



MePAR – The Hungarian Land Parcel Identification System and its LU/LC Layer

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**Institute of Geodesy, Cartography
and Remote Sensing**

<http://www.fomi.hu>

1. The building up and maintenance of Land Parcel Identification System

Common Agricultural Policy (CAP)

- The CAP is a system of European Union agricultural subsidies and programmes.
- The aim: provide farmers with a reasonable standard of living, consumers with quality food at fair prices and to preserve rural heritage.
- Reforms are currently underway transferring subsidy to land stewardship rather than specific crop production. (*GREENING*)

The structure of the Hungarian Integrated Administration and Controls System (IACS) set and operated by the ARDA (Agricultural and Rural Development Agency = Hungarian paying agency)

The IACS data system:

- **Land Parcel Identification System (MePAR)**
- Identification system for farmers
- Identification system for payment entitlements
- System for identification and registration of animals (cattle, sheep, goat)
- Integrated control system:
 - Administrative control,**
 - Control with Remote Sensing (CwRS),**
 - On the spot checks with area measurement.**



GIS!



GIS!

The role of the Land Parcel Identification System (MePAR)

MePAR (Hungarian LPIS) is the exclusive reference, land parcel identification and spatial information system (GIS) of the agricultural and rural development subsidies, financed by EU and national sources.

- MePAR is based on physical blocks (No. blocks in 2013: 373 083);
- Main support scheme: SAPS (Single Area Payment Scheme)
- Until 2013, a necessary condition of eligibility in Hungary was keeping areas in Good Agricultural Conditions on 30 June 2003 (reference date).

The elementary units of LPIS-Hu: orthophoto based physical blocks

Cadastral data

E8VQW-9-07

31.48 ha

Unique block ID
number and net
eligible area



Boundaries of eligible
and non-eligible areas
according to SAPS

Physical block
boundaries

Ortophoto

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In the Land Parcel Identification System (MePAR) the delineation of the eligible and non-eligible areas in physical blocks is primarily based on orthophoto



