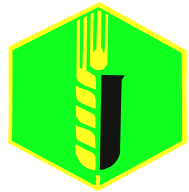


THE CURRENT STATE OF NITROGEN APPROACHES WITHIN THE CZECH REPUBLIC



Dr. Pavel Čermák

Crop Research Institute, Prague



Martin Dědina, Ph.D.

Research Institute of Agricultural Engineering



Dr. Michaela Budňáková

Ministry of Agriculture of the Czech Republic





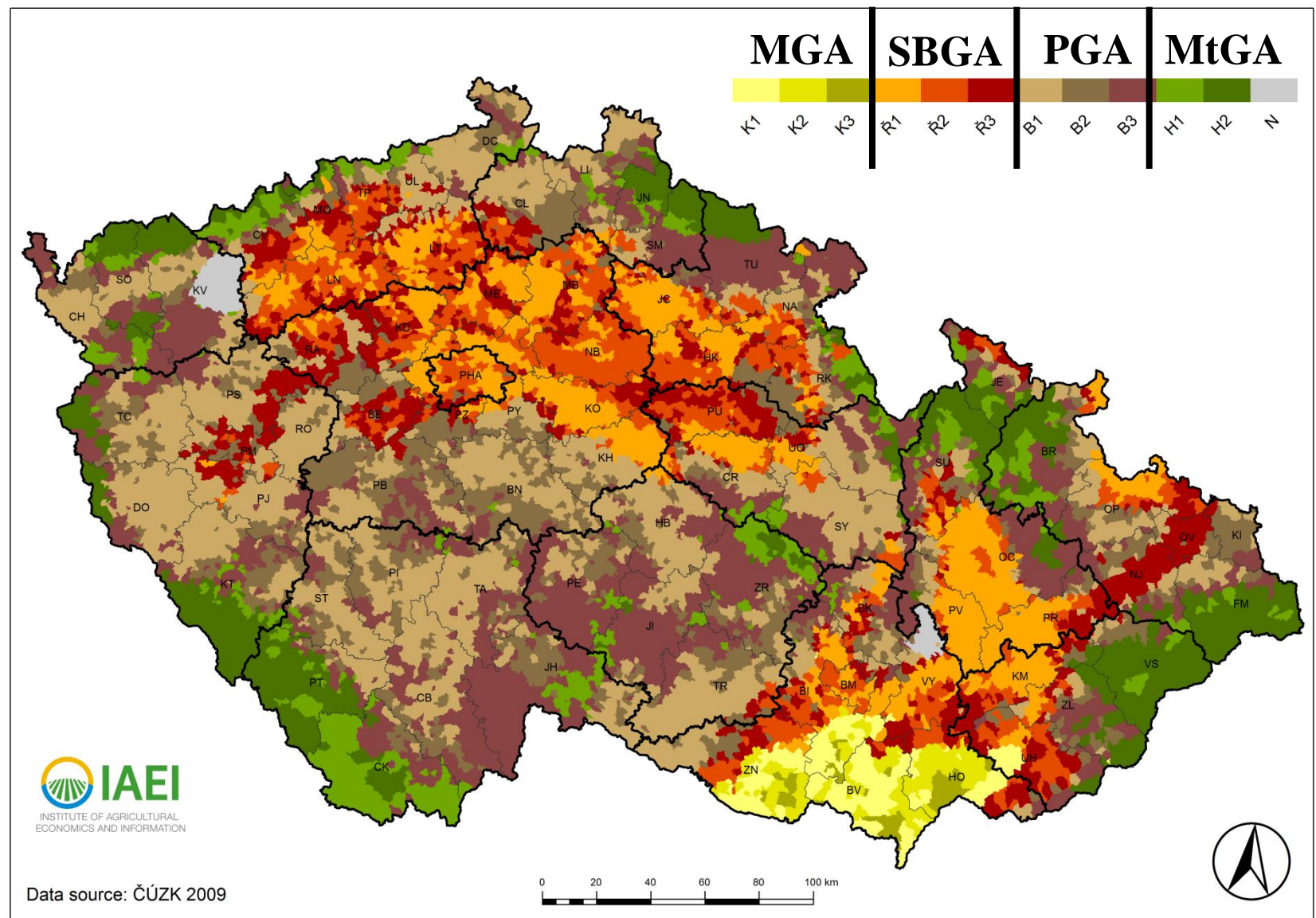
From the point of view of soil and climatic conditions the Czech Republic is a Gordian knot of Europe, so country is divided into four **growing areas:**

Maize growing area (MGA) & Sugar-beet growing area (SBGA):

- higher soil fertility, more conducive climatic conditions (higher temperatures)

Potato growing area (PGA) & Mountain growing area (MtGA):

- lower soil fertility, less conducive climatic conditions (lower temperatures)



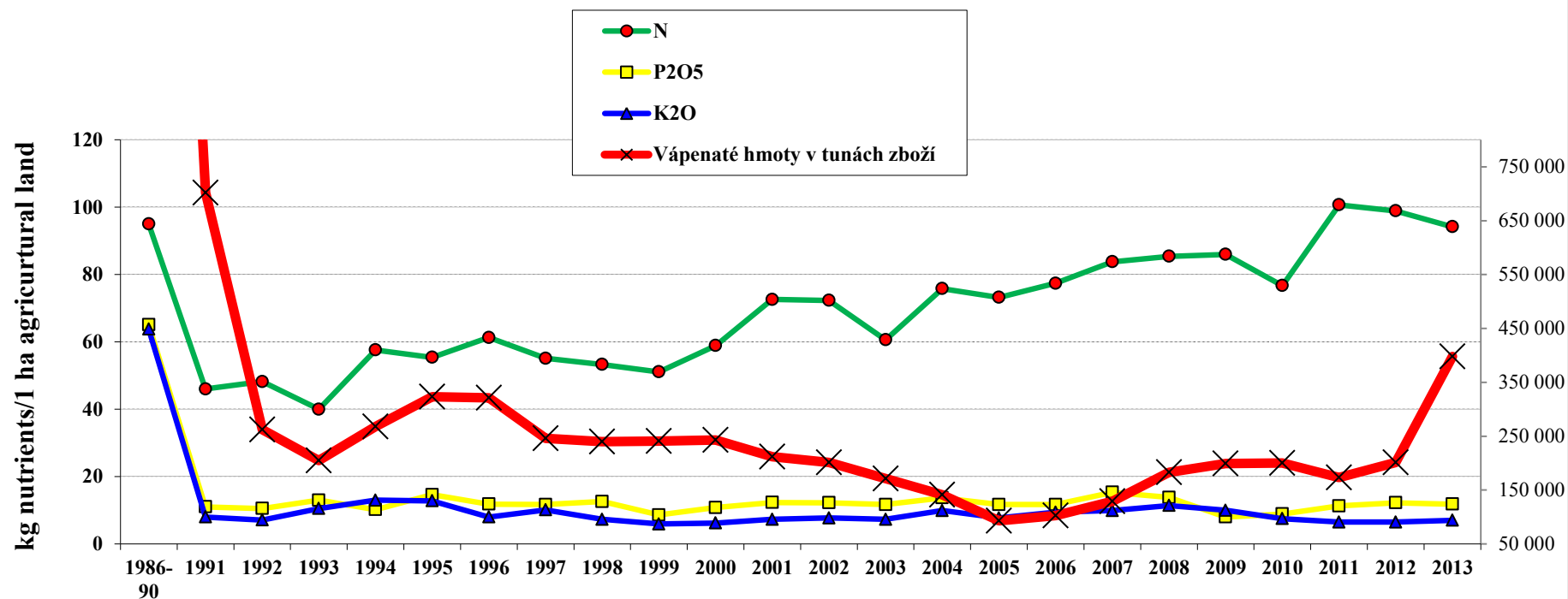
These different areas have different demands on farming (different crop varieties, different plant protection, different application doses of fertilisers, especially nitrogen)

Consumption of mineral nutrients and limy materials in kg.ha⁻¹ of agricultural land

Year	N	P ₂ O ₅	K ₂ O	Σ of nutrients	Limy materials
Ø 1981–85	102	75,9	82,8	260,7	2 316 000
Ø 1986–90	95	65,06	63,76	223,8	2 274 000
Ø 1991–95	49,44	11,86	10,28	71,6	352 000
Ø 1996–2000	55,94	11,1	7,5	74,5	258 200
Ø 2001–2005	70,9	12,34	7,98	91,2	163 620
Ø 2006–2010	77,34	10,8	7,7	95,9	135 221
2011	100,7	11,3	6,5	118,5	173 000
2012	98,98	12,15	6,46	117,59	201 000
2013	94,18	11,83	7,03	113,04	398 072

**Source: Ministry of Agriculture of the Czech Republic, 2014;
relative to 3 525 889 hectares of used agricultural land**

Consumption of mineral nutrients and limy materials in kg.ha⁻¹ of agricultural land



Source: CISTA & Ministry of Agriculture of the Czech Republic, 2014

!!!! BIG PROBLEM !!!!

