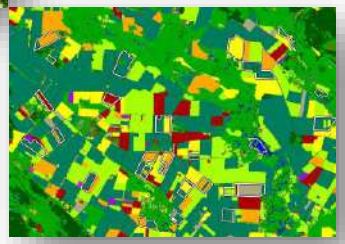



Monitoring of SDG's indicators and agricultural lands productivity using Amazon Cloud Platform

Prof. Andrii Shelestov et. al
NTUU "Igor Sikorsky Kyiv Politechnic Institute"

IAMO Forum, 25 June, 2020

SDG Indicators

- Land cover based indicators
- 15.3.1 "**Proportion of land that is degraded over total land area**" (T2)
- **2.4.1 "Proportion of agricultural area under productive and sustainable agriculture"** (T3);

(T2)
Indicator and methodology – clear + No regular updates

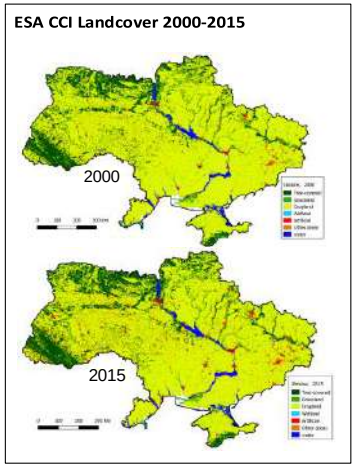
(T3)
No internationally established methodology – indicator is under development

SDG 15.3.1 –Land degradation Neutrality

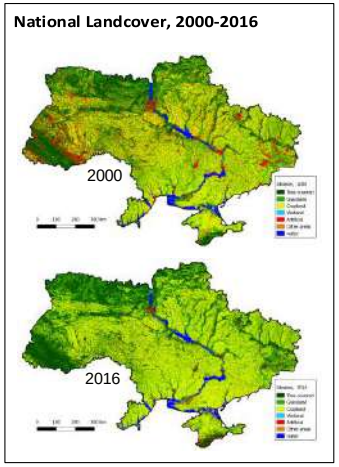
- Based on the rule "**One Out, All Out**"
- **Three sub-indicators**
  - change of the land surface;
  - vegetation trend;
  - carbon stock change.
- Methodology was used under national reporting of Ukraine for UNCCD on land degradation in 2018 (cooperation with Ministry of Ecology of Ukraine since march 2018)
- Up to 25% of Ukraine have signs of land degradation (global data)
- Presented at **Regional Workshop on the UN Desertification Convention**

Land Degradation Methodology

Land Cover Change



OR



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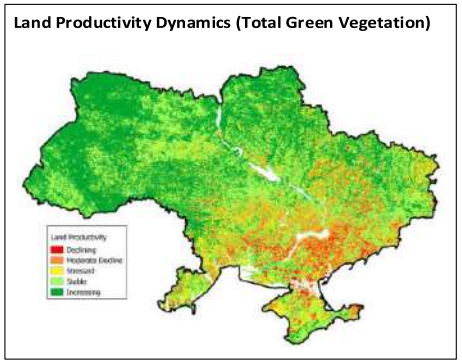
Land Productivity Dynamics



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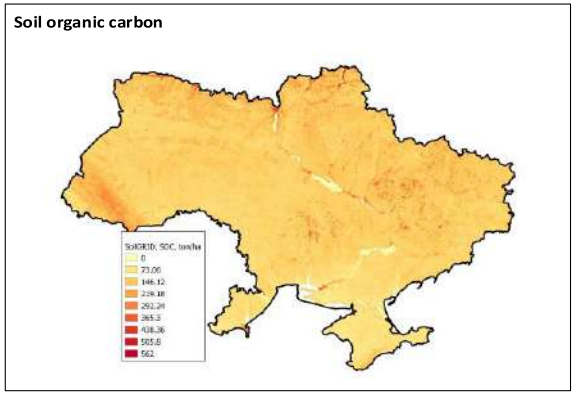
Soil Organic Carbon Change (SoilGrid)



LOOCV-rule –> SDG Indicator 15.3.1 (2000-2015)

Land productivity (SDG 2.4.1)

- ***Modeled LAI*** as LAI for land without soil change (WOFOST Water Limited over spatial GRID -CGMS)
- ***Satellite LAI*** (Sentinel-2, Landsat-8, MODIS) – as real LAI

Solution: Combine within Nexus approach three components: *crop classification map*, outputs of the *biophysical model WOFOST* and *satellite data* that reflect the state of plants over the ROI.


