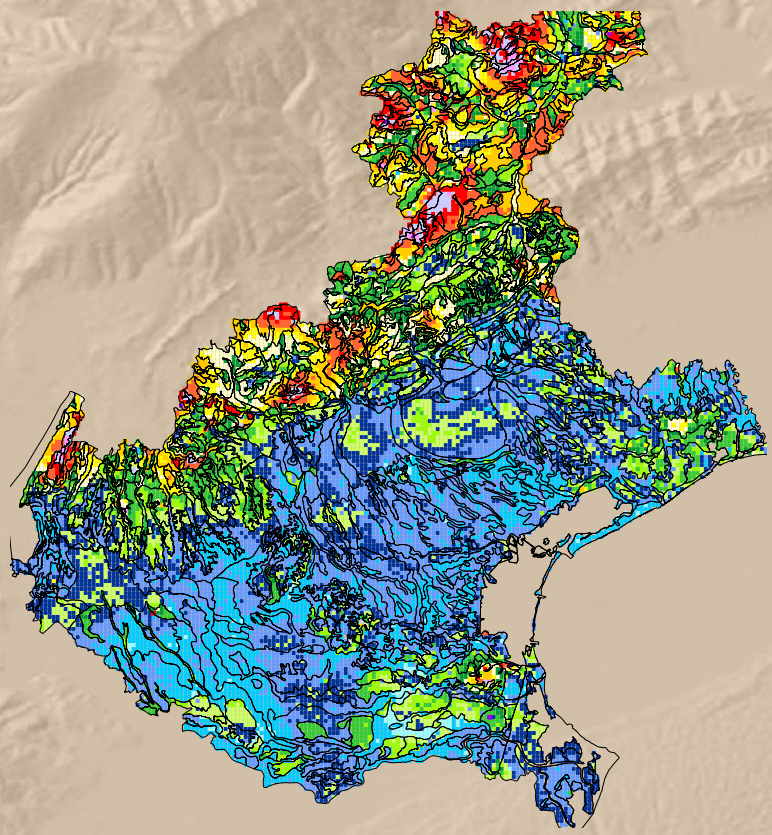
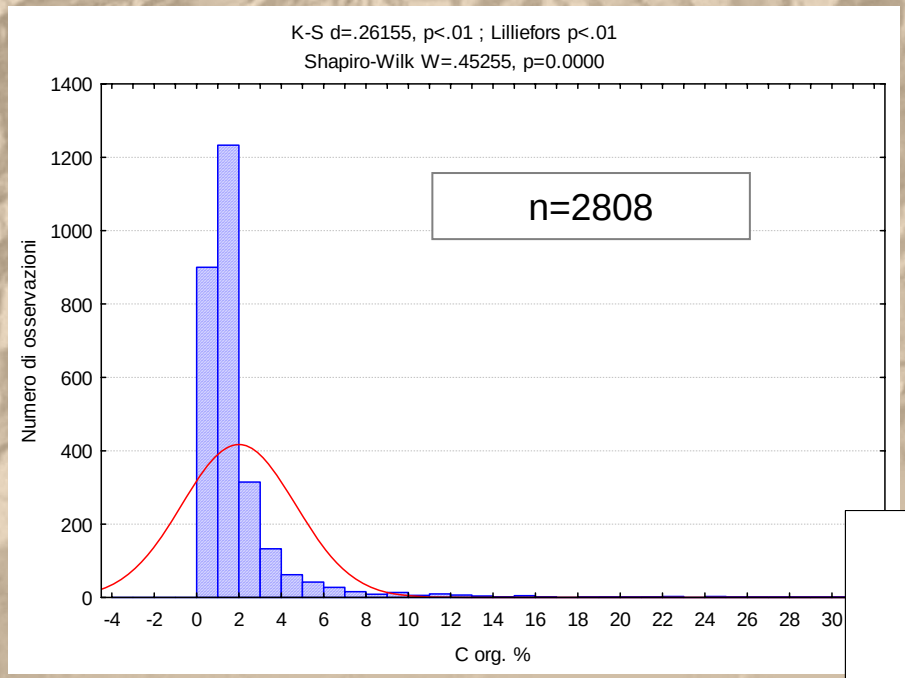
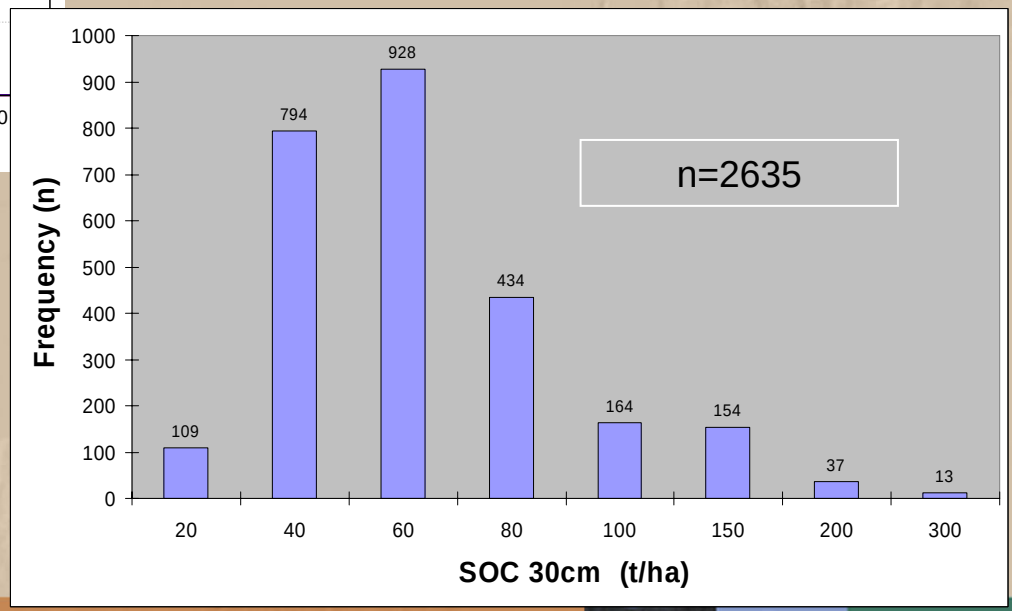
Towards SOIL CARBON STATUS INDICATORS in the Veneto Region



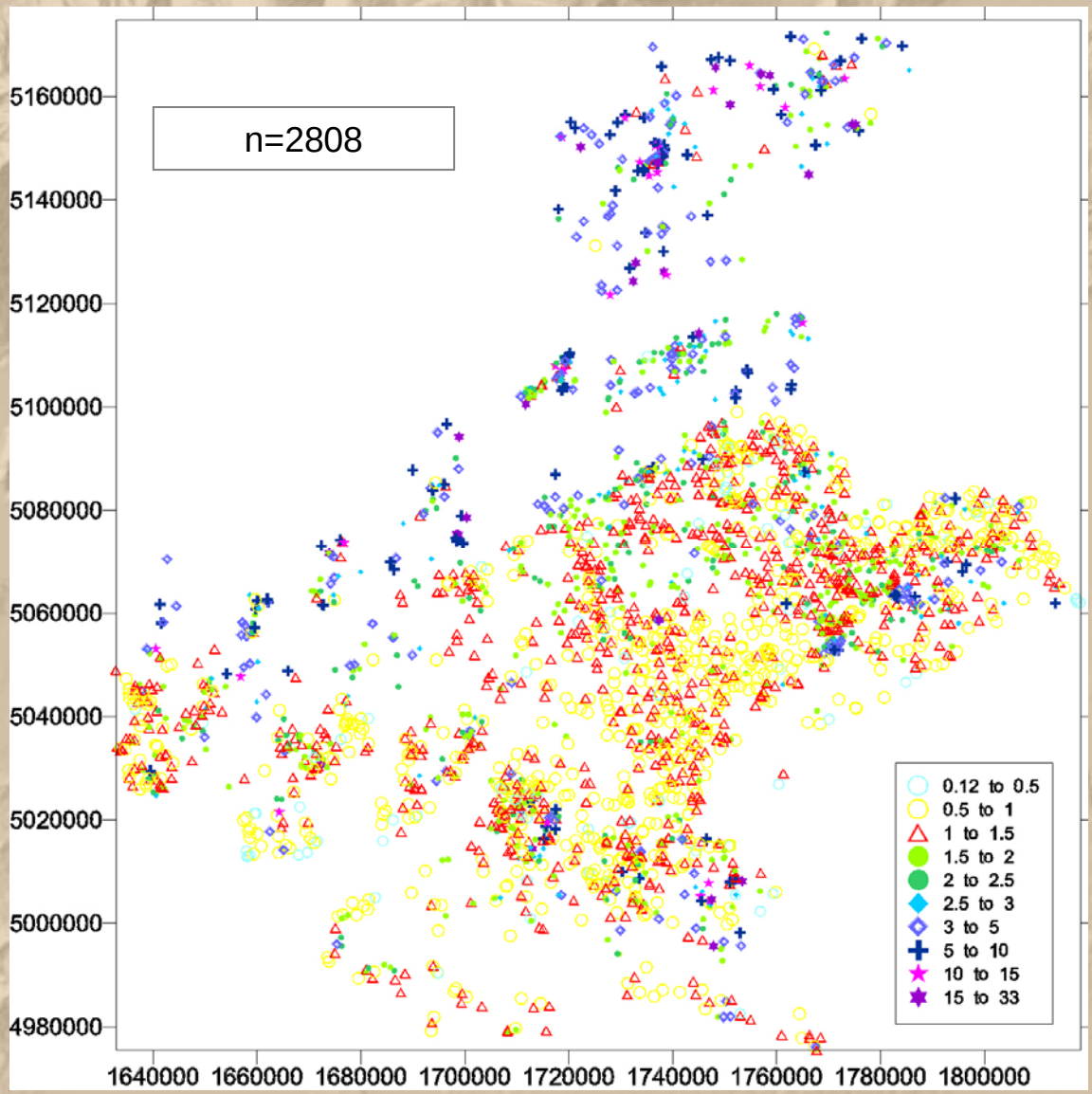
ARPAV - Ialina Vinci – Adriano Garlato – Silvia Obber – Fabrizio Ungaro (CNR)