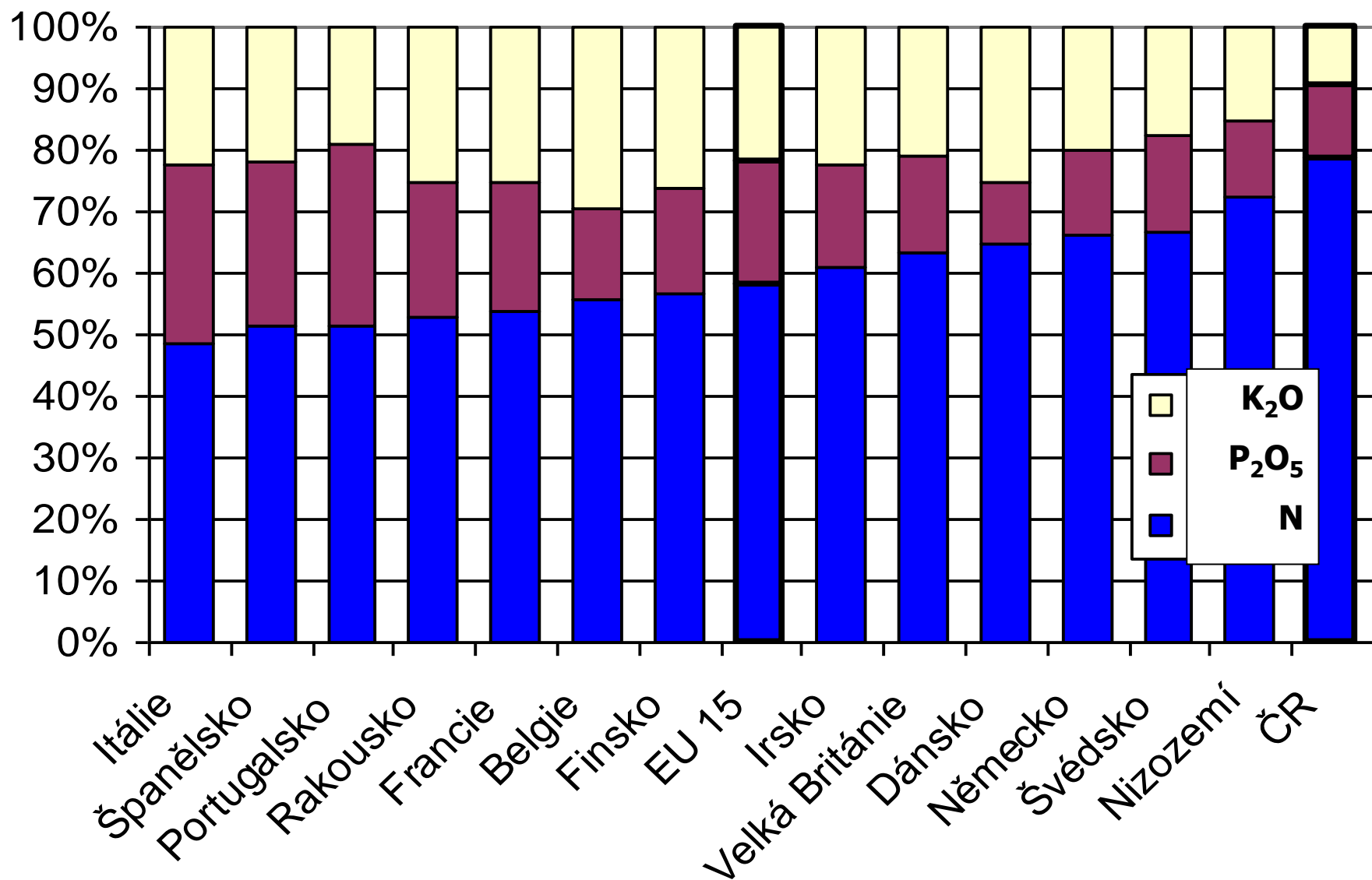
to keep

Optimal ratio of nutrients

N : P : K

1,0 : 0,5 : 0,8-1,0

Nutrients ratio in mineral fertilisers in member states of EU



Livestock density and the livestock composition expressed in livestock units

(as at 1st April 2012)

Year	Livestock units per 1 ha of agricul. land	Share in total number of livestock units in %			
		Cattle	Pigs	Sheep & goats	Poultry
2005	0,526	61,1	31,1	1,2	5,4
2007	0,514	63,9	27,3	1,5	5,9
2008	0,482	66,9	23,7	1,6	6,2
2009	0,476	67,2	23,4	1,8	5,9
2010	0,466	69,0	22,0	1,9	5,2
2011	0,461	70,6	20,2	2,1	5,1

Source: CSO, 2013

Inputs of organic matter and next nutrients in organic form into the soil (according to the Czech Statistical Office it was 0.81 livestock unit.ha⁻¹ (LU.ha⁻¹) in 1989, while in 2011 only 0.46 LU.ha⁻¹).

All these factors:

- 1) low inputs of mineral nutrients in form of mineral fertilisers and limy materials**
- 2) unbalanced ratio of nutrients**
- 3) low inputs of organic matter and nutrients in organic form**

have a negative effect on soil fertility.

Specifics of the Czech agriculture

- **Large size of CZ farms**
- **High proportion of rented land (~ 80 %) – problems with planning and constructing of dung-yards on the fields**
- **Problems with planning and constructing of dung-yards in urban area**
- **Very often the already built dung-yards in villages or near their area can not be used (population protests)**

Structure of agriculture farms in CZ

(to the end 2009)

Source: CSO, 2009

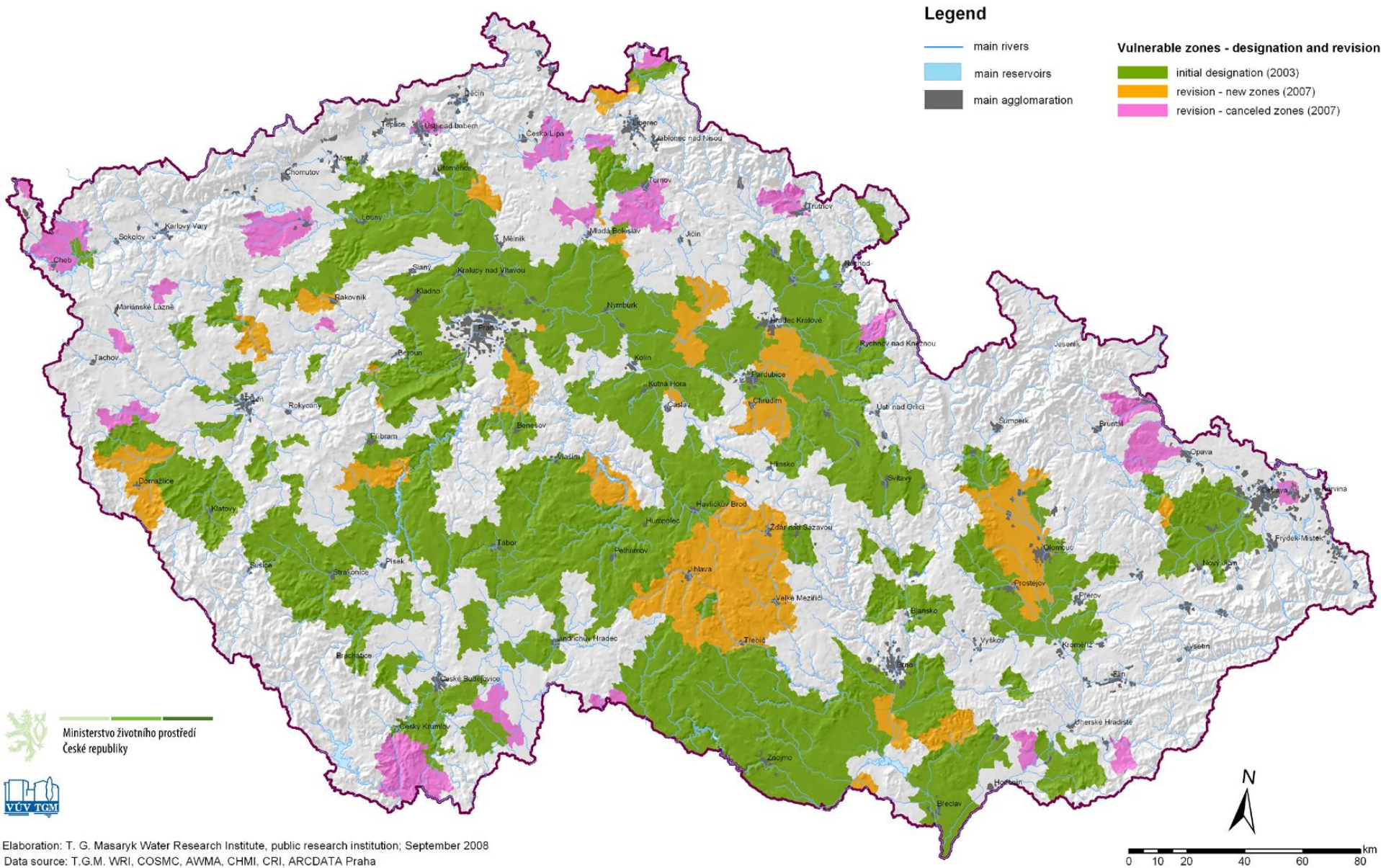
Area of farm (ha)	Distribution of farms in CZ (%)	Portion on total agr. area (%)
> 0 < 5	52,3	1,1
5 – 10	12,2	1,1
10 – 50	20,9	6,1
50 – 100	5,1	4,6
100 – 500	5,6	16,0
500 – 1000	1,7	16,3
1000 – 2000	1,4	26,4
> 2000	0,7	28,4

