SCERIN-7 Capacity Building Workshop

24-27 June 2019, Novi Sad, Serbia

University of Novi Sad Faculty of Science
Faculty of Technical Sciences
Biosense Institute
Institute of Lowland Forestry and Environment

Application of Earth Observation in Agriculture at the BioSense Institute

Miloš Pandžić

…about

INSTITUTE BioSense

Research and Development Institute for Information Technologies in Biosystems

- Founded in 2015
- Leading Institute in eastern Europe
- 100+ employees
- Dozens of H2020 projects
- Becoming Centre of Excellence for Advanced Technologies in Sustainable Agriculture and Food Security throughout ANTARES H2020 project
- Dynamic multidisciplinary international organization - Engineers, material scientists, biologists, agronomists…
- BioSense Accelerator
- University of Novi Sad member

Antares

erc BIRTH
Births, mothers and babies

diatomic

KATANA
CUTTING EDGE TECH IN AGRIBUSINESS

Advance eLTER

CYBELE

SKIN
SHORT SUPPLY CHAIN KNOWLEDGE AND INNOVATION NETWORK

IOF 2020
INTERNET OF FOOD & FARM

EUDAT

fractals

eLTER H2020
Integrated European Long-Term Ecosystem & socio-ecological Research Infrastructure

Inno4agrifood

smartAKIS
Smart Farming Thematic Network

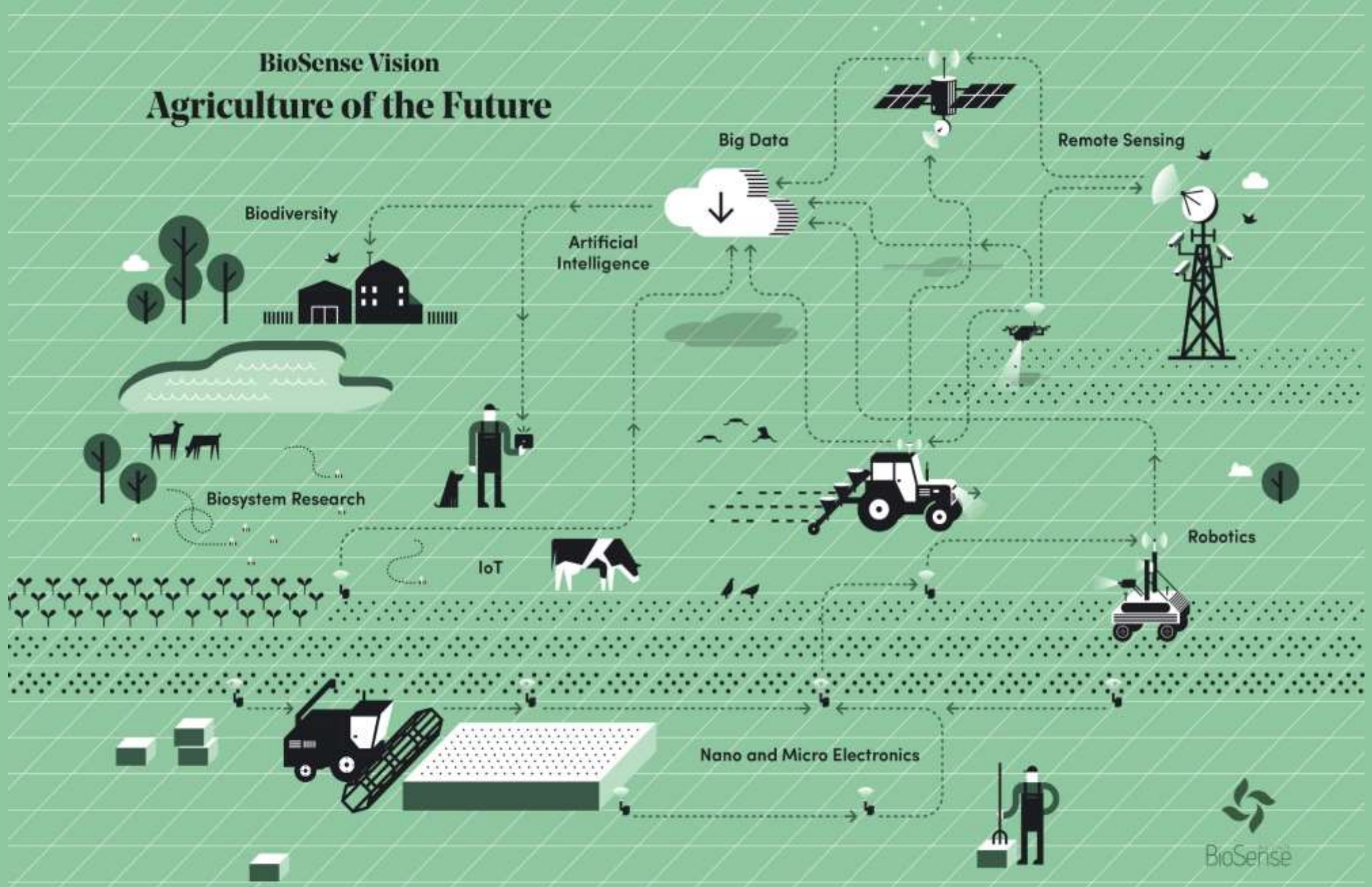
DRAGON

PARSEC

agRO BO food
NETWORK OF DIGITAL INNOVATION HUBS IN ROBOTICS

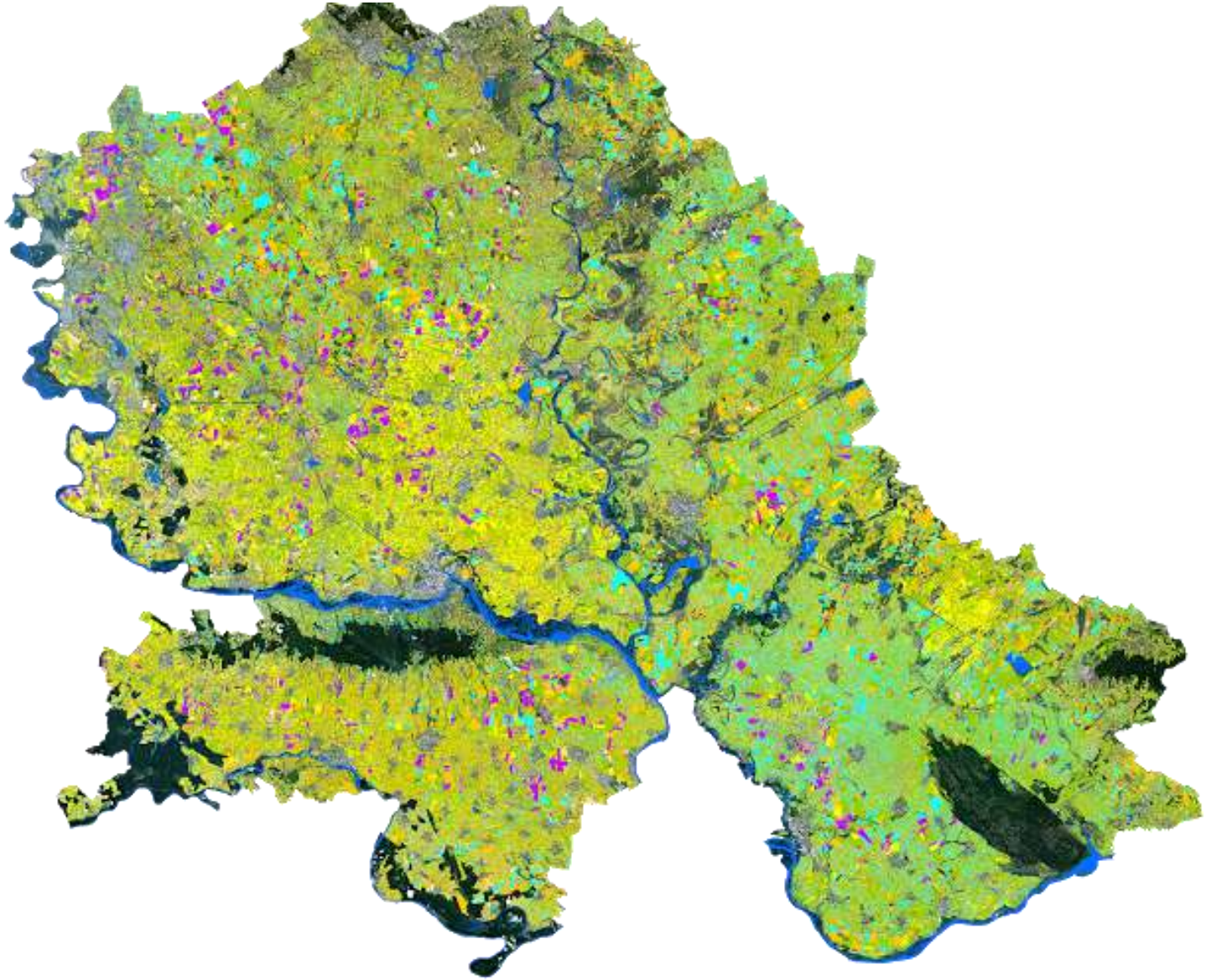
NEFERTITI
F|A|R|M|D|E|M|O

SMART AGRI HUBS

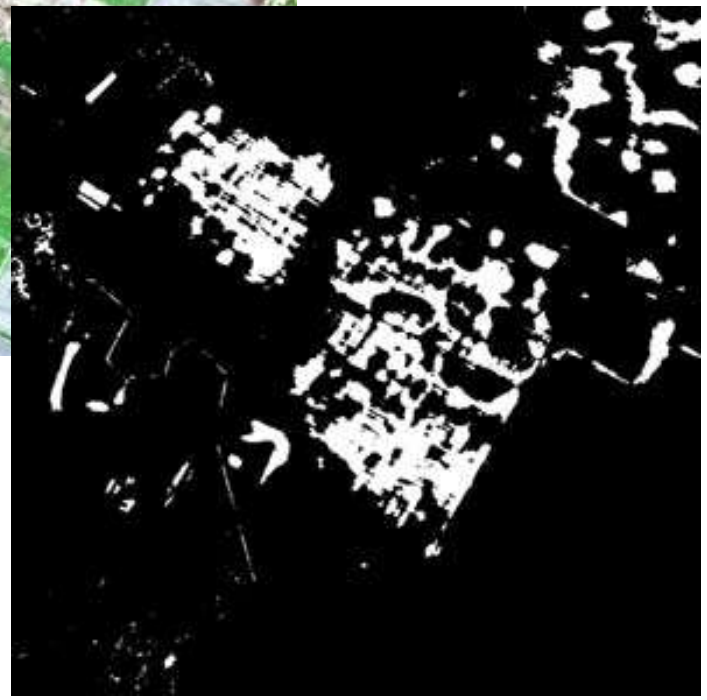

BioSense Vision
Agriculture of the Future
Big Data
Remote Sensing
Biodiversity
Artificial Intelligence
Biosystem Research
IoT
Robotics
Nano and Micro Electronics
BioSense

LULC maps

- Generating LULC maps of Vojvodina, Serbia
- Landsat 8 and Sentinel-2
- Seasons 2013-2019

