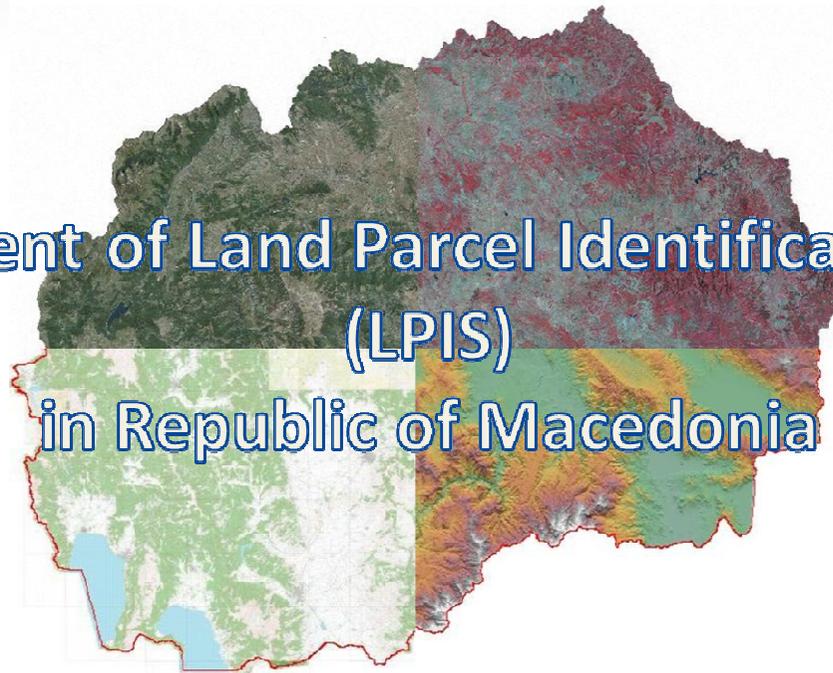




**Republic of Macedonia**  
Ministry of agriculture,  
forestry and water economy

**Establishment of Land Parcel Identification System  
(LPIS)  
in Republic of Macedonia**



**Ljupco Chadinoski**  
**LPIS management unit**

**LPIS 2010 Workshop - Copenhagen, Denmark**



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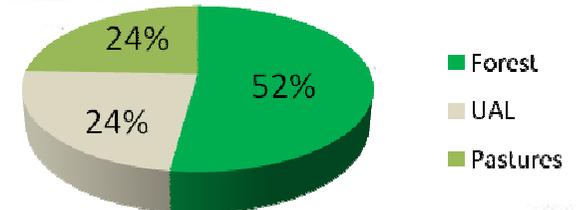
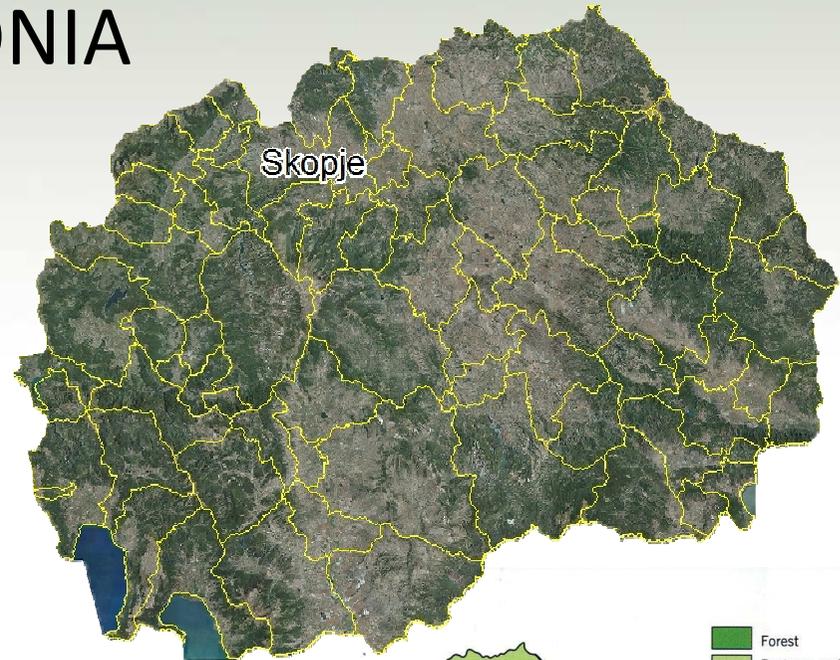


# FACTS ABOUT MACEDONIA

Population: 2.046.177  
 Total area: 25,713 km<sup>2</sup>  
 (Hills and mountains 79,0 % )  
 (Plains 19,1 % )  
 (Natural lakes 1,9 % )