Taylor & Francis Online

International Journal of Digital Earth

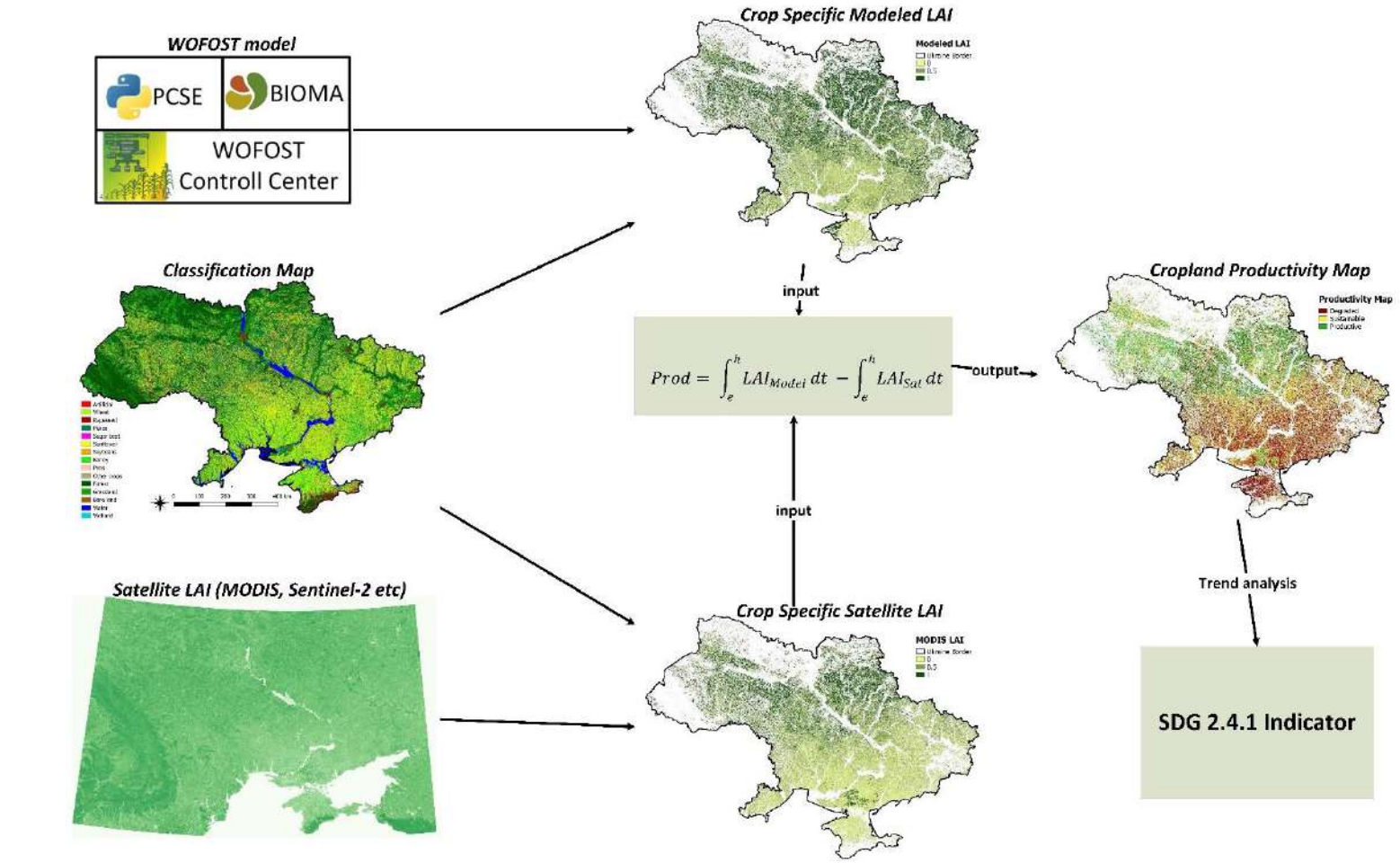
Developing food, water and energy nexus workflows