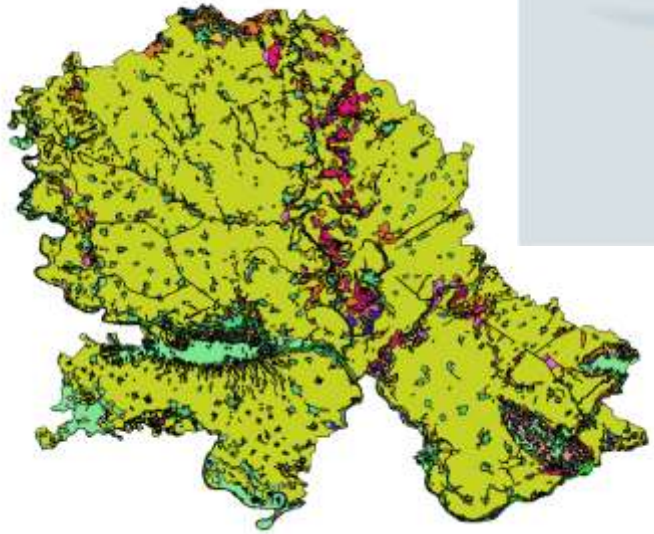


Research



Detection of waterlogged area

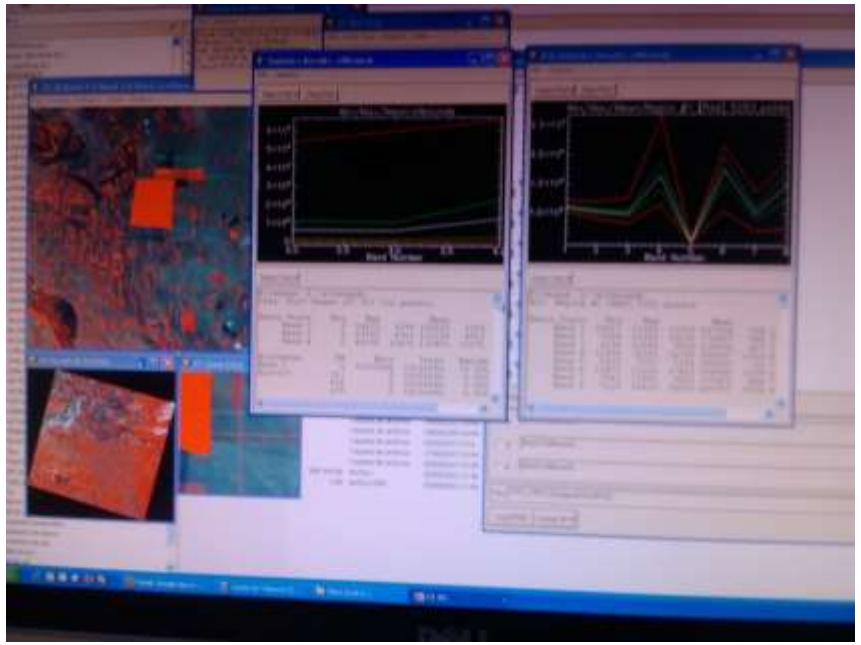
Polen footprint + Land cover map = estimate of infection level



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 810775

LC research cases

- Analysing changes in forest cover in NP Fruška gora
  - Landsat data
  - Determination of forest-cover classes
  - Change detection
- Analysing different management practices

