

Overview of the soil information and policies in the Republic of Serbia



M.Sc. Dragana Vidojevic

Ministry of Science and Environmental Protection, Environmental Protection Agency, Republic of Serbia

E-mail: dragana.vidojevic@sepa.sr.gov.yu
<http://sepa.sr.gov.yu>



Dr. Maja Manojlovic

Faculty of Agriculture, University of Novi Sad, Novi Sad, Serbia

E-mail: majacuv@polj.ns.ac.yu
<http://polj.ns.ac.yu>



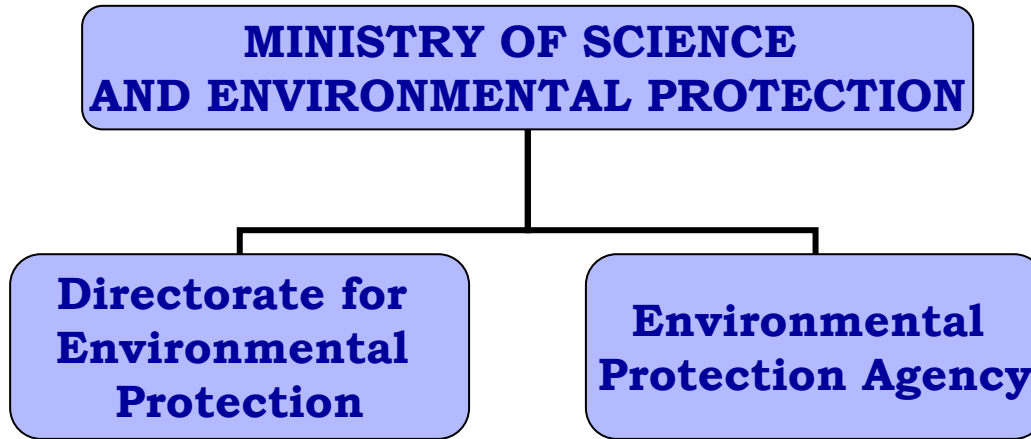
Republic of Serbia



The Republic of Serbia is located in southeastern Europe in the heart of the Balcan Peninsula, and covers the area of 88,361 km².



Institutional framework for environmental management



MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT

- ✓ Agricultural soil
- ✓ Water resources
- ✓ Forests



Policy relevance (2004)

- **Law on Environmental Protection**
- **Law on Strategic Environmental Assessment**
- **Law on Environmental Impact Assessment**
- **Law on Integrated Prevention and Pollution Control**

Policy relevance

Soil contamination

- Regulation on permitted amounts of hazardous and harmful substances in soil and water for irrigation and methods for their testing (1994)

Law on Agricultural Soil (2006)

- Planning
- Protection
- Management
- Usage

Law on organic farming (2006)

Plans and strategies

- The **National Environmental Strategy** was developed in 2006 with the objective to guide the development of modern environmental policy over the next decade
- The NES is followed by **Environmental Action Plans** that provide a detailed implementation of the strategy for the next five years



Environmental policy objectives concerning soil

- **Short-term policy objectives 2006-2010**
To harmonize national soil legislation with the EU environmental acquis
- **On-going policy objectives 2006-2015**
To achieve 20 % reduction of land endangered by soil erosion by introduction of effective erosion control measures
- **Medium-term reforms of the monitoring and reporting system 2011-2015**
Introduction of regular monitoring of heavy metals and pesticides concentration in soil

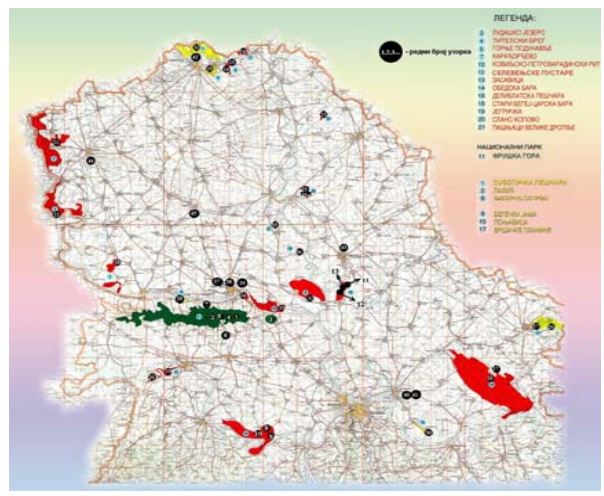


Problems and drawbacks

- **Poor integration of environmental policy with economic and other sectoral policies**
- **Insufficient institutional capacity**
- **Ineffective system of monitoring and reporting**
- **Inefficient environmental enforcement**
- **Ineffective system of environmental financing and lack of economic incentives**
- **Low environmental awareness, insufficient environmental education and inadequate public participation in decision making**

