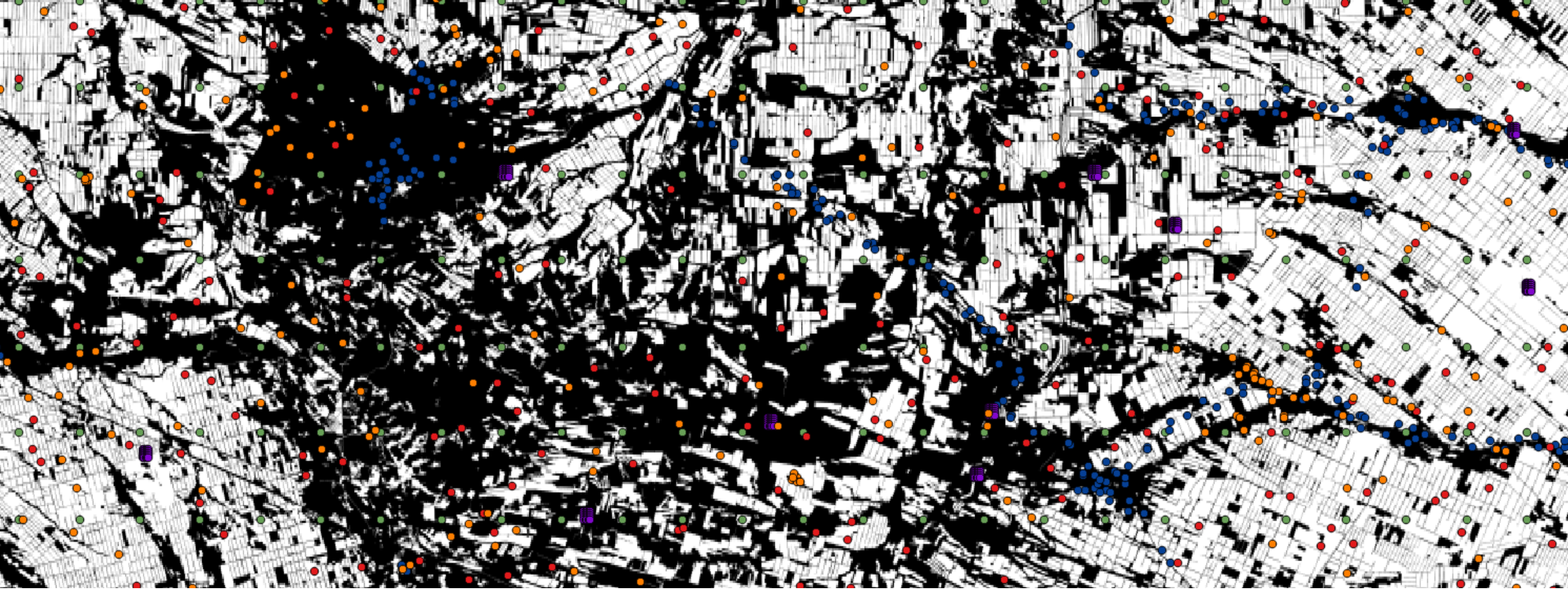


ON THE EFFECT OF SAMPLING SCHEMES ON CROPLAND CLASSIFICATION ACCURACY

F. Waldner et al.

October 11th 2016, Kiev

JECAM
Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON EARTH OBSERVATIONS

SIGMA

UCL Université catholique de Louvain

A FIRST SUCCESSFUL EXPERIMENT

The site-effect is stronger than the method-effect

→ Need for site-specific methods

INTERNATIONAL JOURNAL OF REMOTE SENSING, 2016
VOL. 37, NO. 14, 3196–3231
http://dx.doi.org/10.1080/01431161.2016.1194545

Taylor & Francis
Taylor & Francis Group

OPEN ACCESS

Towards a set of agrosystem-specific cropland mapping methods to address the global cropland diversity

François Waldner [a], Diego De Abelleyra [b], Santiago R. Verón [b,c], Miao Zhang [d], Bingfang Wu [d], Dmitry Plotnikov [e], Sergey Bartalev [e], Mykola Lavreniuk [f], Sergii Skakun [f,g], Nataliia Kussul [f], Guerric Le Maire [h,i], Stéphane Dupuy [j], Ian Jarvis [k] and Pierre Defourny [a]