## Agriculture:

Forests: 1.159.600 ha  
 Utilized agricultural land: 523.185 ha  
 Pastures: 542.000 ha  
 Number of individual agricultural holdings: 192.675  
 Number of registered farmers in Farm register: 102.599  
 Average farm size: 2.5 – 2.8 ha



# MACEDONIAN AGRICULTURAL LANDSCAPE



*the harvested wheat field*



*strawberry plantation*



# MACEDONIAN AGRICULTURAL LANDSCAPE



*plantation of apples*



*plantation of vine*



# MACEDONIAN AGRICULTURAL LANDSCAPE



*Agricultural landscape near Mavrovo lake*



# LPIS in Republic of Macedonia

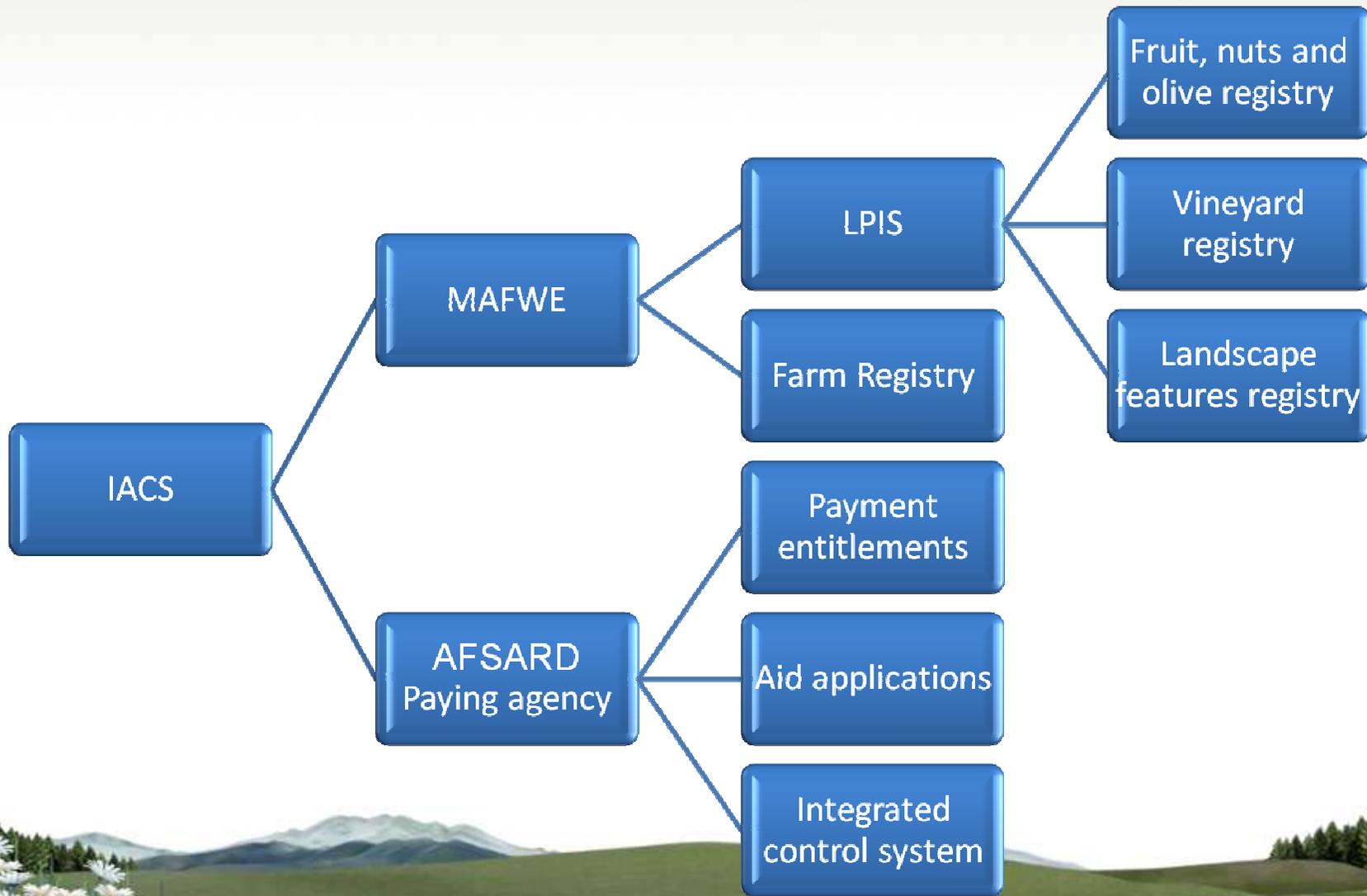
## Institutional setup

- Legislation:
  - Law on Agriculture and rural development
  - Law on establishing the Agency for financial support of agriculture and rural development
- Ministry of Agriculture, Forestry and Water Economy -MAFWE
- establishment and maintenance of Farm Registry
- establishment and maintenance of LPIS and related registries
- central LPIS unit with three full-time employees
- 33 local offices with 90 people for maintenance of LPIS (and another 100 possibly to be engaged in production phase)
- Agency for Financial Support of the Agriculture and Rural Development (National IPARD/Paying Agency)
- Administration, control of support schemes and subsidy claims
  - Department for the control