Soil monitoring

- **Localities under various kinds of protection** (Quality Control of Non-Agricultural Soil in Vojvodina), every year since 2002
- **Industrial localities** (Quality Control of Non-Agricultural Soil in Vojvodina) along with the data from industrial complexes themselves
- **The results are georeferenced and saved in digital form using GIS technology**



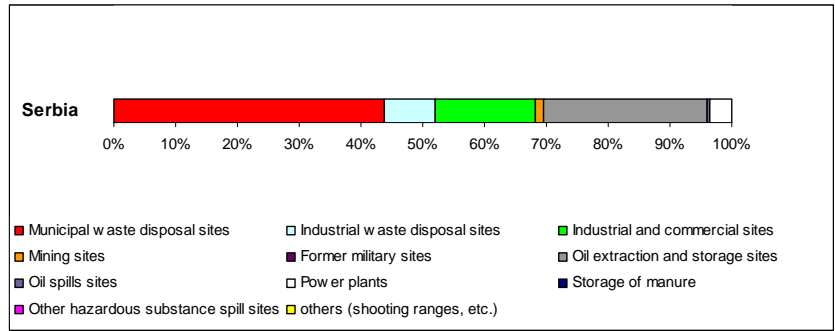
Soil monitoring

- **Quality Control of Agricultural Soils** (Vojvodina Provincial Secretary for Environmental Protection 1992, 2001 plus fertility control at least one in five years)
- **Urban soils** (Determination of Soil Pollution Status in the Municipality of Belgrade every year since 1999 and Novi Sad, since 2001)

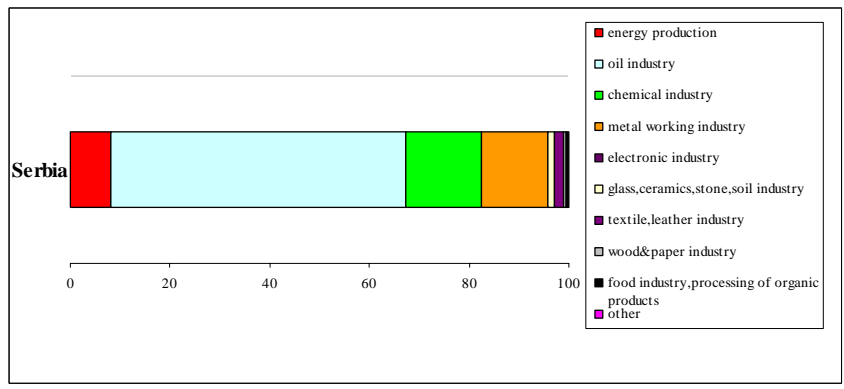


Soil contamination

Soil polluting activities from localized sources as % total sites where (preliminary or main) site investigation has been completed



Breakdown of industrial and commercial branches responsible for local soil contamination as % of total



- We have the database on contaminated sites, localities are not georeferenced
- Localities have been identified by the year 2005
- Presented contaminated localities are identified on the bases of laboratory analysis of soil and groundwater in the near vicinity of localized pollution sources and their long-term presence.

