

# Investigation of the characteristics of surface shapes in rural environment based on point clouds and remote sensing data



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February 11, 2021

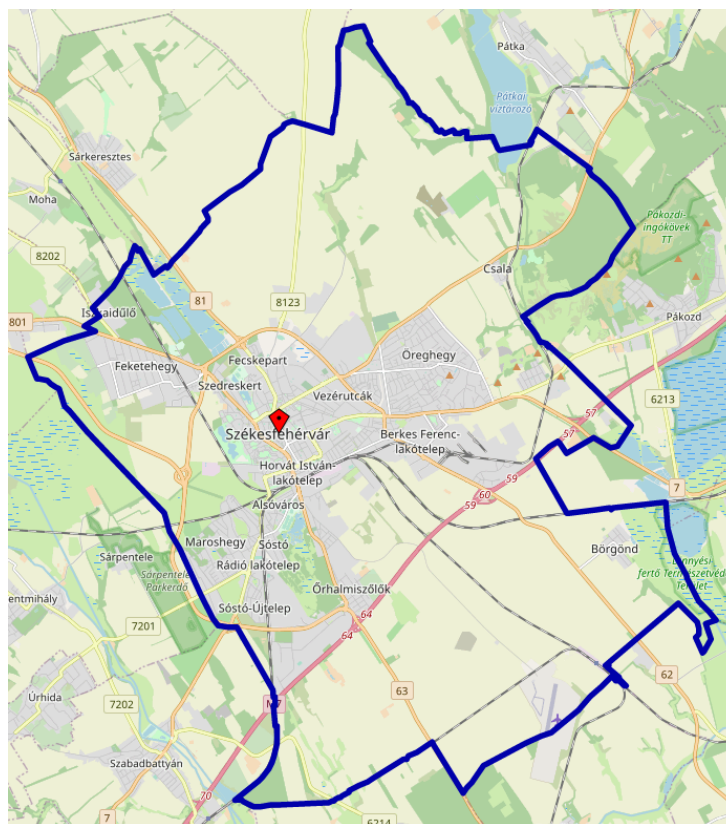
**Projekt ID:** 2019-2.1.11-TÉT-2020-00171

# 1st Milestone - tasks and goals

- ▶ 1. Data collection from remote sensing, attribute data and existing maps:
  - a) WorldView II, RADSARSAT-2, Landsat, Lidar 3D point cloud data and Sunflower 8 satellite data from the demonstration;
  - b) GIS spatial information data(included large scale land use classification map ) from the demonstration;
  - c) Crop Phenology data in the demonstration area;
  - d) Soil texture data in the demonstration area.
- ▶ 2. Studying of rural eco-environmental products using quantitative inversion and validation techniques. Available datasets are: Relevant Chinese satellite image data, basic elements of agricultural environment such as land use, topography and other series of professional maps and background data.
- ▶ 3. Making of vegetation index maps using Chinese and Hungarian satellite images.

# Demonstration Area

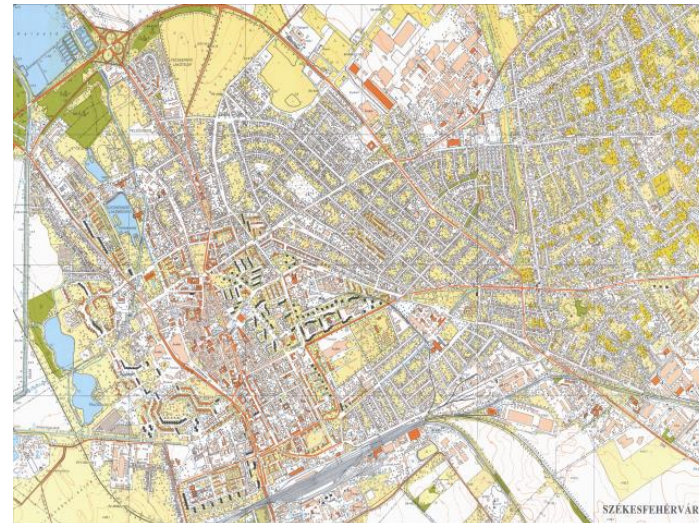
- ▶ Administrative area of Székesfehérvár (144 km<sup>2</sup>)
- ▶ Existing data:
  - a) LANDSAT
  - b) WorldView-2
  - c) LIDAR
  - d) Aerial photos, orthophotos
  - e) Hyperspectral data
  - f) Corine data
  - g) Surveying maps
- ▶ Free downloadable data:
  - a) ESA Archive (WorldView 1-4, Radarsat-2, SPOT 1-7, Landsat-8, etc.)
  - b) Sentinel1-2
  - c) Openstreet Map
  - d) Etc.



# Existing data for Székesfehérvár, Sopron and Szombathely

- ▶ **Topographic maps (M=1:10 000) and Digital Terrain Model (DTM)**
  - a) Resulting from 300 dpi scan resolution: 0.846m / px
  - b) Digital Terrain Model - GRID format, grid size: 20 m, height accuracy: +/- 0.3 m
  - c) Hungarian EOVS Projection System - <http://lazarus.elte.hu/gb/geodez/geod2.htm>
  - d) Height: Baltic basic level

(In 1960, it was ordered that the socialist countries of Eastern Europe should move from the Adriatic to the Baltic. At that time, we switched from the basic level in Nadap to the basic level in Eastern Europe, the so-called to the Baltic (Kronstadt) baseline, which is 67.47 cm higher than the Nadap baseline. The height of the Nadap main base point is thus 173.1638 m compared to the Baltic reference level (173.1638 mBf))



# Existing data for Székesfehérvár, Sopron and Szombathely

## ▶ WorldView-2 images

a) Product. Ortho ready (final)