# LPIS in Republic of Macedonia

## Organizational structure



# LPIS in Republic of Macedonia

## Main Features of Macedonian LPIS

- LPIS - multifunctional reference system used for administration and control of area-related subsidies, including the area of cross-compliance, permanent crops and organic farming
- Reference parcel: farmer block
- Computer-assisted photo interpretation - on-screen digitization using digital orthophoto maps
- Link between photointerpreted agricultural land and the farmers shall be established during direct consultations with farmers
- On-going vineyard registration will be merged with the process of LPIS creation
- LPIS reference parcel layer shall hold the following information: parcel geometry, unique ID, area, perimeter, land use category, farmer ID, administrative unit ID, and terrain characteristics



# LPIS in Republic of Macedonia

## Establishment phase 2008 – 2010

- The Government of Republic of Macedonia accepted an action plan for establishment of LPIS in 2008:
  - ✓ **2008** – Selection of consulting firm, design of the LPIS, preparation of technical specification for system development and establishment of LPIS Unit
  - ✓ **2009** – Selection of contractor and concluded activities: aerial survey of the whole territory of RM (June – July), preparation of ortophoto images, digitalization of initial LPIS blocks and DTM (August – December)
  - ✓ **2010** – finalization of data control (October 2009 – March 2010), and training of the LPIS operative personnel

*All activities till 2010 have been financed by the national funds (budget and WB loan)*



# LPIS in Republic of Macedonia

## Features of the data produced

- Aerial images are covering the whole territory (25.713 sq km), acquired using digital photogrammetric camera in 2009
- Digital orthophoto maps - ground sampling distance 50cm (0.5 m/pix, corresponding to an orthophoto map in scale 1:5000), RGB and CIR, horizontal accuracy RMSE  $\leq 1.5\text{m}$
- New digital terrain model (DTM) – grid 5m, height accuracy RMSE  $\leq 2\text{m}$
- Initial LPIS data – classified polygons of agricultural land covering the whole territory of the country
  - Photointerpretation and Quality Check manuals were provided to digitizers
- Quality Control conducted of all delivered data



# LPIS in Republic of Macedonia

## Features of the data produced – digitalization

- Digitization of physical boundaries
- ✓ Performed by selected contractor
- ✓ Digitized all utilized agricultural land excluding highland pastures
- ✓ Average size: 1.4 ha
- ✓ Number of polygons: 374.123

LANDUSE	ha
Arable land	349.881
Green houses	3.513
Meadows	56.578
Vineyards	29.814
Orchards	9.599
Mixed landuse	64.814