Data sources of LPIS creation

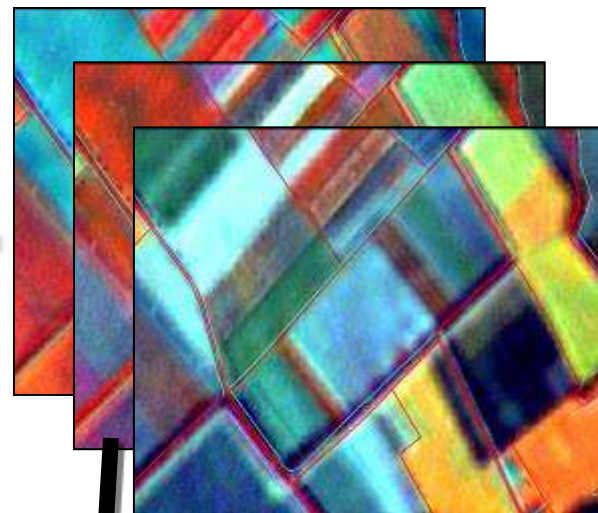
Orthophoto 2000-2010



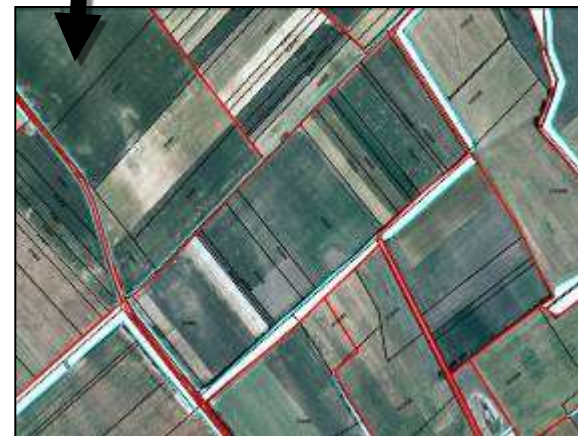
Topographic map



Multiannual satellite image series



Integration of aerial and satellite data



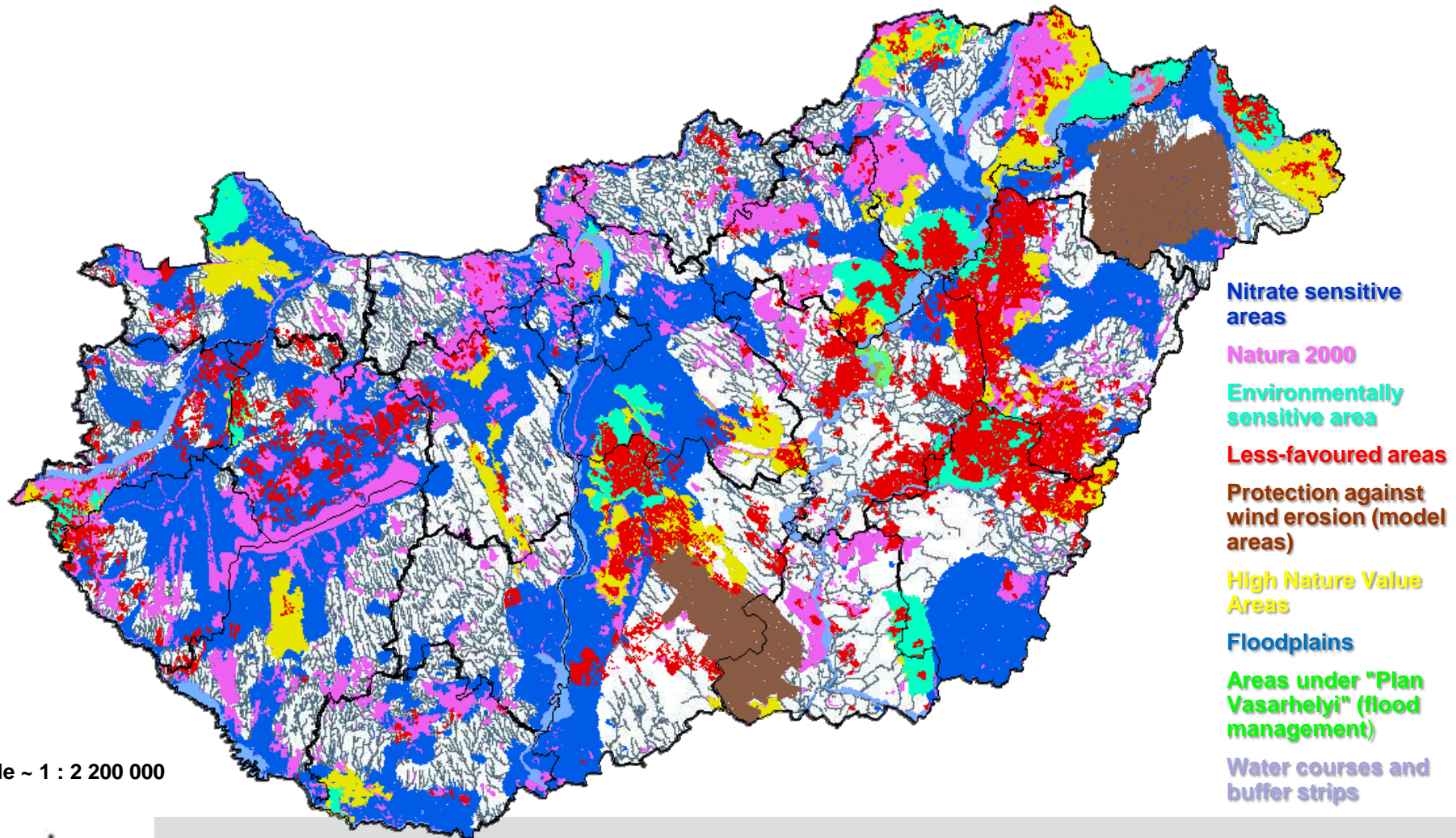
1. Ortho-photography - geographical base (+broad land use)
2. Topographic maps - help in defining stable elements in time
3. Satellite imagery (multiannual) - checking of block land use and permanent boundaries