[a]Earth and Life Institute - Environment, Croix du Sud, Université catholique de Louvain, Louvain-la-Neuve, Belgium; [b]Instituto de Clima y Agua, Instituto Nacional de Tecnología Agropecuaria (INTA), Hurlingham, Argentina; [c]Departamento de Métodos Cuantitativos y Sistemas de Información, Facultad de Agronomía, Universidad de Buenos Aires and CONICET, Buenos Aires, Argentina; [d]Institute of Remote Sensing and Digital Earth, Chinese Academy of Science, Beijing, China; [e]Terrestrial Ecosystems Monitoring Laboratory, Space Research Institute of Russian Academy of Sciences (IKI), Moscow, Russia; [f]Department of Space Information Technologies, Space Research Institute NAS and SSA (SRI), Kyiv, Ukraine; [g]Department of Geographical Sciences, University of Maryland, College Park, MD, USA; [h]UMR Eco&Sols, CIRAD, Montpellier, France; [i]EMBRAPA Meio Ambiante, Jaguariuna, SP, Brazil; [j]TETIS, CIRAD, Montpellier, France; [k]Agri-Climate, Geomatics and Earth Observation, Science and Technology Branch, Agriculture and Agri-Food Canada, Ottawa, Canada

UCL
Université catholique de Louvain

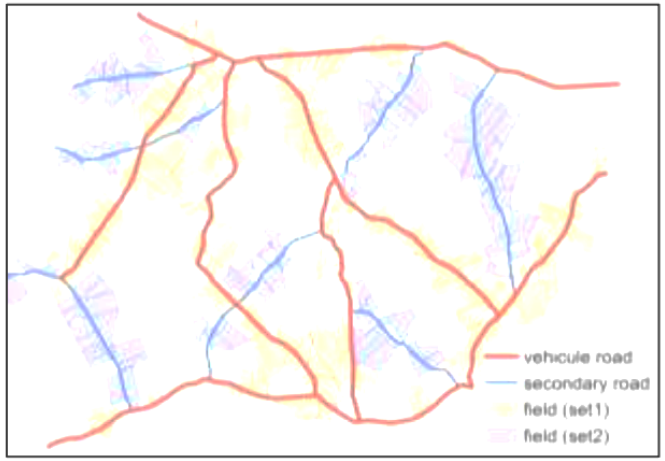
A SECOND EXPERIMENT TO SUPPORT THE GUIDELINES FOR IN SITU DATA COLLECTION

"The overarching goal of JECAM is to reach a convergence of approaches, ***develop monitoring and reporting protocols and best practices for a variety of global agricultural systems.*** *JECAM will enable the global agricultural monitoring community to compare results based on disparate sources of data, using various methods, over a variety of global cropping systems."*

JECAM
Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON EARTH OBSERVATIONS

instance, from Bing or Google maps) and the direction of operator movement. Based on ground inspection, the operator adds points (or polygons) to the map by clicking on the screen and defining the corresponding crop types. Several applications have been tested and are described in a separate JECAM document (In-Situ Field Tools).



Collecting crop type points only partly supports cropland validation. It is also important to add a significant set of "non-cropland" points (i.e. other ***land cover*** classes) to complement the validation data set obtained through field observation.

From the JECAM Guidelines for cropland and crop type definition and field data collection

UCL Université catholique de Louvain

THE EFFECT OF THE SAMPLING DESIGN

The overarching objective is to assess the ability of sampling schemes to deliver:

1. Accurate **cropland maps**;

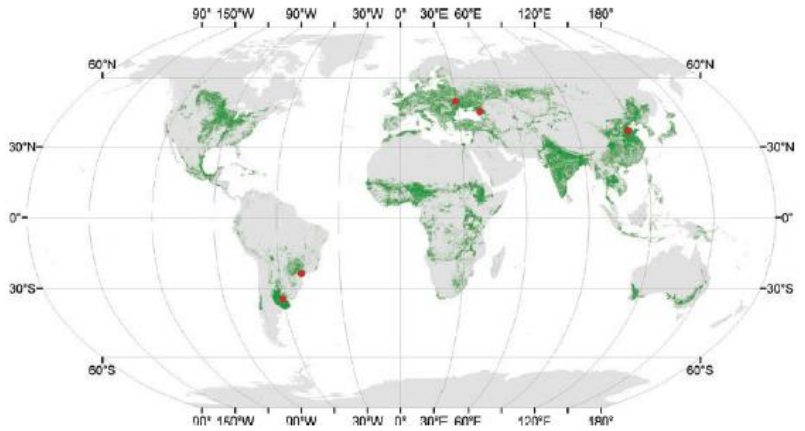
2. Reliable **accuracy indicators**.

