

Evento Regional:
Conmemoración del

Día Mundial del Suelo



Datos e información para enfrentar la salinidad en suelos

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#DíaMundialDeLosSuelos

Salinidad de suelos

- Se refiere a la presencia de Na^+ , Mg^{2+} , Ca^{2+} , K^+ , Cl^- , SO_4^{2-} , HCO_3^- , NO_3^- , CO_3^{2-} en la solución del suelo
- Usualmente medida como la conductividad eléctrica del extracto saturado de suelo (EC_e , dS m^{-1})

No salino ($0\text{-}2 \text{ dS m}^{-1}$)

Ligeramente salino ($2\text{-}4 \text{ dS m}^{-1}$)

Moderadamente salino ($4\text{-}8 \text{ dS m}^{-1}$)

Fuertemente salino ($8\text{-}16 \text{ dS m}^{-1}$)

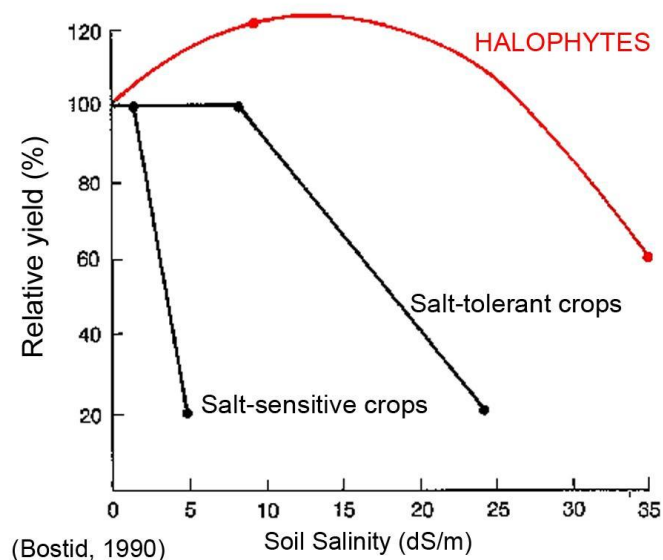
Extremadamente salino ($>16 \text{ dS m}^{-1}$)

- **Salinidad del suelo en el mundo** (ITPS, 2015)

- 1 billón ha de tierras afectadas por sales

- **20%** de ~300 millones de ha of **tierras irrigadas** están afectadas por salinidad

- >50% en cuatro países principalmente:
China, India, Pakistan, and United States



Distribución compleja de salinidad en suelos

Mapa Descargas Documentación Herramientas

- INTISOL
- Tropicales para pastizal, la cerámica y la industria de la construcción
- Plintisol
- Arcillosos de uso forestal
- Acrisol
- Arcillosos fértiles para la agricultura
- Lixisol
- Luvisol
- Con exceso de sales - agrícolas con métodos de control de riego
 - Solonchak
 - Solonetz
 - Calcisol
 - Gipsisol
- Erosionados aptos para pastizales
 - Planosol
 - Durisol
 - Jóvenes con poco desarrollo -





Overview of Salt-Affected Areas in Latin America: Physical, Social and Economic Perspectives

Ildelfonso Pla Sentís

Edith Taleisnik
Raúl S. Lavado *Editors*

Saline and Alkaline Soils in Latin America

Natural Resources, Management and Productive Alternatives

 Springer

Abstract In Latin América (LA), as well as in other parts of the world, salt-affected soils, both saline and sodic, are found under dryland and irrigated conditions, with negative consequences for the environment, for crop productivity and for animal and human health. Additionally, some tropical coastal and river delta areas have developed saline acid soils. Most of the salt-affected areas have extended under natural conditions. However, the development of affected areas as a result of human-induced processes, mainly associated with hydrological changes caused by irrigation and drainage practices, is increasing. This process negatively affects, sometimes irreversibly, the productive capacity of some of the best soils in many countries of LA, with important economic impacts and social consequences. Although recent estimates of the extension and distribution of human-induced salt-affected soils in LA are not available, there are clear indications that both problems, salinity and sodicity, under dryland and irrigated conditions, have been and are presently increasing in many LA countries. A country-by-country overview of soil and water salinity and sodicity is presented in this chapter, focusing mainly on irrigation and drainage problems.