LPIS in Hungary – thematic layers

	Name	Availability from year
Thematic layers	Layer of landscape feature: Groups of trees and bushes	2014-
	Water protection buffer strips along water courses	2012-
	Layer of landscape feature: sweep-pole wells	2010-
	Layer of landscape feature: Cumanian mounds	2010-
	>17% slopes (Nitrate Directive)	2009-
	High Nature Value Areas	2009-
	Areas under the responsibility of Ministry of Defence	2009-
	Reedbeds	2009-
	Floodplains	2009-
	Areas under "Plan Vasarhelyi" (flood management)	2009-
	Areas affected by wind erosion	2009-
	Afforestation (EAGGF, Guidance)	2009-
	Natura 2000 (2008) (Update in progress from 2010)	2008-2009
	Terraces against soil erosion (vineyards)	2008-
	Afforestation (EAFRD)	2008-
	Bare karst	2006-
	Vulnerable water base areas	2006-
	Nitrate Directive Annex B areas	2006-
	Less Favoured Areas (LFA) (Update in progress from 2010)	2005-2009
	Environmentally Sensitive Areas (ESA)	2005-2009
Areas affected by soil erosion (>12% slopes)	2005-	
Cadastral coverage	2004-	
LPIS basic data	Unique block ID number and net eligible area	2004-
	Boundaries of eligible and non-eligible areas according to SAPS	2004-
	Physical block boundaries	2004-
	Orthophoto (2000, 2005, 2007, 2008, 2009, 2010, 2011, 2012, 2013)	2004-

LPIS thematic layers

AEM (Agri-environmental Measures)



Scale ~ 1 : 2 200 000

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Tasks to ensure LPIS revision

- Regular, rotational update (about ¼ of the country / year)
- Block reviews launched pursuant to requests made by clients
- Block review ex officio:
 - Blocks selected for block review during the course of physical control (classical field inspections and remote sensing controls)
 - Introduction of a highway construction monitoring subsystem into the LPIS update
 - Incorporation of areas involved in scheme “afforestation of agricultural areas” into LPIS

Review and change management of physical blocks

Example #1

The reduction of eligible area because of road construction



Orthophoto 2007, MePAR 2010

Orthophoto 2011, MePAR 2012



Review and change management of physical blocks

Example #2

The reduction of eligible area because of urban development



Orthophoto 2007, MePAR 2010

Orthophoto 2011, MePAR 2012



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2. LPIS Land Cover Database

The general attributes of MePAR land cover system

Generally different land cover systems can be told from each other by

- the used methodology,
- the used data,
- applied categories (e.g. our approach is based on agriculture).

The MePAR land cover system

- established using visual interpretation,
- based on ortho imagery, satellite image time series, rapid field visits and GNSS measurements,
- methodology and basic logic is based on MePAR/LPIS methodology,
- part of the MePAR/LPIS system.

In Hungary there is no other system with this resolution, accuracy and frequent update period, using visual interpretation and raster data as data source.

The MePAR land cover system

The resolution of the MePAR land cover system is determined by:

- resolution of raster data used (0.4 m),
- laws and regulations on LPIS build up, update, maintenance and quality control,
- The aim of usage, stability and update cycle.

Objects in the MePAR land cover system are delineated above and around the size of 0.1 ha. However, there are thousands of objects smaller than this threshold because in some special cases we have to delineate smaller ones in the “base” MePAR, therefore they also appear in the land cover data.

The main aspects of creating the categories of the land cover system:

- the MePAR land cover system primarily contains agricultural areas, subdivided by different land use (e.g. arable land, pastures, plantations etc.),
- **the categories even at the topmost level of hierarchy are defined on the basis of eligibility,**
- **the category system is more detailed within eligible areas,**
- if necessary, the categories can be split into new subcategories later,
- does not only contain elements visible on ortho imagery, but special elements that may only be visible on older imagery symbolizing a past state of land cover.