85 % farms (small) ~ 8 % of agr. land

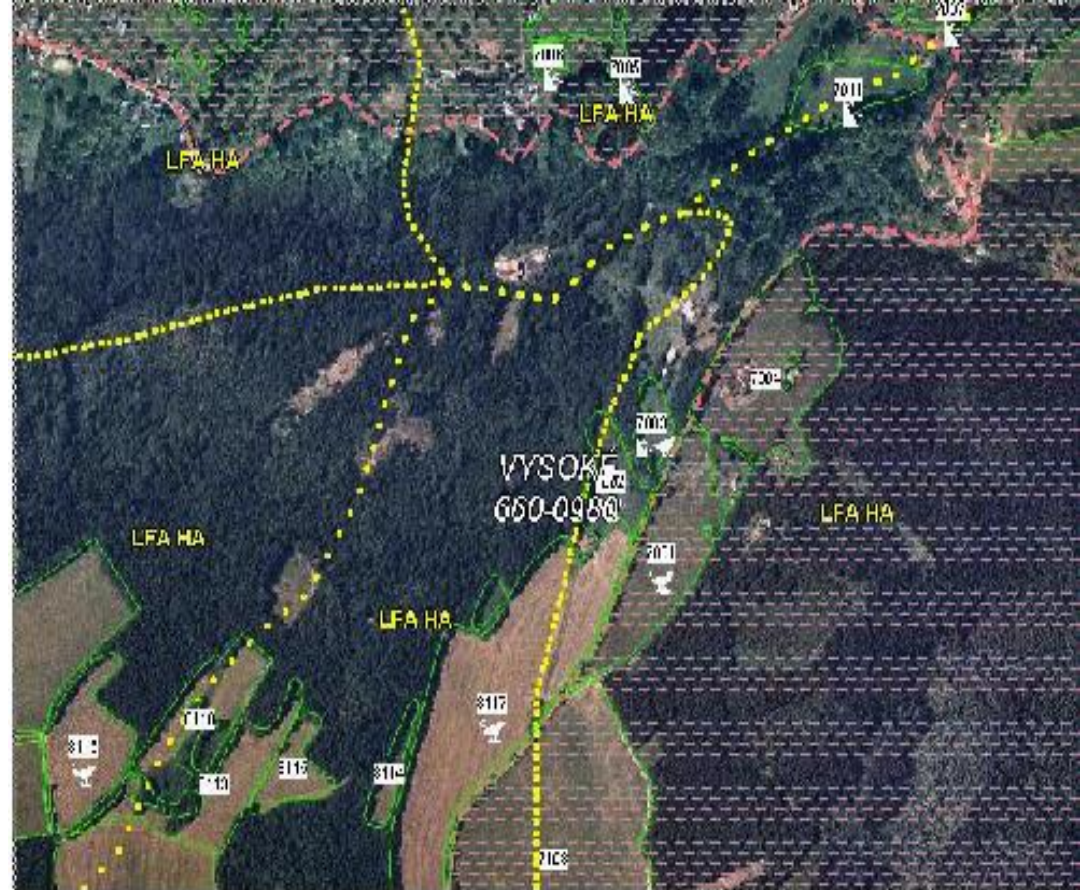
4 % farms (large) ~ 75 % of agr. land

Designation and revision of Vulnerable Zones in the Czech Republic

50 % of the agricultural land of the Czech Republic



Land Parcels Information System



In 1999, the Ministry of Agriculture of Czech Republic decided to build agricultural parcel identification system (LPIS).

The blocks of used land were plotted using aerial photos and **verified with farmers. Land block boundaries were digitally plotted off-line on the contractor's site.**

Land Parcel Information System - LPIS

The Land Parcel Information System registers agricultural land, that is eligible for area-based subsidies. It is part of the Integrated Administrative and Control System (IACS).

In the Czech Republic, the Land Parcel Information System registers physical blocks, which may be divided into farmer blocks. A physical block is a continuous area of agricultural land delimited by distinct terrain barriers (forest edge, trees growing along a river, road, etc).

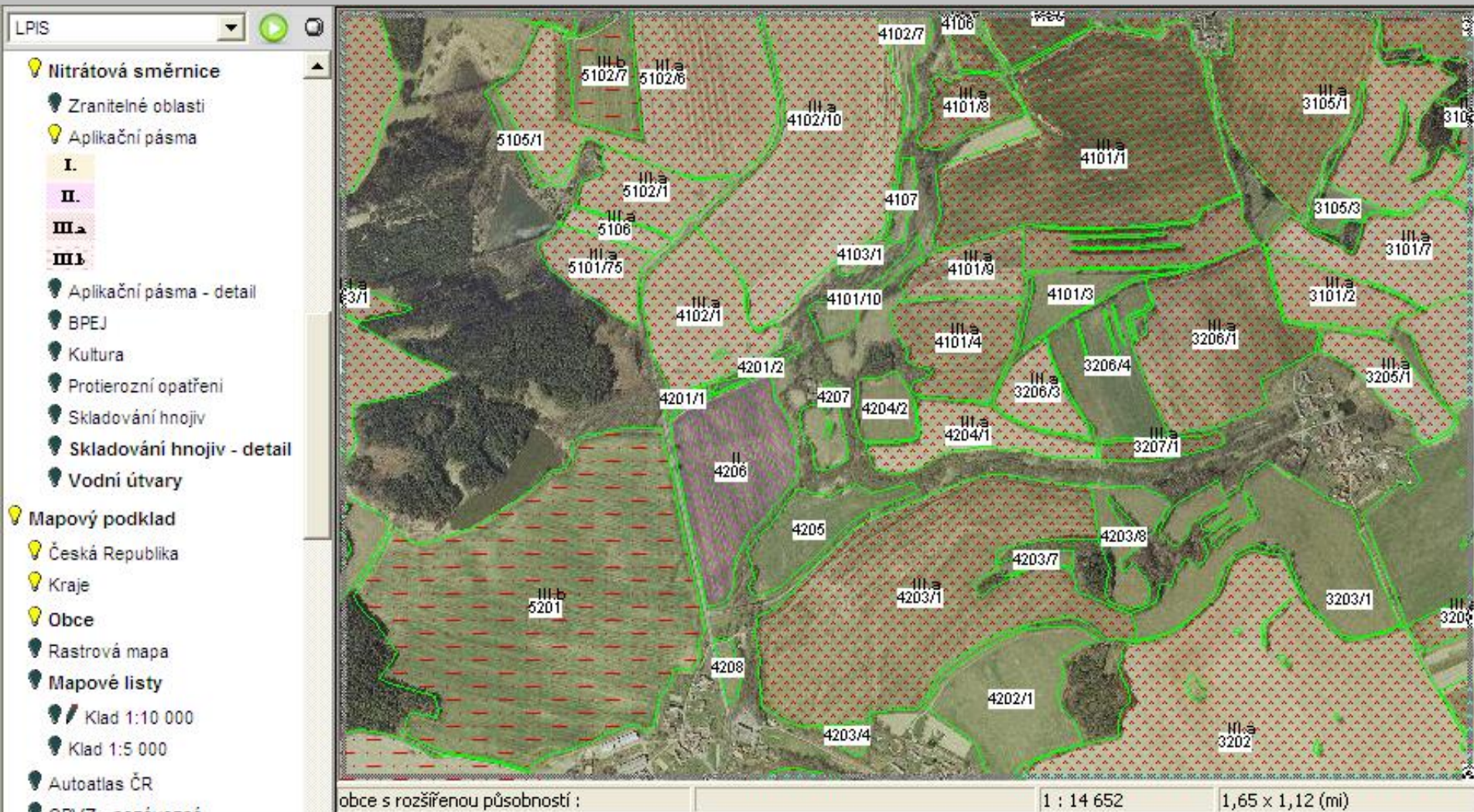
The LPIS is a geographic database, which means that the electronic file stores, for each block, attributes (e.g. land use and farmer) as well as information regarding the location and shape of the block.