Assessment over multiple sites with large field size (open to anyone interested)

Natural vegetation gradients; spatial variations in management practices; soils; other land cover classes.

→ Argentina, Brazil, China, Ukraine, Russia

→ 200x200km²



UCL
Université
catholique
de Louvain

TWO MAIN OBJECTIVES

Two effects to jointly investigate:

1. the sampling design
2. the number of samples

} Several repetitions

CALIBRATION

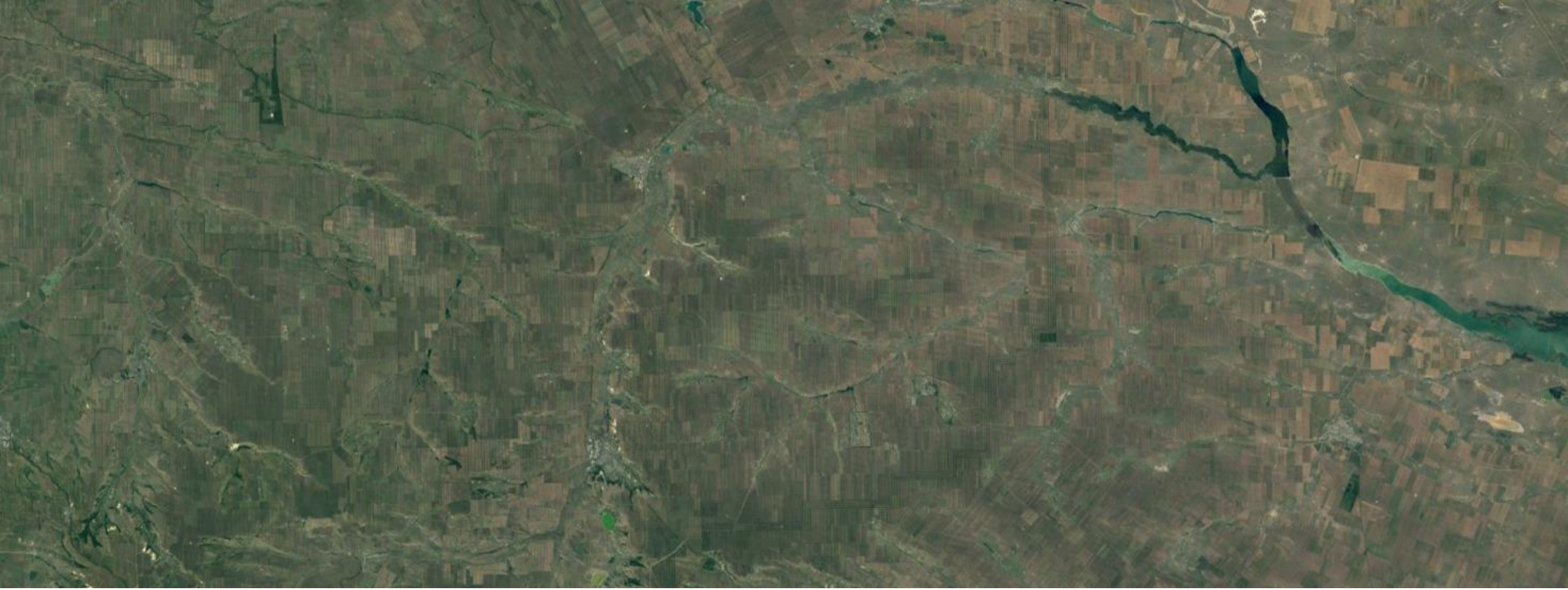
Accuracy assessment of the cropland maps

Assessment of thematic certainty resulting from the classification

VALIDATION

Introduce misclassification on purpose and assess the ability of a sampling scheme to give a reliable accuracy estimate