ABSTRACT

There is a growing recognition of the interdependencies among the supply systems that rely upon food, water and energy. Billions of people lack safe and sufficient access to these systems, coupled with a rapidly growing global demand and increasing resource constraints. Modeling frameworks are considered one of the few means available to understand the complex interrelationships among the sectors, however development of nexus related frameworks has been limited. We describe three open-source models well known in their respective domains (i.e. TerrSysMP, WOFOST and SWAT) where components of each if combined could help decision-makers address the nexus issue. We propose as a first step the development of simple workflows utilizing essential variables and addressing components of the above-mentioned models which can act as building-blocks to be used ultimately in a comprehensive nexus model framework. The outputs of the workflows and the model framework are designed to address the SDGs.

https://doi.org/10.1080/17538947.2019.1626921

Land productivity Methodology



Stage 1 **Stage 2** **Output**

Amazon and GEO project
"Methodology for SDGs indicators assessment"

- **Study area** – Ukraine (S2* – 4Tb), Argentina (S2* - 10 Tb) and India (S2* - 12Tb) ;
- **Data Cube preparation** for the territory of Ukraine (Data Cube on demand) with Sentinel-2 data
- Development of workflows for **SAR data processing** in the cloud (Sentinel-1)
- **Land cover mapping technology** scaling for Argentina and India **(done for Ukraine)**
- **Weather model** deployment (coming years)
- **Development of SDG indicators** (2.4.1, 11.3.1, 15.1.1, 15.3.1) **estimation workflows** in the cloud (starting from Ukraine, with scaling to Argentina and India)
- High Performance computations for Big Data
- Support from GEO community

Partners:

- **Leaded by** Space Research Institute NASU-SSAU
- **CO-PI** from Argentina (Buenos Aires Grains Exchange)
- **Collaborator** from USA (University of Maryland, College Park, MD, USA)
- **Collaborator** from India (Birla Institute of Technology, Mesra, India)

HARVEST

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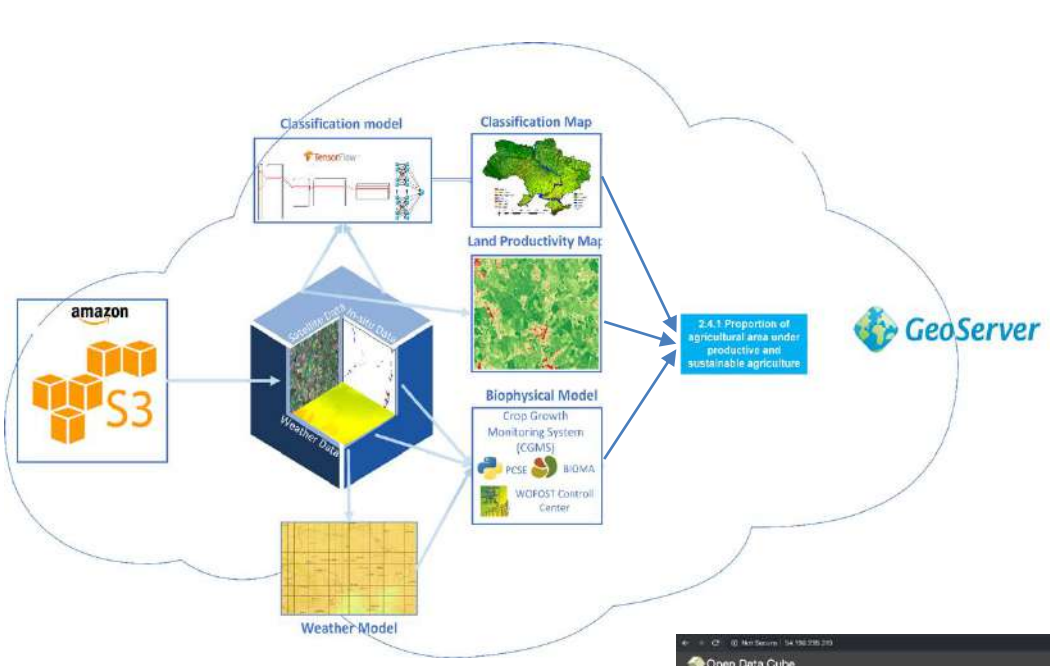
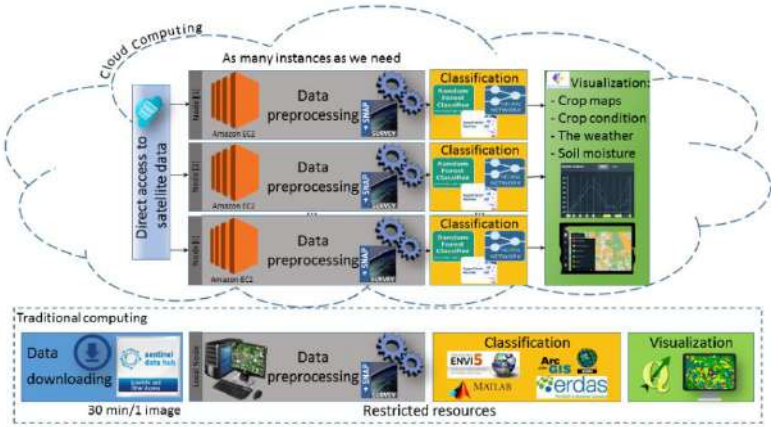
RANCHI