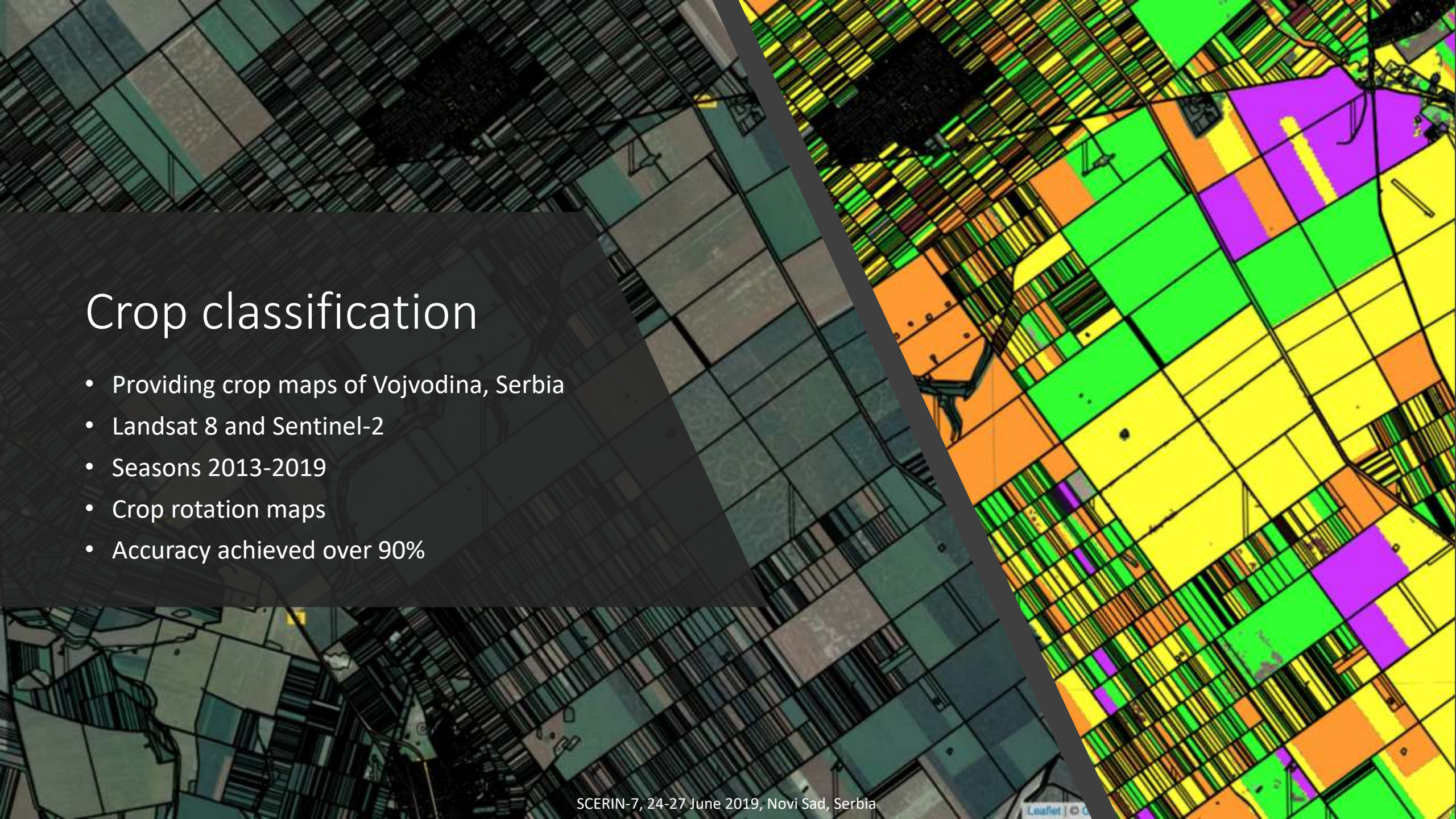


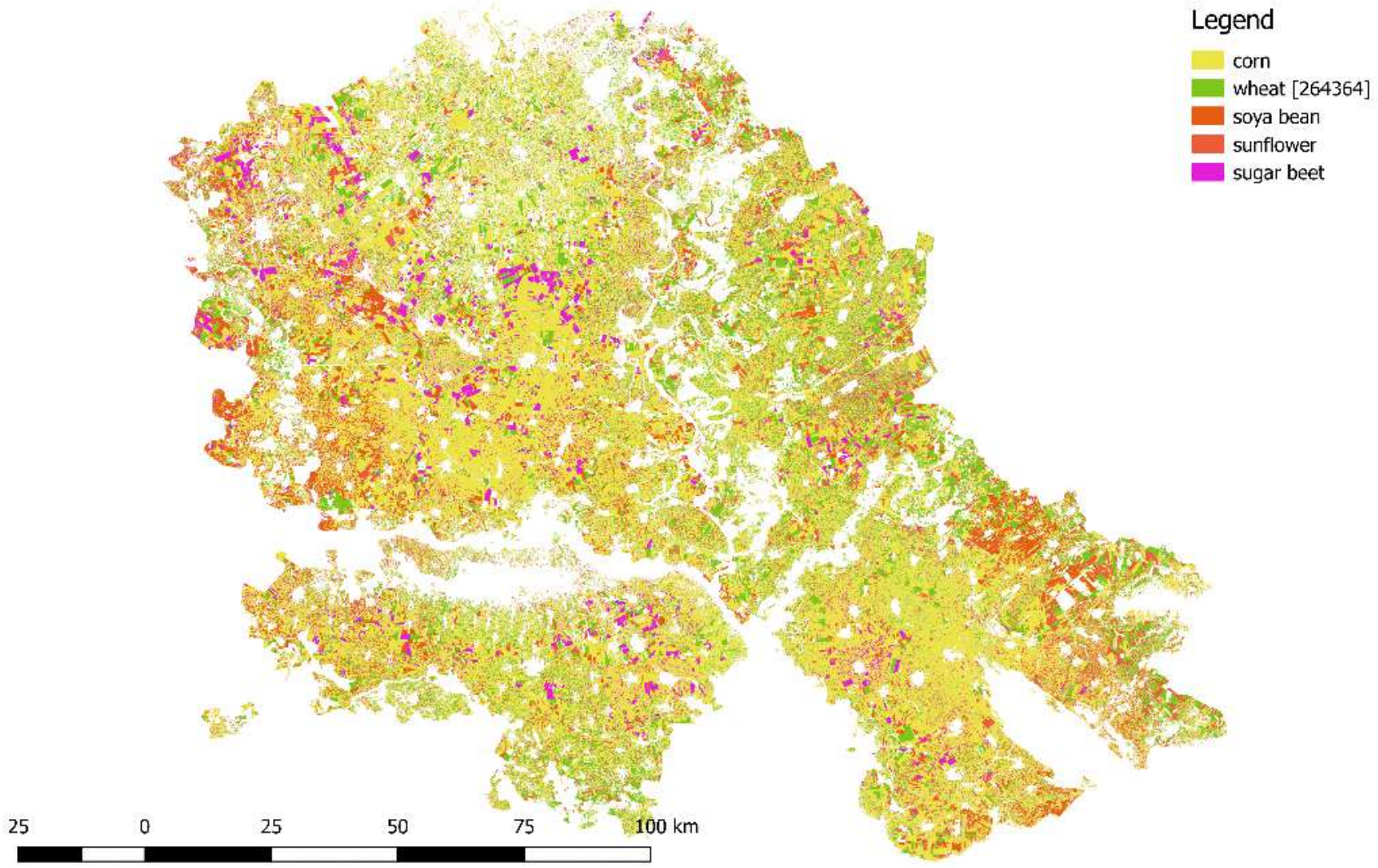
LC research cases

- Assessment of the connectivity of patches (plant communities) within landscape to analyze the population viability under future climate change scenarios
- European ground squirrel (*Spermophilus citellus*), different bird species (*Coracias garulus, Aegolius funereus, Lanius minor*), Mediterranean genera of hoverflies (*Diptera: Syrphidae*)

Crop classification

- Providing crop maps of Vojvodina, Serbia
- Landsat 8 and Sentinel-2
- Seasons 2013-2019
- Crop rotation maps
- Accuracy achieved over 90%