topsoil OC content for the Veneto Region





topsoil OC content (%) for the Veneto Region



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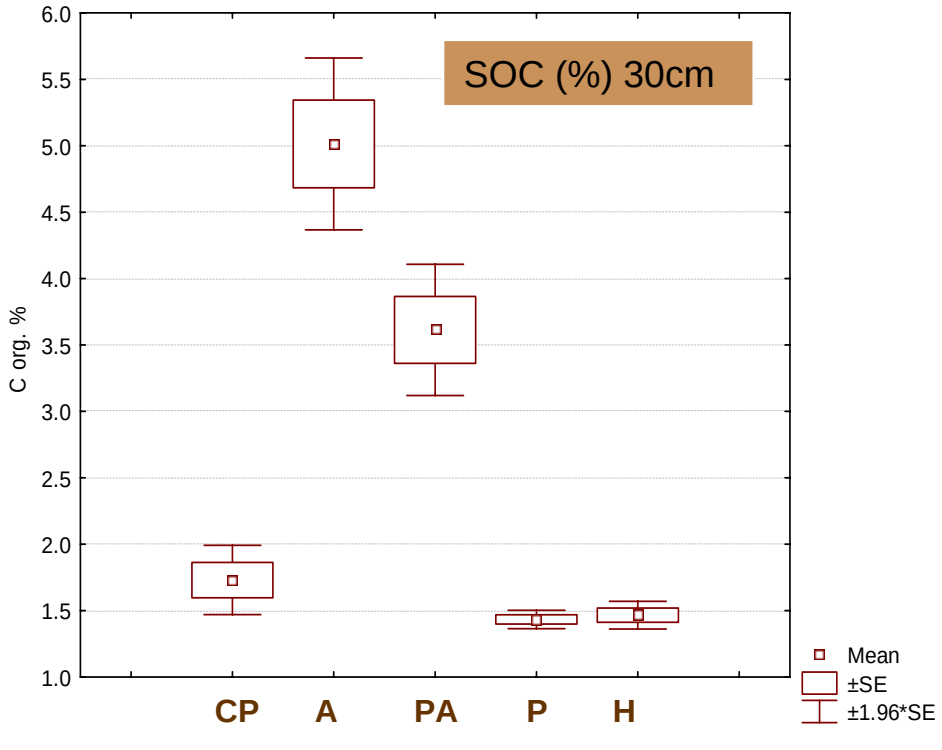
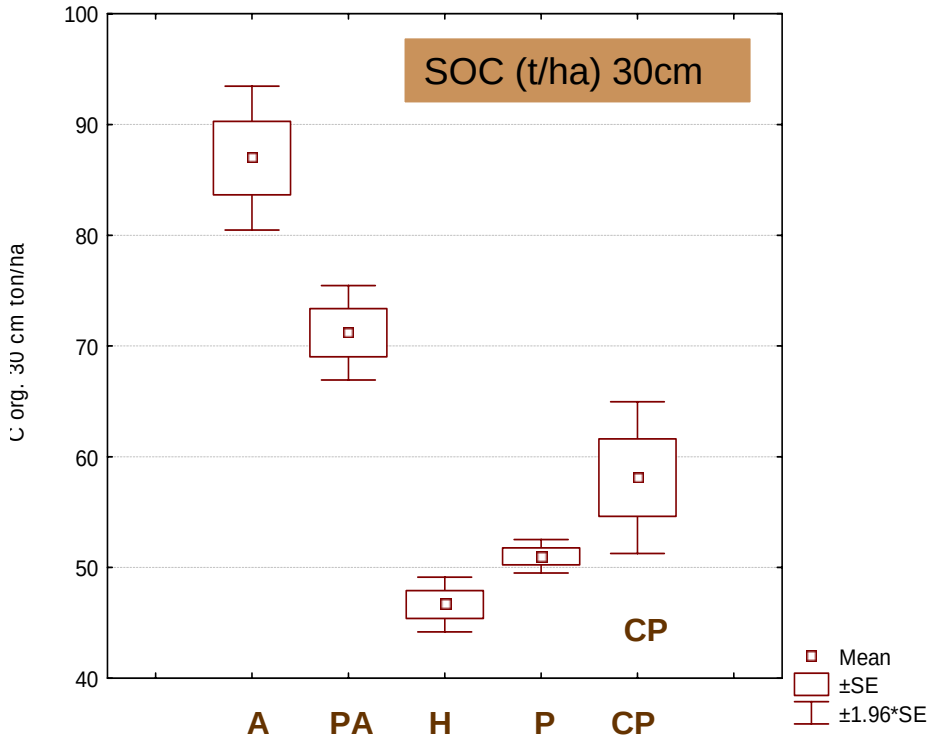
topsoil mean OC content for the Veneto Region



mean values and confidence interval (95%)



mean values and confidence interval (95%)