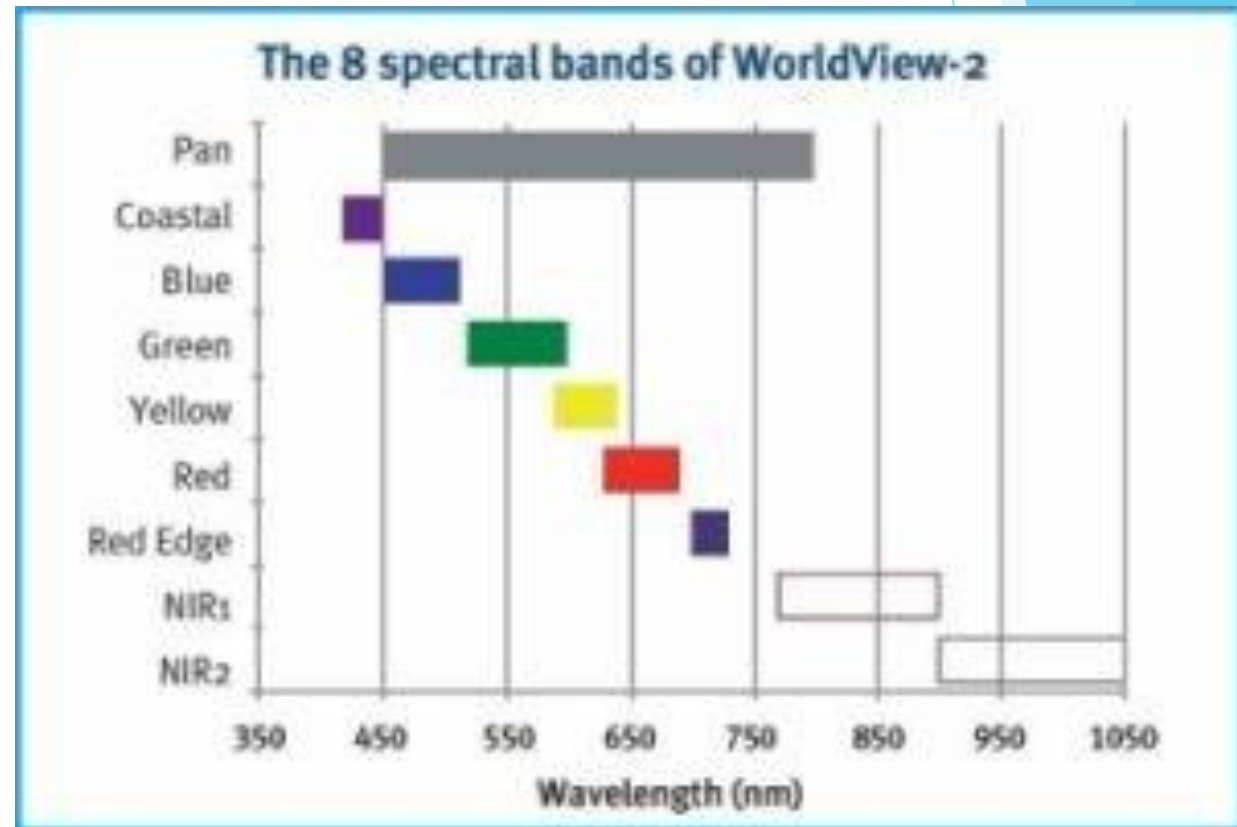
b) Format: GeoTIFF

c) Dates:

- Sopron: August 17, 2011
- Székesfehérvár: July 10, 2011
- Szombathely: May 19, 2011

## ▶ Spatial resolution:

- PAN: 0.5m
- Multispectral: 2m



# Existing data for Székesfehérvár, Sopron and Szombathely

## ► Aerial photos

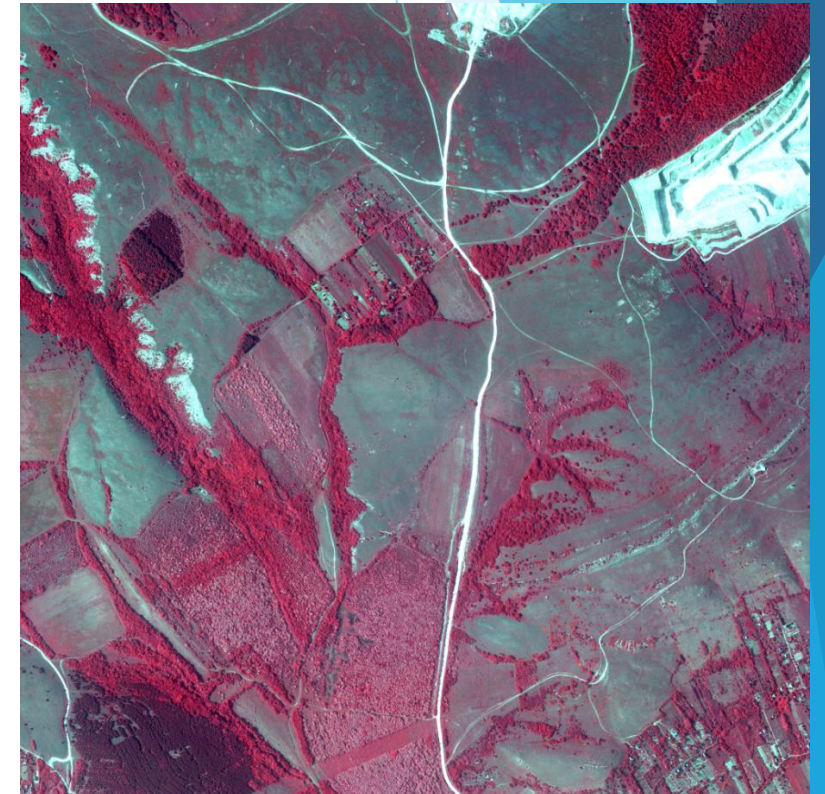
- a) Suitable for DSM and DTM production
- b) Suitable for orthophoto production
- c) Dates:
  - Sopron and Szombathely: May 13, 2005
  - Székesfehérvár: August 15, 2011
- d) Photo Scales:
  - Sopron and Szombathely:  $M=1:15000$
  - Székesfehérvár:  $M=1:8000$
- e) Number of photos:
  - Sopron: 12, Szombathely: 24, Székesfehérvár: 278
- f) Camera: Wild RC30
- g) Scanning resolution: 14 and 21 microns