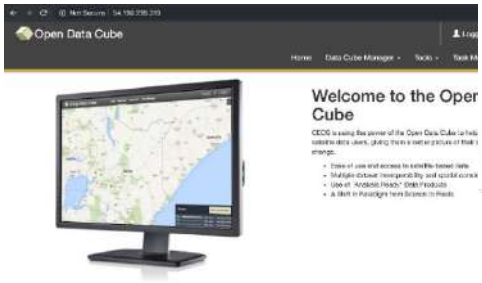
** - scenes with cloudiness <20% (annual estimates)*

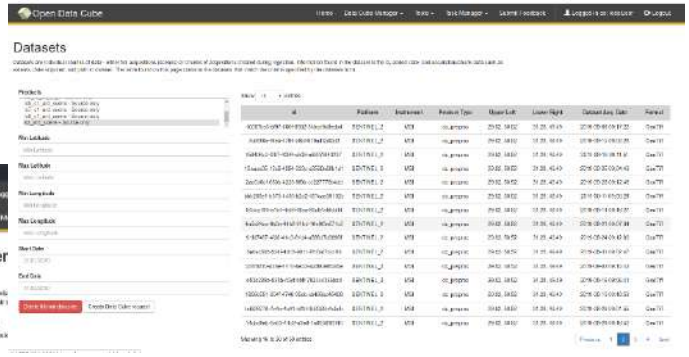
Digital infrastructure

SDG calculation workflow in the cloud