A	**Alps**
PA	**Prealps**
H	**Hills**
P	**Plain**
CP	**Coastal plain**

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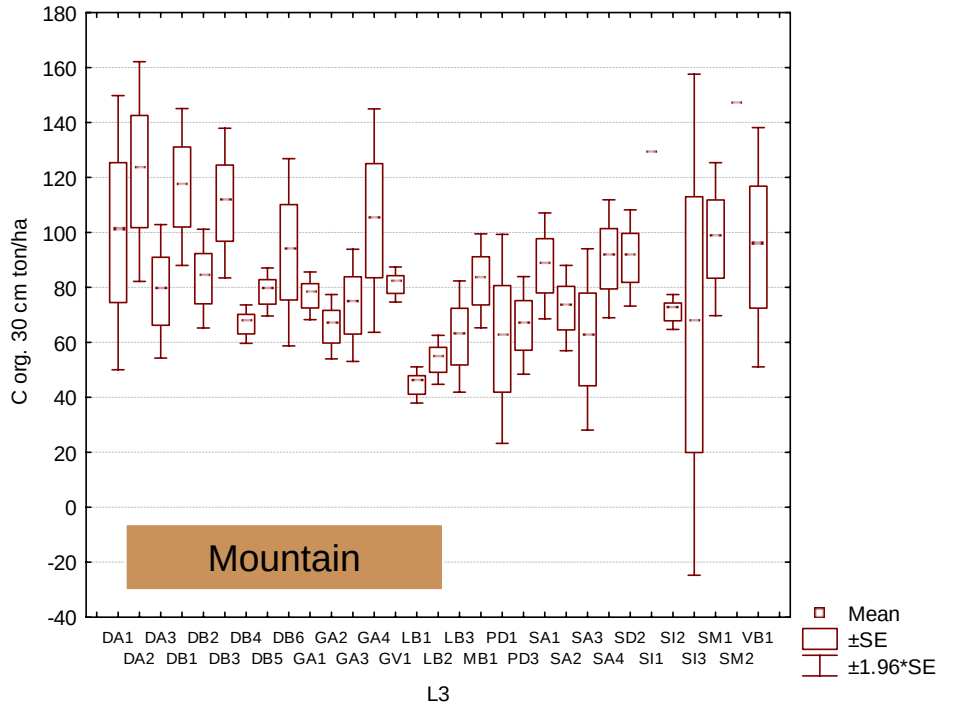
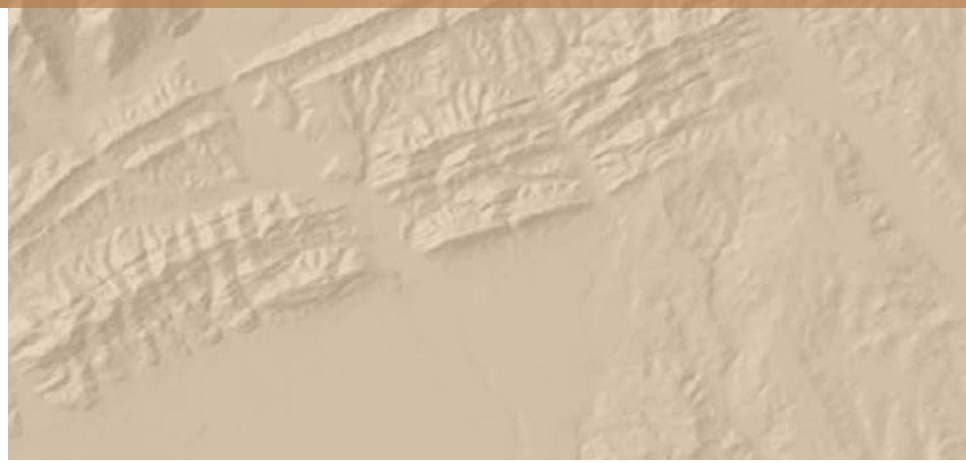
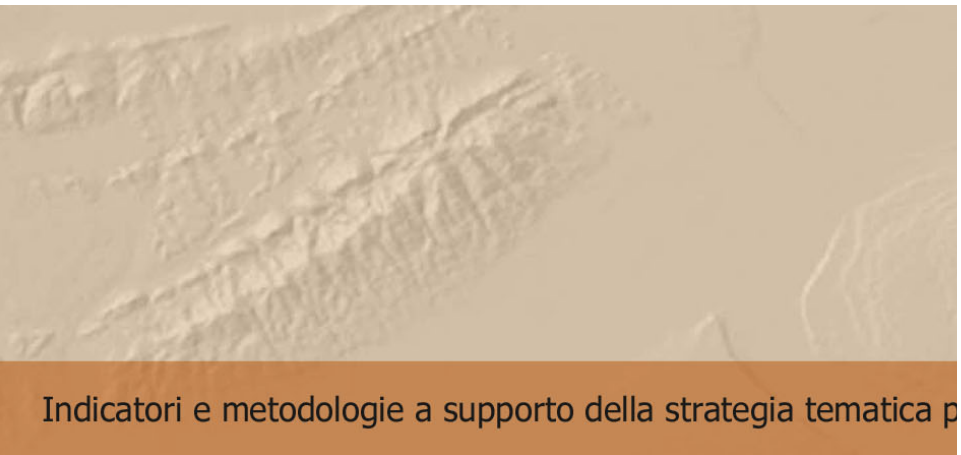
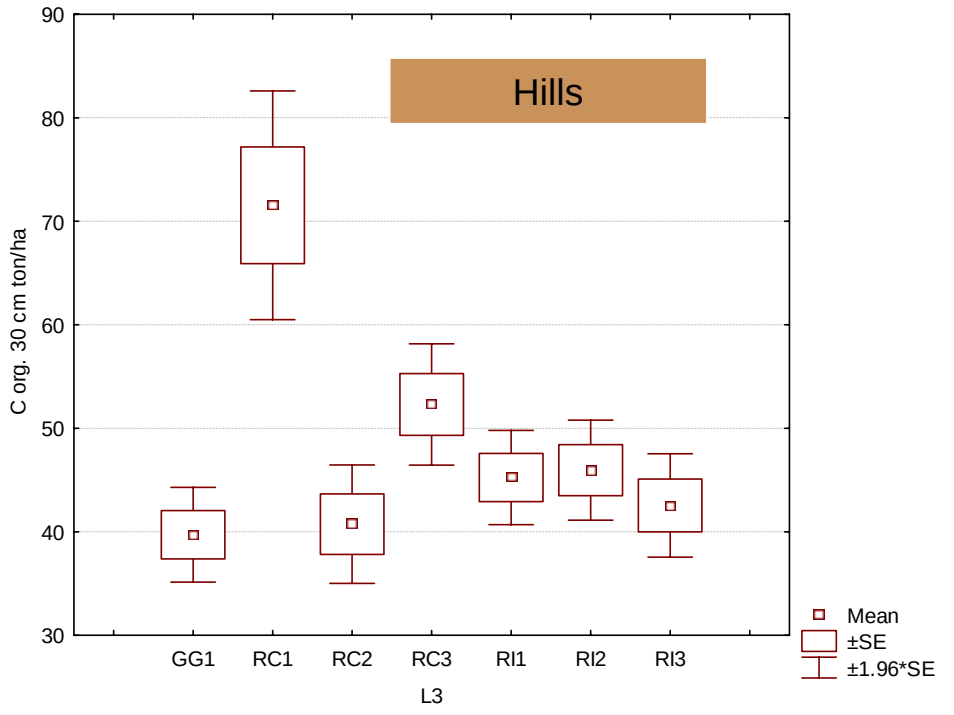
topsoil mean OC content for the Veneto Region - L3