# LIDAR data

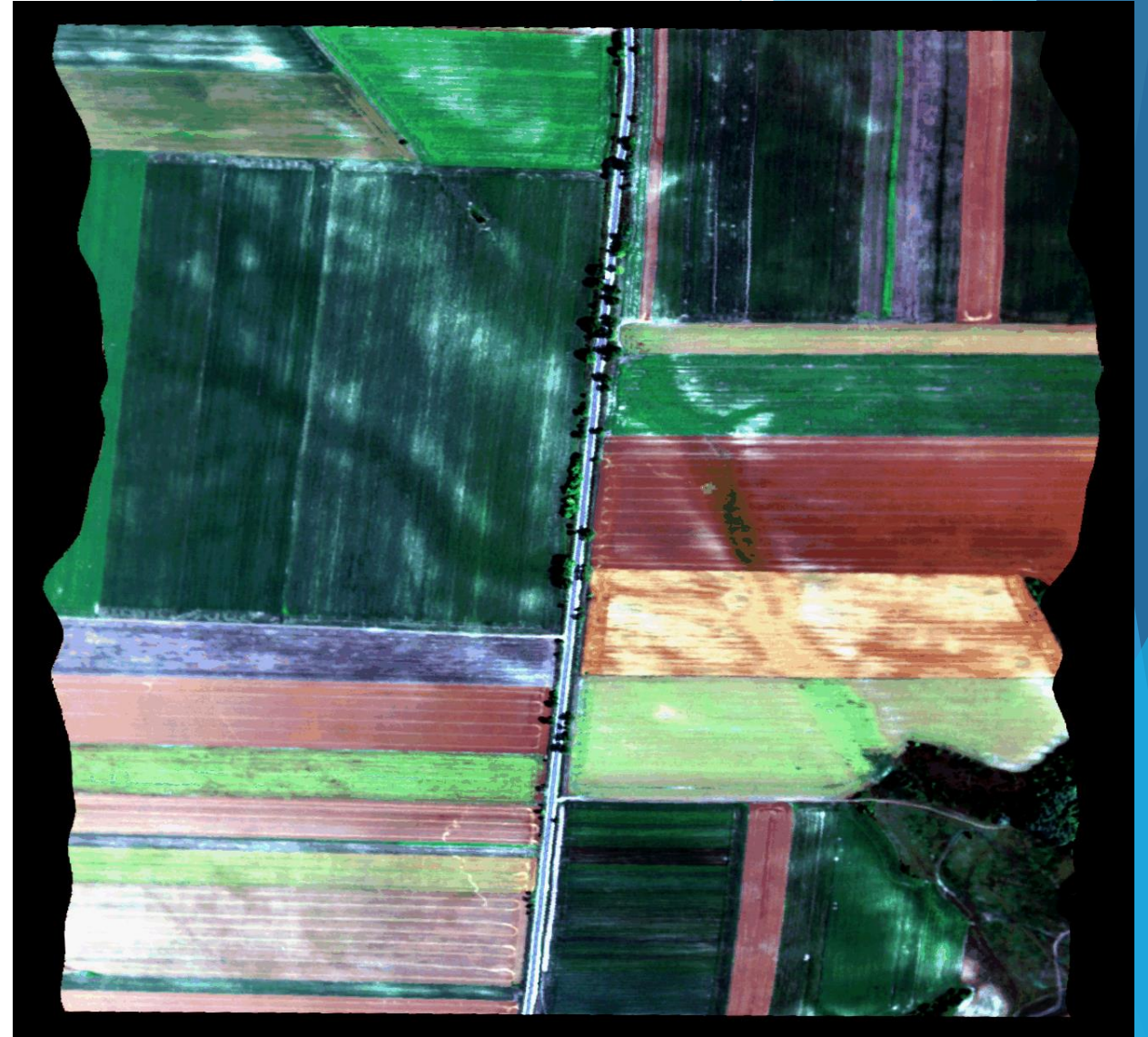
## 1 Short description of the project

Project Name:	Quantil – Hungary
Areas	Two areas: Székesfehérvár – Area 1, Fehérvár – Area 2
Number of flights:	One single flight for both areas
Date of flights:	30/05/2008
Date of delivery:	29 August 2008
Registration Mode:	First and Last Echo, RGBI
Delivered data:	DSM-FE, DTM-LE, FDTM, RGB, CIR, LIDAR point cloud FE/LE
Data medium:	DVD
GPS-Master Station:	from client
Size of tiles:	2000 m x 2000 m
Horizontal Spacing LIDAR:	1.00 m
Horizontal Spacing RGBI:	0.50 m
Vertical Spacing:	0.01 m
Number of Tiles:	Székesfehérvár – Area 1, 4 tiles 2 000 x 2 000 m Fehérvár – Area 2, 12 tiles 2 000 x 2 000 m
$\Sigma$ tiles =	16 tiles 2 000 x 2 000 m for Székesfehérvár – Area 1 and Fehérvár – Area 2



# Hyperspectral data

- ▶ Székesfehérvár and Szombathely
- ▶ AISA Eagle-II sensor
- ▶ Spatial resolution: 1m
- ▶ Number of Channels: 253
- ▶ Channel step: 2.2 nm
- ▶ Spectral bandwidth: 401.49 - 1000.24 nm
- ▶ Dates:
  - ▶ Székesfehérvár: June 22, 2011
  - ▶ Szombathely: July 12, 2011