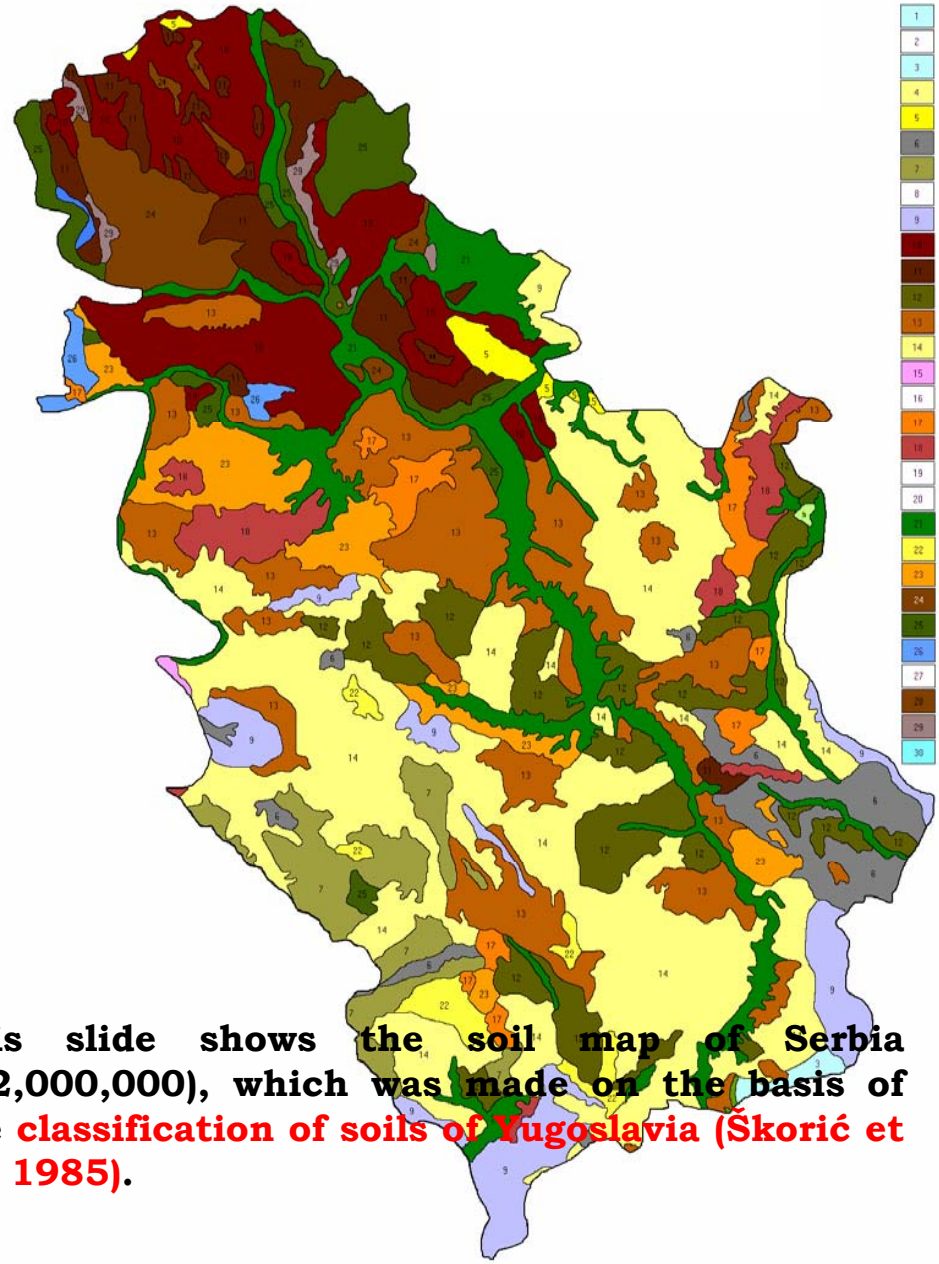
Soil classification system

- **The first national classification was prepared by *Stebut*, in 1927.**
- **The Classification of Soils of Yugoslavia (*Neugebauer et al.*, 1963), not only was based on genetic principles as the first one, but also integrated soil production ability.**
- **The Classification of Soils of Yugoslavia (*Skoric et al.*, 1973; 1985), was adapted to the international classification valid at that time in Europe.**
- **National classification does not correspond to WRB criteria.**

Soil mapping

- The soil map of Kingdom of Yugoslavia (1:3,500,000), *Stebut (1926)*; (1:1,200,000), *Stebut (1931)*.
- From 1970s-1980s:
 - The soil map of former Yugoslavia (1:1,000,000);
 - The soil map of the Vojvodina Province (1:100,000);
 - The soil map of Yugoslavia (1:50,000).
- About **700,000ha** of unmapped.

