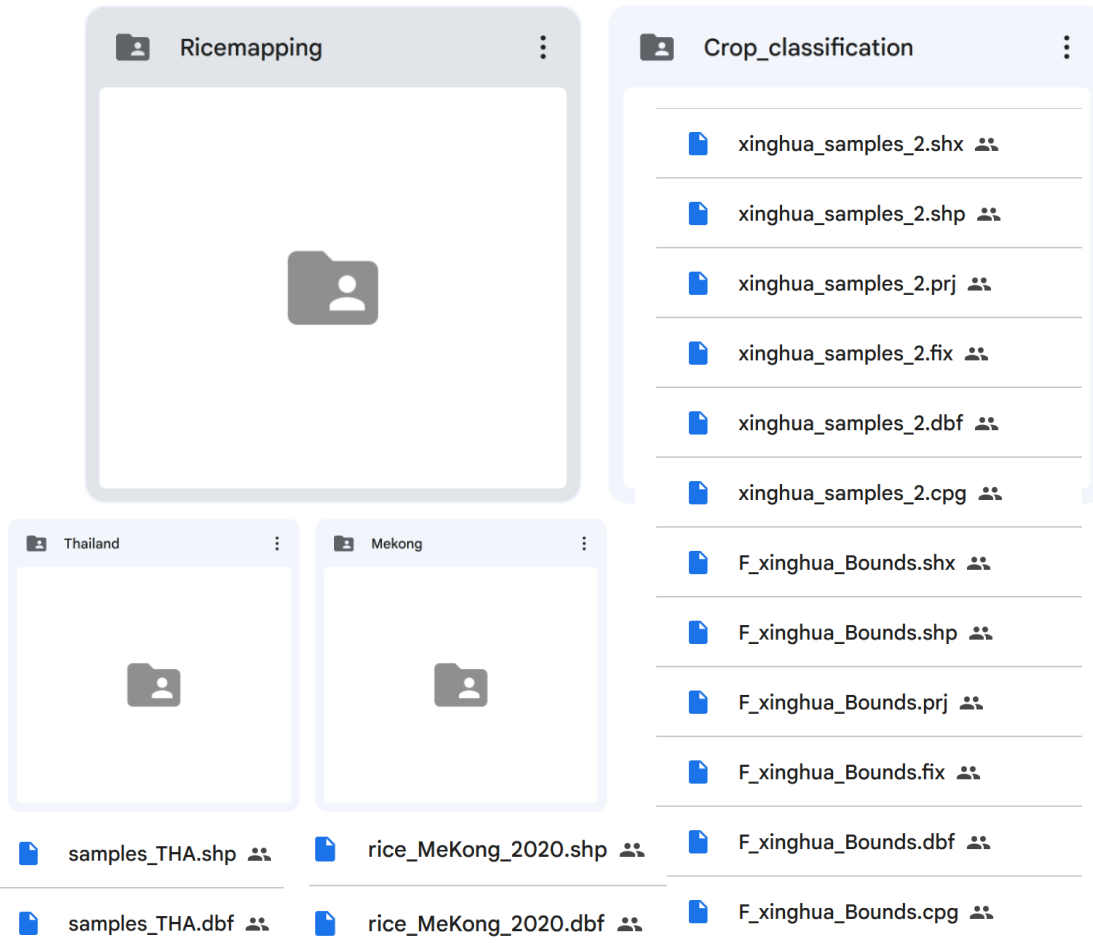
Practice: Crop type mapping



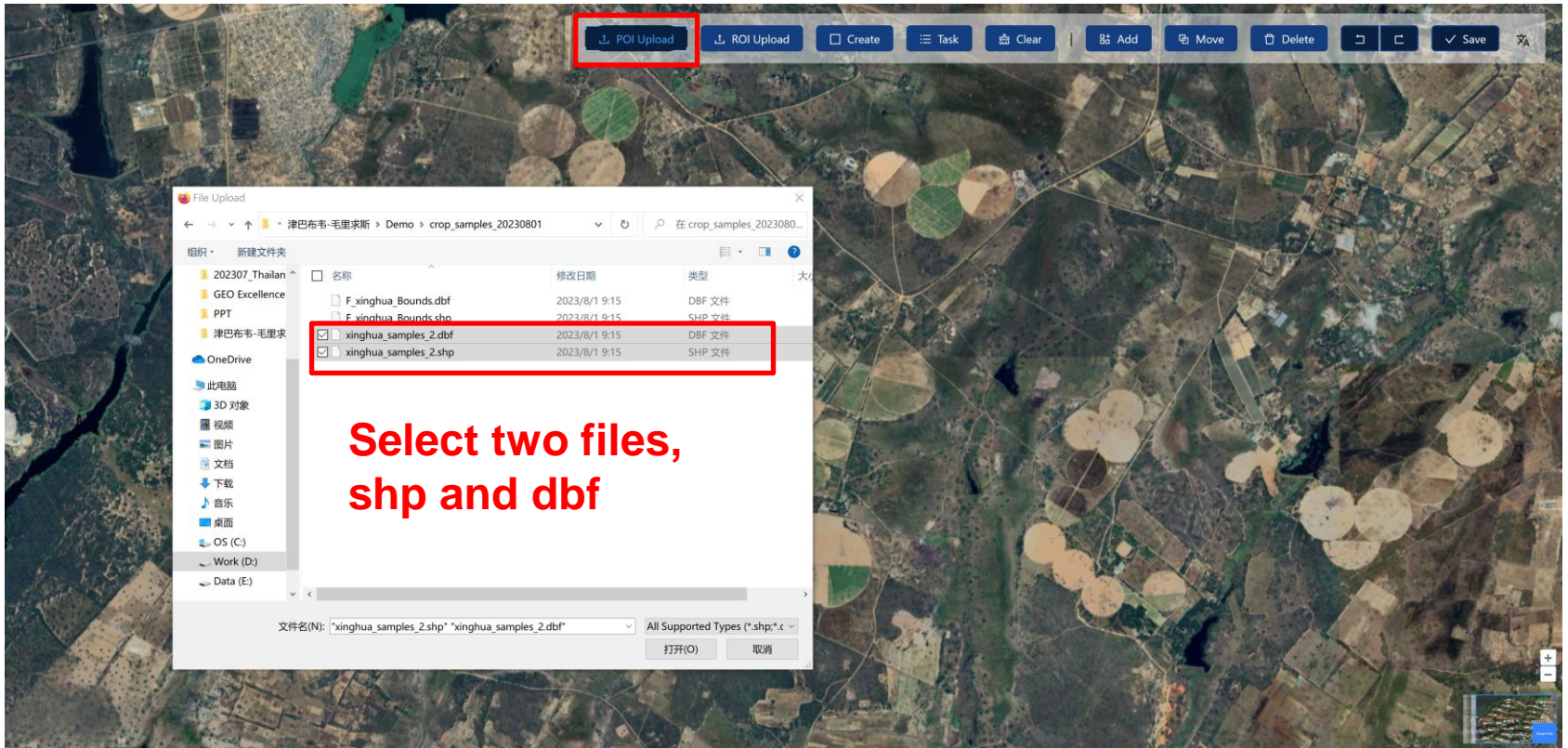
ci.cropwatch.com.cn:5000/crop

Demo data to use the components

<https://drive.google.com/drive/u/1/folders/1HYy5IFWqibpSwjX0U2KI663jZJ1eoCs0>



Data preparation and upload



Define the area of interests

The screenshot displays a web application interface for defining areas of interest. The main view is a satellite map with a blue polygon and yellow markers. A toolbar at the top includes buttons for 'POI Upload', 'ROI Upload', 'Create', 'Task', 'Clear', 'Add', 'Move', 'Delete', and 'Save'. A 'File Upload' dialog box is open, showing a file named 'F_xinghua_Bounds.shp' selected. A 'Background Layers' panel at the bottom right shows 'Tian Ditu Map', 'Tian Ditu Image', 'Google Map', and 'Marker' options.