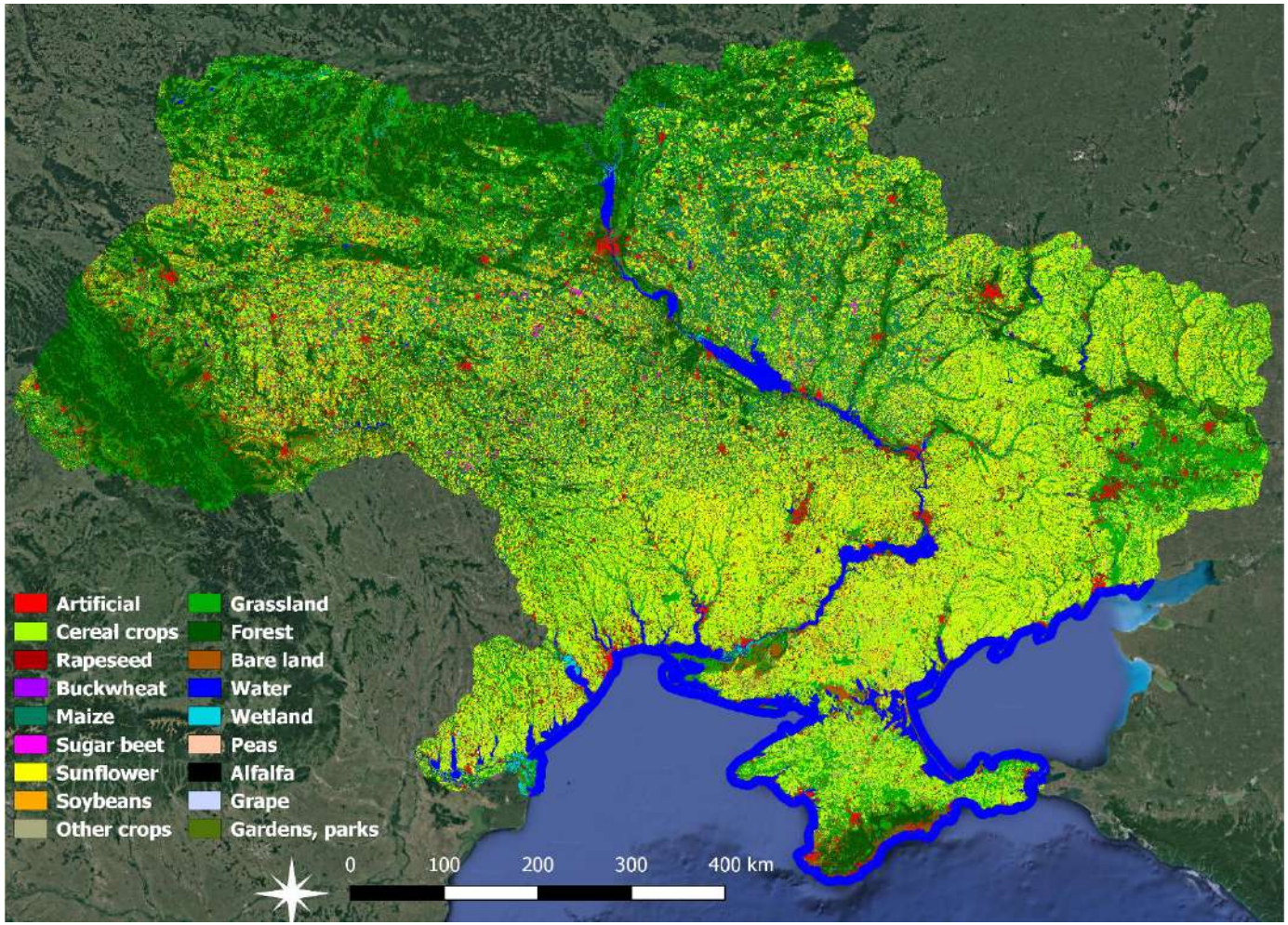




Data Cube for Kyiv region is under data preparation

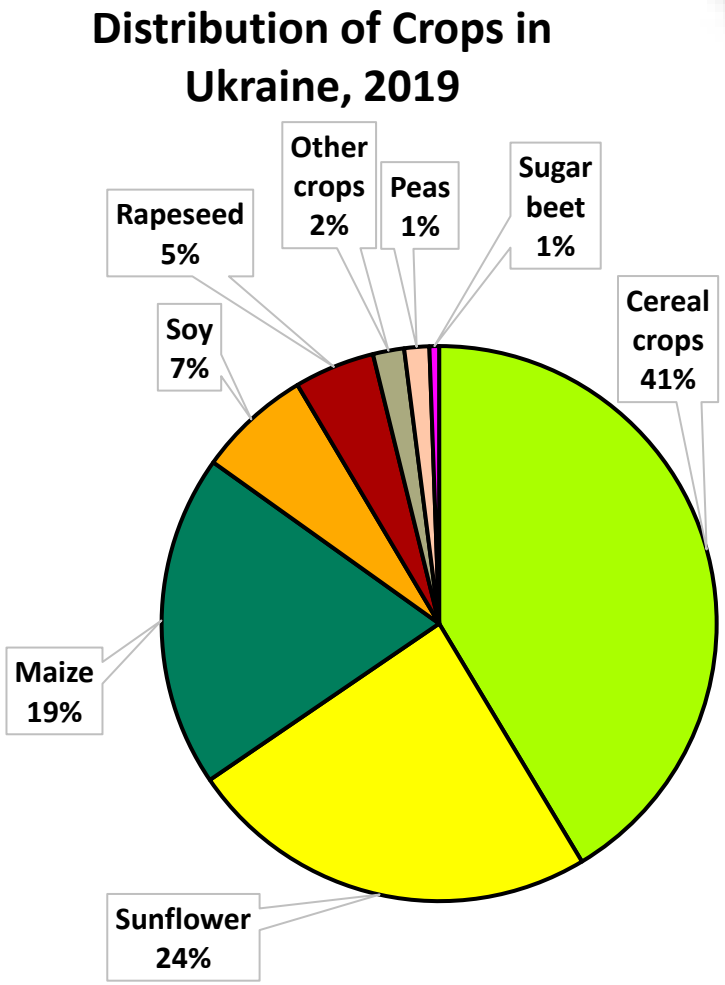
Land cover map, 2019