In the database, each physical block (or a farmer block) is identified by a unique code. In order to identify physical block, a nine-character code is used that is based on the position of the block's centroid in the S-JTSK national coordinate system.

Each physical/farmer block in the LPIS covers a specific area in hectares.

Further, there are other data: i. e. land use, farmer, organic farming, location in a less favoured area.

Application zones



Soil erosion



Water bodies



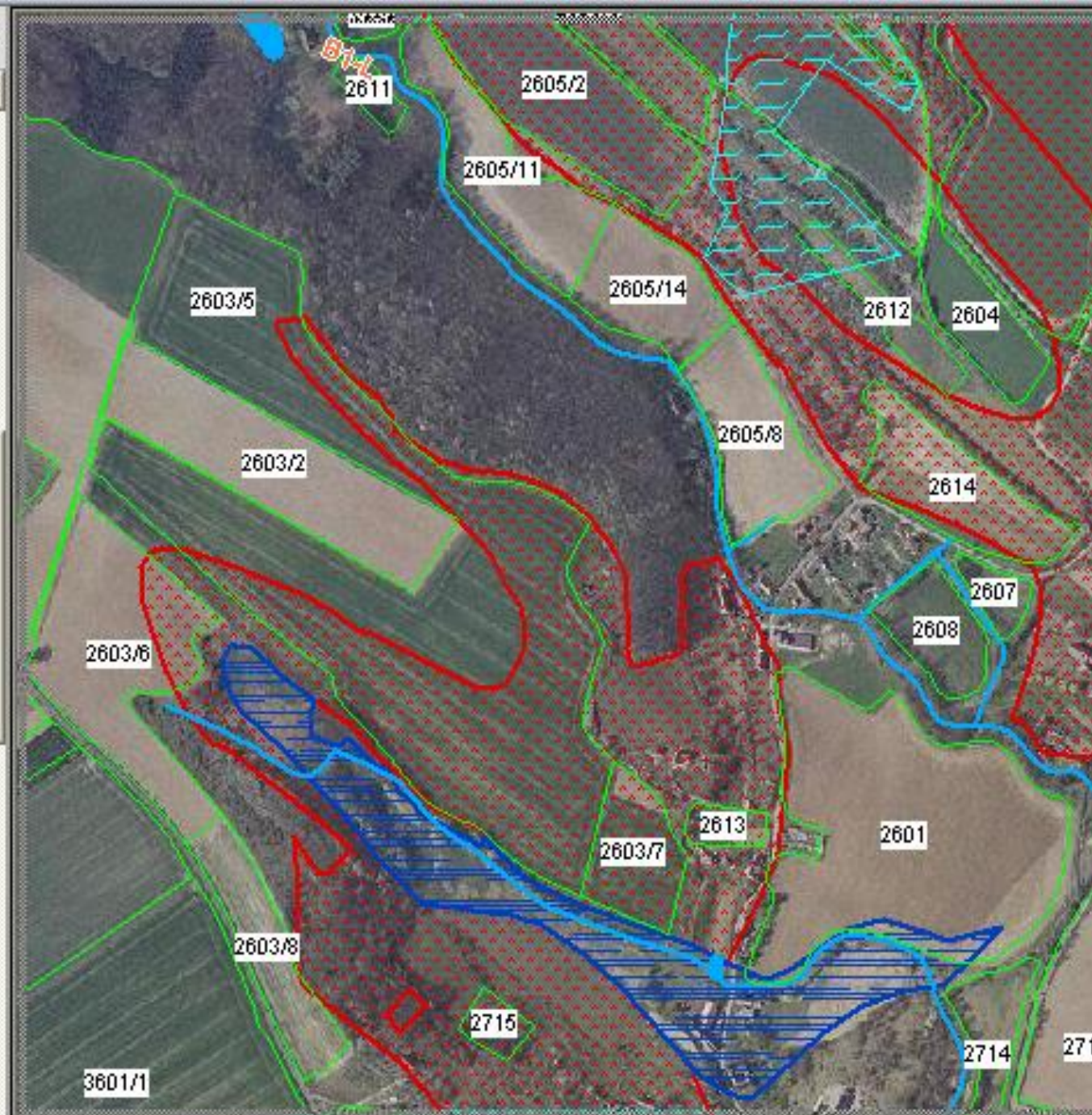
LPIS

Nitrátová směrnice

- Zranitelné oblasti
- Aplikační pásma
- Aplikační pásma - detail
- BPEJ
- Kultura
- Protierozní opatření
- Skladování hnojiv
- Skladování hnojiv - detail**
 - Meliorace
 - Zamokřené půdy
 - Vodní útvary
 - Půdy ohr. erozi
- Vodní útvary