SOIL MAP OF SERBIA



- | | |
|----|--|
| 1 | 1. Karst (rocky soil) with spots of terra rossa, brown soil and lithosol |
| 2 | 2. Lithosols and eutric cambisol |
| 3 | 3. Lithosols on acid rocks and rankers |
| 4 | 4. Regosols, rendzinas and eutric cambisols |
| 5 | 5. Arenosols and Eutric cambisol on sand |
| 6 | 6. Lime dolomite black soils, lithosols and rendzinas |
| 7 | 7. Lime dolomite black soils, cambisols and terra rossa |
| 8 | 8. Rendzinas and regosols |
| 9 | 9. Rankers and distric cambisols |
| 10 | 10. Chernozem on loess |
| 11 | 11. Chernozem and chernozem-semigley soil |
| 12 | 12. Smonitzas |
| 13 | 13. Eutric cambisol |
| 14 | 14. District cambisols, luvisols and calcocambisols |
| 15 | 15. Cambisols, luvisols and calcomelanosols |
| 16 | 16. Terra rossa (ilimerized) and calcocambisols |
| 17 | 17. Luvisols and eutric cambisols |
| 18 | 18. Luvisols |
| 19 | 19. Pseudogley soils and rendzinas |
| 20 | 20. Acric soil and cambisols on limestone |
| 21 | 21. Fluvisols and eugleys |
| 22 | 22. Pseudogleys |
| 23 | 23. Pseudogleys and ilimerized pseudogley soils |
| 24 | 24. Chernozem-semigley soil |
| 25 | 25. Humogleys |
| 26 | 26. Gley and semigley soils |
| 27 | 27. Eugleys |
| 28 | 28. Histosols |
| 29 | 29. Halomorphic soils |
| 30 | |

This slide shows the soil map of Serbia (1:2,000,000), which was made on the basis of the **classification of soils of Yugoslavia (Škorić et al., 1985)**.



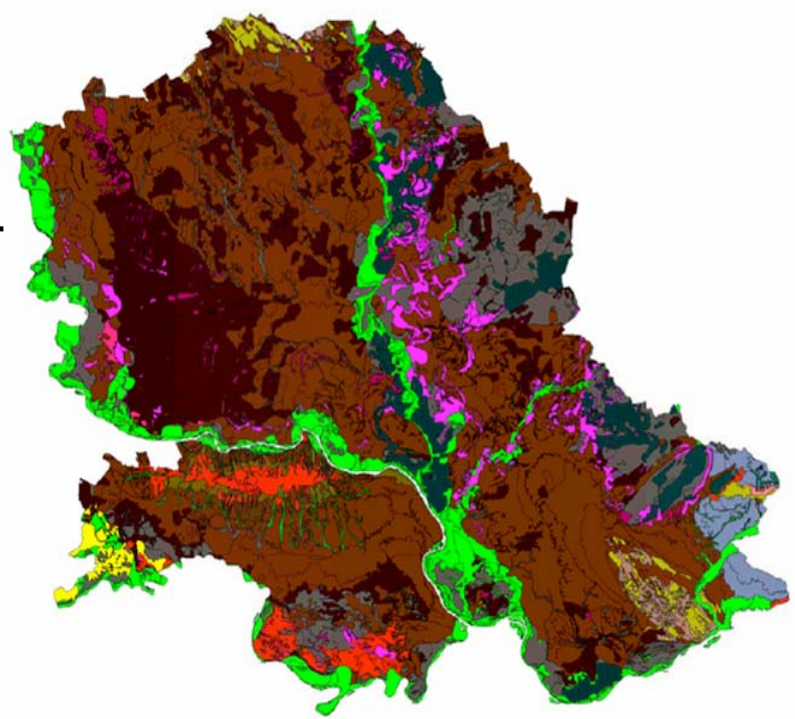
Table 1: Main soil types (ha) and main limitations to use

Soil type	Area in h	Restrictions (Intensity and type)
Lithosol	107,000	Unproductive soil
Aeolian sands (Arenosol)	86,000	Severe restrictions due to excessive filtration; poor to medium productive soil
Rendzinas	~ 527,000	Severe to medium restrictions
Black earth on limestone (Calcomelanosol)	~ 155,000	Severe restrictions
Humus-siliceous soil (Ranker)	572,000	Severe restrictions
Chernozem (Phaeozem)	1,200,000	Without restrictions
Smonitza (Vertisol)	780,000	Moderate restrictions
Brown soil on limestone (Calcocambisol)	~ 350,000	Severe to medium restrictions
Eutric brown, typical- brown forest soil- (Eutric Cambisol)	560,000	Moderate restrictions
Dystric brown (Dystric Cambisol)	~ 2,280,000	Severe to very severe restrictions
Illimerised soil (Luvisol)	~510,000	Moderate to medium restrictions
Pseudogley (Planosol)	538,000	Moderate to Severe restrictions- conditionally productive soil
Podzol	~ 17,000	Severe to very severe restrictions
Alluvial soil (Fluvisol) Meadow soil (Humofluvisol) Hydromorphic black earth and Marsh-gley (Humogley, Eugley)	~ 760,000	No restrictions to serious restrictions- conditionally can be highly productive soils
Solonchak and Solonetz	233,000	Severe restrictions
Peaty soil (Histosol)	~ 3,000	Moderate to Severe restrictions
Deposol	~ 50,000	Moderate to severe restrictions (unproductive soil)