The MePAR land cover system - purposes

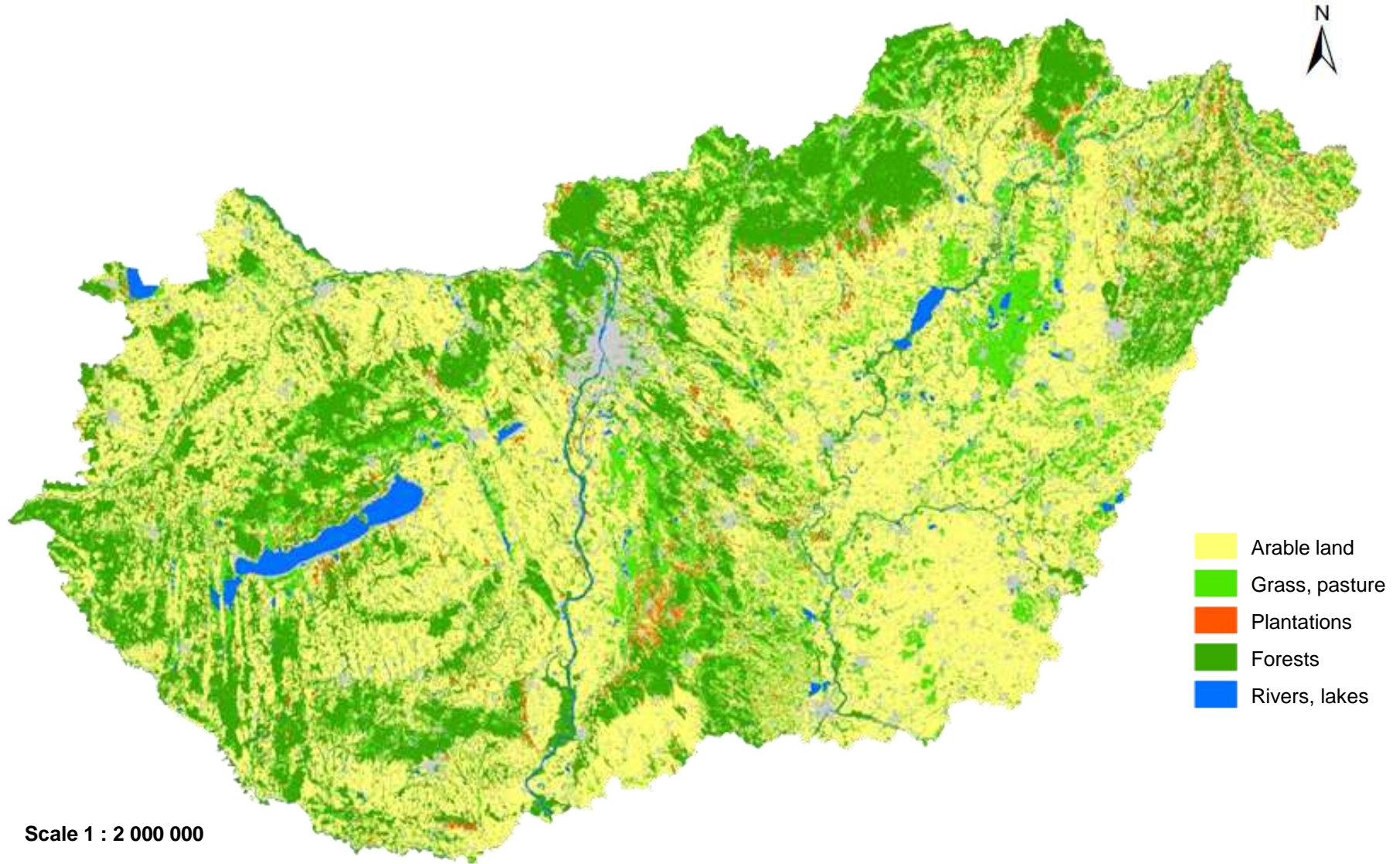
The main purposes of the creation of the MePAR land cover system are:

- to improve the efficiency of control of area-based subsidies,
- to provide statistical data for developing new agrarian strategies,
- to help the creation of new thematic layers,
- to help implementing the CAP reform,
- and to help tracing agricultural changes, depending on the update cycle (3 or 4 years).

Possible uses of the MePAR land cover system

- Help in on-the-spot controls, the identification of risky areas.
- Using the land cover data, the Paying Agency can make administrative checking more reliable and robust.
- Land cover data can be used as a reference background data set in the on-line subsidy claiming system.