UCL Université catholique de Louvain

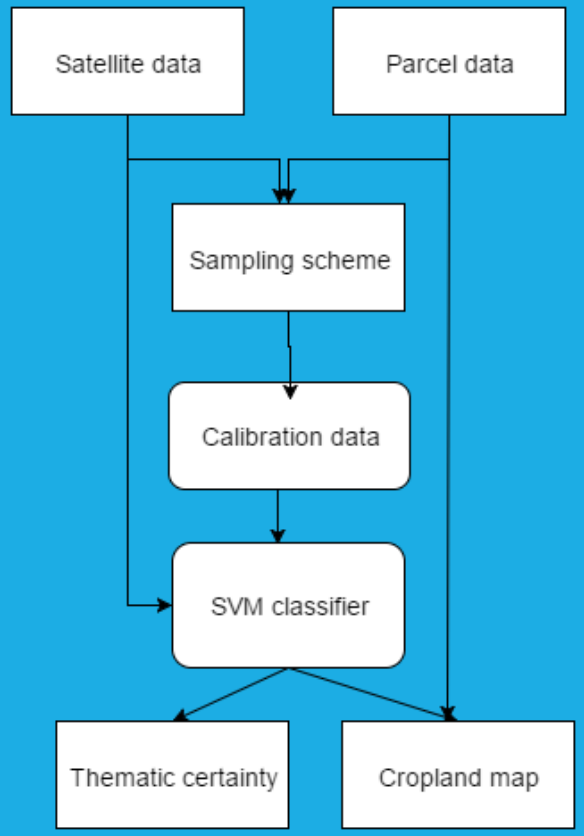


CASE STUDY IN RUSSIA BASED ON A PRELIMINARY PROTOCOL

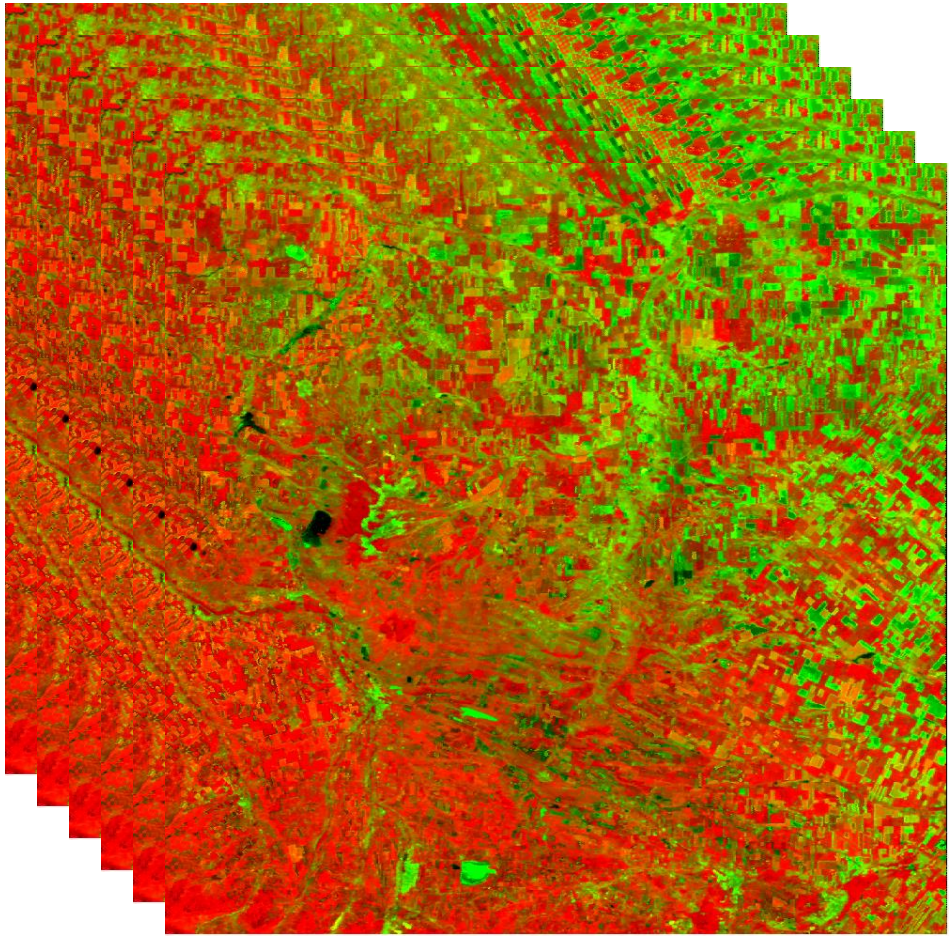
October 11th 2016, Kiev

UCL
Université
catholique
de Louvain

METHODOLOGY



Satellite data: annual MODIS time-series



UCL Université catholique de Louvain

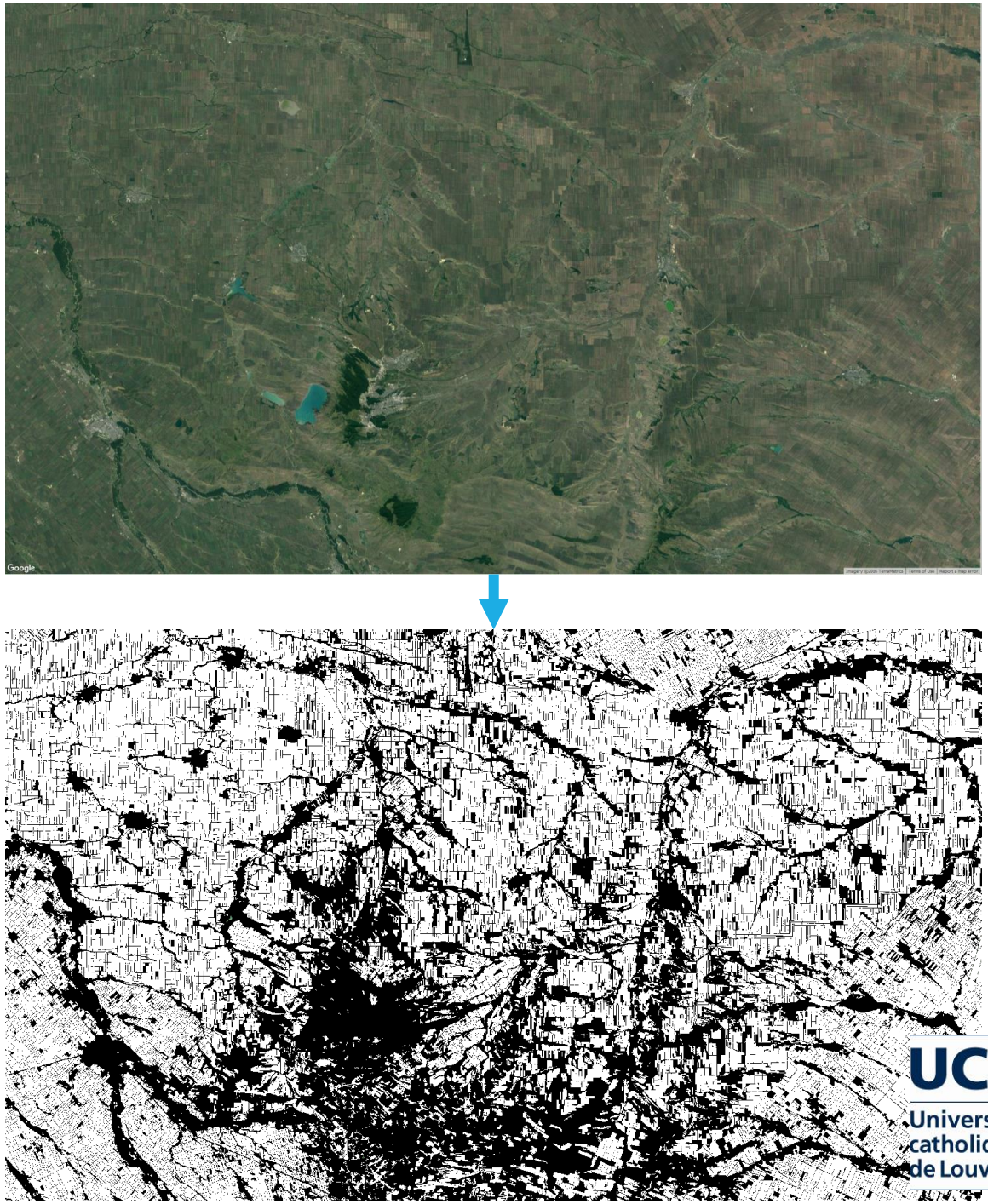
SETTING UP THE SANDBOX

1. Download the available and cloud-free Sentinel-2 data (red, nir)

2. Segmentation of the imagery and interactive supervised classification to extract the fields.

3. Manual correction by the field partners

3. Resampling to the spatial resolution of interest (in this case MODIS).



DIFFERENT SAMPLING STRATEGIES

Systematic;