Soil information systems in Serbia

Digitalized soil map

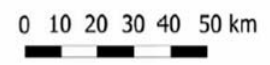
The soil map of
Vojvodina, based on
classical map in a
scale of 1:50,000
presented on 60
sheets (*Benka and
Salvai, 2005*)



Legend:

- Regosol
- Pararendzina soil
- Rendzina soil
- Humus-silicate soil
- Chernozem
- Smonitza soil
- Brown forest soil
- Acid brown soil
- Pseudogley
- Alluvial soil
- Deluvial soil
- Alluvial-deluvial soil
- Chernozemlike meadow soil
- Hydromorphic black soil
- Hydromorphic smonitza
- Hydromorphic gleyed soil
- Peaty soil
- Solonchak soil
- Solonetz soil
- Solodi soil

Scale:

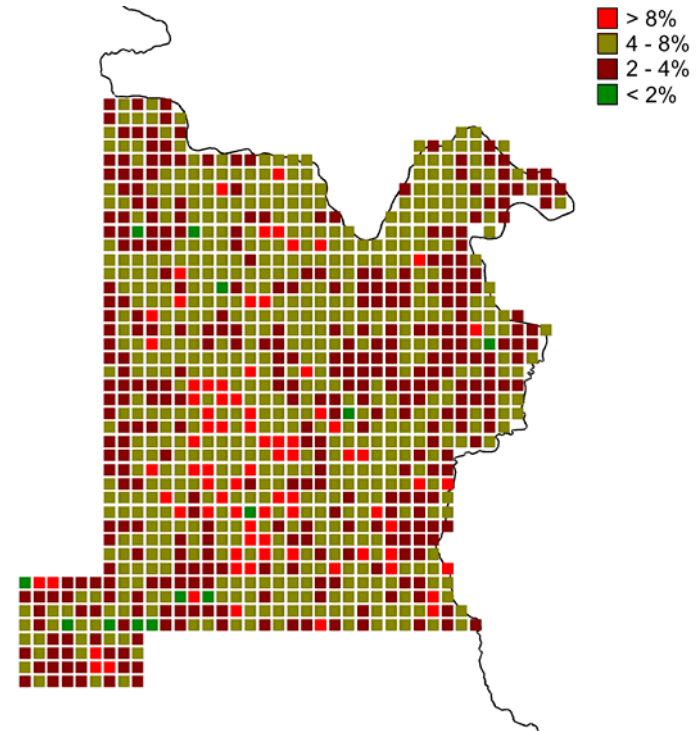


ESBN Workshop Zagreb 28-30 September 2006

Georeferenced databases

‘Control of fertility and determination of the contents of dangerous and harmful substances in the soils of the Republic of Serbia’

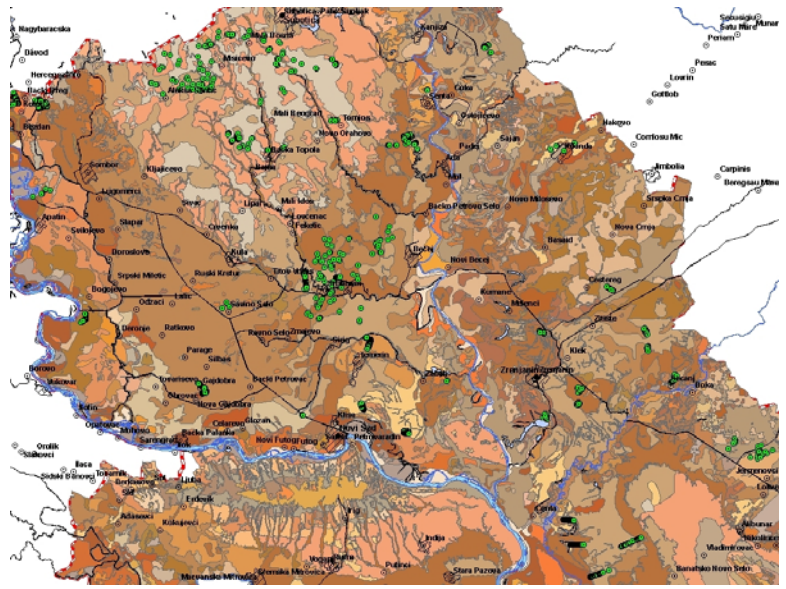
- 4.2 million ha, since 1992
- The soil was sampled to depth of 25 cm in the grid of 1000 ha (10 km²).
- The database contains the following data:
 - Cadastral parcel, land use, crop
 - Soil fertility parameters (pH, CaCO₃, humus, AL-P₂O₅, AL-K₂O)
 - Microbiological activity
 - Trace elements, heavy metals
 - Pesticides and organic pollutants