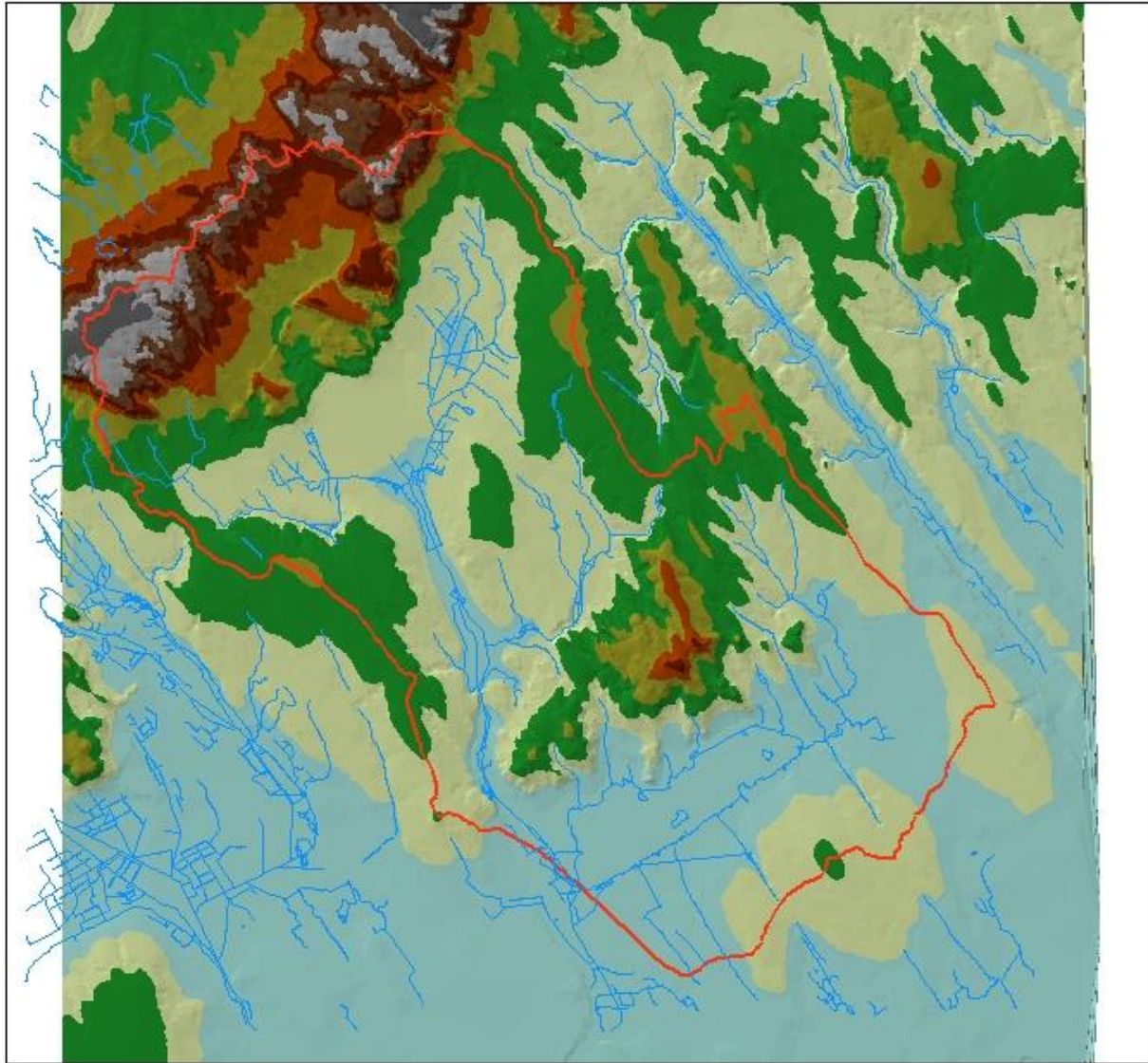




Short explanation	Short name	Resolution	Formats	Remark
LIDAR first echo DTM	DTM_FE	1m, 0.5m	ENVI, IDRISI, SURFER, ASCII	0.5m produced by interpolation
LIDAR last echo DTM	FDTM	1m, 0.5m	ENVI, IDRISI, SURFER, ASCII	0.5m produced by interpolation
DDM from contour lines	DDM	1m	SURFER, ASCII	Original resolution is 20m, 1m GRID is interpolated
Orthophoto	LIDAR_PHOTO	0.5m	ENVI, IDRISI, GEOTIFF	Channels: RGB, NIR
Topographic map	TOPOMAP	1m	ENVI, GEOTIFF	Map sheet No.:54-411
WorlView-2 image	WV2	MS 2m, Pan 0.5	ENVI, IDRISI	Number of channels: 8 MS (400-1040nm), 1 Pan (450-800nm)
Hyper-spectral images	HYPER	1m	ENVI	No. of channels:253, 401.49 - 1000.24 nm