Mapový podklad

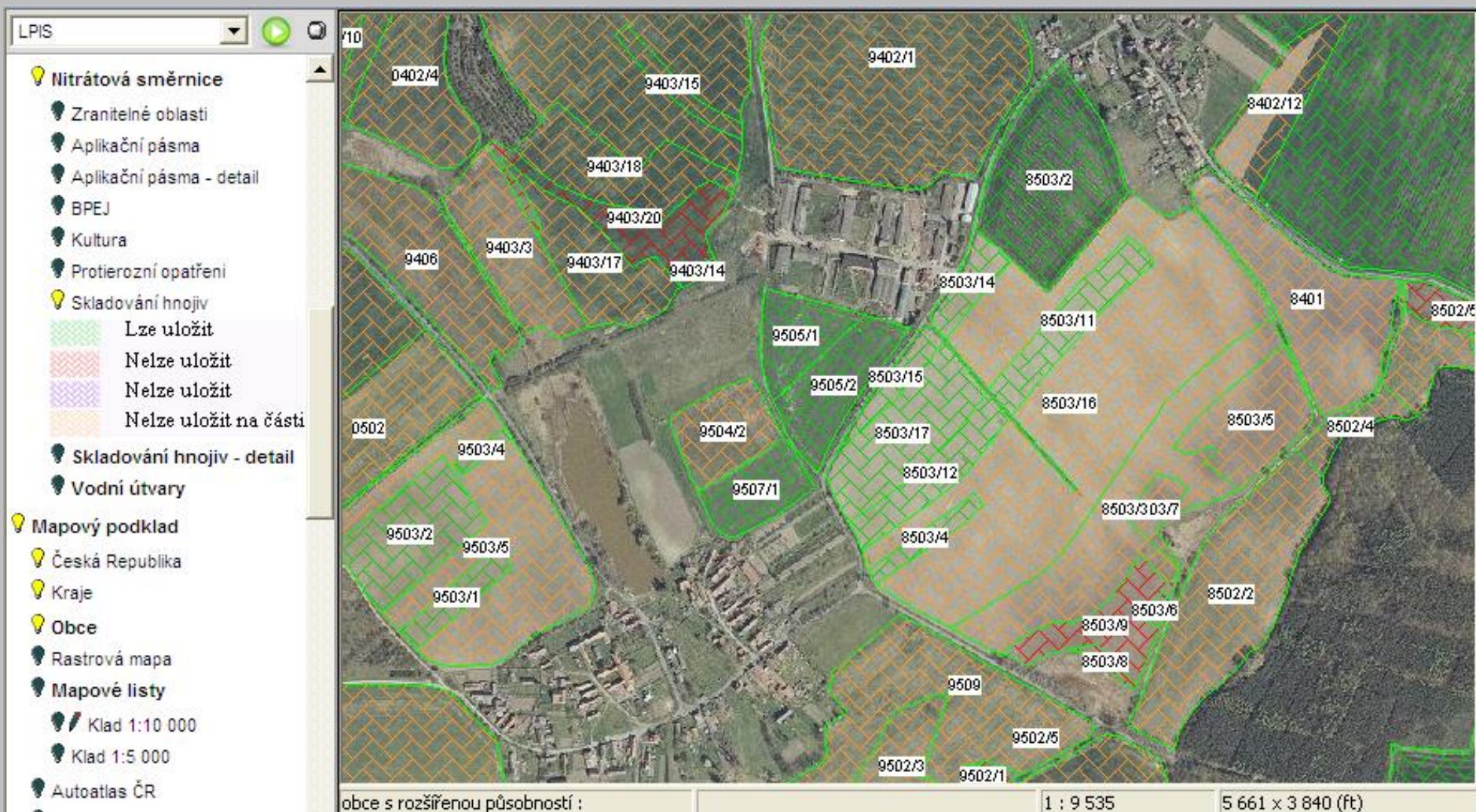
- Česká Republika
- Kraje
- Obce



účinné FB : 3601/1 R9,83ha-První zeměděls

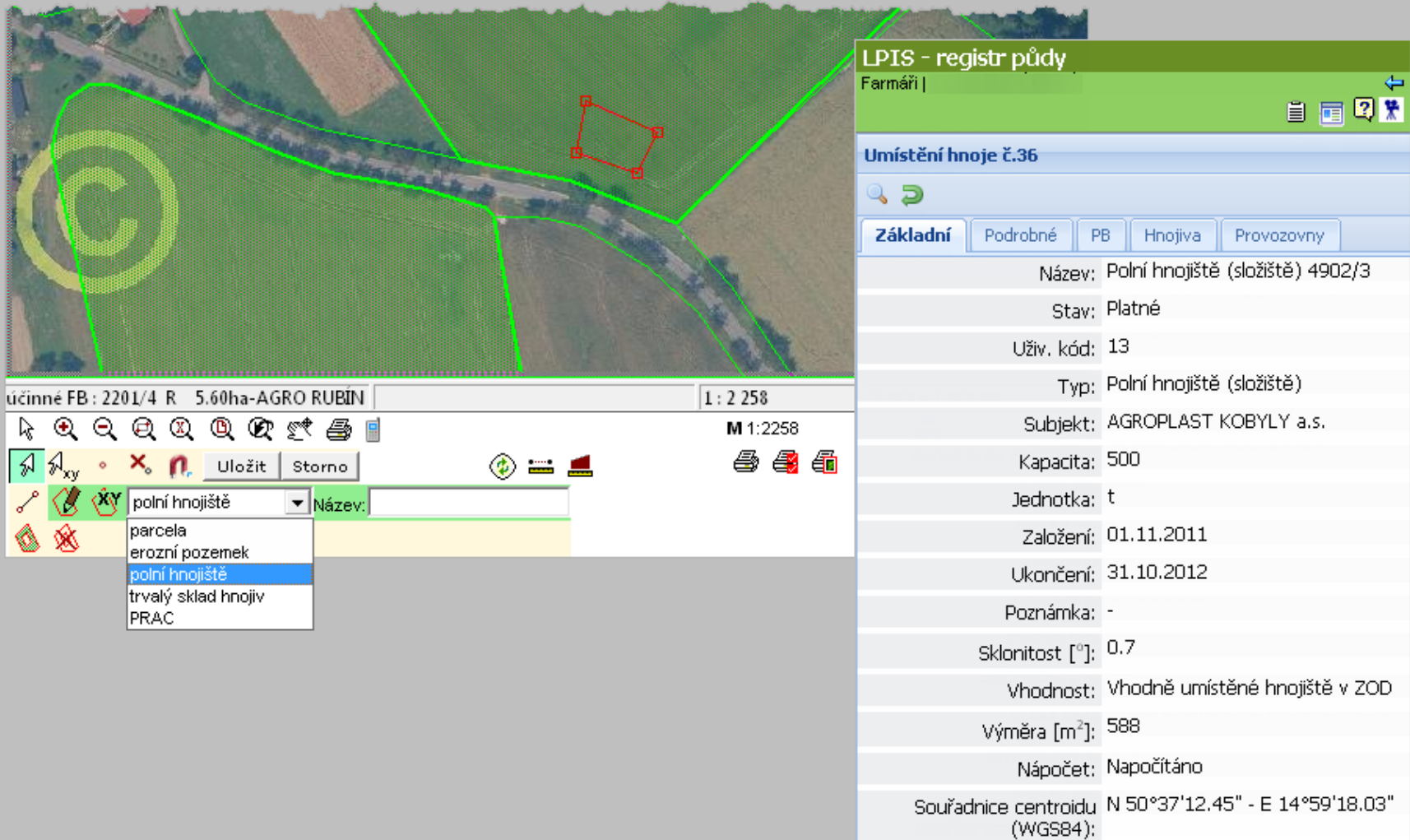
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Storage of the manure



LPIS: Mapping of manure heap (on the field)

Good tool for farmers and simultaneously for inspection bodies



The screenshot displays the LPIS (Lands Parcel Information System) software interface. The main window shows a map of a field with a manure heap marked by a red rectangle. The interface includes a toolbar with various mapping tools, a legend, and a detailed data entry form for the manure heap.

LPIS - registr půdy
Farmáři |

Umístění hnoje č.36

Základní | Podrobné | PB | Hnojiva | Provozovny

Název:	Polní hnojiště (složistiště) 4902/3
Stav:	Platné
Uživ. kód:	13
Typ:	Polní hnojiště (složistiště)
Subjekt:	AGROPLAST KOBLY a.s.
Kapacita:	500
Jednotka:	t
Založení:	01.11.2011
Ukončení:	31.10.2012
Poznámka:	-
Sklonitost [°]:	0,7
Vhodnost:	Vhodně umístěné hnojiště v ZOD
Výměra [m²]:	588
Nápočet:	Napočítáno
Souřadnice centroidu (WGS84):	N 50°37'12.45" - E 14°59'18.03"

Characteristics	Data	Characteristics	Data
Map, parcel code	(640-1170)-1905/1 - vedle	Floodplain	No
Cadastral area	Stupečice	NVZ	Yes
Name	Place for manure deposition No. 3	Overlap of drainage (m ²)	0
Type	Place for manure deposition	Threatened by soil erosion (m ²)	0
Capacity (t)	600	Water saturated soil (m ²)	0
Area (m ²)	2 000	Near water course (50 m)	No
Manure type	Cattle FYM, deep litter	Distance from water course (m)	532
Water source protection zone	No	Slope (°)	0,4
GPS	N 48°59'7.59" - E 16°3'23.15"	Suitability of the location	Yes

Practical procedure (Example - farm XY)

- selection of suitable places for manure deposition (LPIS maps)
- drawing of proposal places to the emergency plan, filling in the table with characteristics for each place



Monitoring of the Action programme

- **Evaluation of the effectiveness of the Nitrates Directive Action Programme in the Czech Republic is provided under the monitoring of the **Action Programme****
- **Monitoring of the Programme includes:**
 - verification survey of meeting the requirements of the Action Programme on farms in NVZ (about 30 to 40 pilot enterprises)
 - evaluation of the development of soil nitrogen content in terms of crops, and agricultural technologies used during weathering,
 - field survey on farms in NVZ (about 250 farms)
 - monitoring of the impact of farming management in accordance with the action program on water quality in the pilot area in NVZ ,
 - evaluation of the impact of farming , soil-climatic conditions and weather during the water quality in 360 sub-basins of the Czech Republic ,
 - measuring the flows of nitrogen in NVZ, and modeling the movement of nitrogen in soil and water for the prediction of the future development of water quality
 - monitoring of the development of farming in NVZ based on data from the Czech Statistical Office , Evidence of soil by user relations and Evidence of livestock