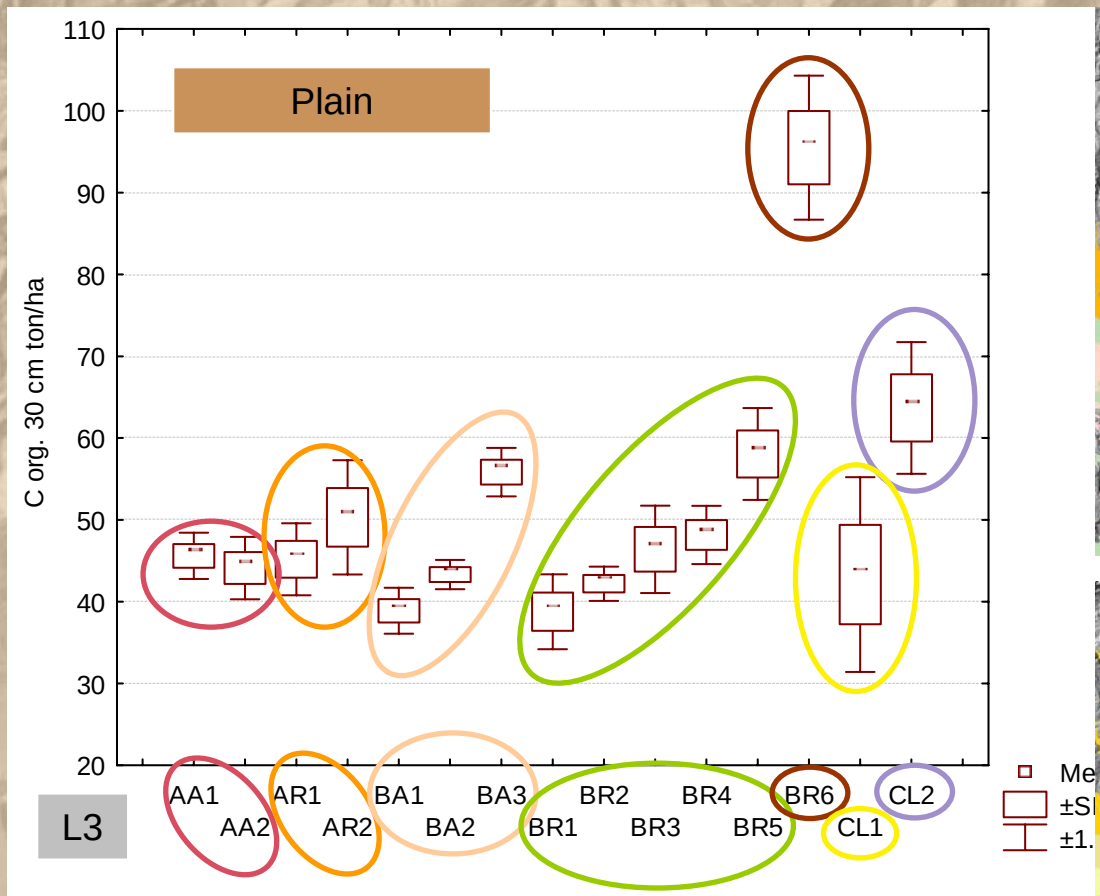


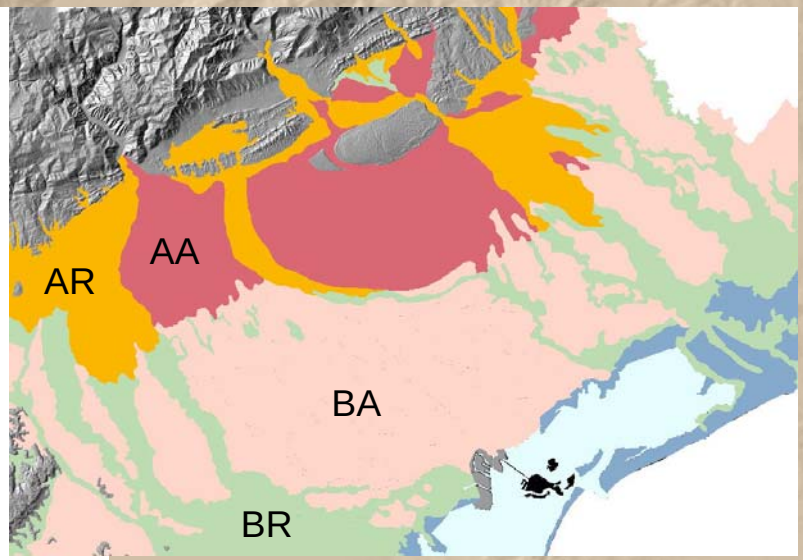


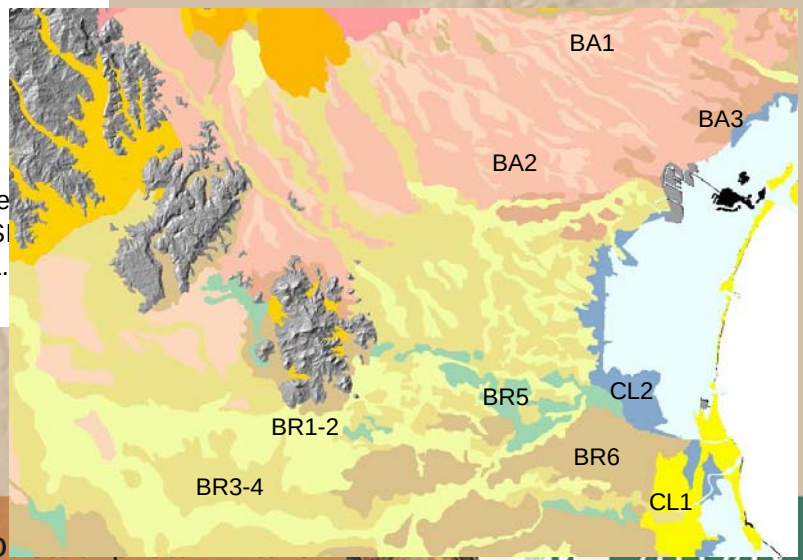




topsoil mean OC content for the Veneto Region - L3







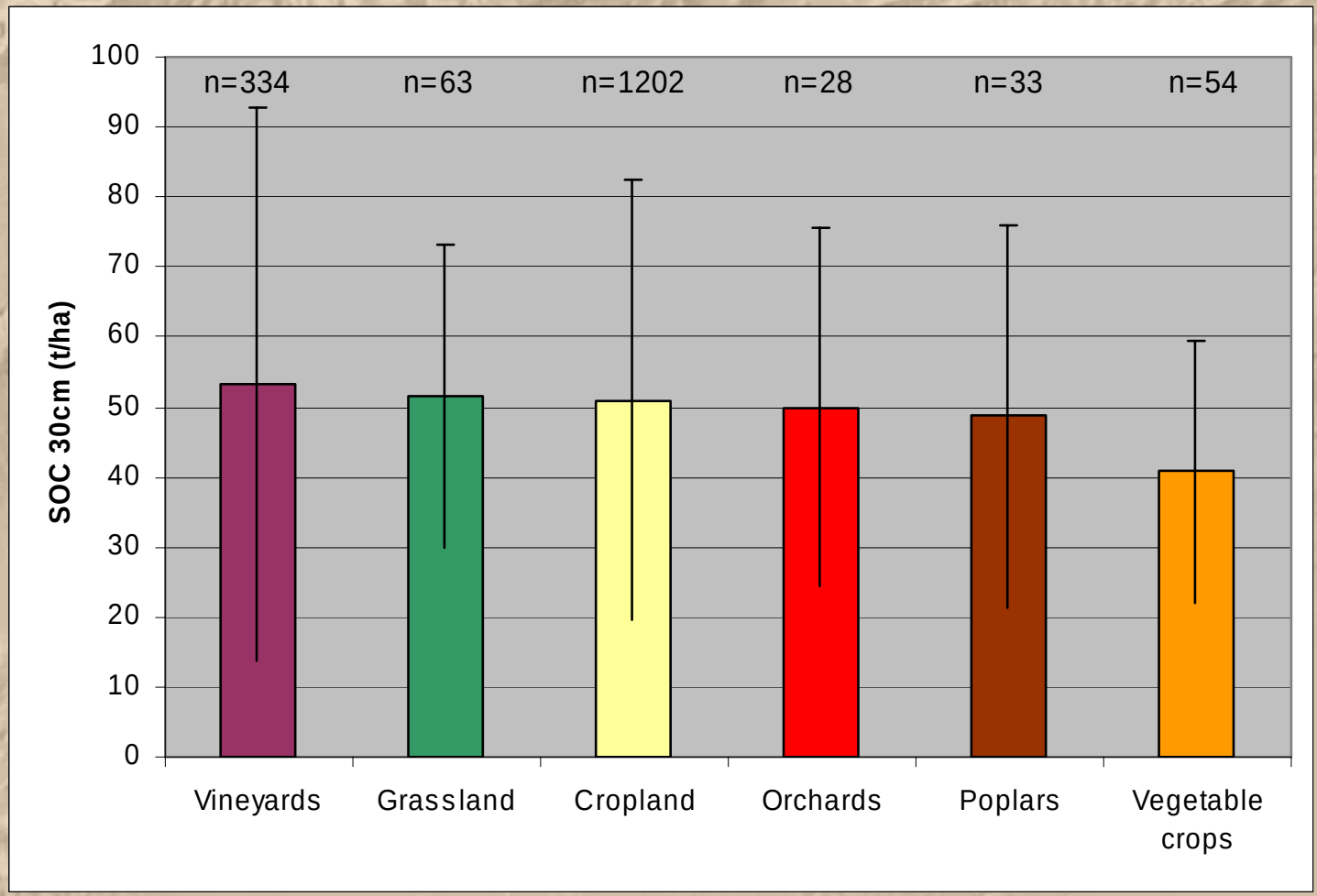
n=1714

- OC trend increases according to clay content:
  - in gravelly soils of **high plain** (**A**):
    - AR2 has a higher OC content probably due to higher clay content.
    - OC content seems not to be influenced by carbonates (no significant differences between the old (Pleistocene) glaciofluvial high plain (**AA**) and the recent one (**AR**);
  - in soils of the **low plain** (**B**):
    - in the **old** (Pleistocene) **low plain** (**BA**) from the river levee coarse-loamy soils (BA1), to the alluvial plain fine-silty soils (BA2), to fine soils of depressions (BA3);
    - in soils of the **recent** (Holocene) **low plain** (**BR**) where same particle size classes are linked to the same land elements (river levees BR1-BR2, alluvial plain BR3-BR4, depressions BR5), but where carbonate, as well as clay, content shows his effect ($CaCO_3$ in BR1<BR2; BR3<BR4).

- **Organic soils** of reclaimed marshes (**BR6** Histosols or soils with mollic horizon) have obviously the higher amounts.

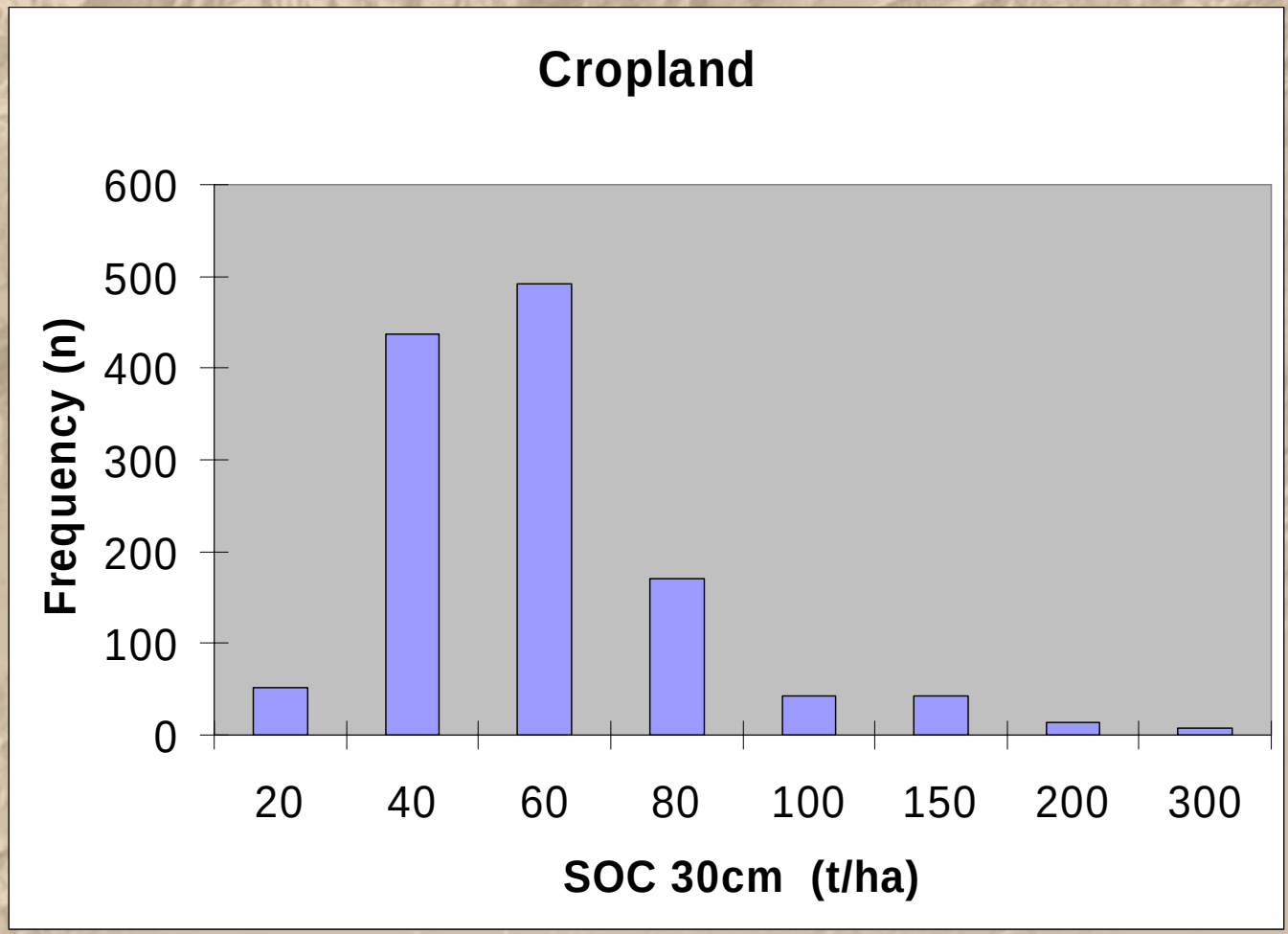
- Soils on **coastal plain** (**CL**) show:
  - high variability on dunes (CL1: sandy soils on dunes vs. interdune organic soil)
  - high OC content in reclaimed lagoon soils).