# LPIS in Republic of Macedonia

## Data examples



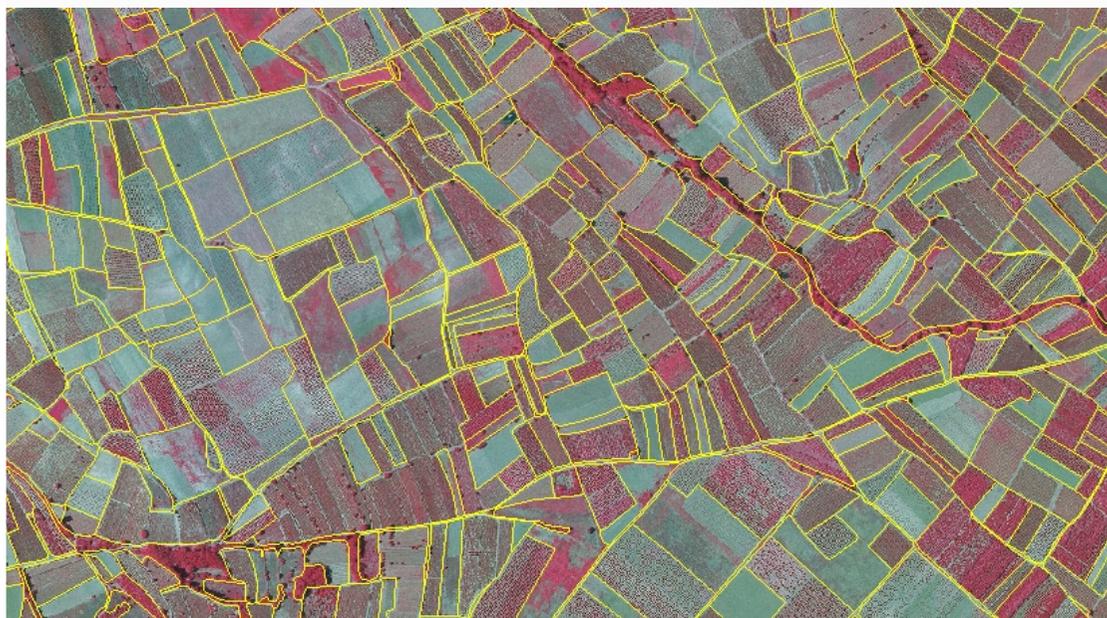
CIR DOP 2009

RGC DOP 2009



# LPIS in Republic of Macedonia

## Data examples



Initial LPIS 2009 on CIR DOP

Initial LPIS 2009 on RGB DOP



# LPIS in Republic of Macedonia

## Production phase – current and future activities

### ➤ Development of SW Application

✓ Project start: June 2010

✓ Functional prototype: August 2010

→ Pilot project in 5 regions: October 2010

→ Acceptance testing: December 2010

→ Start of operations: Q1 2011



# LPIS in Republic of Macedonia

## Production phase – current and future activities

- Production phase will take place during Q1 2011 – end 2011
  - ✓ Training and ongoing advice to support capacity building staff of the LPIS/IACS Unit;
  - ✓ A campaign for setting up a functional LPIS in the whole territory of the country;
  - ✓ Cooperation agreements relating to land identification between farmers/breeders and the IACS unit;
  - ✓ The basis for a functioning LPIS established and operational on the whole territory of the country.
  - ✓ Operating manuals, including written internal procedures and methodologies;

*This phase is supported by TA provided by the EU (IPA) funded project*



# LPIS in Republic of Macedonia

## Integration with Farm Registry



Република Македонија  
МИНИСТЕРСТВО ЗА ЗЕМЈОДЕЛСТВО  
ШУМАРСТВО И ВОДОСТОПАНСТВО



Ново Барај

РЕГИСТАР

ЗЕМ. СТОПАНСТВА

ОВЛАСТУВАЊЕ

СРЕДБИ

LPIS Navigator

ПЕЧАТЕЊЕ

АДМИНИСТРАЦИЈА

Admin Client

FAQ

Дома

Помош

Промена на лозинка

Излез

### ПРОФИЛ ЗС

Дата: Тековен

ИДБР:00005018328

Движења

Име на ЗС: АЛЕКСАНДАР  
Организациски облик: Семејно земјоделско стопанство

Внесено: 26/04/2010  
Ажурирано: 31/08/2010  
Валидно до:  
Неконтинуирано:

Статус: **ВО ТЕК**

Валиден Затвори

ЗЕМ. СТОПАНСТВО Внеси Печати

ЧЛЕНОВИ	Општина	сопственост	закуп на државно земјиште	останат закуп	концесија	користење без надокнада	Вкупно	
СМЕТКИ	САСА (МК)	98,906	0	0	0	0	<b>98.906</b>	
ПАРЦЕЛИ								
РС REGISTRY			Претх. Бр. на Парцела	Името	На користење на земјиштето	Површина (м²)		
GRAPE DECLAR.			1652461	Домаче име	Траен тревник	40.173		
ПРОИЗВОДСТВО			1652466	Вода	Мешани трајни насади	1.271		
ОДГЛЕДУВАЛИШТА			1652609	Биомаса	Short rotation Coppice	48.740		
ДОБИТОК			1652610	Тестно име	Ливада	4.715		
ДОБИТОК ПРЕГЛЕД			1652611	Тест	Лозје	4.007		
МАШИНИС								
ДОКУМЕНТИ	ГЛИШИК (AV)	2,442	0	0	0	0	<b>2.442</b>	
СРЕДБИ								
ВАЛИДАЦИЈА	<b>Вкупно</b>	<b>101.348</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>101.348</b>	

Нотација/Обележување:  Земјоделство  Децимала

# LPIS in Republic of Macedonia

## Digitization module

The screenshot displays the LPIS 0.2.2 (Giselle 1.5.3) user interface. The main window shows a map of agricultural parcels with various colors and boundaries. A modal window titled "Детали за жетва" (Harvest details) is open, displaying the following information:

ГЛИШИЌ (AV) - ИД на парцела: 2196621 - Површина (квад. метри) : 2441

Листа на жетви

Детали за жетва

Површина (квад. метри)	3500
Разнобразност на винско грозје	106 Агадај
Година на насад	2005
Растојание помеѓу редови (цм)	3
Растојание во редови (цм)	31
Систем на насадување	Друго
Систем за наводнување	Бразда

Buttons: Промени, Назад

The interface also includes a table of parcels, a "Лоцирај катастарску парцелу" section, and an "Инфо резултати" section with the following data:

Column	Value
ИД	1652609
FARM_ID	51652
HOME_NAME	Биомаса
FARM HOLDER	ТАСЕВ АЛЕКСАНДАР
Кориштено земљиште	430

At the bottom, the status bar shows: Катастарске парцели господарства, Во мирување, 586823.772, 589387.39, 0.0 m, 1:7416, LPIS.