The map of soil humus content in central Serbia after phase V of the Project

Database of soil fertility properties of soils in private ownership

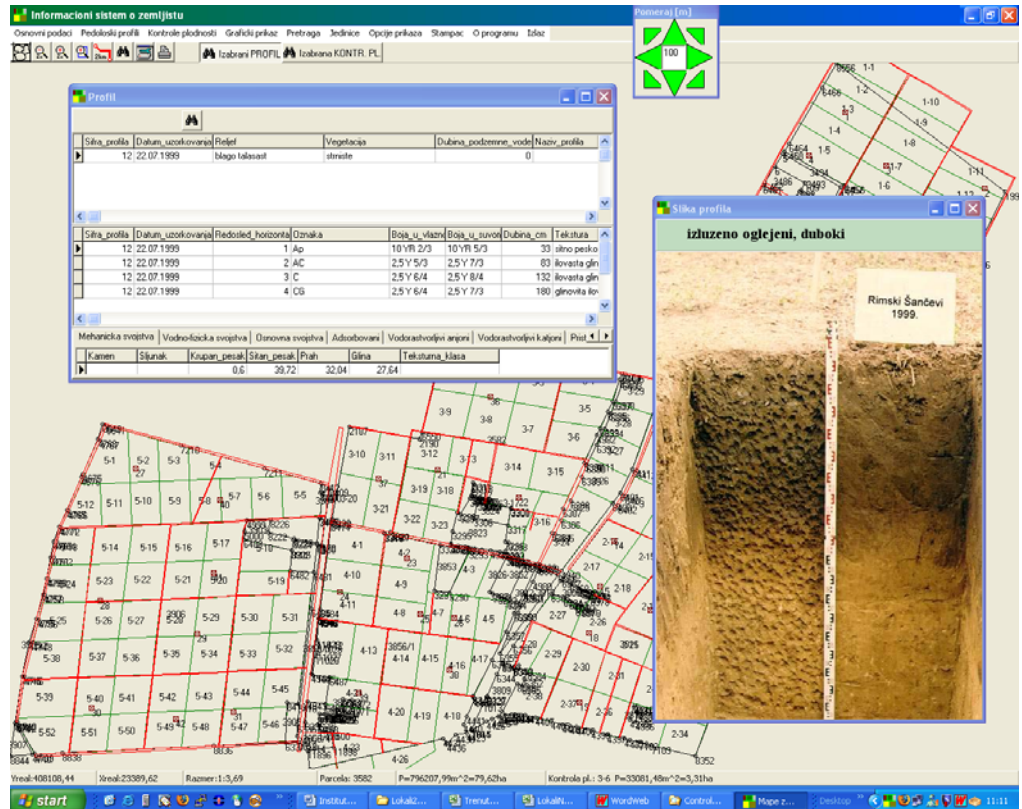
- For fertilization purposes the soils at about **83,000 sites** have been investigated since 2003.
- The data from about **2000 sites** was georeferenced and stored in that databases.
- This year about 3000-4000 new sites are planned to be included in the database.
- The database contains the following data:
 - Owner, cadastral parcel, land use, crop
 - Soil fertility parameters (pH, CaCO_3 , humus, $\text{AL-P}_2\text{O}_5$, $\text{AL-K}_2\text{O}$)



GPS sampling sites in 2005.