SOC content in soils of the plain for different Land Uses (n=1714)

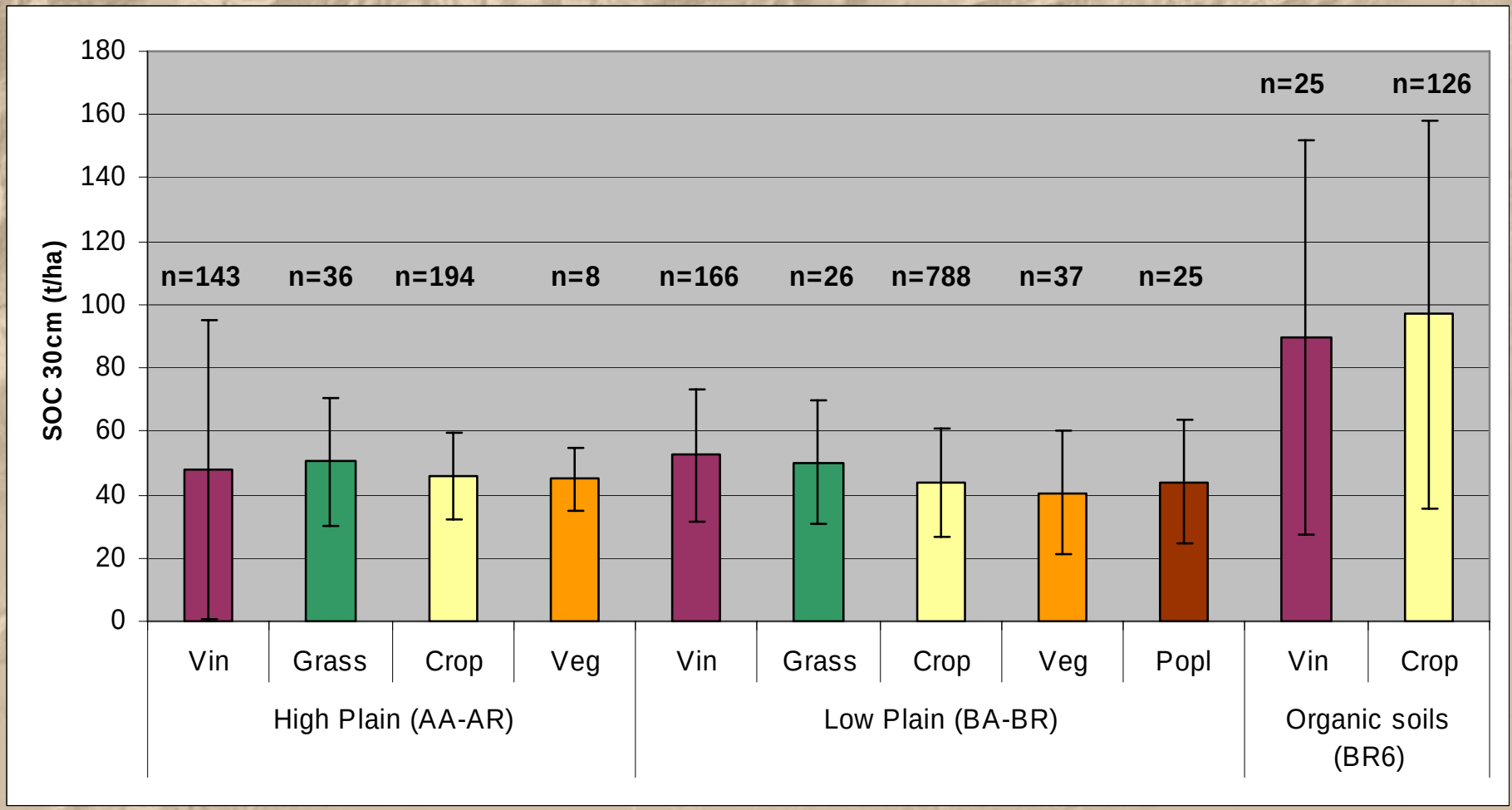


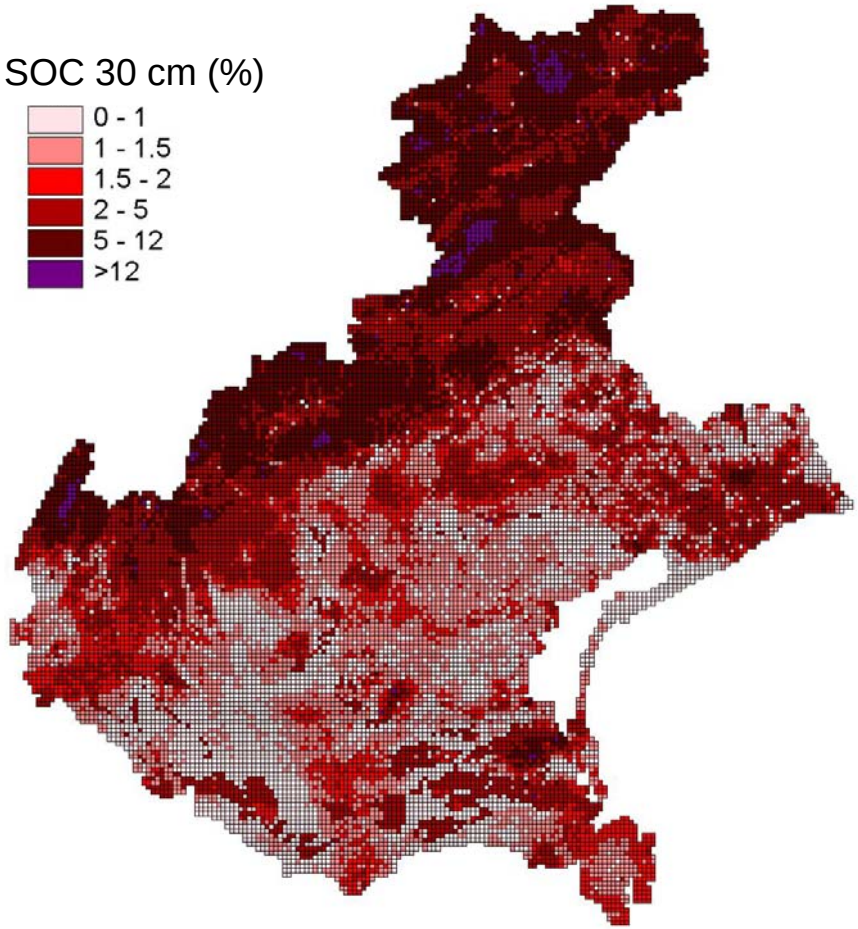
topsoil OC content for cropland in the plain

(n=1256)