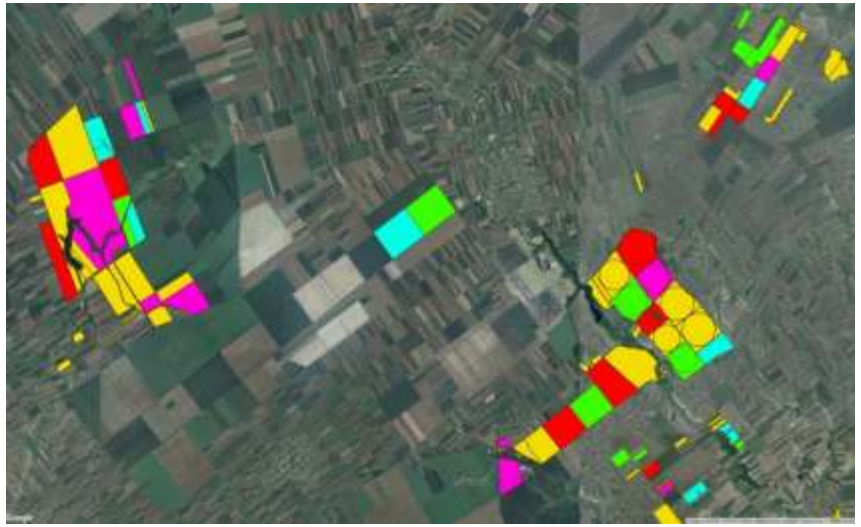

Legend
corn
wheat [264364]
soya bean
sunflower
sugar beet
25
0
25
50
75
100 km

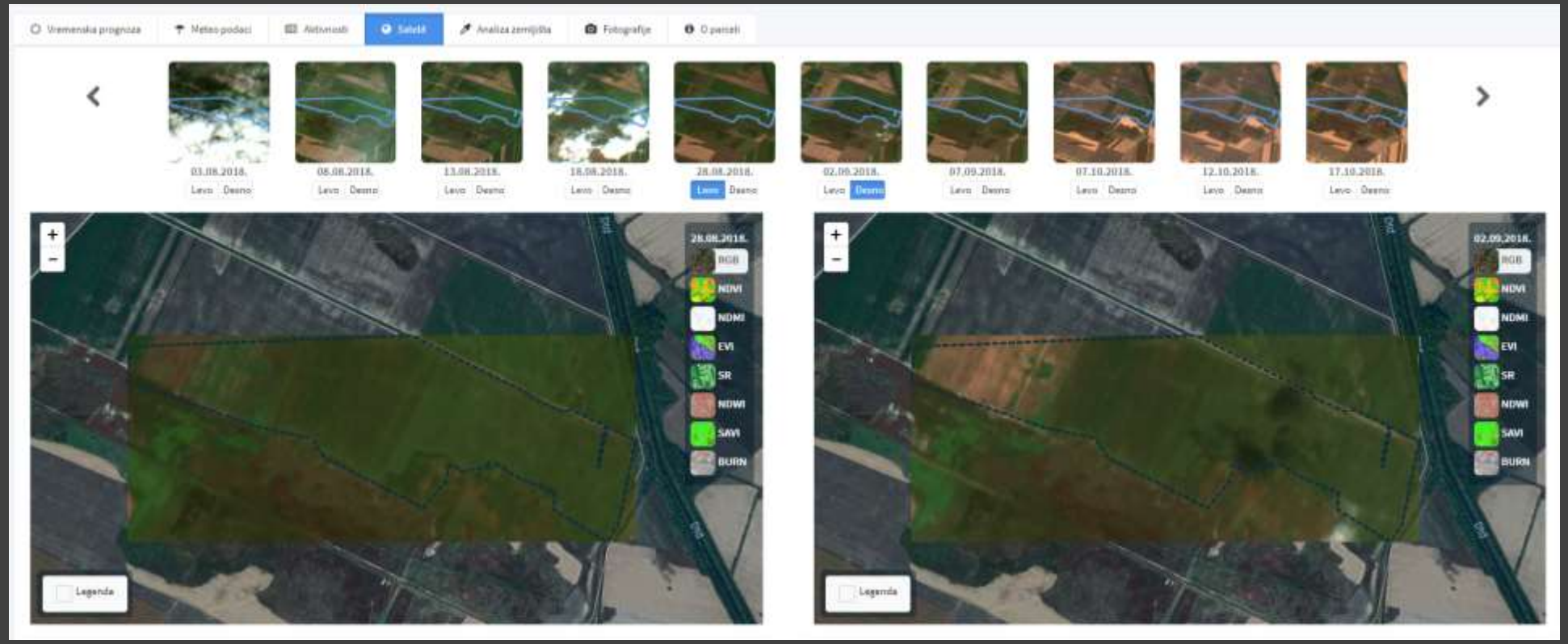
Agriculture

- Seasonal monitoring & time series analysis
- Yield prediction
- Prescription maps
- Natural hazards and damage extent detection

Crop structure planning

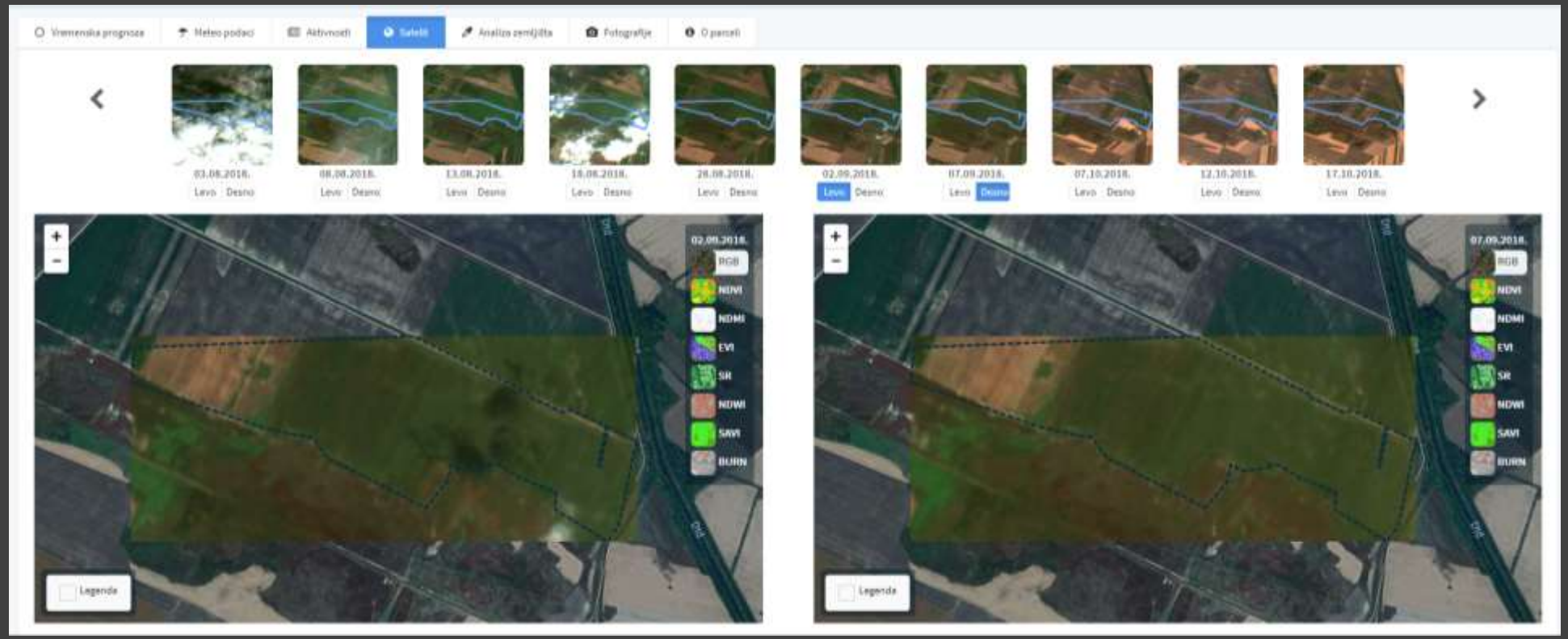
