

WATER STORAGE CAPACITY OF TRÁS-OS-MONTES SOILS, NE PORTUGAL: SPATIAL VARIABILITY AND RISK FACTORS

Instituto Politécnico de Bragança (IPB), Laboratório Associado para a Sustentabilidade em Regiões de Montanha (SUSTEC), Centro de Investigação de Montanha (CIMO) (Portugal)



Centro de
Investigação
de Montanha



Associate
Laboratory for
Sustainability and
Technology in
Mountain Regions



Zulimar Hernández
IPB / LASUSTEC / CIMO (Portugal)
zulimar@ipb.pt

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Background

- Among many other, soils provide water cycle regulation ecosystem service, with utmost importance in dry environments
 - attenuating peak runoff during heavy rainfalls
 - ensuring water provision for plant growth
 - enabling deep infiltration for groundwater recharge
- Soil water storage and available water capacity set soils performance in providing water related ecosystems services
- Soil degradation reduces soils water cycle regulation role, driving drylands towards positive feedback degradation cycle

Objectives

Taking Trás-os-Montes region, NE Portugal, as an exemple

- Present a geographical distribution of soil water storage, derived from soil analytical data
- Identify main risk factors threatening regional soils performance in providing water cycle regulation ecosystem service

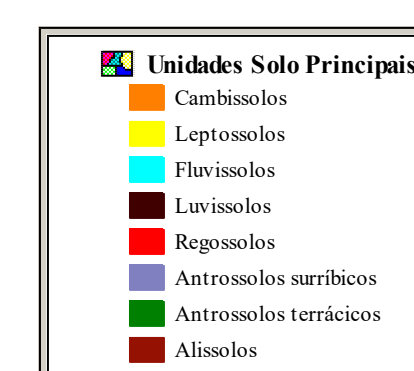
Methodology

- Trás-os-Montes is largely affected by soil degradation and severe susceptibility to desertification.
- Analytical data 192 profiles Soil Map of NE Portugal
- Total (TWS ⇔ soil moisture at -33 kPa) and available soil water storage capacities (AWS ⇔ soil moisture at -1.5 MPA)
- Intrinsic soil properties and soil group characteristics explored to identify drivers of TWS and AWS

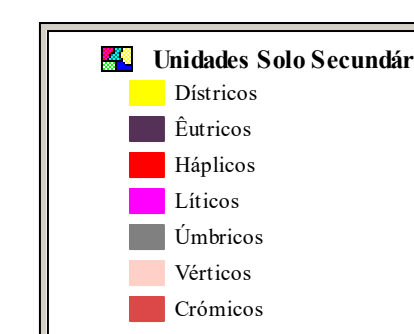
Results

Globally, Trás-os-Montes soils show low intrinsic TWS and AWS, averaging, respectively, 33% and 19% by mass. As expected, higher values of TWS and AWS are found in deep soils as Fluvisols, richer in organic matter as umbric secondary units, and with finer texture as those derived from basic rocks. Intrinsic soil properties better correlated with TWS and AWS are bulk density and organic matter content, key indicators of soil degradation status by severe water erosion. Regional most degraded soils - schist and granite derived eutric and dystic Leptosols - average 26% TWS and 16% AWS, a direct effect of poorer structural status on water storage capacity.