The MePAR land cover system

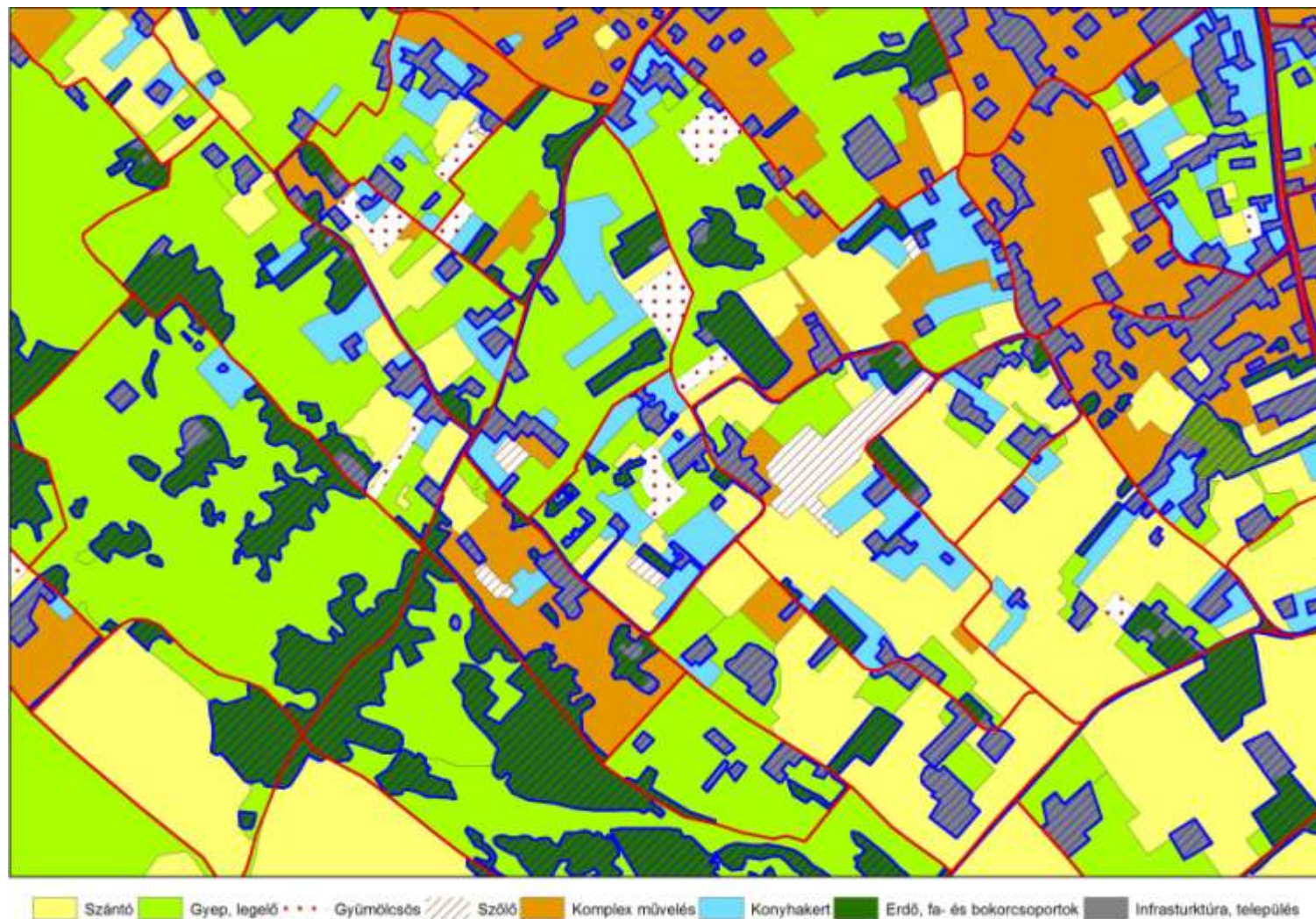


- Arable land
- Grass, pasture
- Plantations
- Forests
- Rivers, lakes

The MePAR land cover system



The MePAR land cover system



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3. Control with Remote Sensing of Agricultural Subsidies

Remote sensing control of area-based agricultural subsidies: an indirect way of updating MePAR Land Use database