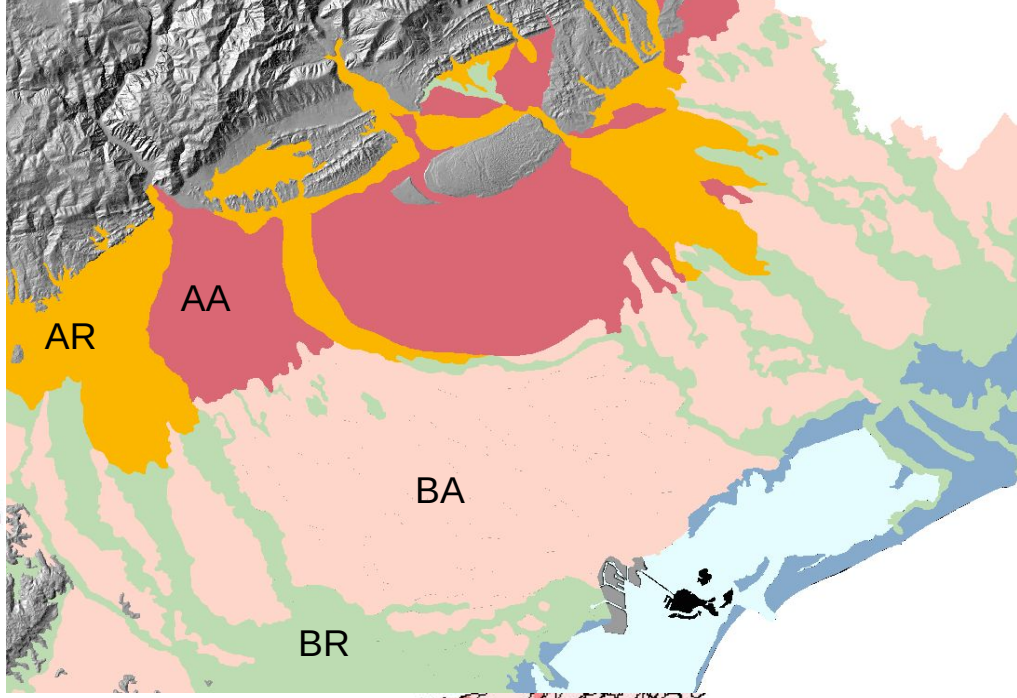


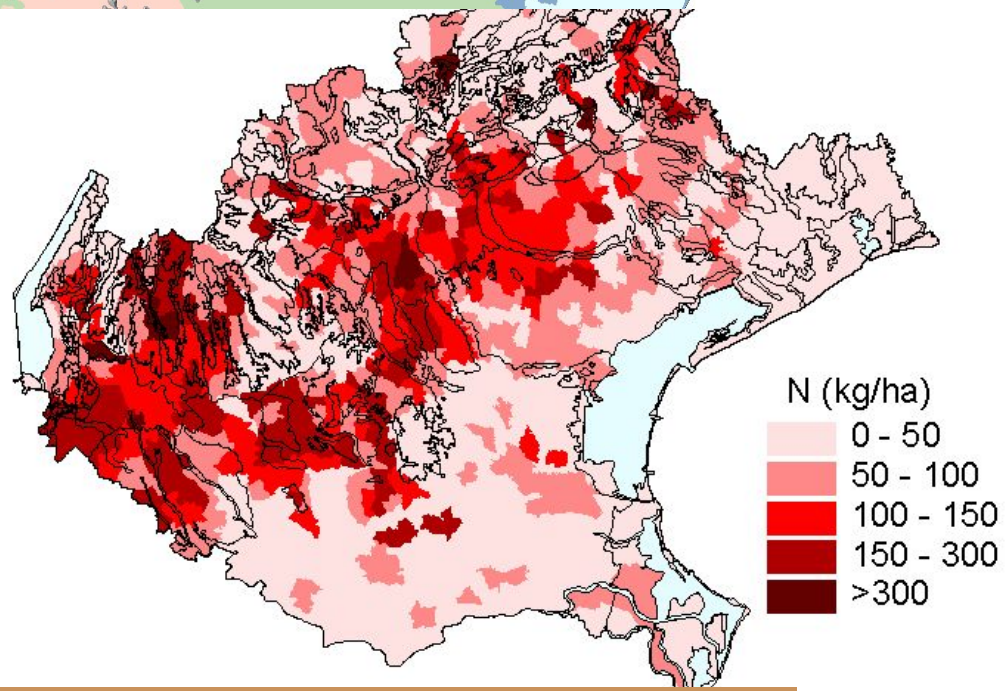
SOC content for different Land Uses for group of soils (n=1574)





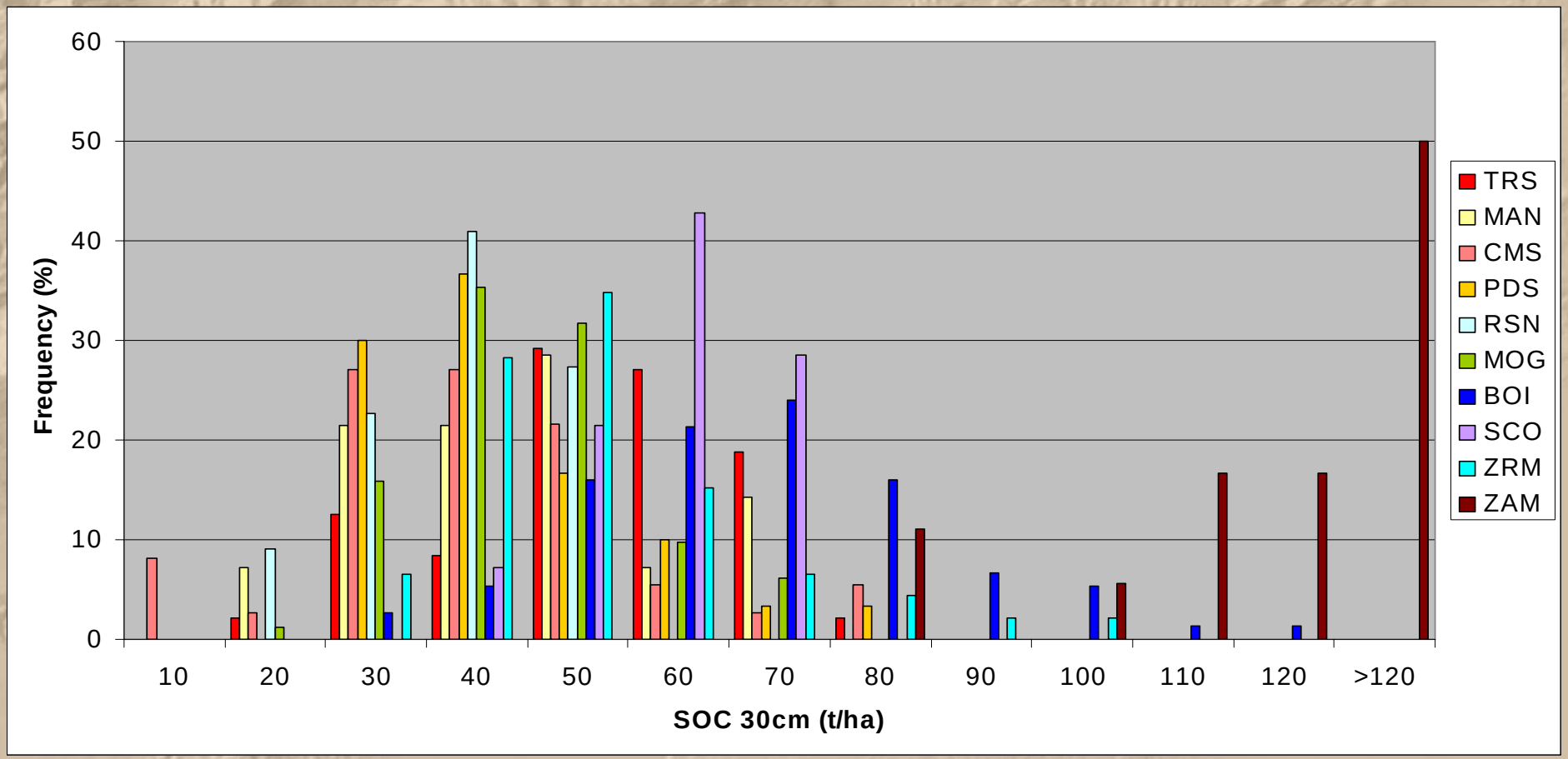
OC obtained by geostatistical anlysis (CNR)