Random;

Area frame-like;

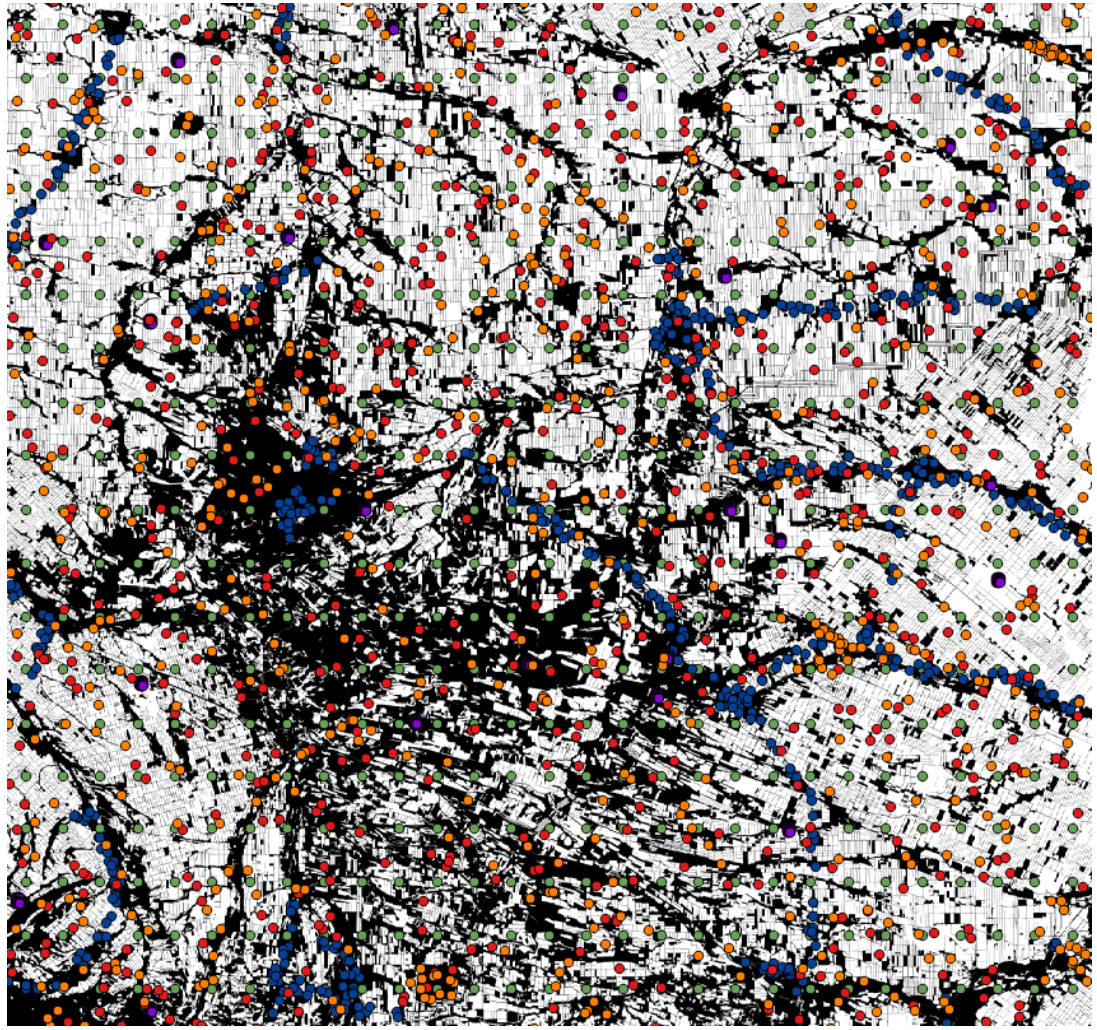
Random stratified;

Using GL30 classes as strata

Along roads;