- **Holy grail of agriculture**
- What to plant, where to maximise the profit and minimize risk?
- Take into account other constraints: crop rotation, environmental impact, cost of operation…..
- Machine learning algorithms





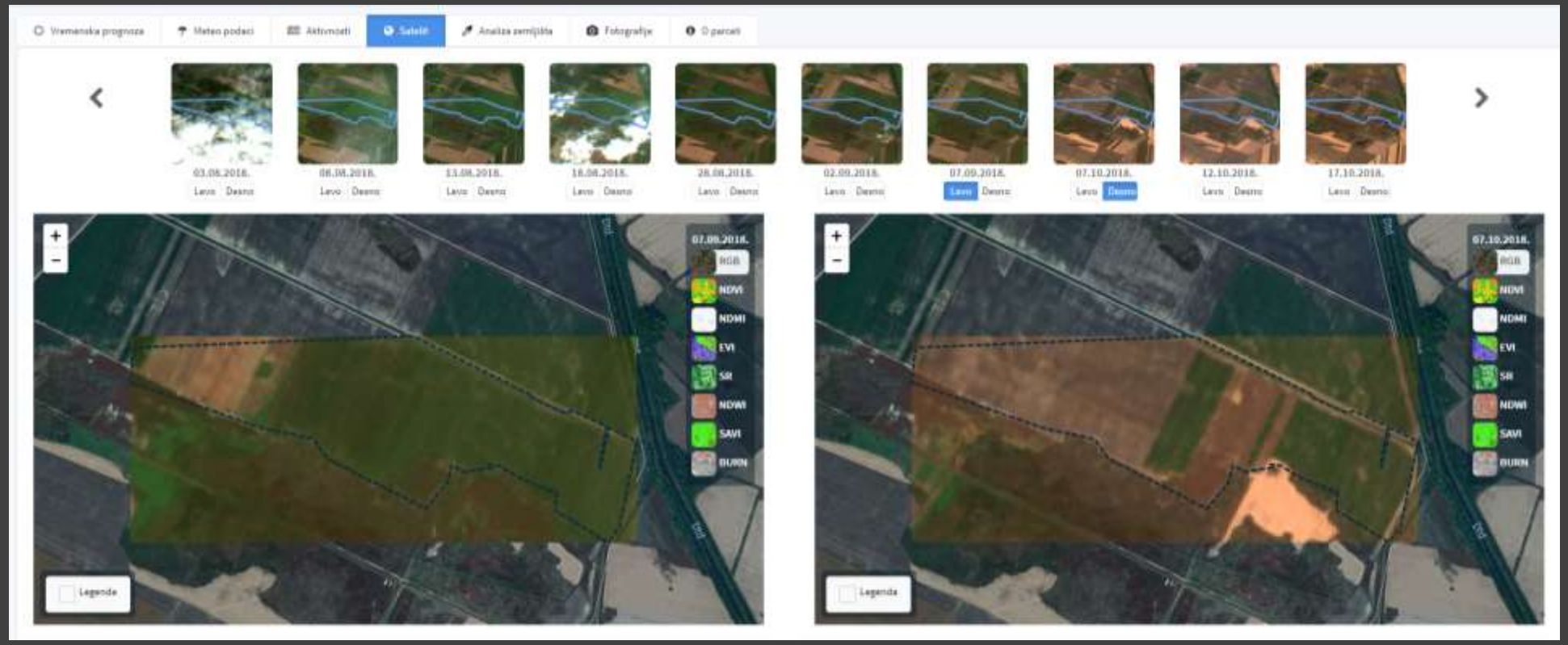
- 28.08.2018. - 02.09.2018.
- Vegetation change occurred on the left side of the parcel
- Harvested