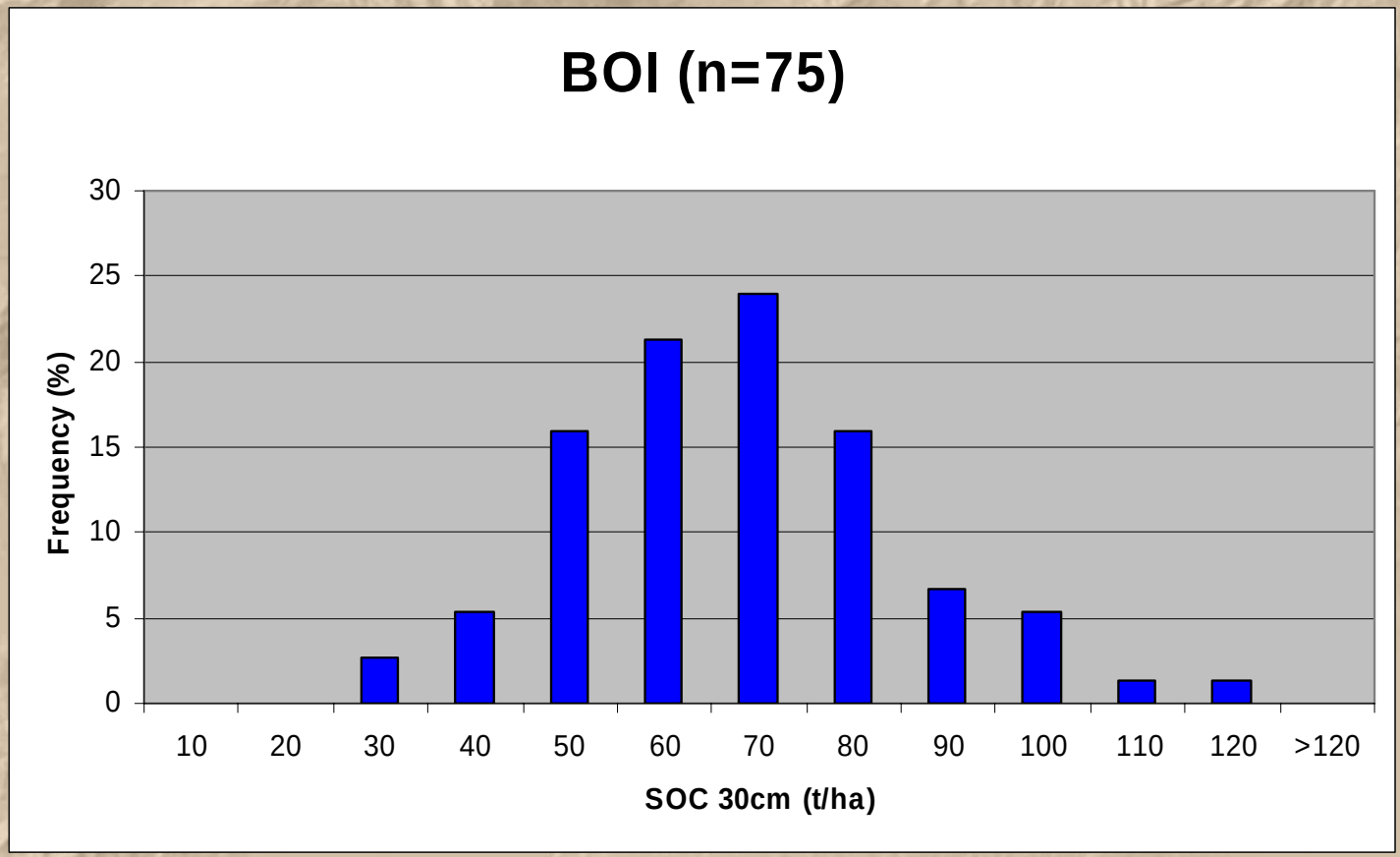


Nitrogen from animal waste/municipality

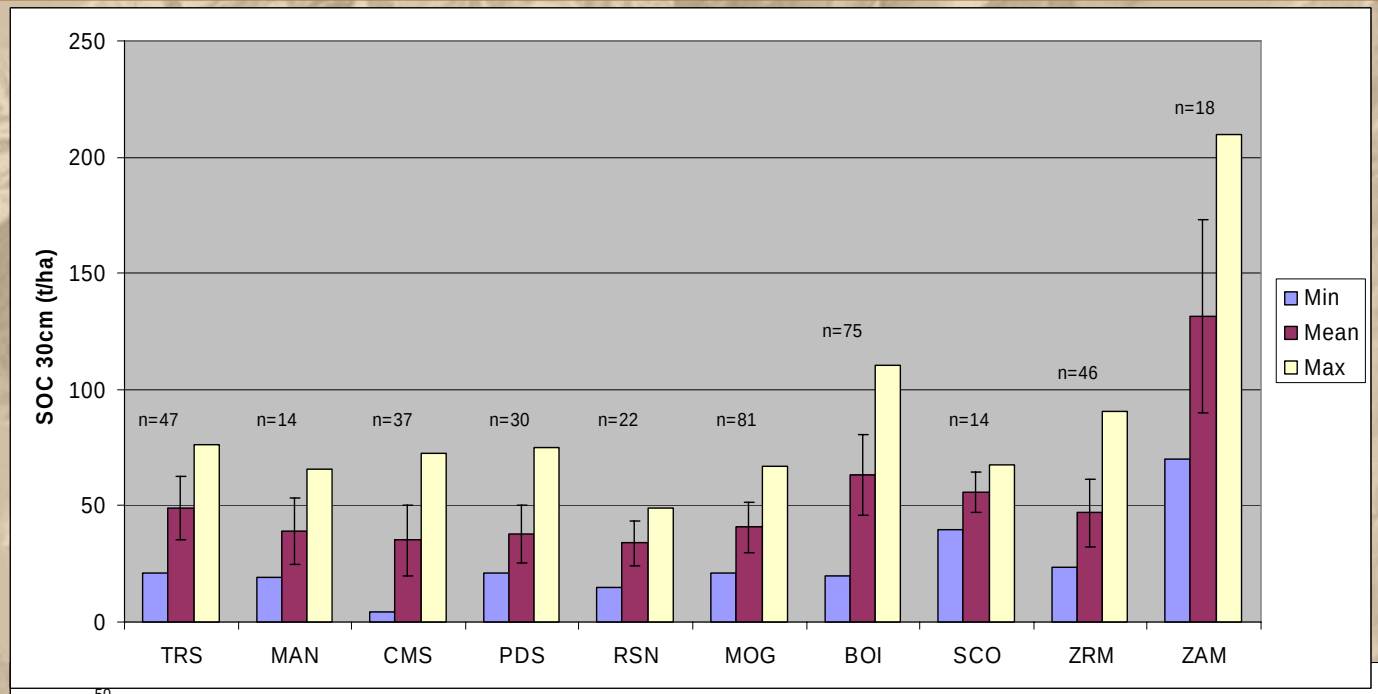
Distribution diagram of OC content for different STUs

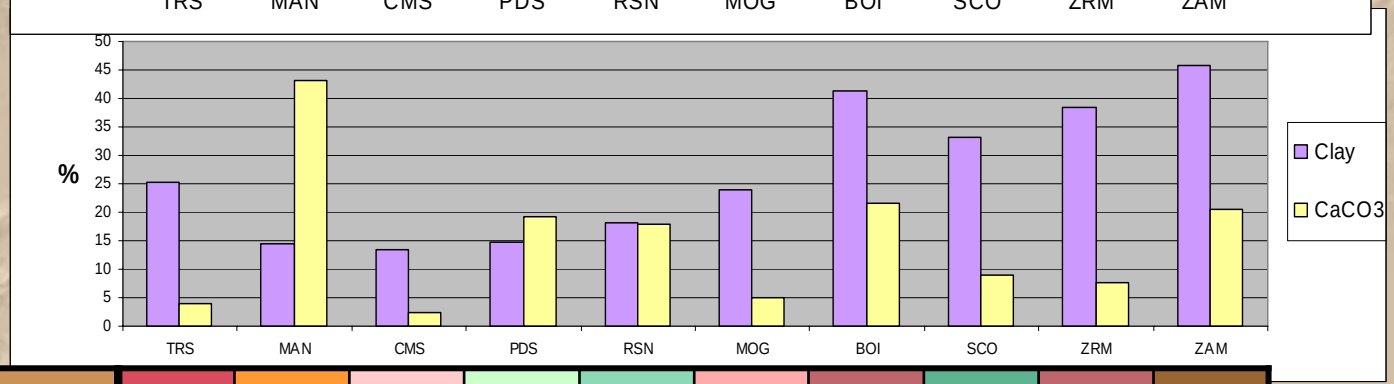


Distribution diagram of OC content for STU BOI



OC content for different STUs





Land Element	AA1	AR1	BA1	BR2	BR4	BA2	BA3	BR5	BA3	BR6
TextTopsoil/Part.sizeFam	CL/Lsk	SL/Ssk	SL/cL	L/cL	SiL/cSi	SiL/fSi	SiC/F	SiCL/F	SiCL/F	SiC/F
Drainage	W/S	S	W	W	M	M	I	I	I	I
WRB	LV cr ct sk	RG hu cah sk	CM euh	CM ca	CM ca	CL gl	CL vr gl	GL cc ca	CL gl	GL mo vr

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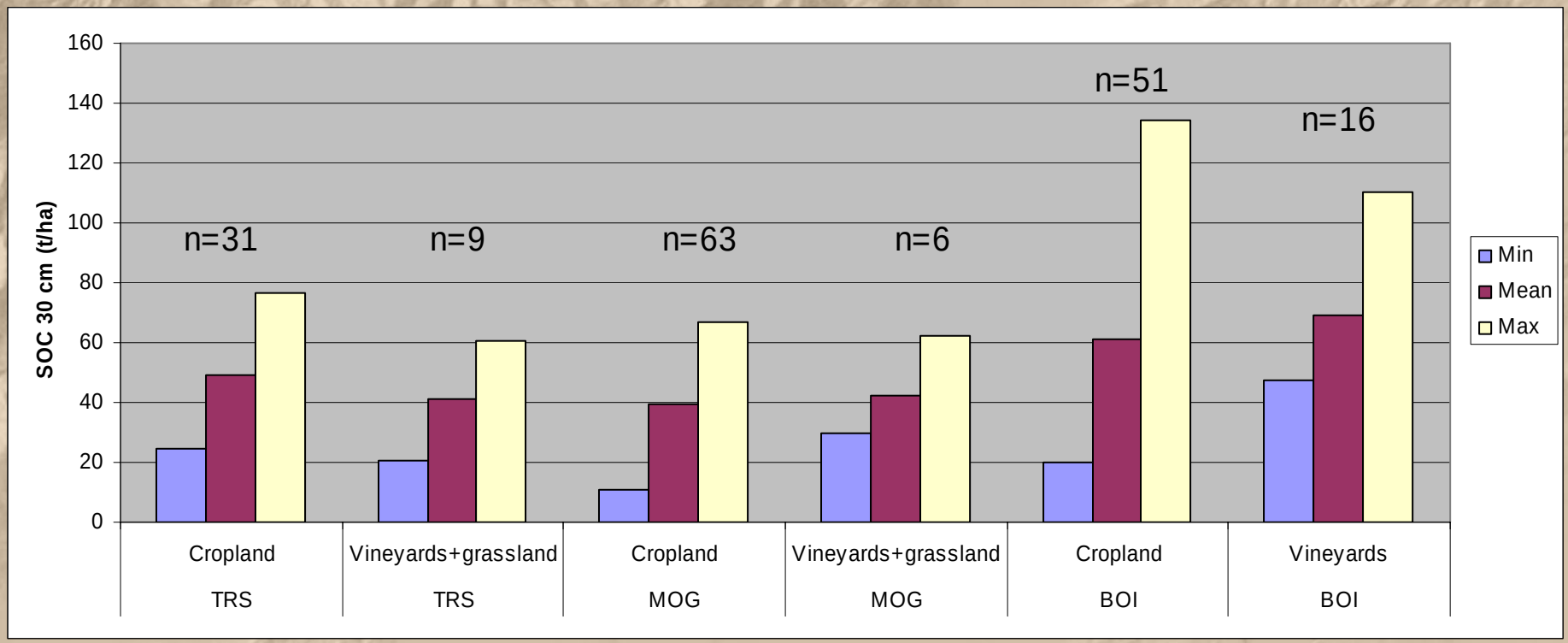
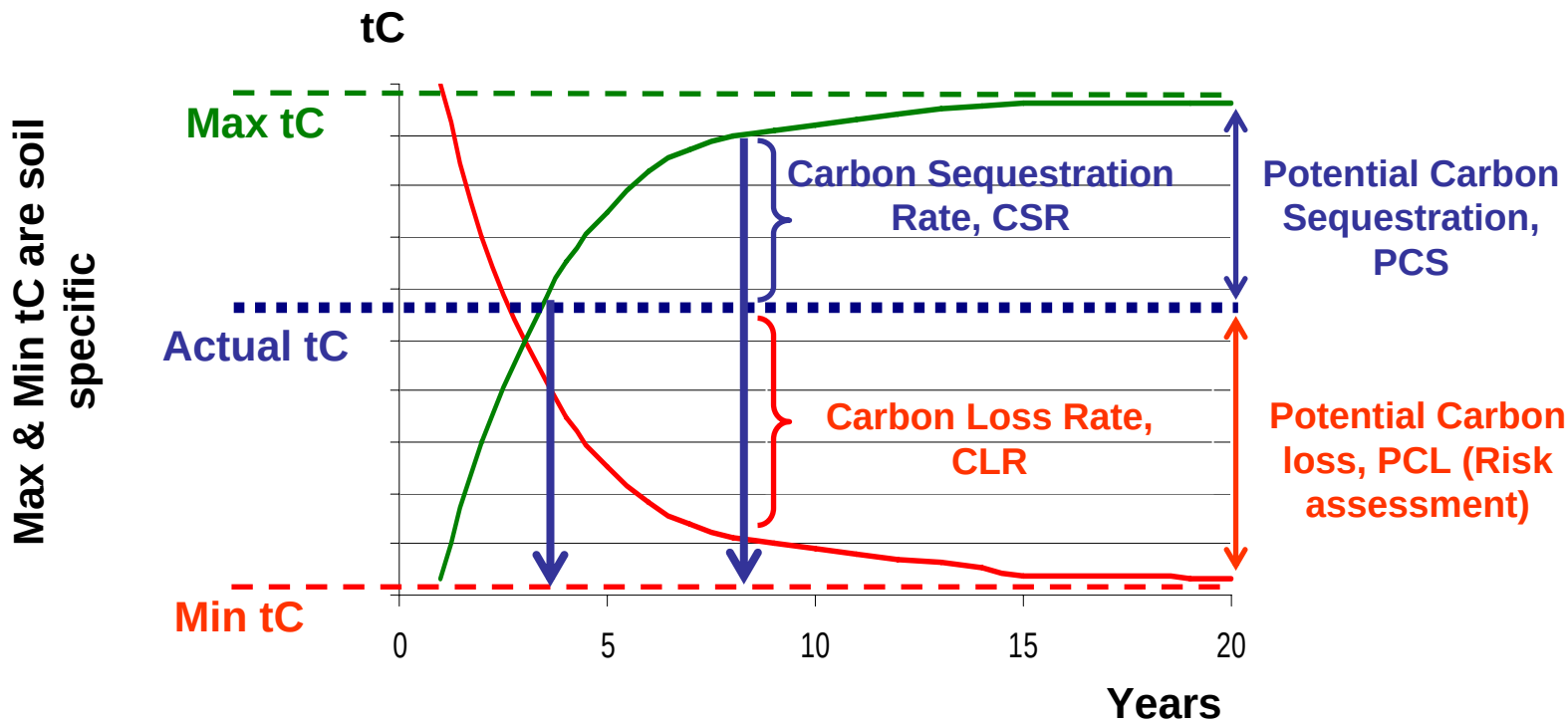
OC content for STU TRS, MOG, BOI for different LUs