World Band Project “Supporting Transparent Land Governance in Ukraine”

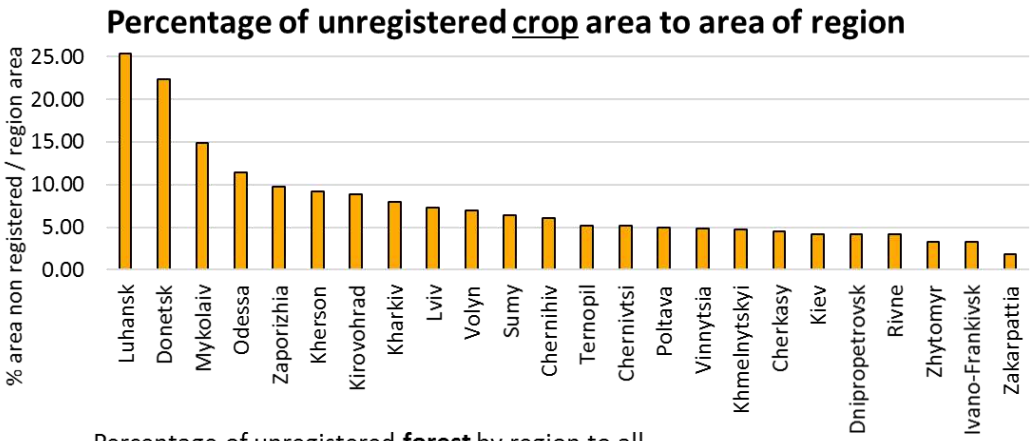


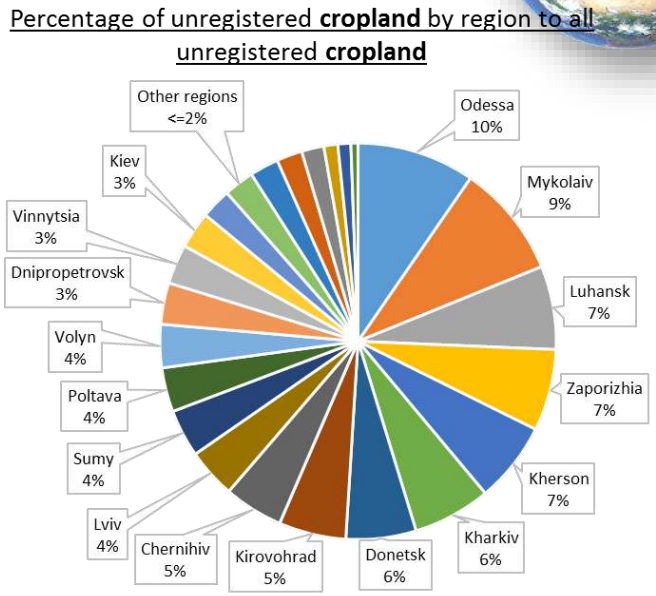
Accuracy metrics of LC and crop structure