Buffer areas Based on level-2 OpenStreetMap

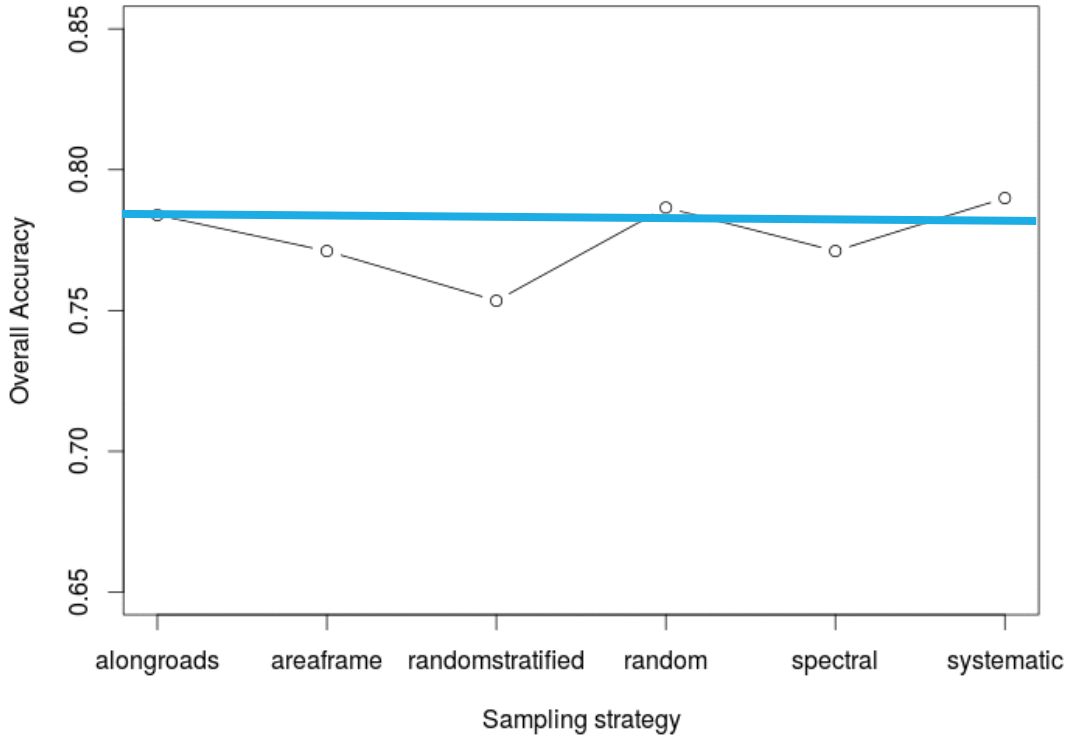
…



UCL Université catholique de Louvain

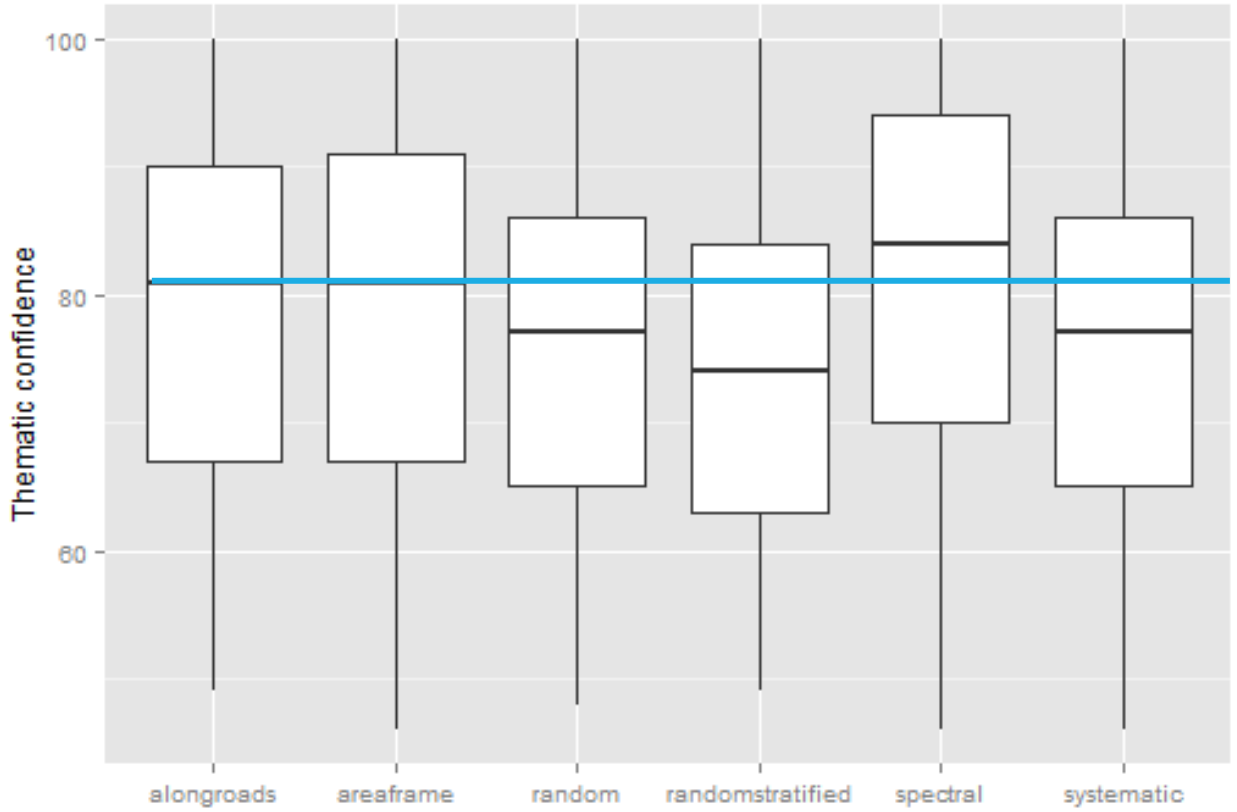
SAMPLES USED AS CALIBRATION DATA – ACCURACY

with 600 calibration points



UCL Université catholique de Louvain

SAMPLES USED AS CALIBRATION DATA – THEMATIC CONFIDENCE