# LPIS in Republic of Macedonia

## Quality Control

'proactive approach' e.g. build quality into the system on a continuous basis, from conception through implementation and update

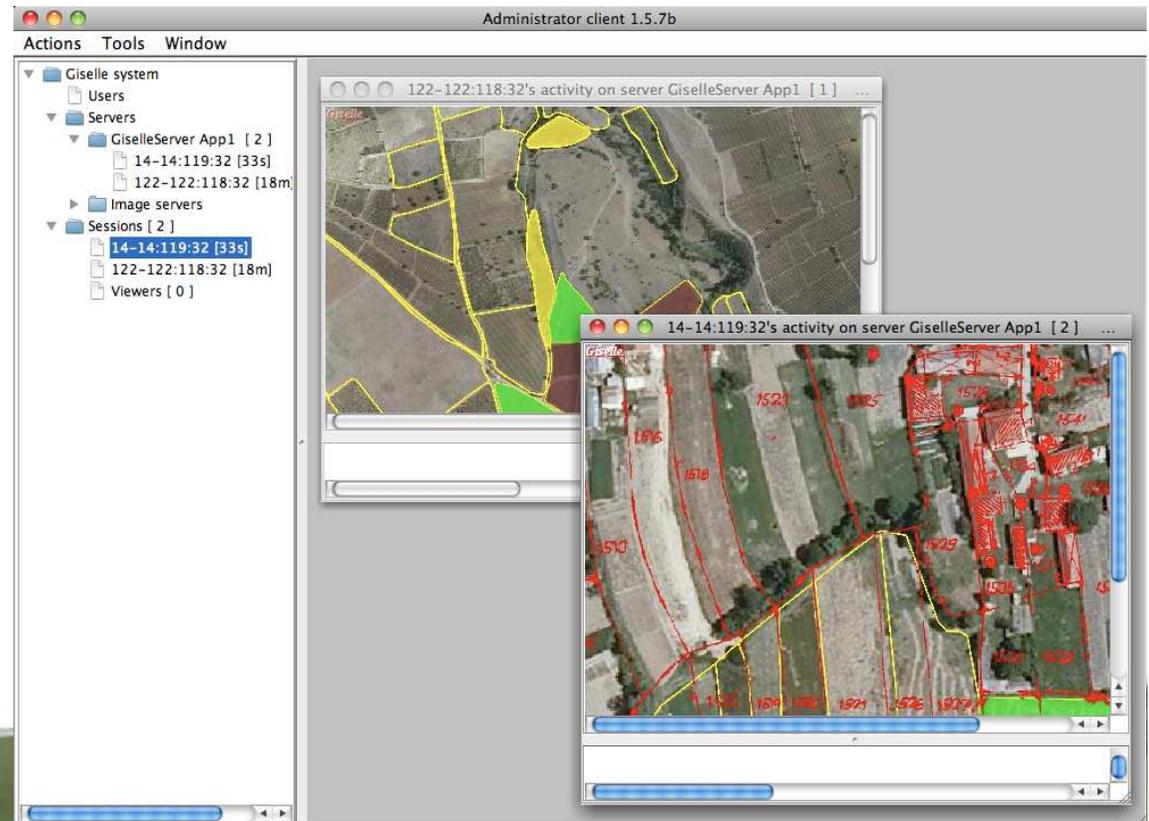
- Implementing quality standards during the building of the system
  - Real-time quality checks
    - ✓ Spatial accuracy – no unintentional overlapping is possible
    - ✓ Data consistency
      - ✓ Declared landuse not same as initial LPIS
      - ✓ Non logical data combinations
      - ✓ Area checks within permanent crop registry
      - ✓ ...
  - ✓ Prevent user errors at entry level



# LPIS in Republic of Macedonia

## Quality Control

- Monitoring of consultant's activity
  - ✓ Real-time activity monitoring and support
  - ✓ Support centre is double-checking new user's data