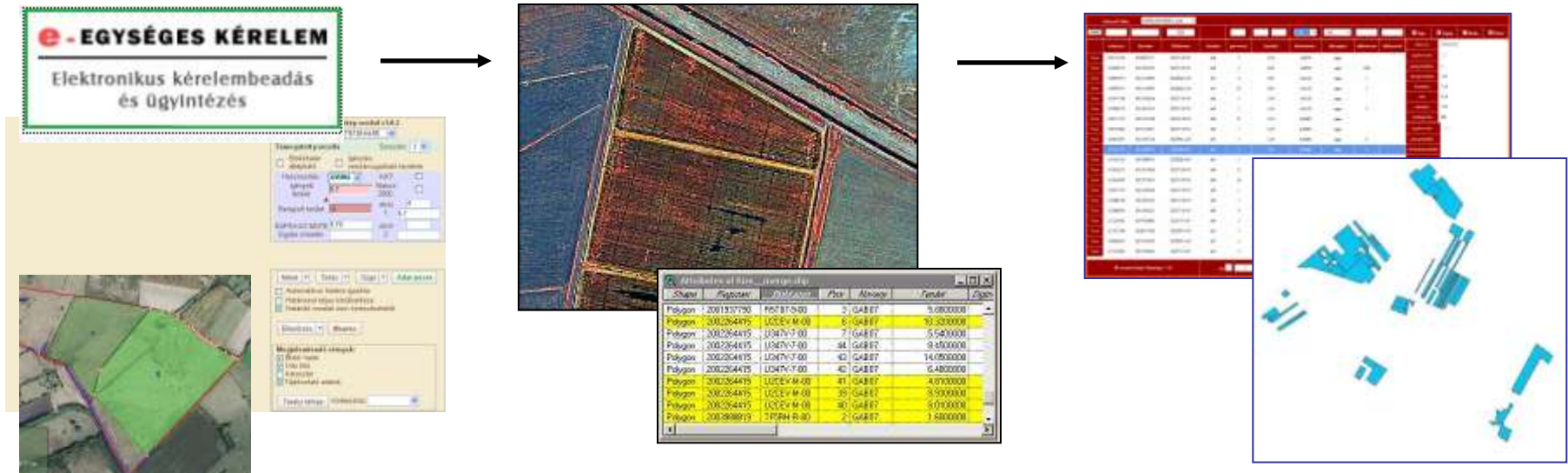
The comparison of claims and real situation:

- **Cultivated crop**
- **Parcel area**
- **Good Agricultural and Environmental Conditions (GAEC)**

Claims
(electronic)

Control in GIS
using satellite images

Result: control
documents
(electronic)



Sites of control with remote sensing

9000-12000 dossiers (2013: 9000)

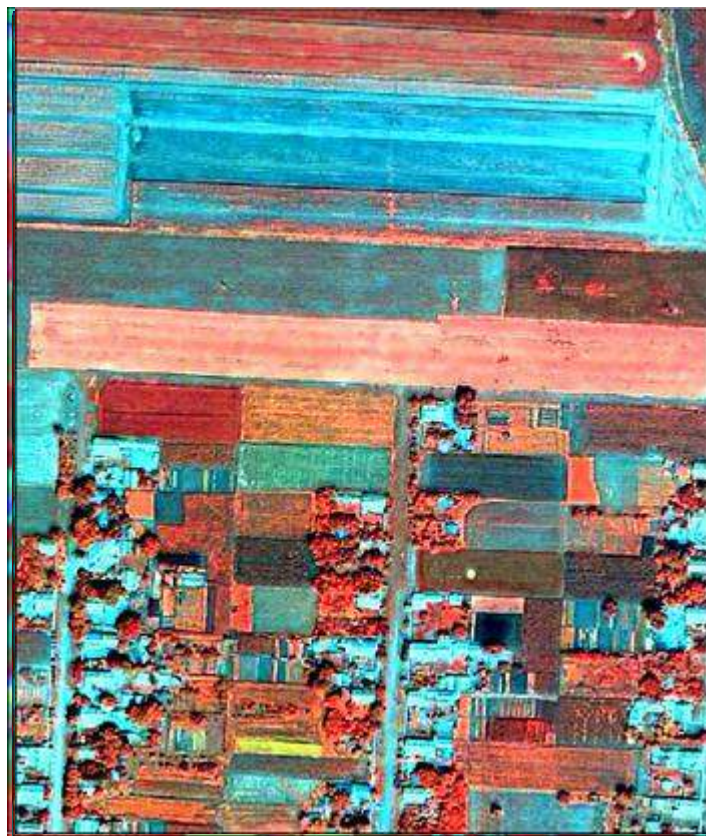
60000-80000 parcels (2013: 91000 in sites, 60000 actually controlled)

8-10 sites (2013: 9)

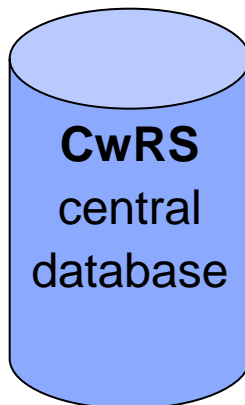
8000-10000 square kilometers (2013: 8800 km²)



Basic data of CwRS: high and very high resolution satellite images (HR, VHR)