# Digital Elevation Model - Velence lake and Vertes Mountains

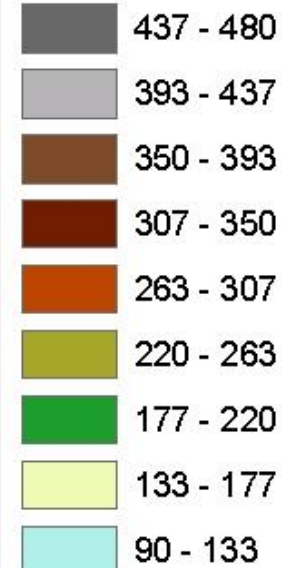


0 2.5 5 10 Kilometers



## Legend

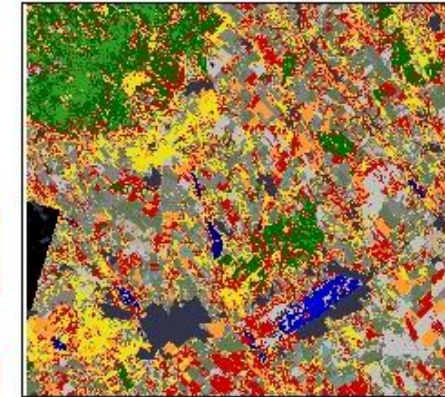
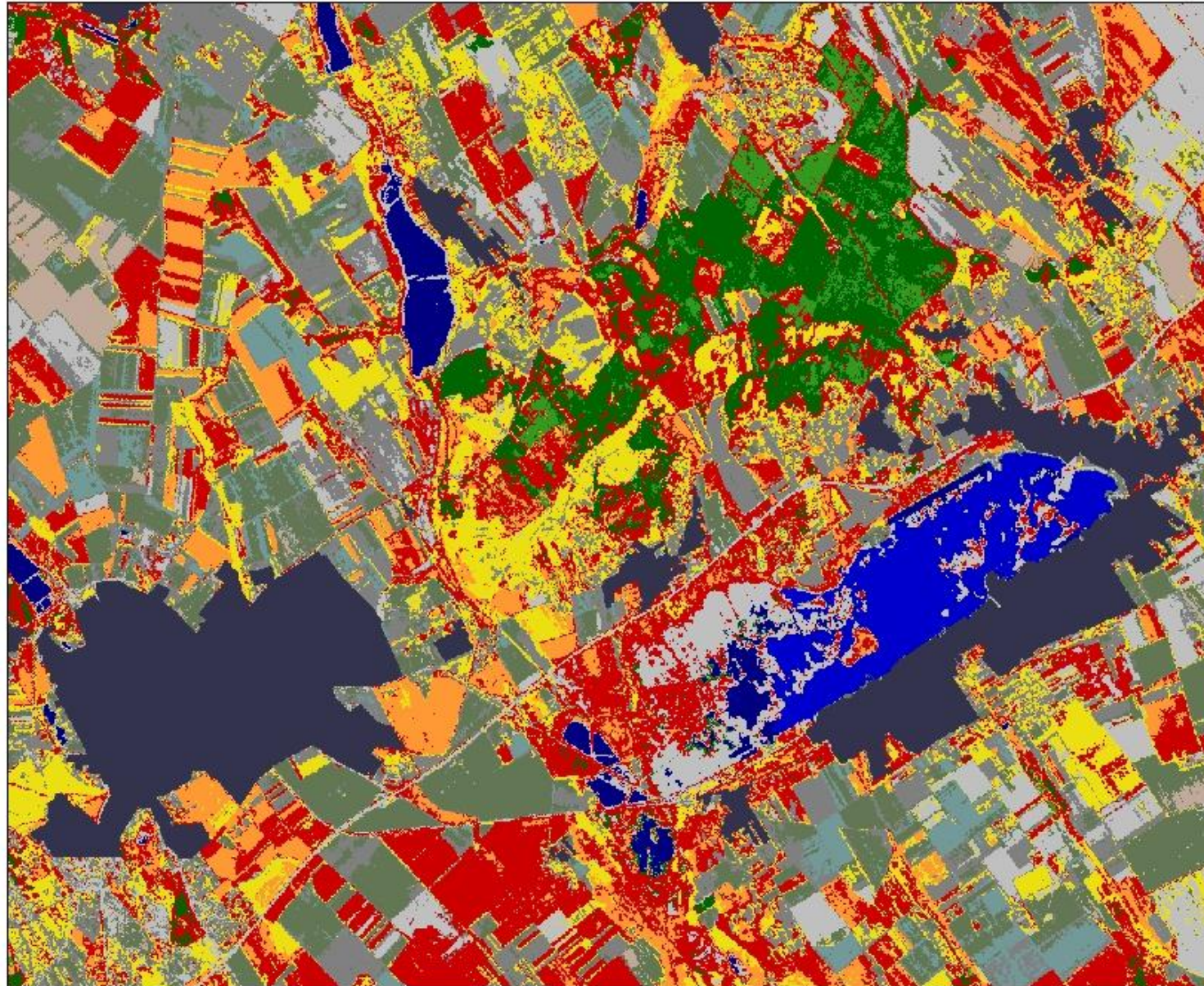
### Elevation



— Watershed

— Hydrological network

# Georeferenced Satellite Raster image of Velence Lake



## Legend

### Classification

- Forest 1
- Forest 2
- Grassland
- Settlement
- Cultivated vegetation-21
- Cultivated vegetation-11
- Arable land
- Arable land1
- Arable land2-21
- Arable land3-31
- Arable land4-41
- Unclassified
- Water surface
- Velence Lake

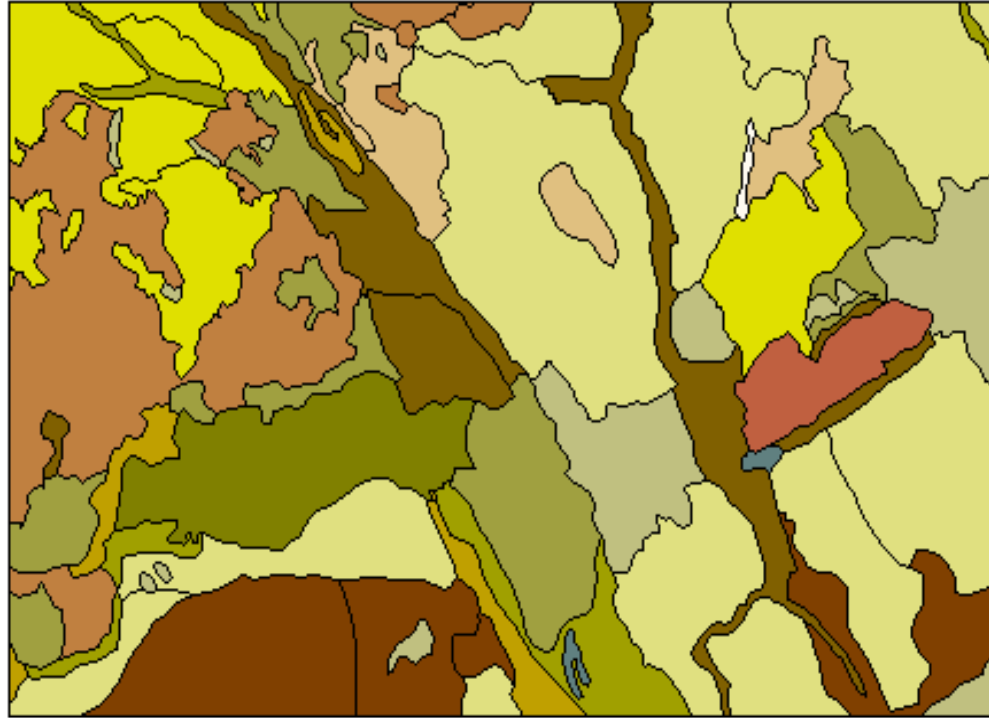
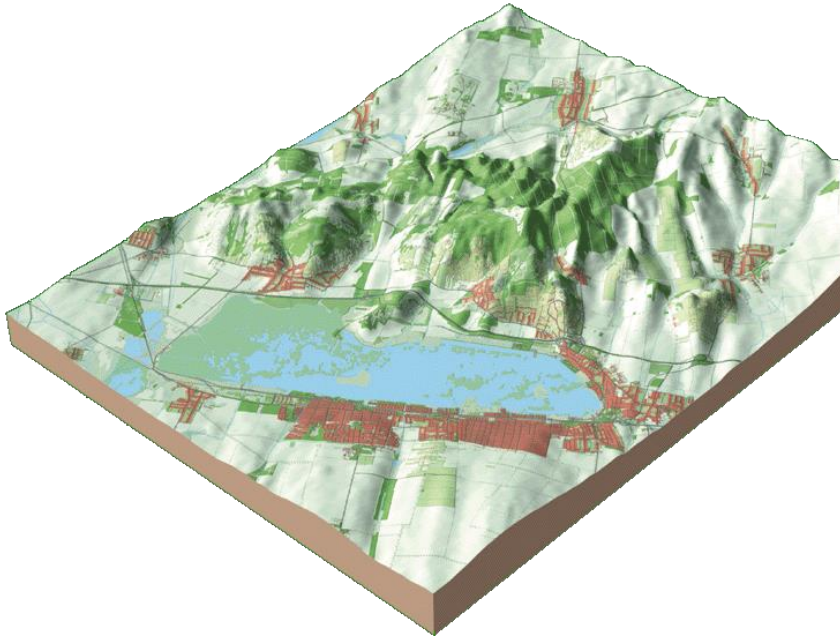
# AGROTOPO database