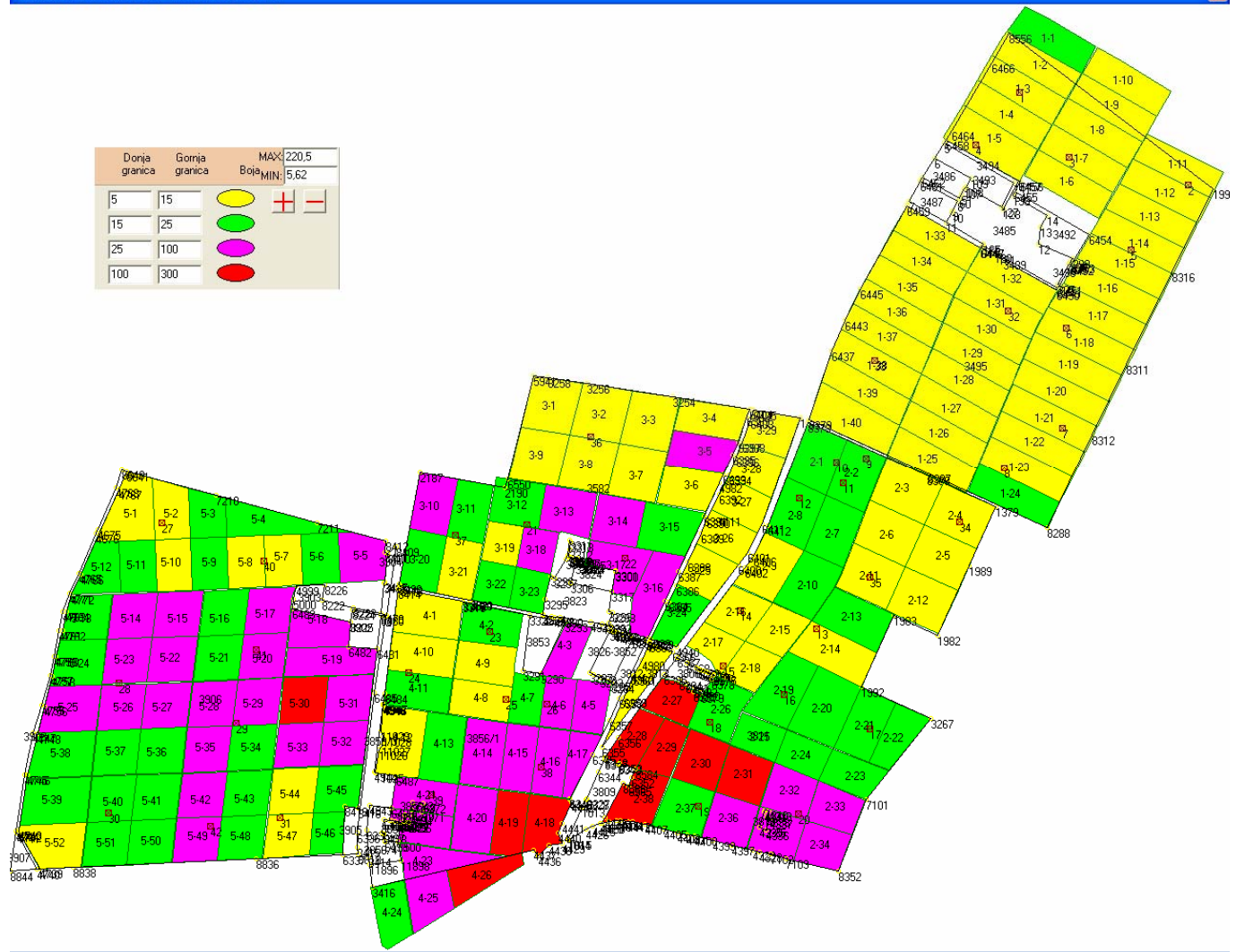
Soil information system developed at Institute of Field and Vegetable Crops, Novi Sad

- **SIS was established in 1999.**
- **Over 100,000 soil parameters analysed and stored in that database.**
- **Recommendations for optimal fertilization on the basis of predicted yields for selected crops could be graphically presented.**