Insurance



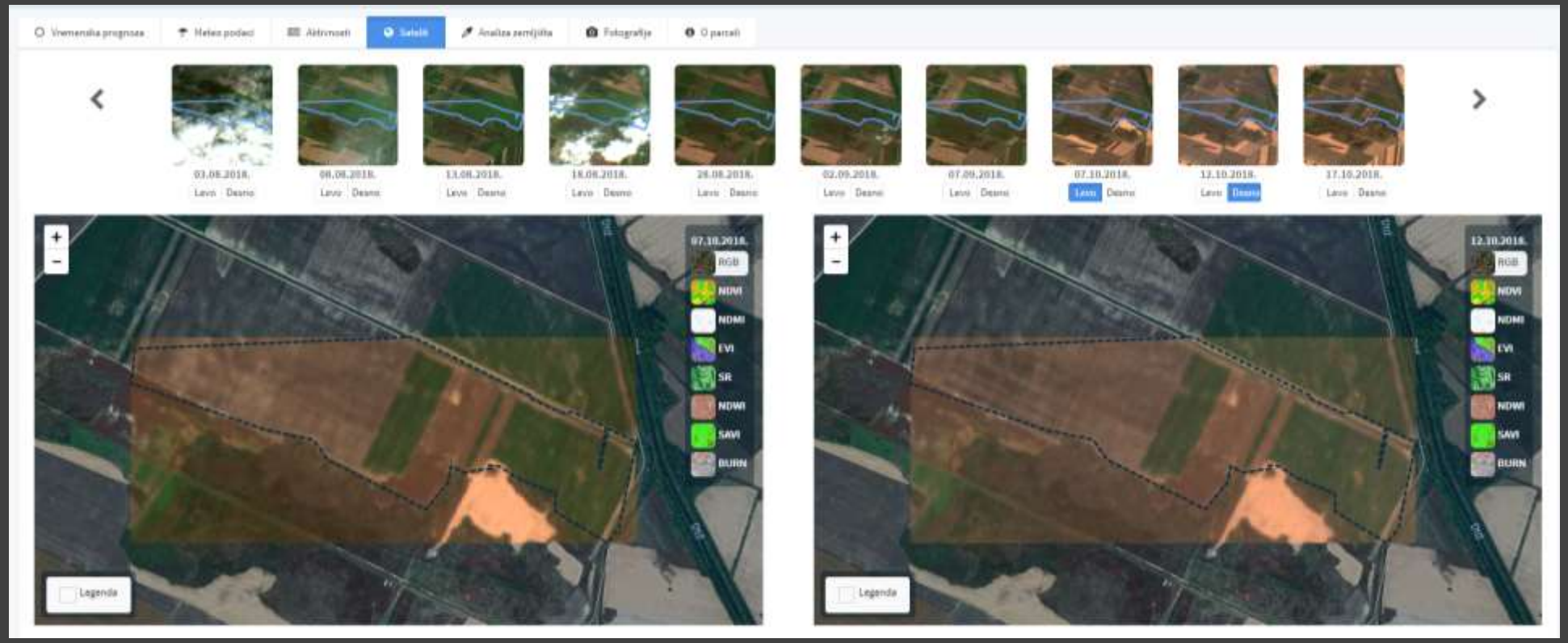
- 02.09.2018. - 07.09.2018.
- No significant changes

Insurance



- 07.09.2018. - 07.10.2018.
- Significant changes
- Harvested (partially)