# LPIS in Republic of Macedonia

## Interoperability

### ➤ Required by design

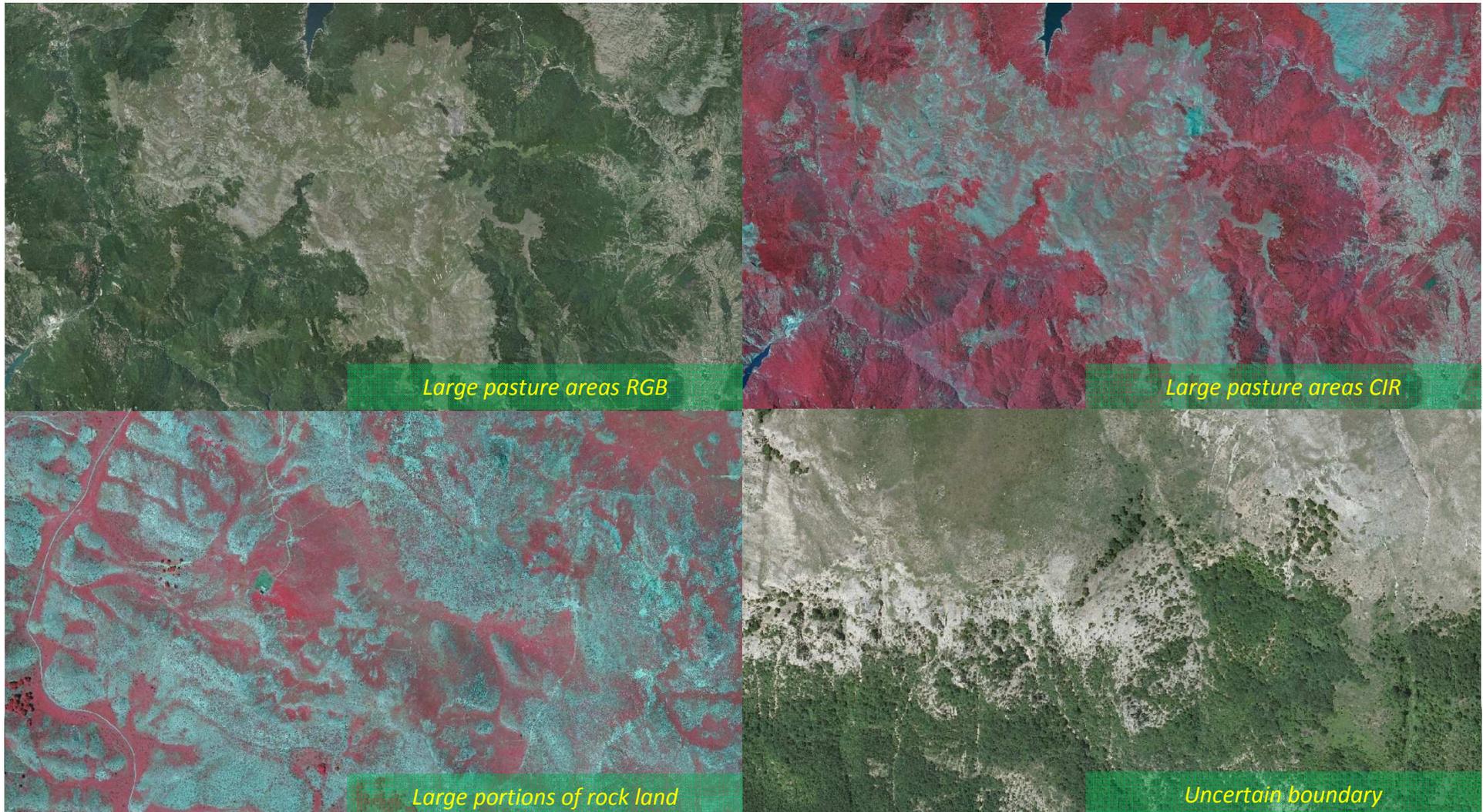
- ✓ Supported by the same infrastructure
  - ✓ Farm registry
  - ✓ Vineyard, orchard and olive registry
  - ✓ Landscape features registry
- ✓ Integration with external systems
  - ✓ Web services (Paying agency, Veterinary information system, ...)



# LPIS in Republic of Macedonia

## Challenges

Mountain pastures near Mavrovo  
- Approximately 18.000 ha



# LPIS in Republic of Macedonia

## Challenges



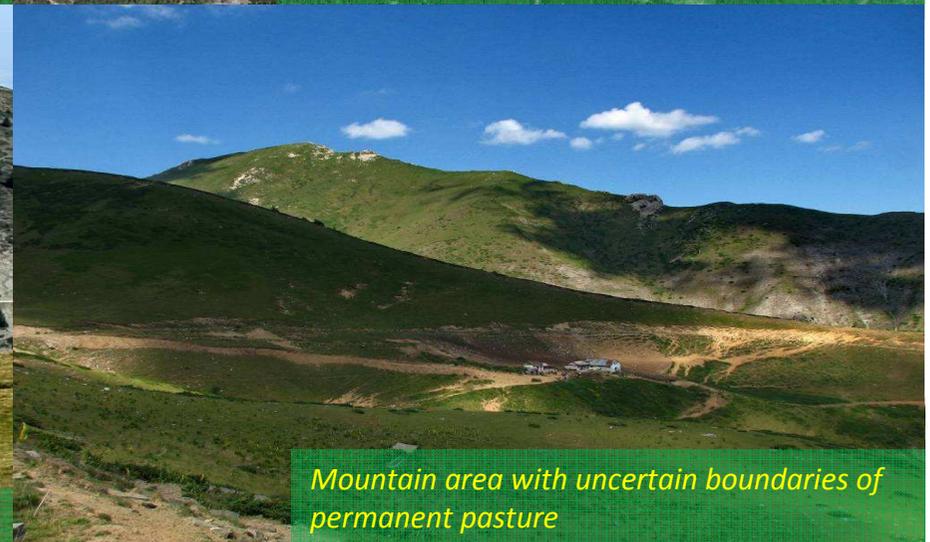
*Mountain area with uncertain boundaries*