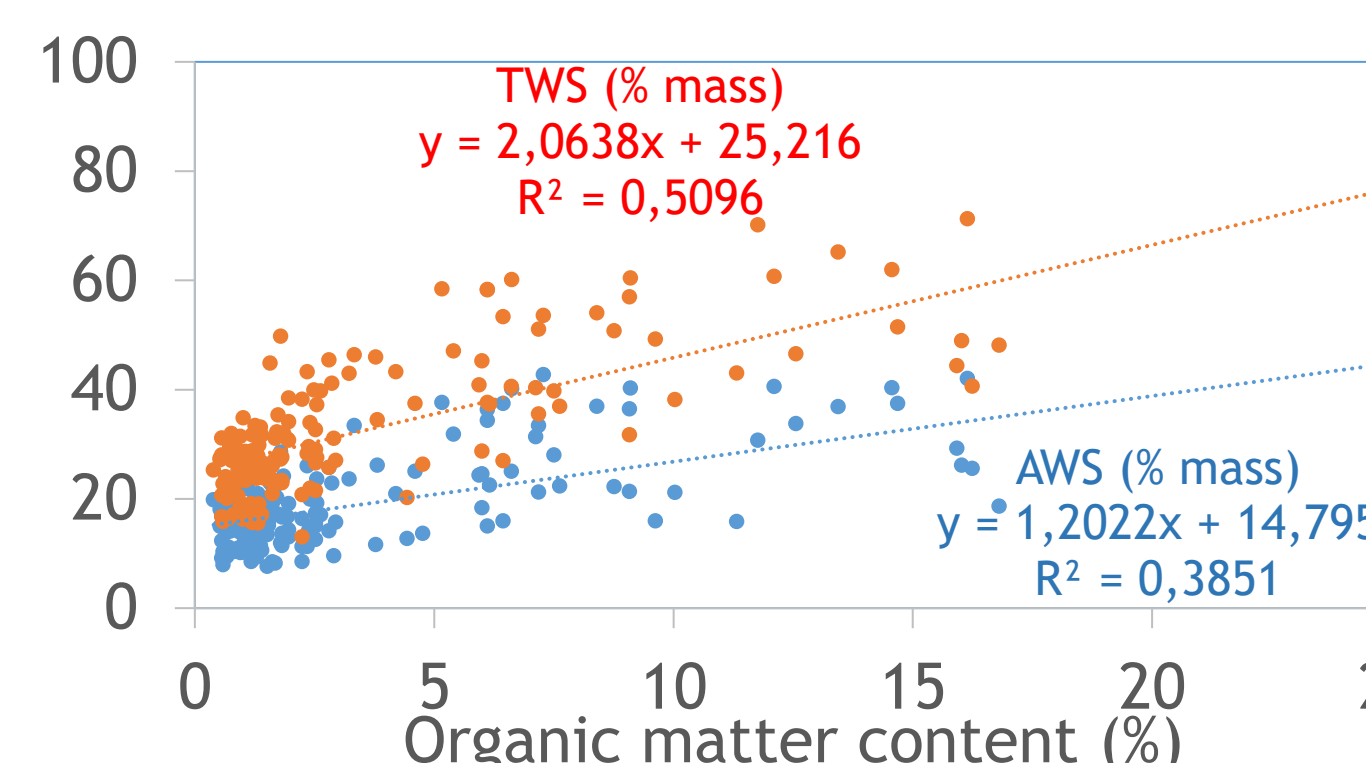
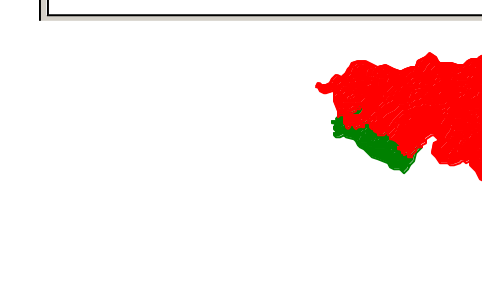
Unidades Solo Principais	Área (ha)	Área (%)
Cambissolos	132750	14,0%
Leptosols	986441	75,3%
Fluvisols	12505	1,0%
Luvissolos	7179	0,5%
Regossolos	335	0,0%
Antrossolos surríticos	62219	4,8%
Antrossolos terrácicos	42343	3,2%
Alissolos	15659	1,2%



Unidade Solo Secundária	Área (ha)	Área (%)
Districos	651518	49,8%
Eutricos	182814	14,0%
Háplicos	15659	1,2%
Líticos	19642	1,5%
Umbricos	430693	32,9%
Vérticos	829	0,1%
Crómicos	8276	0,6%



Formações Litológicas	Área (ha)	Área (%)
Depósitos aluvionares	12505	1,0%
Rochas básicas	75929	5,8%
Granodioritos	12702	1,0%
Granitos	487147	37,2%
Migmatitos	6755	0,5%
Formações sedimentares	14624	1,1%
Rochas ultrabásicas	5758	0,4%
Xistos	639999	48,9%
Quartzitos (em áreas de xistos)	54012	4,1%



Averages for Main Soil Units (FAO, 1988) (nº of profiles)

	AWS (% mass)	TWS (% mass)
Alisols (9)	15	28
Anthro- terracic (8)	23	36
Anthro- surribic (3)	15	23
Rego- (19)	22	35
Luvi- (10)	16	29
Fluvi- (12)	17	36
Lepto- (38)	17	29
Cambissols (60)	21	35

Secondary Soil Units (FAO, 1988) (nº of profiles)

	AWS (% mass)	TWS (% mass)
Vertic (2)	23	41
Umbric (46)	28	46
Eutric (43)	16	29
Dystic (65)	16	26
Lithic & Calcaric (4)	15	29

Soil parent material (nº of profiles)

	AWS (% mass)	TWS (% mass)
Schists (66)	21	35
Sedimentary (9)	13	24
Quartzites (10)	19	35
Granites (33)	18	28
Basic rocks (19)	20	37
Alluvial (12)	17	36

Conclusion

Results obtained may contribute to identification of critical soils where effective soil conservation measures and of degraded soils recovery are most required to improve soils performance in their water cycle regulation function.

