GLOBAL SYMPOSIUM ON
SALT-AFFECTED SOILS

20 - 22
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Virtual meeting

Fresh Manure as a Risk of Soil Salinization at High Rates of Application

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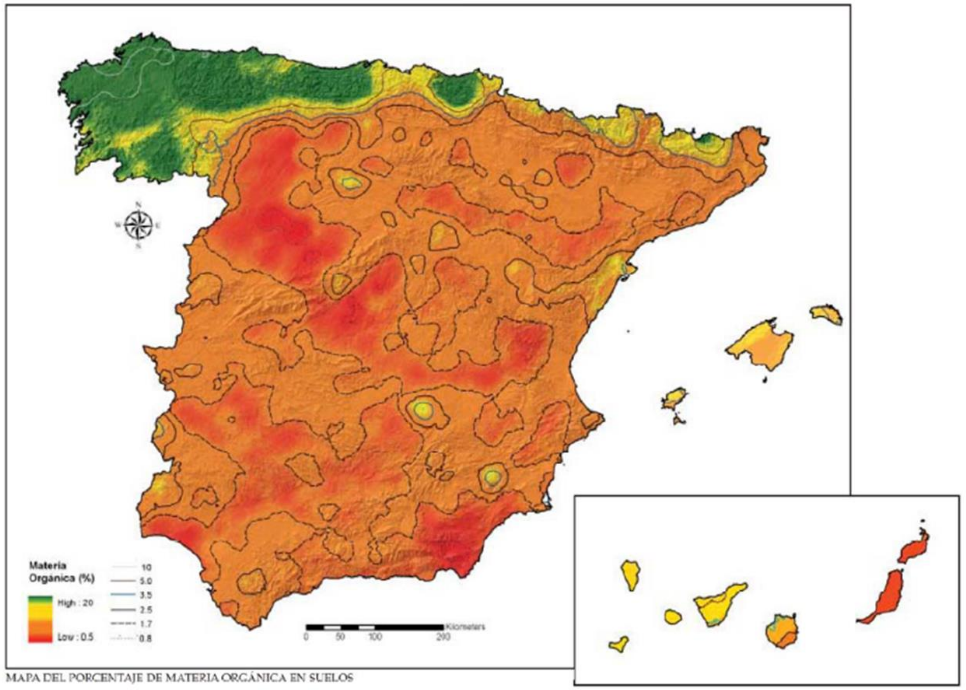
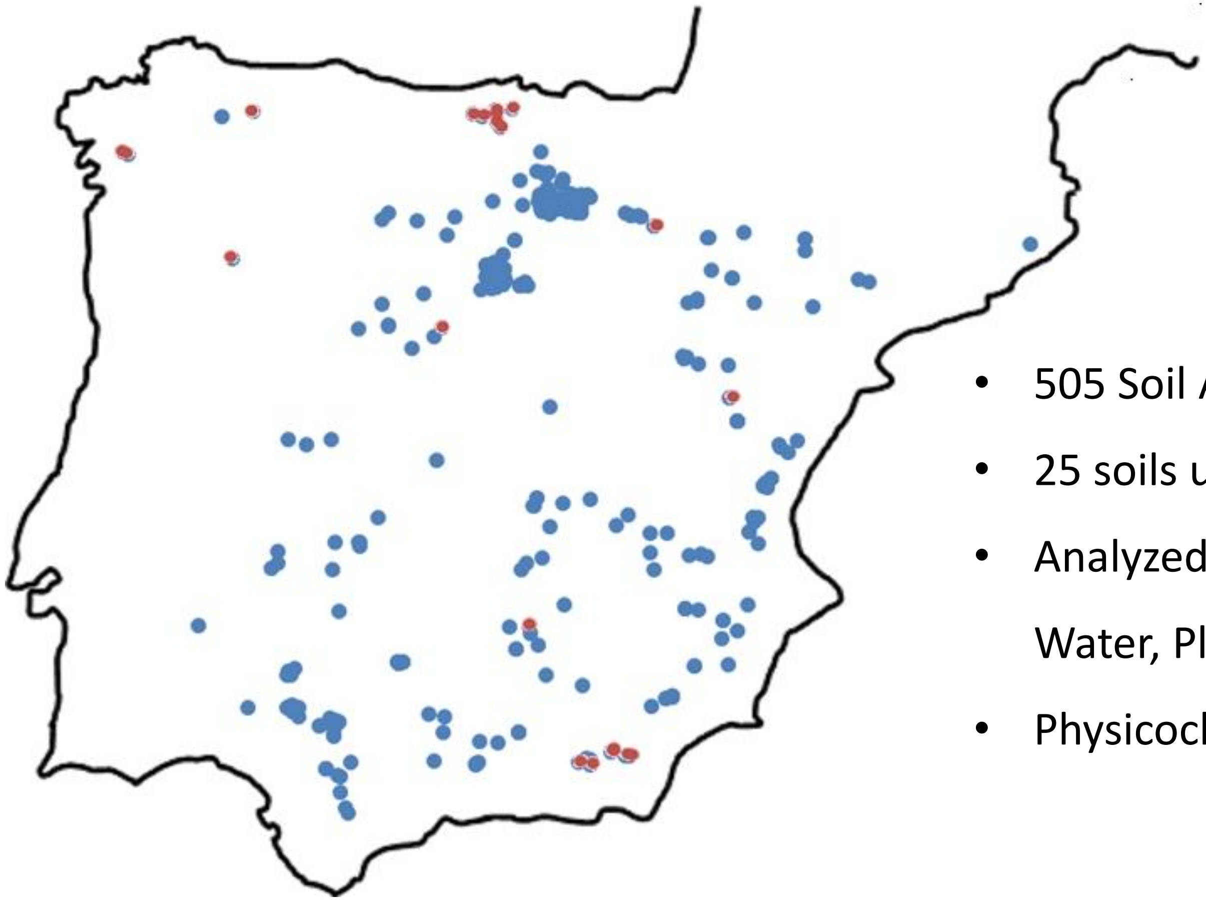