*Mountain area partly covered by grass, shrubs, trees and rocks with uncertain boundaries*



*Mountain pastures near Popova Šapka*



*Mountain area with uncertain boundaries of permanent pasture*

# LPIS in Republic of Macedonia

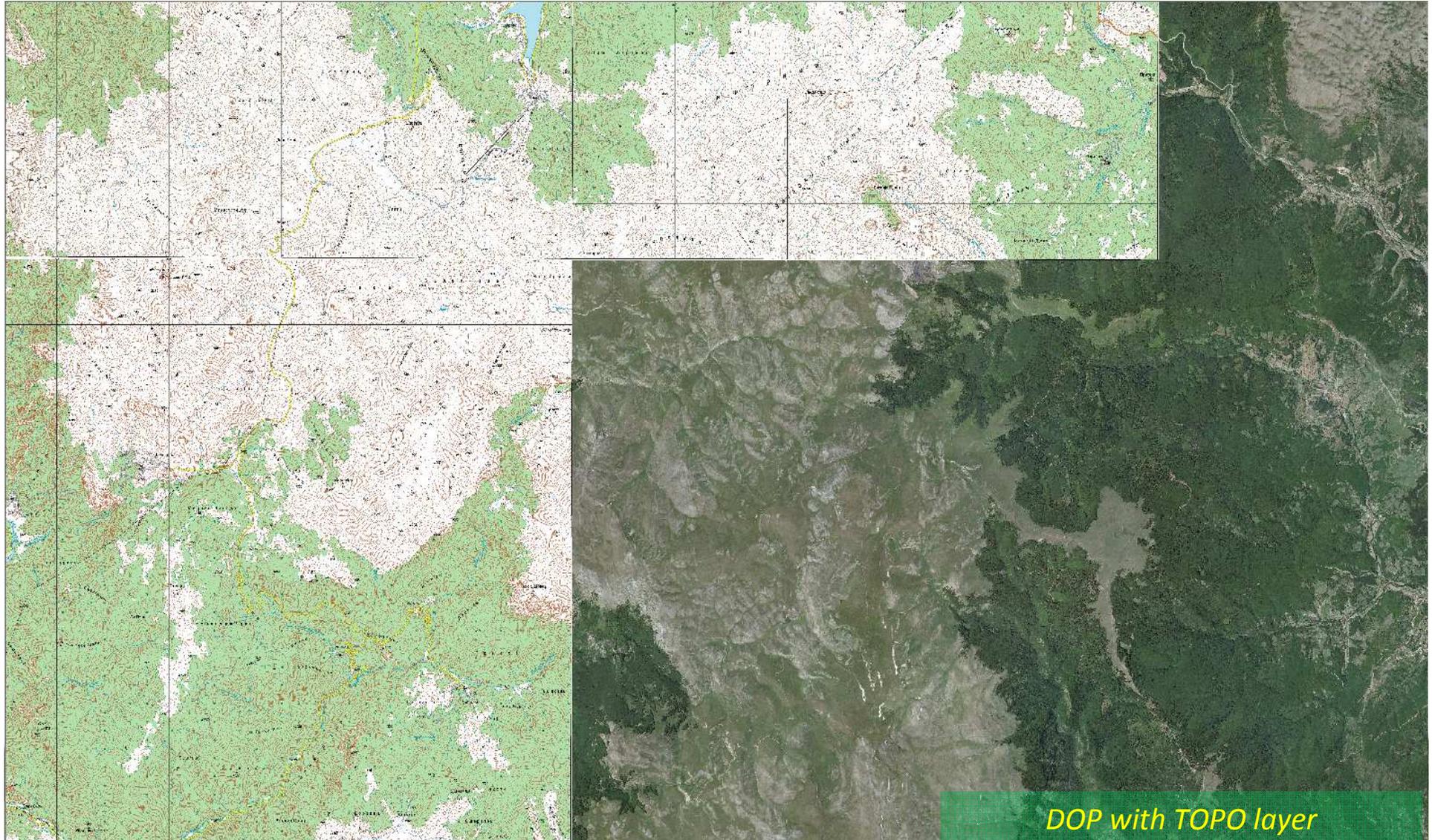
## Challenges

- Converting topographic forest raster layer into vector format
- Clearly visible forest boundaries
- Separation of pastures from forest
- Image processing - automatic classification to determine percentage of rock land within pasture (eligibility factor)