Rimski Sancevi, 1999. - osnovna2.AIP2054

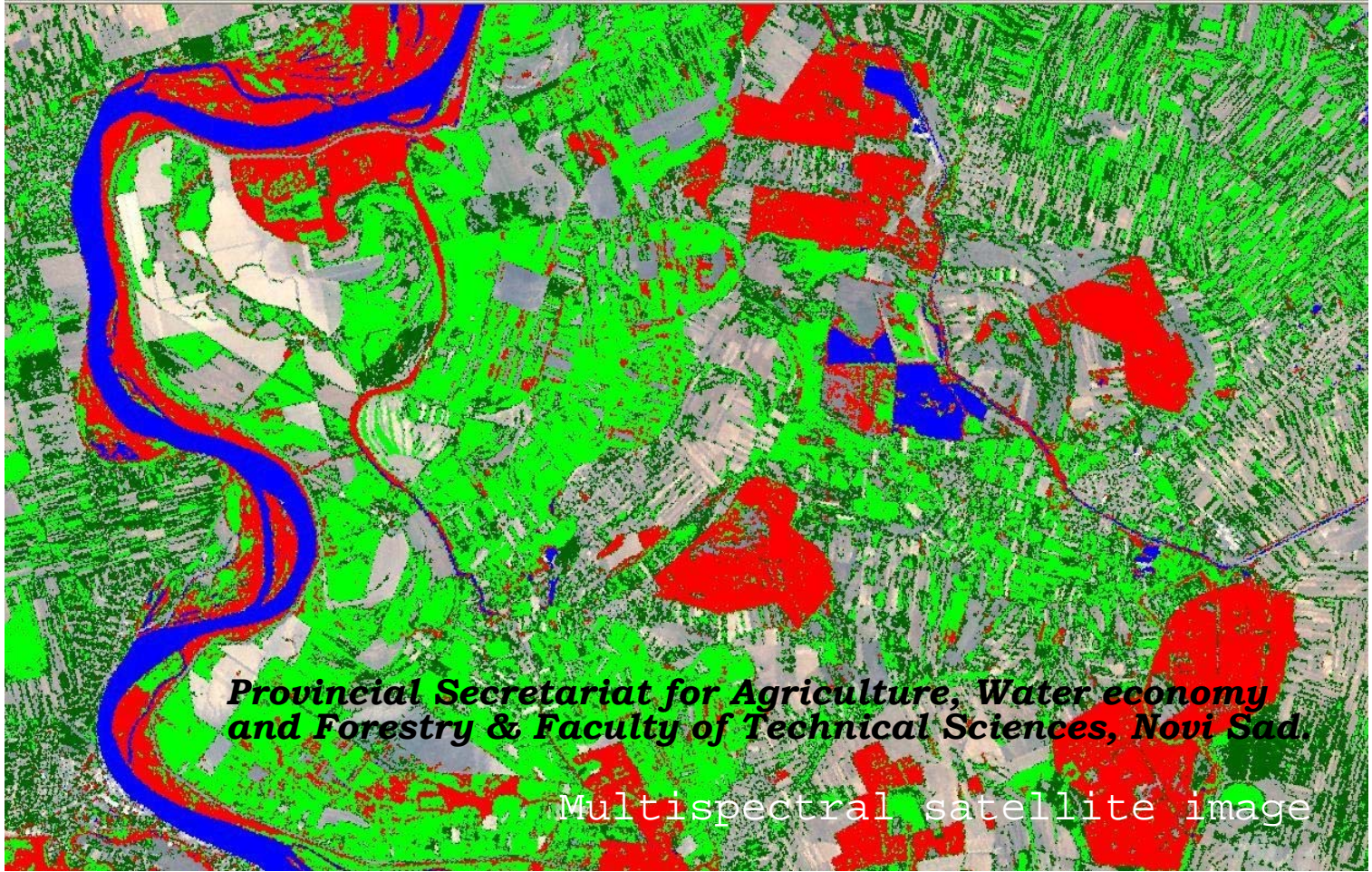
Donja granica	Gornja granica	Boja	MAX	MIN
5	15	Yellow	220,5	5,62
15	25	Green		
25	100	Magenta		
100	300	Red		



Phosphorus content in soils of the Institute's experimental fields.



Project " New technological procedure for monitoring of agriculture land use in AP Vojvodina"





Conclusion

- **Serbia lacks a permanent monitoring and integrated information system of soils;**
- **Methodologies of soil analysis do not correspond to WRB criteria;**
- **Differences in the taxonomic classification of the soil;**
- **There are still 700,000 ha of unmapped soils in Serbia;**
- **Some parts of the country have digital cadastre.**
- **There is a need for GIS software.**
- **Large-scale soil surveys together with the Soil Information System should be supported as the basis for decision making system and land management in Serbia.**