Few data are available for Veneto STUs of the plain cultivated as grassland, therefore it seems difficult to assess the effect of a change in LU.

Important seems to be, even more than LU, crop management practices, first of all, animal waste/manure use

soil carbon status indicators



$$PCS = f_{S,LU} (MaxSOC - ASOC)$$

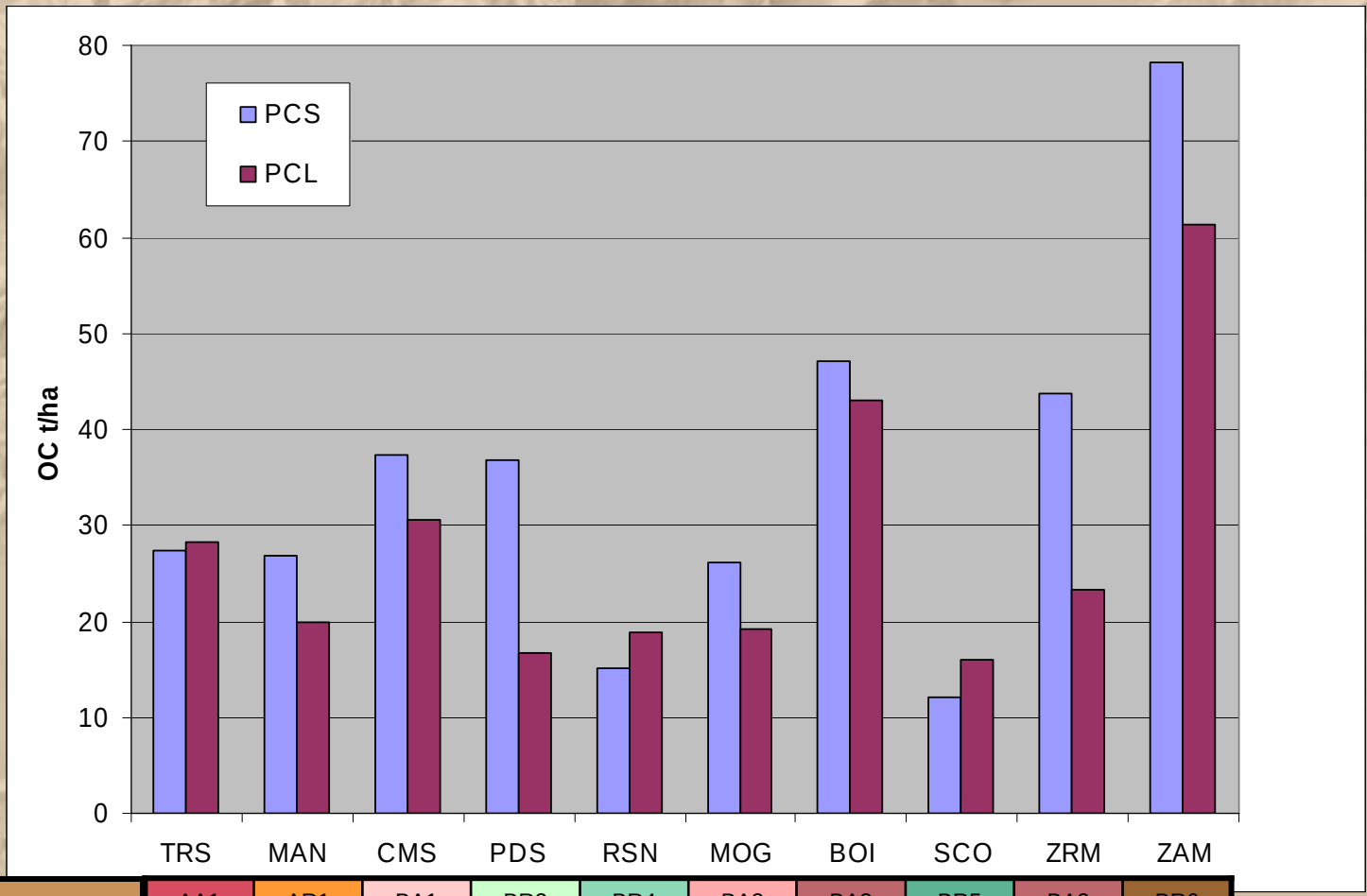
$$PCL = f_{S,LU} (MinSOC - ASOC)$$

Measures for increasing SOC in agricultural land and potential yearly soil carbon sequestration rates (t CO2 ha-1 y-1)

Measure	Potential soil carbon sequestration rate (t CO2 ha-1 y-1)	Estimated uncertainty (%)	Effect on farm profitability
Zero-tillage	1.42 but see reference	> 50%	+ or - unclear, regionally specific
Set-aside	< 1.42	>>50%	+ or -
Perennial grasses and permanent crops	2.27	>50%	+ or -
Crop residues	2.54	> 50%	+

Source: Working Group Sinks Related to Agricultural Soils. Final Report (httpc.e://europa.eu/environment/climate/finalreport)

PCS and PCL for different STUs



Land Element	AA1	AR1	BA1	BR2	BR4	BA2	BA3	BR5	BA3	BR6
TextTopsoil/Part.sizeFam	CL/Lsk	SL/Ssk	SL/cL	L/cL	SiL/cSi	SiL/fSi	SiC/F	SiCL/F	SiCL/F	SiC/F
Drainage	W/S	S	W	W	M	M	I	I	I	I
WRB	LV cr ct sk	RG hu cah sk	CM euh	CM ca	CM ca	CL gl	CL vr gl	GL cc ca	CL gl	GL mo vr

CONCLUSIONS

- Soils that seem to have the higher, and reliable, PCS values are those on river levees, thus with good drainage condition and coarse loamy particle size (topsoil texture loamy/sandy loam).
- Gravelly soils on the high plain, both rich in carbonate and not, seem to be able to increase SOC at a great extent.
- Soil with silty-loam topsoil texture show sometimes PCS lower values (RSN coarse silty), but comparable to previous soil for very widespread STU MOG (fine silty).
- Fine-textured soils formed in morphological depressions show the higher variability in SOC, partially due to variability in clay content, but probably more to the very strong effect of (previous) drainage conditions.

OC content is function of clay and carbonate content, but **drainage** seems here to play a major role:

in PCS evaluation it should be carefully taken into account possible effect of STU inherited variability (e.g. soils developed in depressions show high OC because of high clay content, but also for OM accumulation in, previous, hydromorphic conditions)