MAPA DEL PORCENTAJE DE MATERIA ORGÁNICA EN SUELOS

- The beginning of Aridic Soils may be a loss of Organic Matter of Soils.
- In Spain most soils have 1.5% OM or less.
- The majority of Spanish agricultural areas are developed under a high risk of desertification.
- OM amendments is the usual management to fight against this problem.
- But not all OM amendments are adequate to solve this.

FRESH MANURE at HIGH RATES of application may be a PROBLEM more than a SOLUTION



- 505 Soil Analyses from FERTINAGRO BIOTECH Data Base.
- 25 soils under High rates of fresh manure application.
- Analyzed under Spanish Official Methods of Analyses for Plants, Soils, Water, Plant Protection Products and Fertilizers.
- Physicochemical completed with Metagenomic analyses.

	Sand	Slit	Clay	O.M %	pH	Conductivity	C/N Ratio	CEC	TN %	MiN	TP	Avai. P	Avai. K	Avai. Ca	Avai. Mg	Avai. Na	Ext. Fe	Ext. Mn	Ext. Cu	Ext. Zn
Sand	1.000000	-0.829310	-0.728275	-0.009521	-0.293810	0.026086	-0.113308	-0.254401	0.067570	0.067876	0.013909	0.136447	0.005016	-0.406372	-0.074157	0.170956	0.097856	0.012839	0.110564	0.232184
Slit	-0.829310	1.000000	0.230915	0.174253	0.179345	0.108184	0.166719	0.287289	0.057376	0.057144	0.004066	-0.065110	0.015095	0.396561	0.075483	-0.165201	-0.065624	-0.034009	-0.183863	-0.196898
Clay	-0.728275	0.230915	1.000000	-0.226328	0.334027	-0.168879	0.002832	0.064617	-0.223194	-0.223440	-0.025597	-0.153200	-0.017242	0.230457	0.026202	-0.120698	-0.146047	0.014541	0.029083	-0.204705
O.M %	-0.009521	0.174253	-0.226328	1.000000	-0.293506	0.195820	0.148470	0.635928	0.872177	0.872095	0.296480	0.257167	0.366495	0.305429	0.21148	0.212935	0.118042	-0.009852	-0.059507	0.154916
pH	-0.293810	0.179345	0.334027	-0.293506	1.000000	0.033095	-0.023411	0.051359	-0.304207	-0.304198	0.055101	-0.298786	0.111717	0.296943	0.082588	0.001225	-0.526811	0.028815	-0.041370	-0.154617
Conductivity	0.026086	0.108184	-0.168879	0.195820	0.033095	1.000000	0.238365	0.014808	0.094108	0.094260	0.271856	0.213050	0.295980	-0.123167	0.199106	0.398558	-0.075048	0.006017	0.199675	0.126512
C/N Ratio	-0.113308	0.166719	0.002832	0.148470	-0.023411	0.238365	1.000000	0.072316	-0.270048	-0.269883	-0.087514	-0.072168	-0.069309	0.117941	-0.028615	-0.060371	-0.003170	0.013743	-0.114768	-0.183927
CEC	-0.254401	0.287289	0.064617	0.635928	0.051359	0.014808	0.072316	1.000000	0.550567	0.550332	0.328553	0.039331	0.497764	0.712134	0.363694	0.337799	-0.013587	-0.006114	-0.090703	0.038308
TN %	0.067570	0.057376	-0.223194	0.872177	-0.304207	0.094108	-0.270048	0.550567	1.000000	0.999976	0.289298	0.295789	0.334323	0.176646	0.193252	0.235151	0.128111	-0.007379	0.001651	0.263578
MiN	0.067876	0.057144	-0.223440	0.872095	-0.304198	0.094260	-0.269883	0.550332	0.999976	1.000000	0.288807	0.295987	0.333818	0.176701	0.192616	0.234707	0.127913	-0.006758	0.002202	0.263694
TP	0.013909	0.004066	-0.025597	0.296480	0.055101	0.271856	-0.087514	0.328553	0.289298	0.288807	1.000000	0.537493	0.708314	0.025378	0.396519	0.581100	0.009856	-0.035846	0.216173	0.295598
Avai. P	0.136447	-0.065110	-0.153200	0.257167	-0.298786	0.213050	-0.072168	0.039331	0.295789	0.295987	0.537493	1.000000	0.427394	-0.218555	0.210912	0.201640	0.251203	-0.005914	0.306456	0.346650