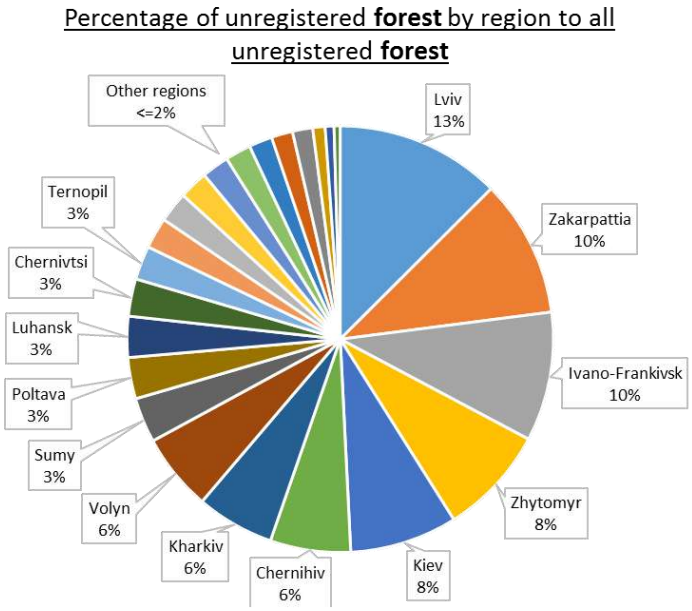
Kappa = 0.94	UA	PA	F1
Artificial	57,1	92,5	70,6
Cereal crops	96,3	99,3	97,8
Rapeseed	98,1	99,7	98,9
Buckwheat	100	13,7	24
Maize	95,7	98,1	96,9
Sugar beet	93,1	80,9	86,6
Sunflower	97,4	99	98,2
Soy	90,1	84	86,9
Other crops	43,3	28,5	34,4
Forest	83,6	99,8	91
Grassland	71,4	92,4	80,5
Bare land	76,1	55,2	64
Water	100	98,4	99,2
Wetland	92,3	48,4	63,5
Peas	98,5	52,7	68,6
Alfalfa	97,2	52,9	68,5
Gardens, parks	76,2	48,1	59
Grape	97	30,6	46,6
OA	**94,8**		