- ▶ Standard digital database for Hungary
- ▶ 1 : 100 000 scale
- ▶ Provided by Soil Research Institute (Hungarian Academy of Sciences)
- ▶ Meets the Uniform National Projection System standard requirements
- ▶ Multi-purpose applicability

# Parameters

- ▶ Genetic type of soil
- ▶ Base rock type
- ▶ Physical type of soil (sand, loam, clay)
- ▶ Colloid content
- ▶ Hydrological status of the soil
- ▶ pH, lime content (%)
- ▶ Organic matter (humus) content (tons per hectare)
- ▶ Soil depth (cm)
- ▶ Soil economic value (1-100)
- ▶ Average precipitation per year
- ▶ High-temperature days
- ▶ Freezing days
- ▶ Average day of the first freezing in the year
- ▶ Average day of the last freezing in the year

# Lake Velence and its catchment area



Soil type map

# Free satellite images

► Source: [https://earth.esa.int/eogateway/search?text=&category=Data&filter=agriculture&sortBy=NEWEST\\_FIRST](https://earth.esa.int/eogateway/search?text=&category=Data&filter=agriculture&sortBy=NEWEST_FIRST)

The screenshot displays the Earth Online website interface. At the top, the 'earth online' logo is on the left, followed by navigation tabs for MISSIONS, DATA, NEWS, EVENTS, TOOLS, and SEE ALL. A search bar on the right contains the text 'Find something on Earth Online' and a magnifying glass icon. Below the navigation, a secondary menu lists categories: ALL, DATA (selected), NEWS, MISSIONS, EVENTS, TOOLS, ACTIVITIES, INSTRUMENTS, CAMPAIGNS, and DOCUMENTS. On the left side, there are filter sections: 'Active filters' with 'Clear filters', 'THEMATIC AREA' with checkboxes for Human Dimensions, Land Surface, Frozen Ground and Permafrost, Geomorphic Landforms and Processes, Land Use and Land Cover, Landscape, Mapping and Cartography, Soils, Surface Radiative Properties, and Topography; and 'INSTRUMENT TYPE' with checkboxes for Imaging Radars, Interferometric Radiometers, Photon/Optical Detectors, and Scatterometers. The 'MISSION' section is partially visible at the bottom left. The main content area shows search results for 'DATA'. It includes a sub-header 'DATA' with a description: 'Discover and download the Earth observation data you need from the broad catalogue of missions the European Space Agency operate and support.' Below this, there are four data cards, each featuring a satellite image of Earth and a title: 'Landsat 8 Collection 2 European Coverage', 'ALOS AVNIR-2 L1C', 'SPOT-6 to 7 full archive and tasking and SPOTMaps 2.5...', and 'ALOS PRISM L1B'. Each card also contains a brief description of the data collection.

earth online • MISSIONS • DATA • NEWS • EVENTS • TOOLS | SEE ALL

Find something on Earth Online

Active filters:  Clear filters

Frozen Ground and Permafrost

Geomorphic Landforms and Processes ...

▼ THEMATIC AREA

Human Dimensions

Land Surface

Frozen Ground and Permafrost

Geomorphic Landforms and Processes

Land Use and Land Cover

Landscape

Mapping and Cartography

Soils

Surface Radiative Properties

Topography

▼ INSTRUMENT TYPE

Imaging Radars

Interferometric Radiometers

Photon/Optical Detectors

Scatterometers

▼ MISSION

ALOS-1

ALL DATA NEWS MISSIONS EVENTS TOOLS ACTIVITIES INSTRUMENTS CAMPAIGNS DOCUMENTS

Newest First All Data Types

**DATA** | Discover and download the Earth observation data you need from the broad catalogue of missions the European Space Agency operate and support.

Data - Data Description

**Landsat 8 Collection 2 European Coverage**

This dataset contains the European Coverage of Landsat 8 Collection 2 data, both Level 1 and Level 2, since the beginning of the...

Data - Data Description

**ALOS AVNIR-2 L1C**

This collection provides access to the ALOS-1 AVNIR-2 (Advanced Visible and Near Infrared Radiometer type 2) L1C data acquired by ES...