Deposition of manure on fields

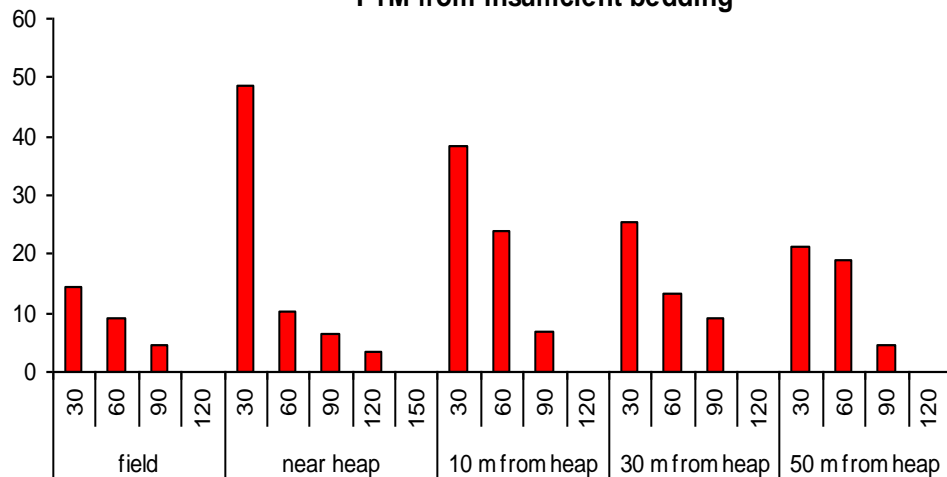
Manure heaps monitoring 2013

- **About 80 manure heaps in 2013
(100 heaps in 2010, 2011, 2012)**
- **Focused on:**
 - ❖ **manure quality,**
 - ❖ **Nmin content in the soil**
 - ❖ **quality of water**

N_{min} content near manure heap with different bedding

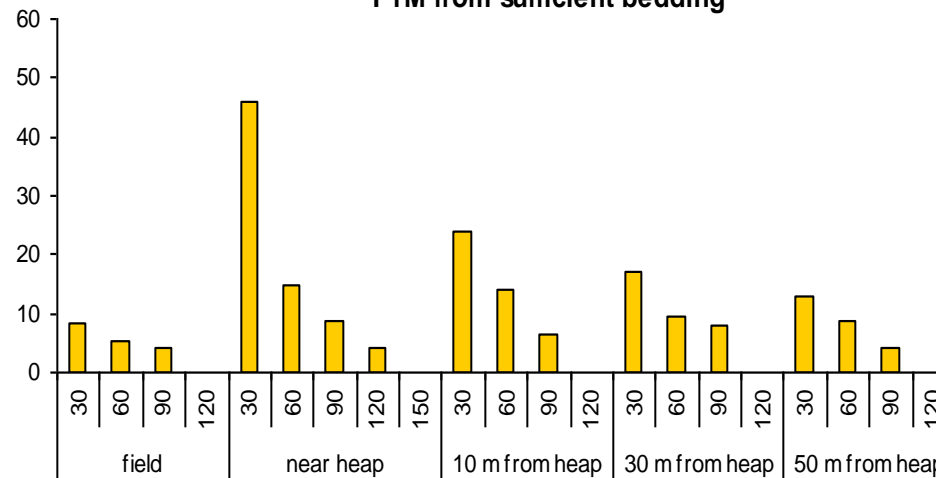
mg N/kg

FYM from insufficient bedding



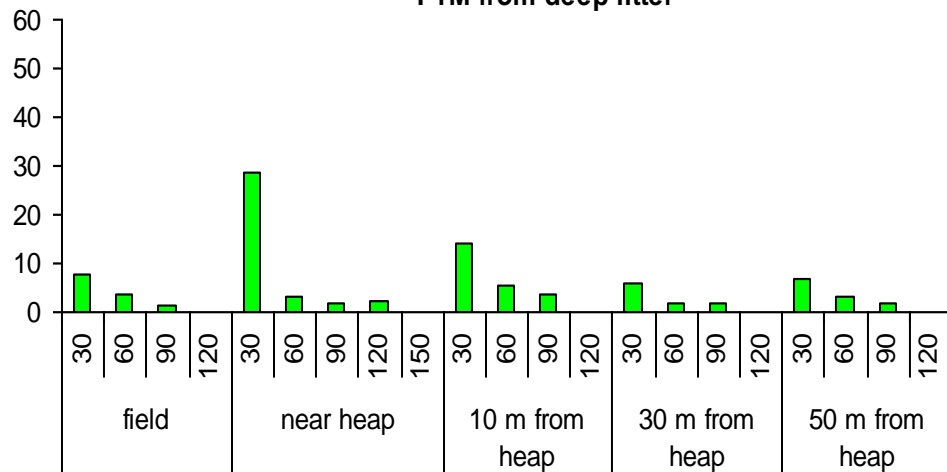
mg N/kg

FYM from sufficient bedding



mg N/kg

FYM from deep litter

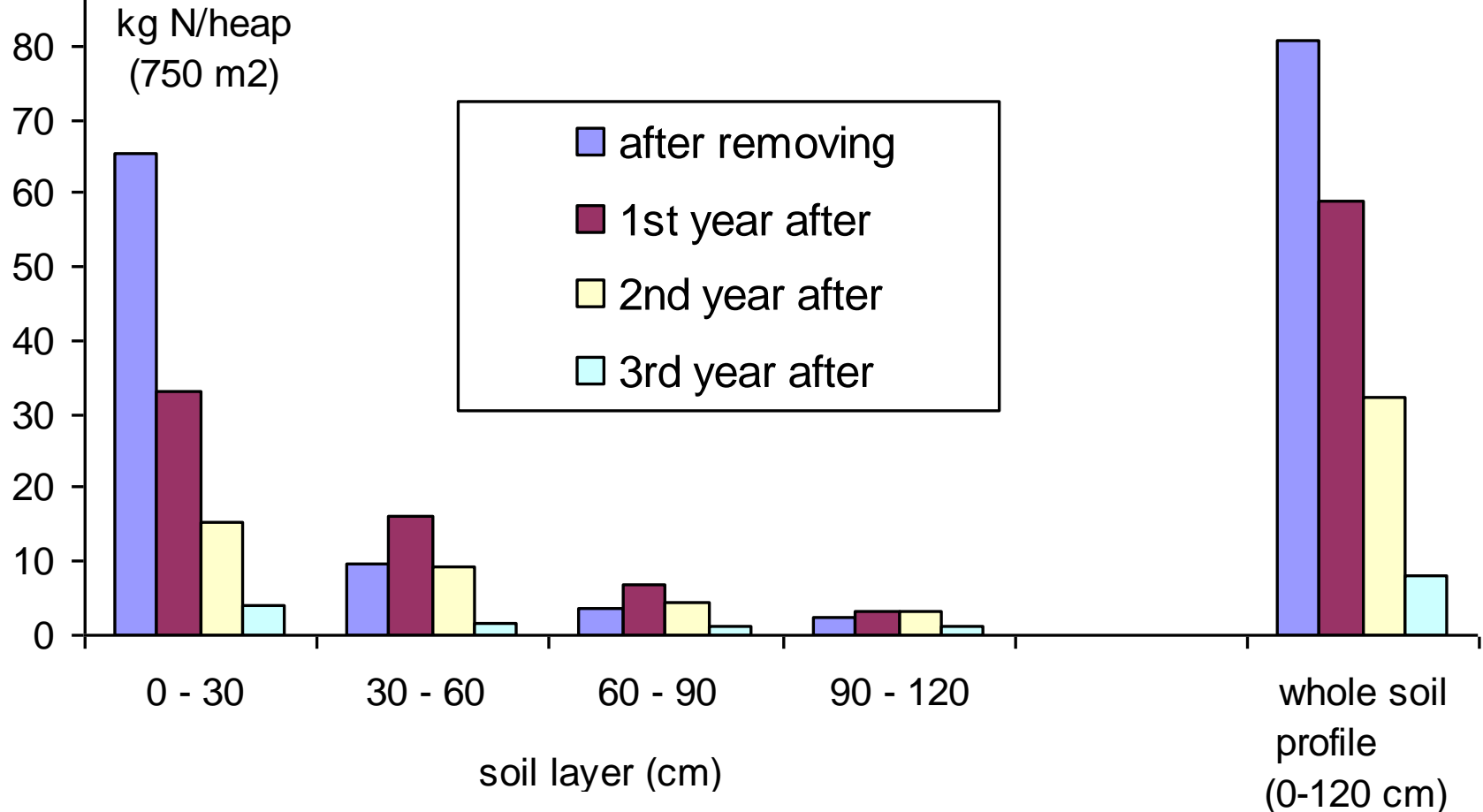


soil
layer
(cm)