Insurance



- 07.10.2018. - 12.10.2018.
- No significant changes

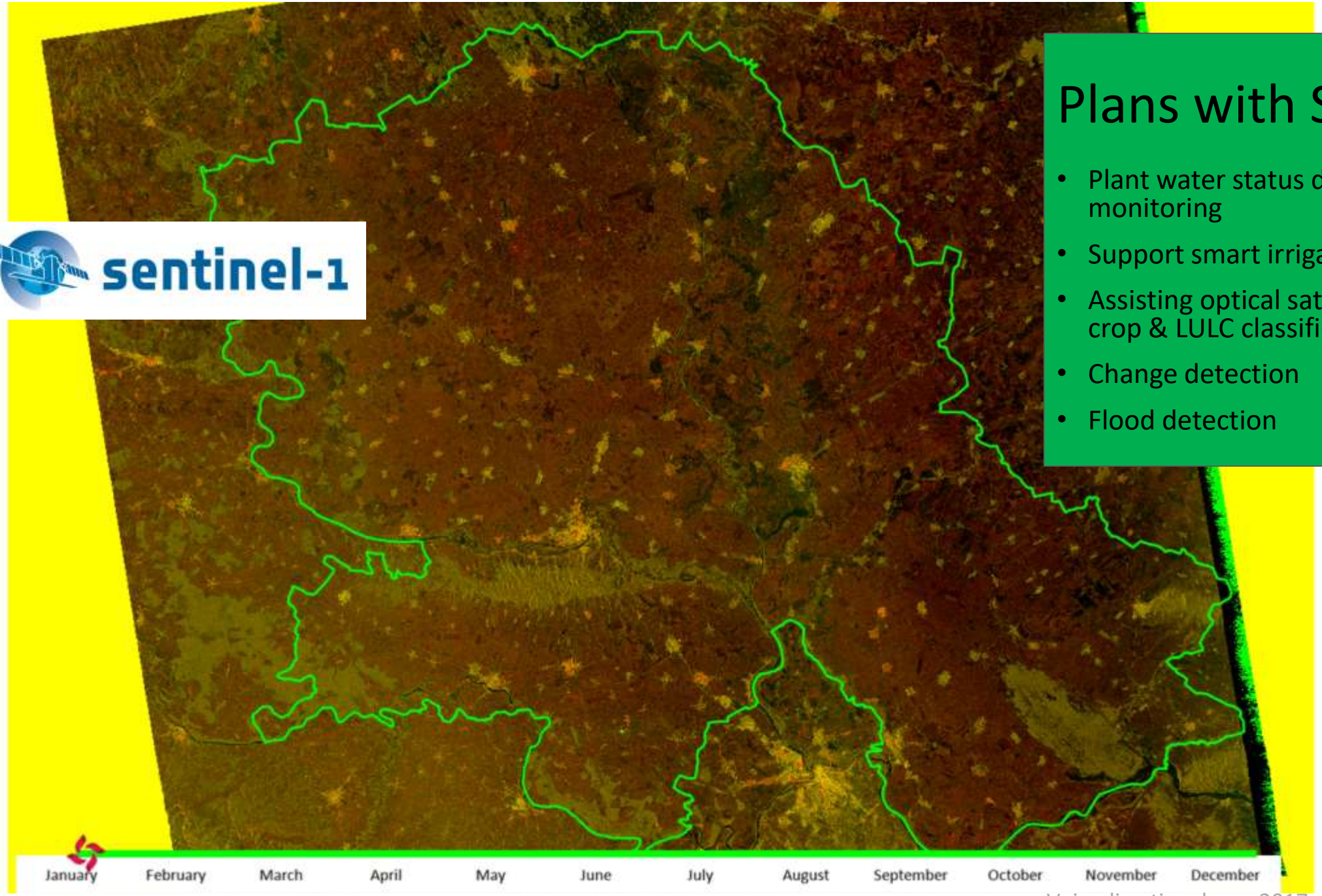
Insurance

- 12.10.2018. - 17.10.2018.
- Fire damage reported on 16.10.2018.
- No visible changes on the parcel of interest
- Damages on a neighbouring parcel

Insurance

BioSense data hub

- Regional hub for distribution of Copernicus data
- High bandwidth connections from data hub to data hub
- Co-ordinate and promote the use of information and data provided by the Copernicus programme with various Serbian institutions in the public sectors and with academia and private enterprises
- Interlocutor with the European agencies for data and information exchange



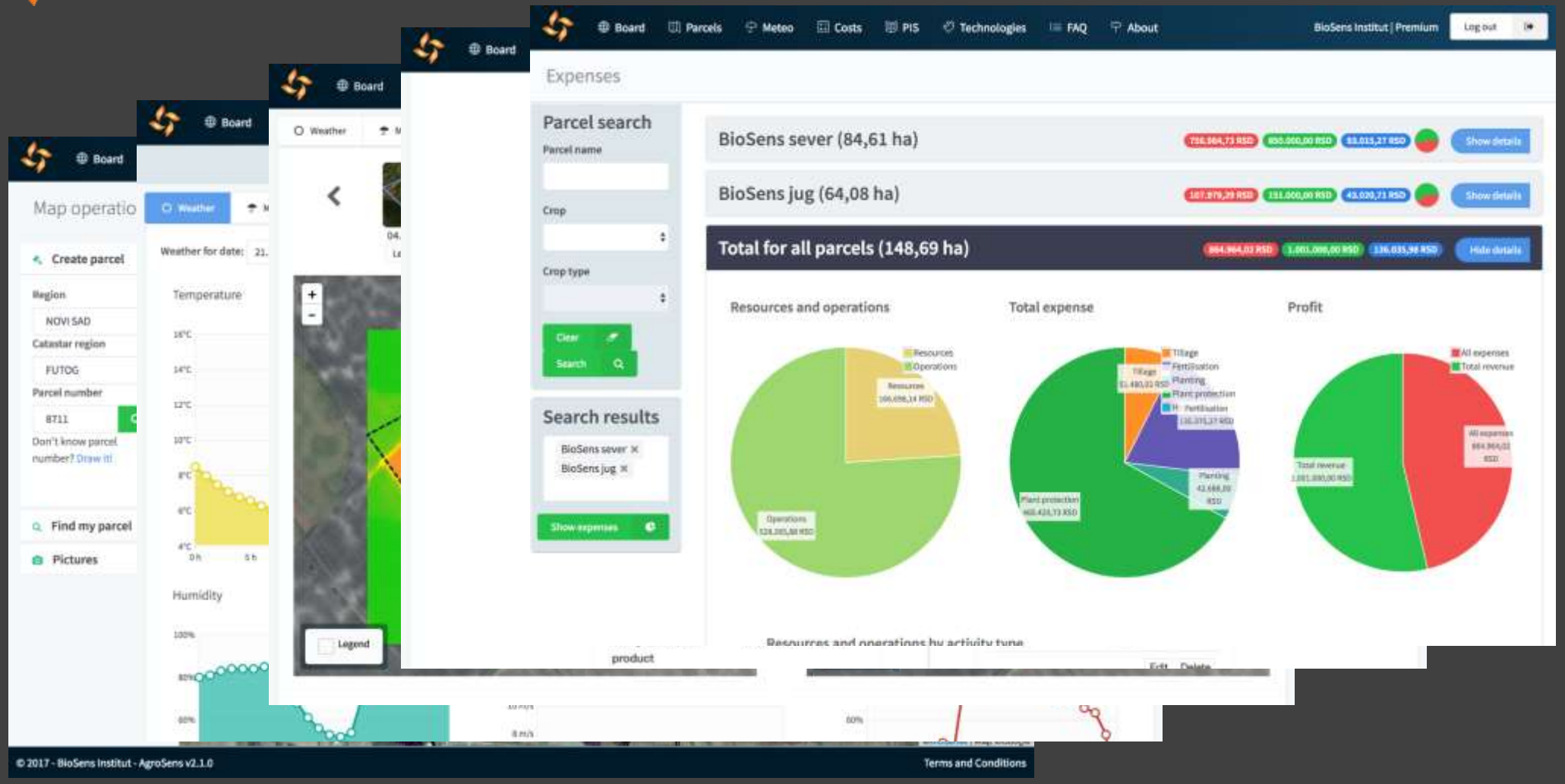
Plans with SAR data

- Plant water status detection and monitoring
- Support smart irrigation
- Assisting optical satellite imagery for crop & LULC classification
- Change detection
- Flood detection