Data - Data Description

**SPOT-6 to 7 full archive and tasking and SPOTMaps 2.5...**

SPOTMaps 2.5 is a dataset providing nationwide or regional seamless coverage, orthorectified, derived from colour imagery...

Data - Data Description

**ALOS PRISM L1B**

The full mission is covered, though with gaps outside of the ADEN zone: Time window: from 2006-07-09 to 2011-03-31 Orbits: from 242...

## ▼ MISSION

- Aeolus
- ALOS-1
- Aura
- COSMO-SkyMed
- COSMO-SkyMed Second Generation
- CryoSat
- Deimos
- Deimos-1
- Deimos-2
- DMC First Generation

- Envisat
- ERS
- ERS-1
- ERS-2
- GeoEye-1
- GOCE
- GOSAT
- GOSAT-1
- GOSAT-2
- GRACE
- ICEYE
- IKONOS-2
- IRS-1C
- IRS-1D
- IRS-P5
- IRS-P6
- IRS-R2
- JERS-1
- KOMPSAT-2
- Landsat
- Landsat-1
- Landsat-2

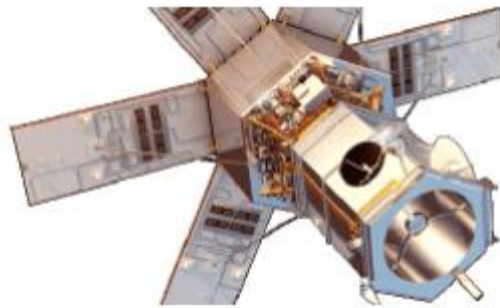
- Landsat-3
- Landsat-4
- Landsat-5
- Landsat-7
- Landsat-8
- Metop
- NOAA POES
- OceanSat-2
- ODIN
- PAZ
- PlanetScope
- Pleiades
- PROBA-1
- PROBA-V
- QuickBird-2
- RADARSAT-1
- RADARSAT-2
- RapidEye
- SAOCOM
- SCISAT-1
- Seasat
- Sentinel-1

- Sentinel-2
- Sentinel-3
- Sentinel-5P
- SkySat
- SMOS
- Spire
- SPOT
- SPOT 1
- SPOT 2
- SPOT 3
- SPOT 4
- SPOT 5
- SPOT 6
- SPOT 7
- Swarm
- TanDEM-X
- TerraSAR-X
- WorldView-1
- WorldView-2
- WorldView-3
- WorldView-4

## ▼ THEMATIC AREA

- Agriculture ▼
- Atmosphere ▼
- Biosphere ▼
- Climate ▼
- Cryosphere ▼
- Human Dimensions ▼
- Land Surface ▼
- Oceans ▼
- Solid Earth ▼
- Space Weather ▼
- Sun-Earth Interaction
- Terrestrial Hydrosphere ▼

### Mission - Third Party Missions



### WorldView-4

WorldView-4 was an imaging and environment-monitoring satellite from Maxar of the United States, which offered very hig...

### Mission - Copernicus Sentinels



### Copernicus Sentinel-2

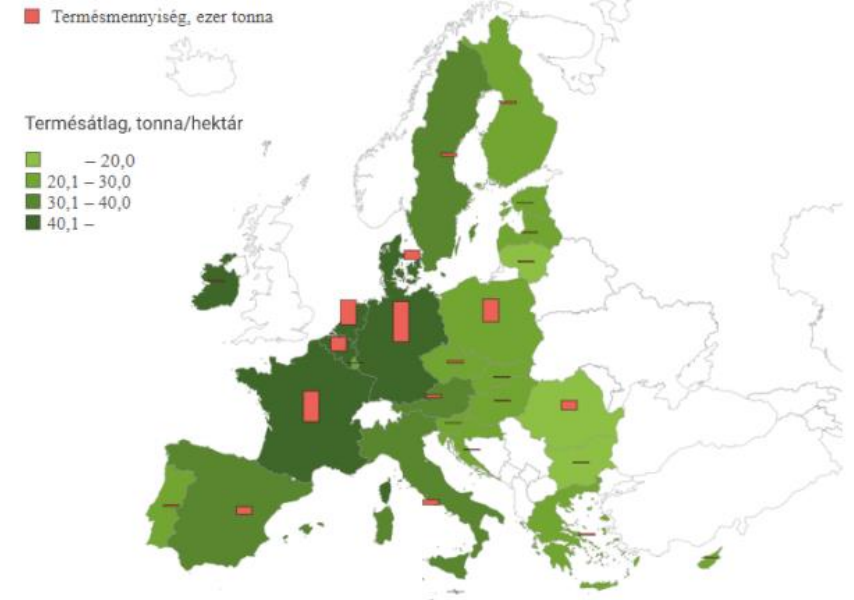
The Copernicus Sentinel-2 mission comprises a constellation of two polar-orbiting satellites placed in the same sun-synchronous orbit,...



# Farmland Crops Yield

Hungarian Statistical Office  
Eurostat  
National Agricultural Chamber

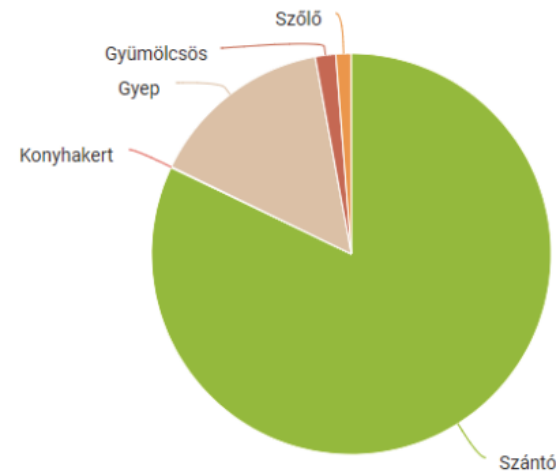
A burgonya termésátlaga és termésmennyisége az Európai Unió országaiban, 2020



A búza termésmennyisége és termésátlaga megyénként, 2020



A mezőgazdasági terület megoszlása művelési áganként, 2021. június 1. (ezer hektár)



# Meteorological data Weather

met.hu  
idokep.hu  
public.wmo.int



Időkép Shop

Legyen saját időjárás állomásod!