# LPIS in Republic of Macedonia

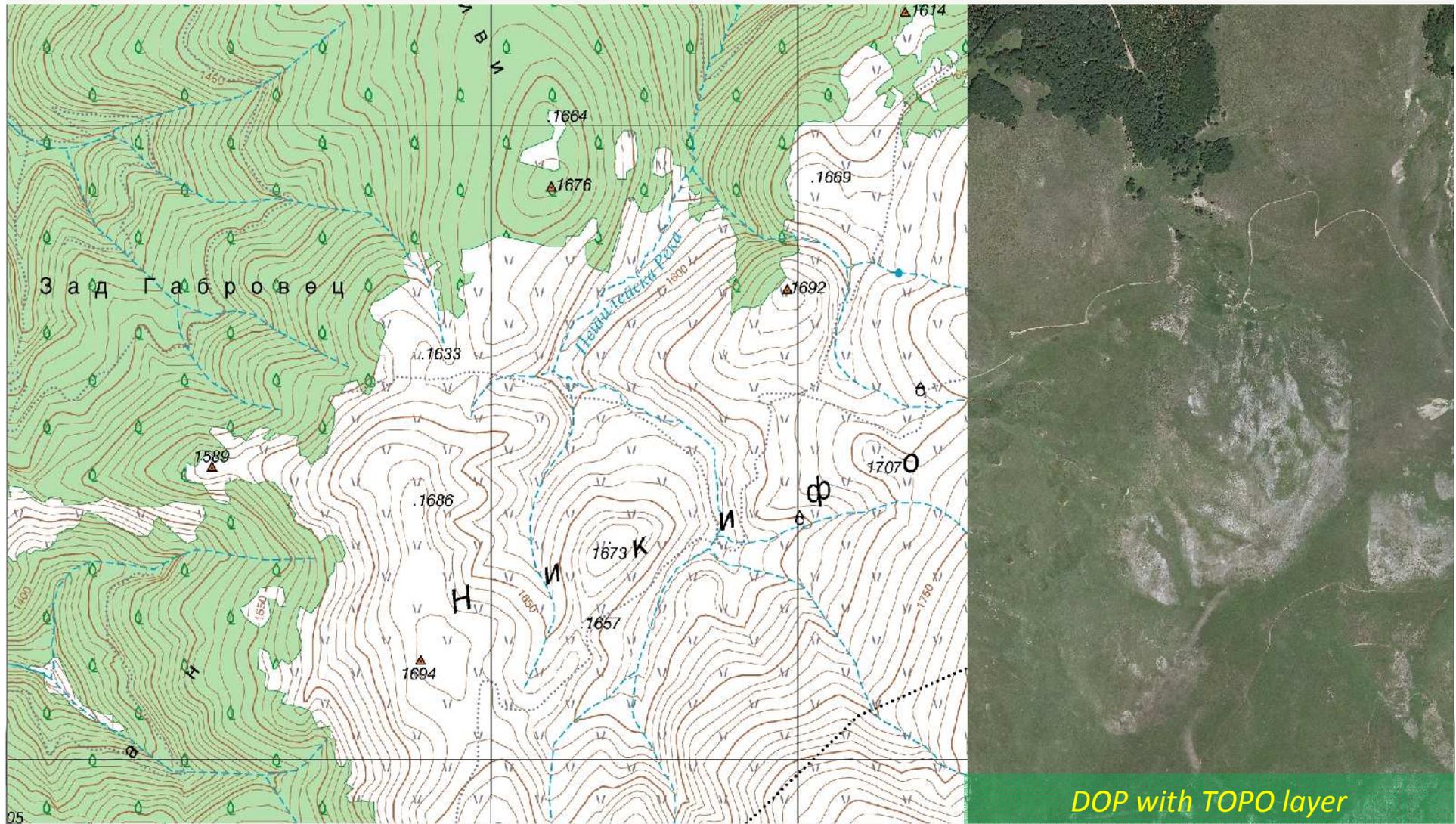
## Challenges



# LPIS in Republic of Macedonia

## Challenges

- Matching boundaries between layers



# LPIS in Republic of Macedonia

## Challenges

- Matching boundaries between layers





**Republic of Macedonia**  
Ministry of agriculture,  
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**Thank you for your attention!**



**Ljupco Chadinoski**  
**LPIS management unit**

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