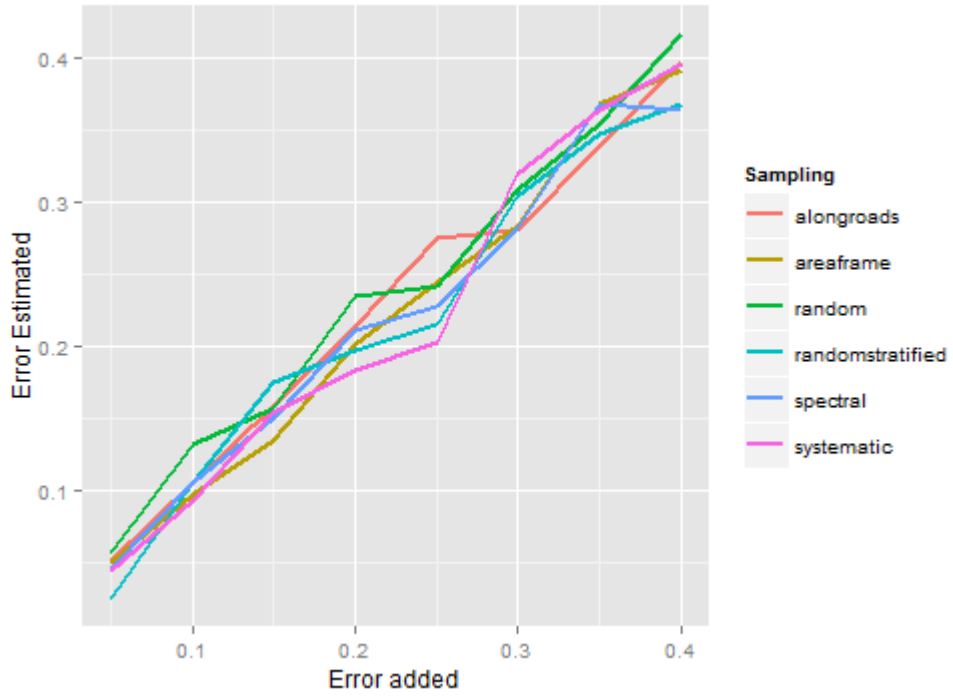


UCL
Université
catholique
de Louvain

SAMPLES USED AS VALIDATION DATA

1. Random generation of maps with known accuracy;

2. Assessment of the reliability of the accuracy estimate given by each sampling scheme



UCL
Université
catholique
de Louvain