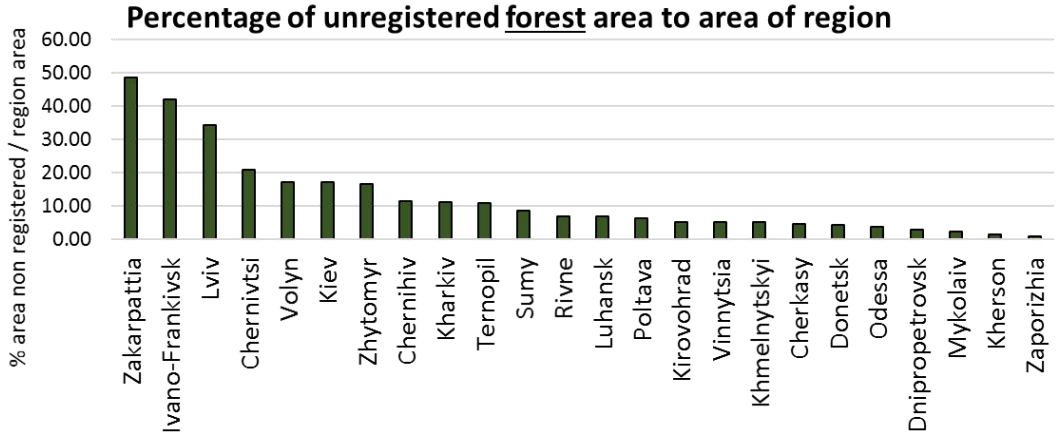


Non-registered areas structure



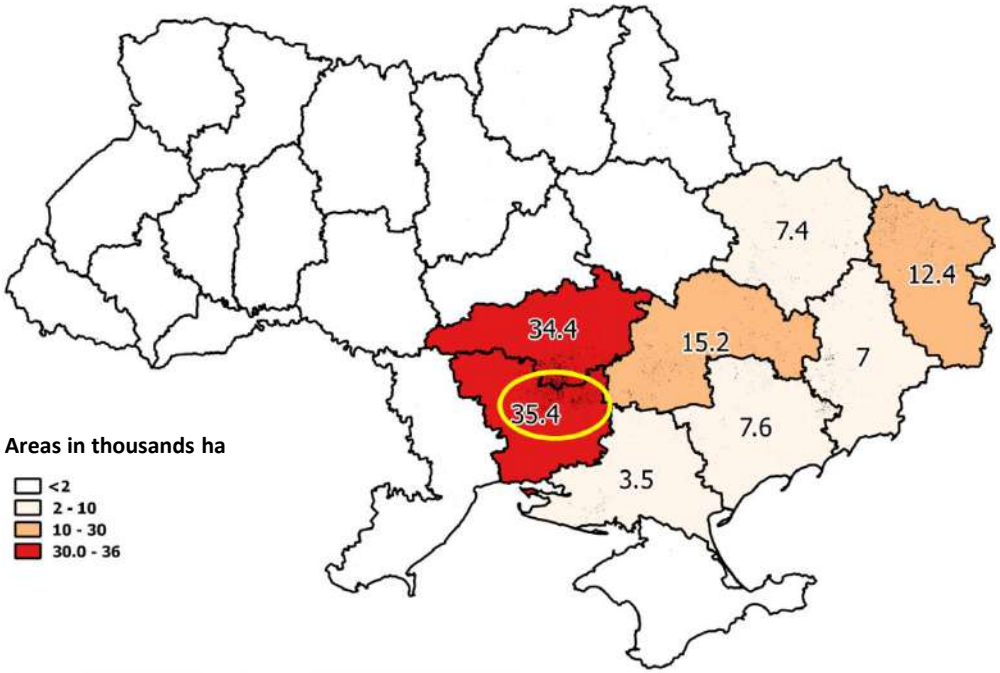


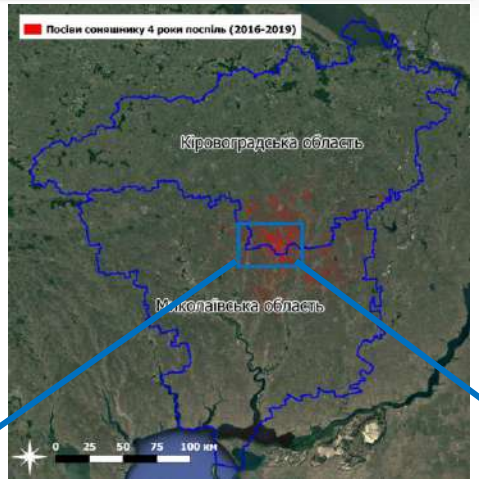


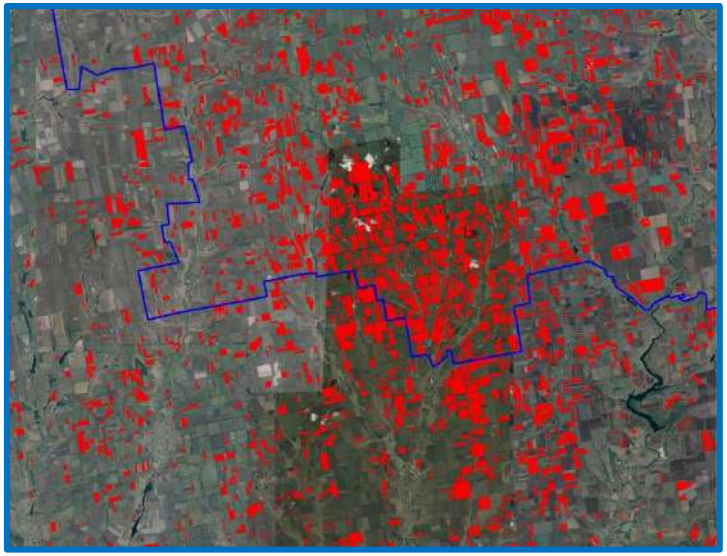


Crop rotation of heavy crops

Sunflowers on the same fields during 2016-2019







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- Kussul, Nataliia, et al. **Deep Learning Classification of Land Cover and Crop Types Using Remote Sensing Data.** IEEE Geoscience and Remote Sensing Letters 14.5 (2017): 778-782.
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Thank you!

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