Content of Nmin in the soil under manure heap

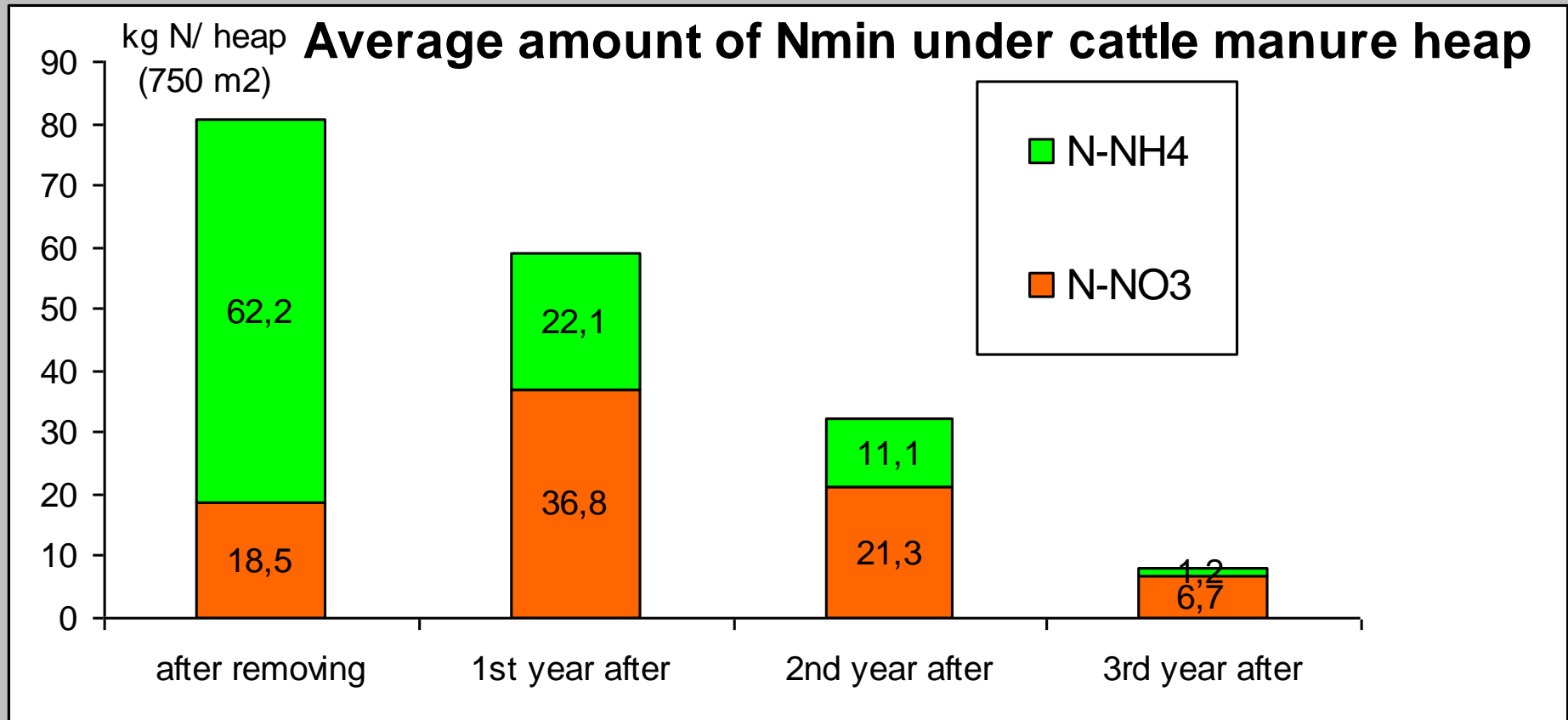
- space (soil profile) scaling

Average amount of Nmin under cattle manure heap



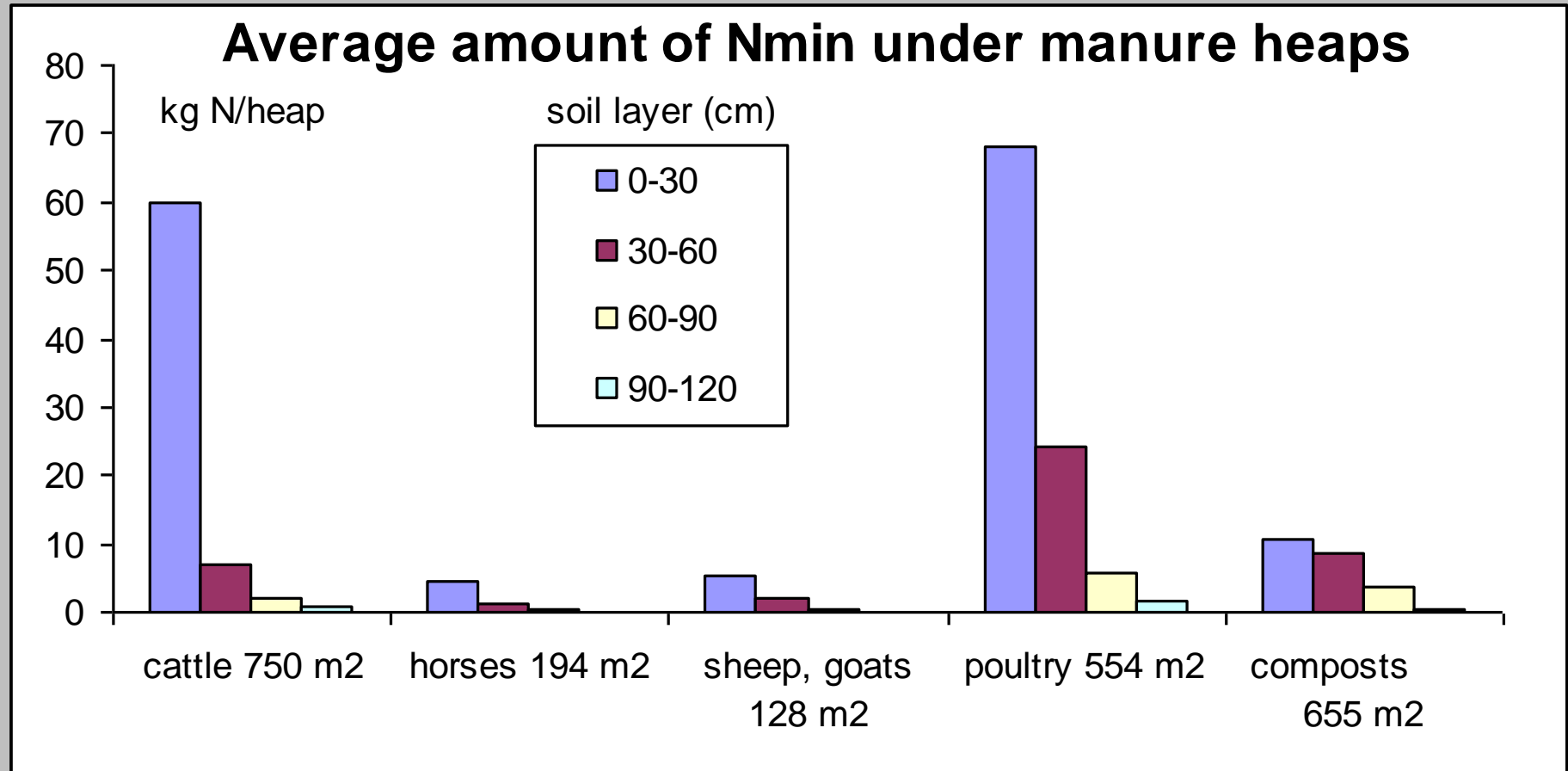
Content of Nmin in the soil under manure heap