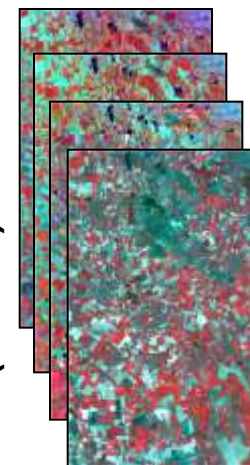
VHR



SPOT 2 XS
SPOT 4/5 Xi
Landsat 5/7 (E)TM
IRS-1C/D/P6/R2 LISS
RapidEye

Satellite images

High resolution
(10-25m) time series



Very high resolution
(0,5-1m)



Area measurement

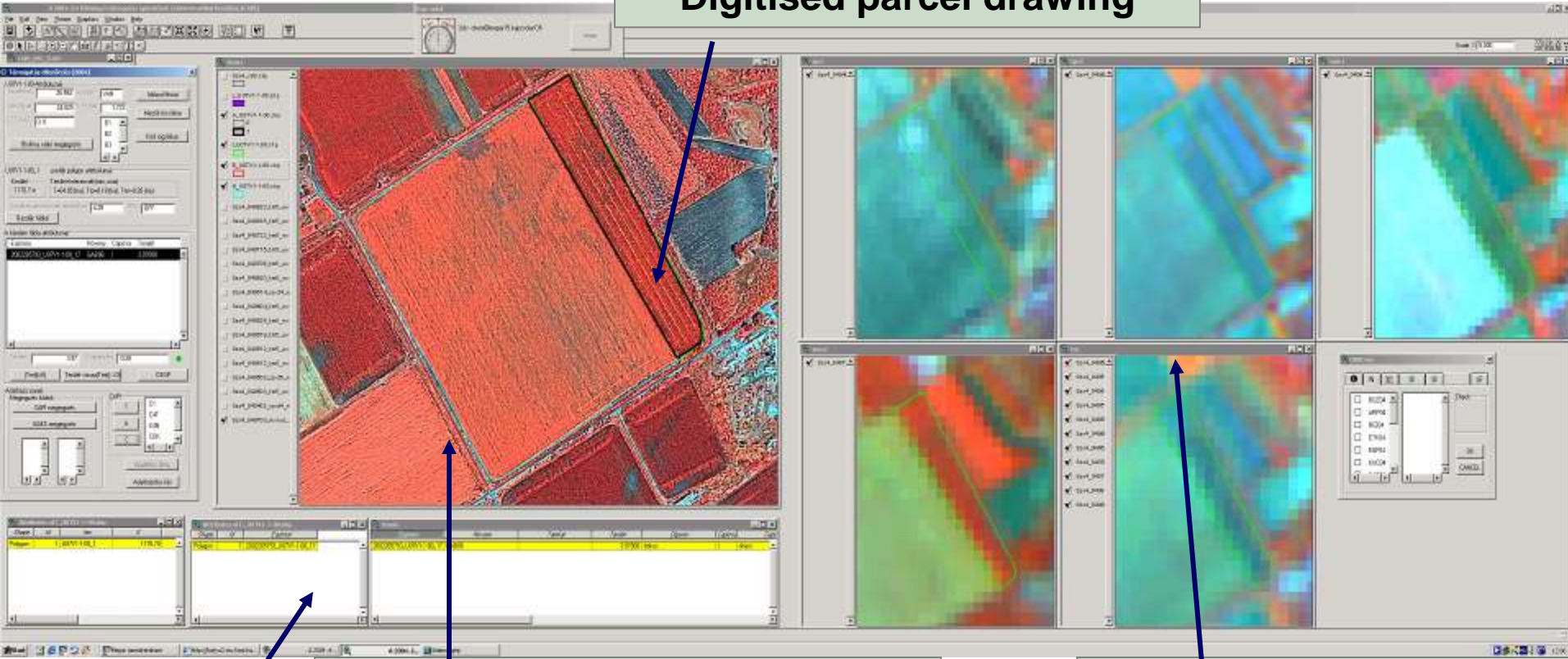
Ikonos
QuickBird
Pléiades 1A/1B
GeoEye
WorldView 1/2

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Computer-aided Photo-interpretation (CAPI) with GIS software developed within FÖMI

Digitised parcel drawing



Claim
database

Very high resolution (VHR)
satellite images for area
measurement

High resolution satellite
image time series for
crop determination

The role of control with remote sensing in the updating of Land Use Database

During the Computer-aided Photo-interpretation, operators mark the blocks that need updating in MePAR:

- Block boundary
- The delineation of eligible / ineligible areas
- “Coding”, land use category.