Avai. K	0.005016	0.015095	-0.017242	0.366495	0.111717	0.295980	-0.069309	0.497764	0.334323	0.333818	0.708314	0.427394	1.000000	0.153323	0.539728	0.706858	-0.069646	0.011545	0.083841	0.262214
Avai. Ca	-0.406372	0.396561	0.230457	0.305429	0.296943	-0.123167	0.117941	0.712134	0.176646	0.176701	0.025378	-0.218555	0.153323	1.000000	0.054238	-0.100125	-0.196711	-0.027848	-0.167160	-0.201301
Avai. Mg	-0.074157	0.075483	0.026202	0.211484	0.082588	0.199106	-0.028615	0.363694	0.193252	0.192616	0.396519	0.210912	0.539728	0.054238	1.000000	0.495432	-0.004644	0.038976	0.066001	0.267165
Avai. Na	0.170956	-0.165201	-0.120698	0.245848	0.001225	0.398558	-0.060371	0.337799	0.235151	0.234707	0.581100	0.201640	0.706858	-0.100125	0.495432	1.000000	0.057914	-0.008065	0.090466	0.265725
Ext. Fe	0.097856	-0.065624	-0.146047	0.118042	-0.526811	-0.075048	-0.003170	-0.013587	0.128111	0.127913	0.009856	0.251203	-0.069646	-0.196711	-0.004644	0.057914	1.000000	0.219108	0.013798	0.144761
Ext. Mn	0.012839	-0.034009	0.014541	-0.009852	0.028815	0.006017	0.013743	-0.006114	-0.007379	-0.006758	-0.035846	-0.005914	0.011545	-0.027848	0.038976	-0.008065	0.219108	1.000000	0.058201	0.101624
Ext. Cu	0.110564	-0.183863	0.029083	-0.059507	-0.041370	0.199675	-0.114768	-0.090703	0.001651	0.002202	0.216173	0.306456	0.083841	-0.167160	0.066001	0.090466	0.013798	0.058201	1.000000	0.275024
Ext. Zn	0.232184	-0.196898	-0.204705	0.154916	-0.154617	0.126512	-0.183927	0.038308	0.263578	0.263694	0.295598	0.346650	0.262214	-0.201301	0.267165	0.265725	0.144761	0.101624	0.275024	1.000000

StatSoft, Inc. (2011). STATISTICA (data analysis software system), version 10. www.statsoft.com.

Unexpected result because OM is applied for the opposite, to recover saline soils!!!!

Parameters with indicative changes

	All soils	Fresh Manure applied soils	Units
O.M.	2.58	3.40	%
Avai.Na	258	390	$mg\ kg^{-1}$
Ext. Fe	31.7	89.6	$mg\ kg^{-1}$
Ext. Mn	10.4	8.54	$mg\ kg^{-1}$
Ext. Cu	2.28	3.48	$mg\ kg^{-1}$
Ext. Zn	2.80	5.84	$mg\ kg^{-1}$
Planctomycetes	18.8	21.8	%
Verrucomicrobia	2.11	3.69	%

16S Genomic libraries following official Illumina 16S Prep guide, results were then analysed using Qiime2 (Bolyen et al, 2019)

30% of current content in Soils!!!

FERTINAGRO BIOTECH

Our hypothesis

High Rates of Fresh Manure

→ High content in labile C

→ High Na content as kidney excreted residue

→ High Metal content as excreted residue from feed complements

High content in labile C → Increase of copiotroph microorganisms, r-selected

↓

O_2 consumption

Our hypothesis

Increase of anammox microorganisms ← **O_2**

↓

NO_3^- and NH_4^+ consumption → **N_2 (atm.) and H_2O** → **O_2**

- Decrease of NO_3^-. → **Unfertile Soils**
- Increase on Planctomycetes and Verrucomicrobia. → **Unfertile Soils**
- Increase of Extractable Fe, Cu and Zn. → **Toxicity**
- Increase of Available Na. → **Salinity Problems and Sodic soils**

To avoid this…

Fresh manure

↓

Composting

Animal manures **Vegetal rests** **Calcium materials**

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Thanks for your attention!!!