Option 1

Background Layers

Google Images

Define the area of interests



Submit crop type classification tasks

Task Creation ×

* Name:

* Date: →

Monitoring period

* Field:

Attribution in the samples

* Scale:

* Cropland Mask:

* Machine Learning Algorithm:

Machine Learning method

* Earth Observation Data:

Data Source

Optical Indices: NDVI EVI LSWI GCVI

Features

SAR Indices: VV + VH

Features

Terrain Indices: Elevation Slope

Features

Submit

Cancel

Classification and results

Left click to add a vertex of the polygon, double click to complete the drawing

Task List

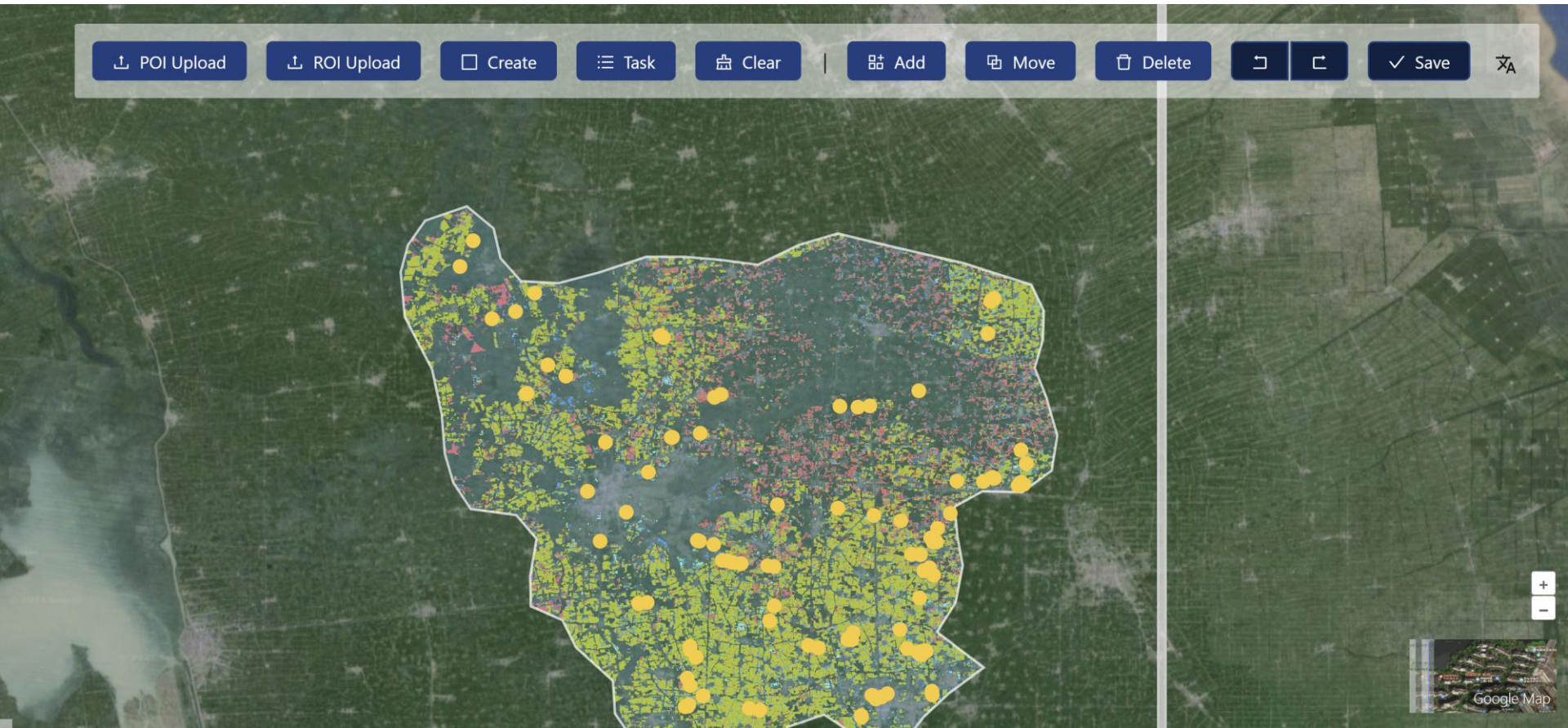
Filename: Created Time:

ID	Filename	Start Date	End Date	Created Time	Status	Operation
3	crop_test_yourname	2021-02-01	2021-05-31	2023-08-02 01:43:48	Running	
2	crop_test	2021-02-01	2021-05-31	2023-08-01 20:51:13	Success	<input type="button" value="Preview"/> <input type="button" value="Download"/>
1	crop_test	2021-02-01	2021-05-31	2023-08-01 19:38:40	Success	<input type="button" value="Preview"/> <input type="button" value="Download"/>

1-3 of 3 items

Preview or download the geotiff file

Preview the results





Thank you for your attention!

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zenghw@aircas.ac.cn