Vojvodina time lapse 2017

AgroSens

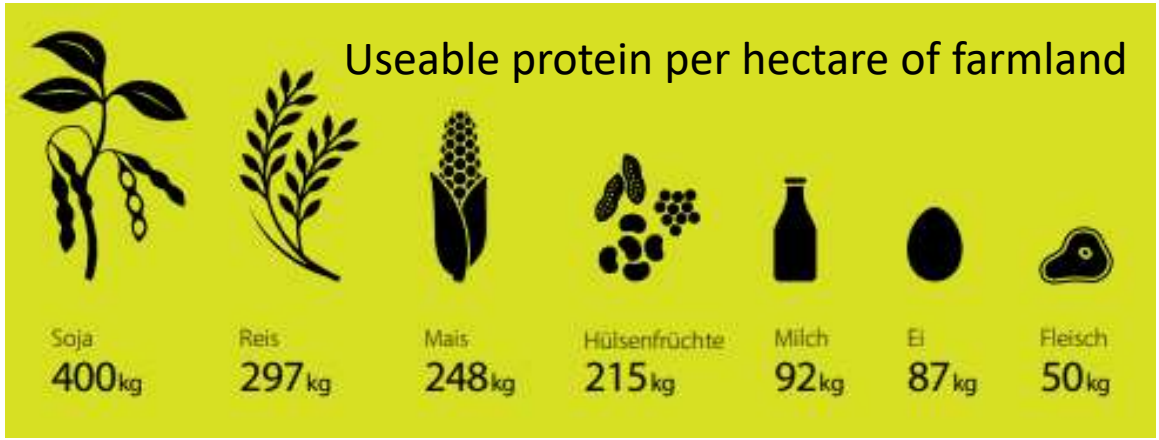
Also available as Mobile App



www.AgroSense.rs

- Single entry point with all the relevant data for agricultural production
- Free service for most of the users
- Combines data from heterogeneous sources
- Real big data agricultural platform
- Privacy guaranteed
    - User's data are used in anonymized and aggregated form to develop new products and services for various stakeholders: farmers, agri-companies, government, banks, insurance…

CYBELE
INTRASOFT INTERNATIONAL
ILVO
Flanders Research Institute for Agriculture, Fisheries and Food
gmv
University of Strathclyde Glasgow
HLRS
EXODUS
LEANCALE
ENGINEERING
cooperatives agro-alimentaires
comunitat valenciana
EUROPE SOYA
DONAU SOJA
PCSS
Bull
atos technologies
CINECA
evenflow
TAMPERE UNIVERSITY OF TECHNOLOGY
CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS
OGC
Making location count.
Agroknow
Vion
FOOD GROUP
BSC
Barcelona Supercomputing Center
Suite5
We Deliver Intelligence
UNIVERSITY OF PIRAEUS RESEARCH CENTER
UBITECH
ubiquitous solutions
WAGENINGEN
UNIVERSITY & RESEARCH
ryax
Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE



EU soya stats
Production: 2.4 Mt
Imports: 32Mt

33 – 45 %
High variability of protein content

Produce of different quality mixed and sold at a lower price

Increase soya production
Increase EU's food security

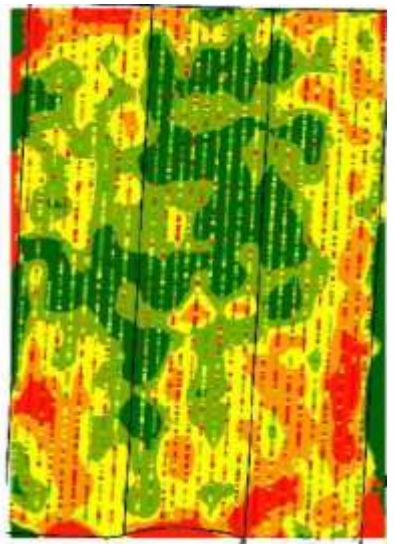
Identify good practice
Protein-content maximisation

Selective harvesting

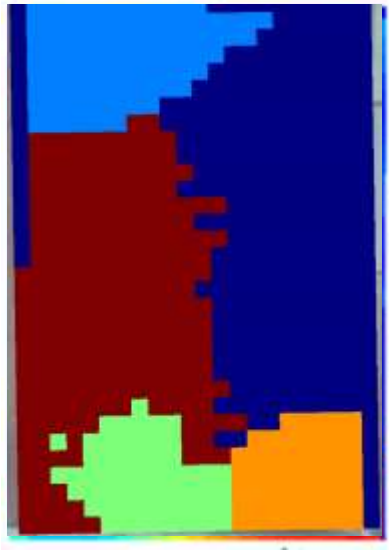
CYBELE

Proposed Solution

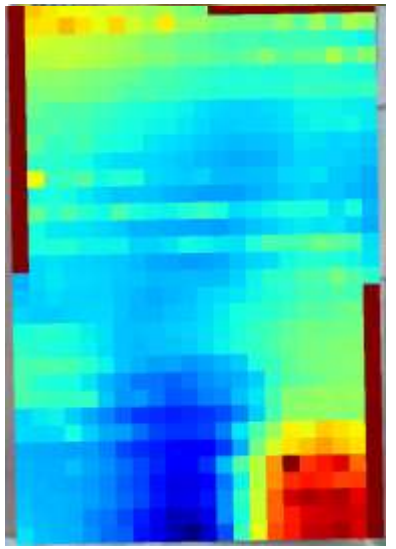
- ML, deep learning, Big Data analytics
- Management zone delineation based on protein content
- Yield prediction
- Identifying the best practice for fertiliser application
- Yield maps for selective harvesting



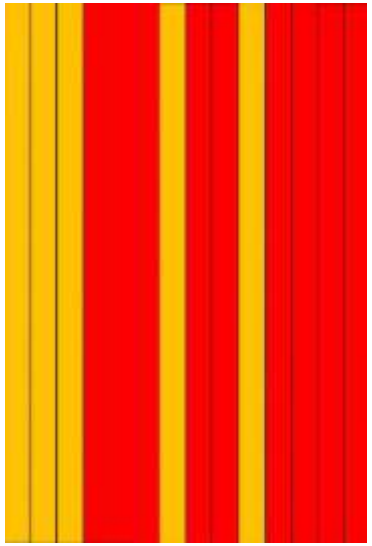
Yield prediction



Zones



Prescription maps



Classification A/B

CYBELE, 2019

Our kitchen

- Machine Learning
- Deep Learning
- Big data analysis

…we love to automize...

Thank you!

Research and Development Institute
for Information Technologies in Biosystems

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