ELŐREJELZÉS IDŐKÉP HŐTÉRKÉP FELHŐKÉP RADAR KAMERÁK KÖZÖSSÉG TEMATIKUS TÉRKÉPEK BEJELENTKEZÉS

KÉPTÁR ÉSZLELESEK TÁRSALGÓ ÚJ ÉSZLELES KÉP FELTÖLTÉSE AUTOMATÁK TUDÁSTÁR GYIK

## Automaták

Automata választás:

Székesfehérvár (titkokhaza\_oe\_amk)

### Székesfehérvár automata

Jelenlegi adatok Székesfehérvár térségében

Üzemeltető: Titkok Háza



Utolsó mérés	ma 21:45
Hőmérséklet	3.41 °C
Harmatpont	-1 °C
Páratartalom	72.5 %
24 órás csapadék	0 mm/24h
Csapadékinintzés	0 mm/h
Szélereő	0 km/h
Szélirány	352 ° (É)

## Székesfehérvár 2022-01-03 - 2022-01-31

Dátum	Hőmérséklet (°C)			Alapszél (km/h)		Sz.lökés (km/h)	Csapadék (mm)	Páratartalom (%)			Légnyomás (hPa)			UV	R.állás (%)
	min	átlag	max	átlag	max	max	össz	min	átlag	max	min	átlag	max	max	
2022-01-03	2.91	7.62	12.60	0.00	(-1)	(-1)	0.00	60.90	77.89	91.40	973.25	1006.34	1035.19		74.31
2022-01-04	2.45	7.33	11.23	1.61	11.00 (NY)	28.00 (NY)	0.00	73.70	82.46	91.40	969.88	997.44	1026.30		99.79
2022-01-05	3.98	7.47	10.92	2.97	18.00 (É-ÉK)	37.00 (É-ÉK)	1.80	65.30	80.19	86.20	964.44	984.09	1005.66		99.72
2022-01-06	-1.84	3.09	5.84	3.57	16.00 (É-ÉK)	31.00 (É-ÉK)	0.00	60.20	69.49	75.20	983.83	999.08	1019.64		99.72
2022-01-07	-5.38	-2.46	2.59	0.81	10.00 (ÉNY)	18.00 (K-DK)	0.00	58.00	74.16	84.00	998.83	1007.64	1021.36		99.93
2022-01-08	-7.21	-3.82	1.61	0.13	5.00 (É-ÉK)	10.00 (D-DNY)	0.00	56.10	78.24	85.60	987.97	999.68	1014.77		99.93
2022-01-09	-8.04	-3.11	0.92	0.53	8.00 (DK-D)	12.00 (DK-D)	0.00	73.80	82.67	90.00	983.18	1000.83	1015.96		99.79
2022-01-10	-2.46	-0.25	4.12	1.41	10.00 (É-ÉK)	20.00 (É-ÉK)	0.00	68.90	82.42	88.00	987.02	1006.80	1026.41		99.86
2022-01-11	-4.50	-1.62	3.33	3.45	14.00 (ÉK)	27.00 (É-ÉK)	0.00	55.60	76.13	84.50	1004.86	1019.78	1027.23		99.72
2022-01-12	-6.18	-3.97	0.50	2.15	11.00 (DK)	26.00 (É-ÉK)	0.00	64.20	78.33	84.90	1012.71	1021.48	1032.92		99.79
2022-01-13	-6.64	-1.07	3.36	2.48	11.00 (NY-ÉNY)	31.00 (ÉNY-É)	0.00	71.30	79.57	89.20	1005.76	1024.29	1043.46		99.79
2022-01-14	-3.08	3.85	9.62	3.74	22.00 (DNY-NY)	50.00 (DK-D)	0.00	53.00	69.31	83.50	999.78	1014.12	1041.80		96.46
2022-01-15	-3.43	2.77	7.70	3.84	19.00 (ÉK)	43.00 (DK-D)	0.00	42.00	72.84	83.60	994.34	1008.58	1026.95		99.93
2022-01-16	-6.77	-2.61	3.25	0.49	9.00 (ÉNY)	18.00 (D-DNY)	0.00	45.80	82.96	89.00	993.71	1014.99	1030.91		100.00
2022-01-17	0.88	4.07	6.94	6.73	23.00 (ÉK-K)	60.00 (ÉNY)	0.90	62.60	71.45	83.20	988.73	1004.33	1020.97		99.86

The screenshot shows the idokep website interface for Székesfehérvár. It features a navigation bar with various weather-related links, a main content area with a temperature chart for the month of February, and a map of Hungary with a color-coded temperature overlay. The chart shows daily temperature ranges from -6.4°C to 6.15°C. The map shows a color scale from -40°C to 40°C.



GINOP - 2.3.2-15-2016-00055 számú projekt: Légzennyvesztés előrejelző rendszer kifejlesztése légköri víz-aeroszol kölcsönhatásainak figyelembevételével

KEHOP-1.1.0-15-2015-00001 számú projekt: Az éghajlatváltozás magyarországi hatásainak feltérképezése regionális klímadat-szimulációk elvégzésével és reprezentatív adatbázis fejlesztésével

# Attribute data sources

- ▶ <https://ec.europa.eu/eurostat/web/agriculture/data/main-tables>
- ▶ <https://ec.europa.eu/eurostat/databrowser/explore/all/agric?lang=en&subtheme=agr&display=list&sort=category>
- ▶ [https://www.ksh.hu/stadat\\_files/mez/hu/mez0070.html](https://www.ksh.hu/stadat_files/mez/hu/mez0070.html)
- ▶ [https://www.met.hu/ismeret-tar/erdekessegek\\_tanulmanyok/index.php?id=2808](https://www.met.hu/ismeret-tar/erdekessegek_tanulmanyok/index.php?id=2808)