- time scaling



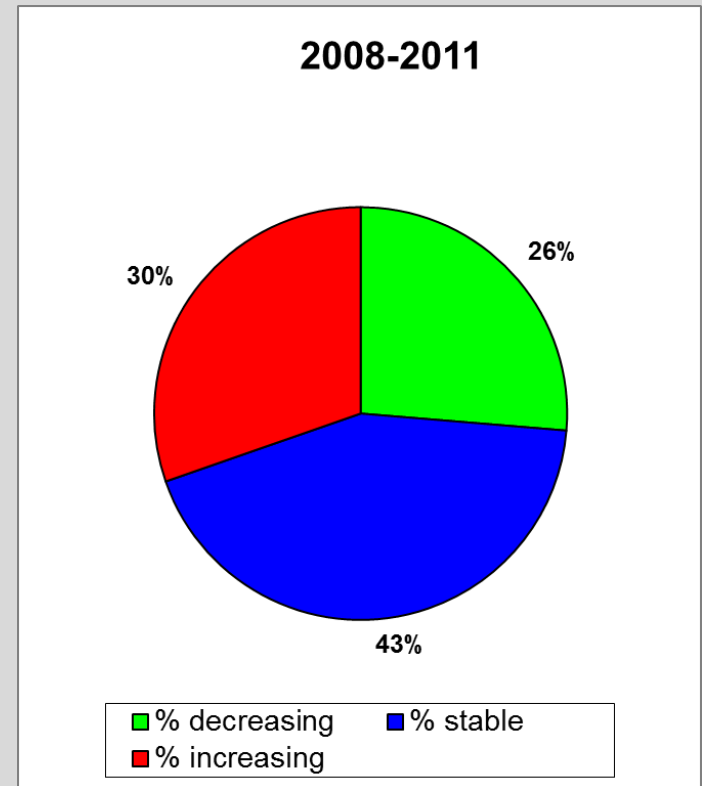
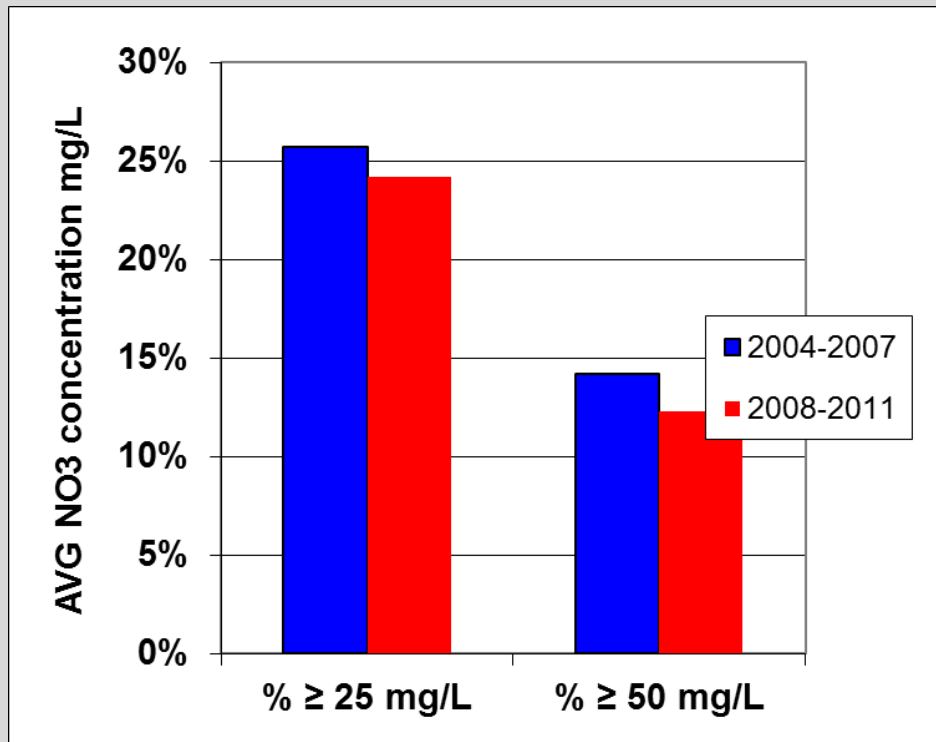
Content of Nmin in the soil under manure heap

- type aspect



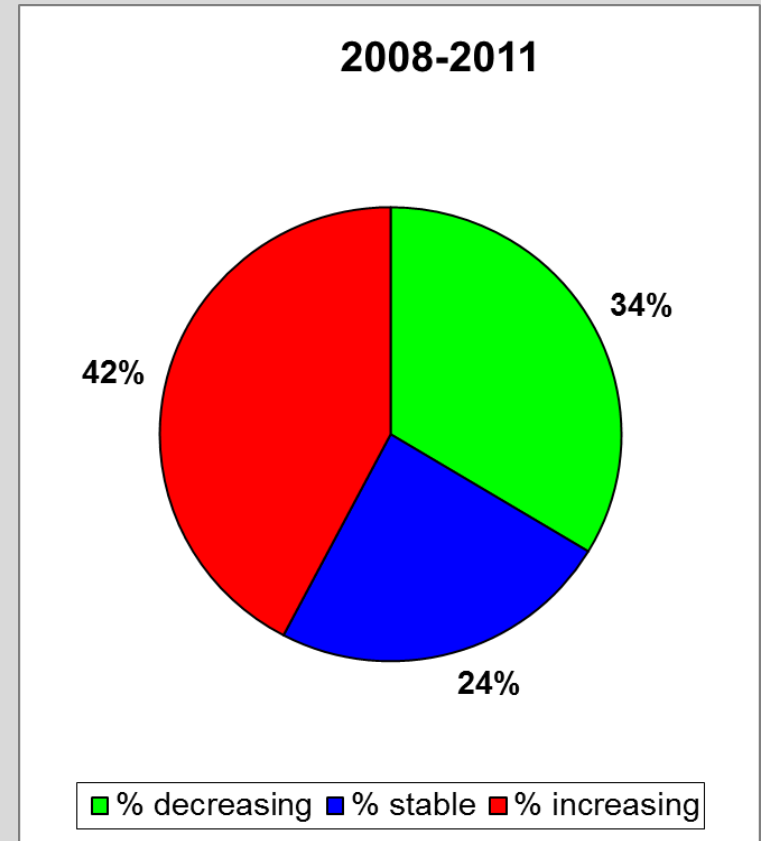
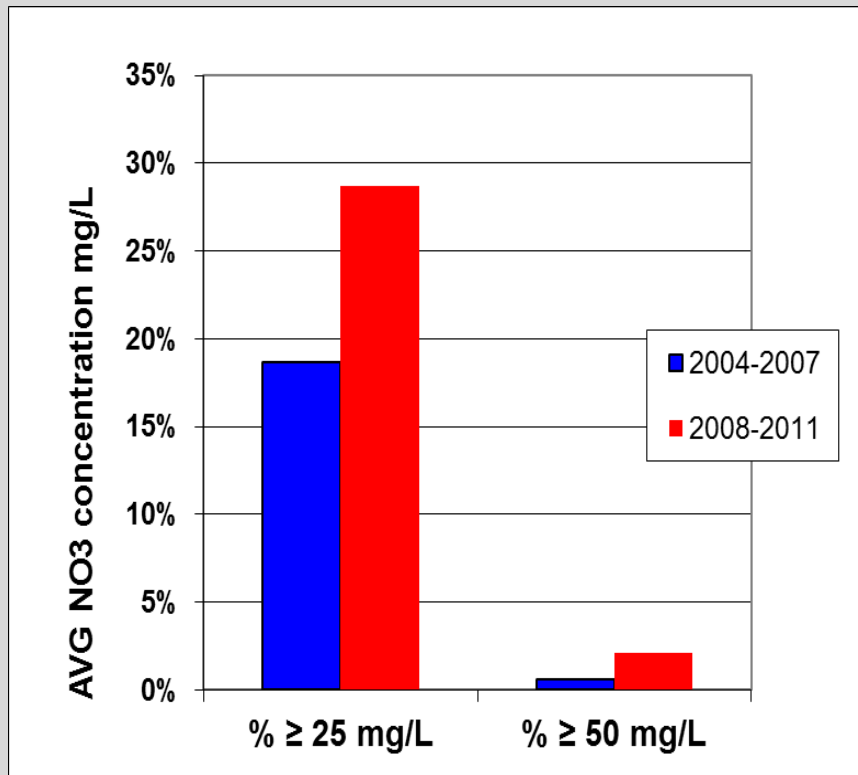
Water quality

Monitoring of groundwater – a comparison between the periods 2004-2007 and 2008-2011



Water quality

Monitoring of surface water - a comparison between the periods 2004-2007 and 2008-2011



New legislative requirements since 2014

(this provision shall enter into effect on 1. 1. 2014)

Storage of manure on farmland (under legislation requirements):

- **Manure storage capacities (FYM, slurry) for 6 months**
- **Solid manure can be deposited on agricultural land** after 3 month period of storage (after dewatering) or after uniphase dispatch from the stable with deep litter
- **FYM can be deposited only in places approved in the emergency plan**
- **Storage max. for 12 months (in vulnerable zones) & 24 months out of vulnerable zones**

New legislative requirements since 2014

(this provision shall enter into effect on 1. 1. 2014)

Limitation of fertilization by nitrogen compounds:

- Limit 170 kg of nitrogen (in organic form) per hectare
- New limits of crop fertilization by nitrogen (totaly)
- Fertilizing with nitrogen compounds is determined by the needs of individual crops on particular sites

Fertilization near by watercourses:

- No fertilizers in a strip next to the watercourses and other waters formations
- No liquid fertilizers with rapidly releasable N in strip near by the watercourses

It's time to finish !!!!!



**A lot of thanks to my co-authors
and colleagues**

Thank you for your attention