Keywords Latin America · Salinity · Sodictity · Salt-affected soils · Irrigation · Drainage

Table 1 Global distributions of saline and sodic soils

Continent	Area (million hectares)		
	Saline	Sodic	Total
Africa	412,2	208,0	620,2
Asia	378,6	236,8	615,3
Europe	19,6	57,7	77,3
Latin America	94,5	78,9	173,4
North America	36,6	56,7	93,4
Oceania	5,5	106,7	112,2

Source: FAO/IIASA/ISRIC/ISSCAS/JRC (2012) and Szabolcs (1989).

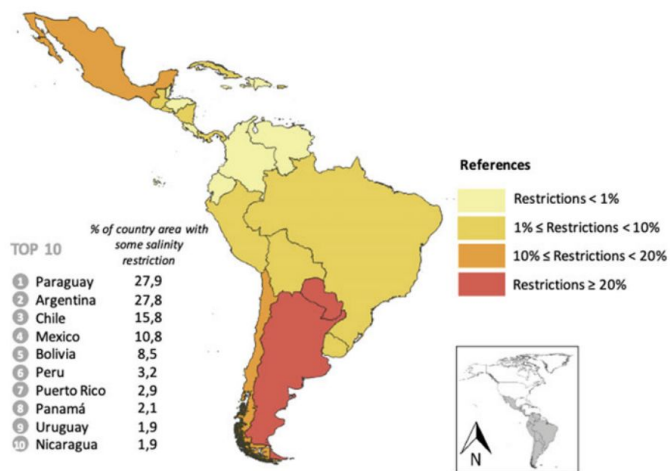


Fig. 2 Surface proportion of Latin American countries affected by some degree of salinity restriction. Modified from FAO/IIASA/ISRIC/ISSCAS/JRC (2012)

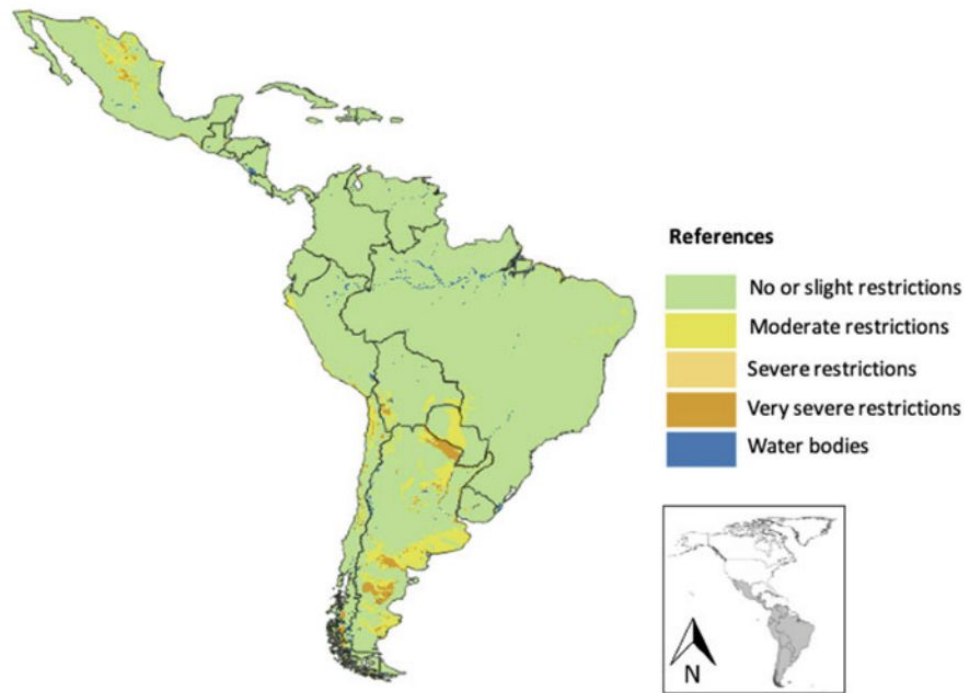
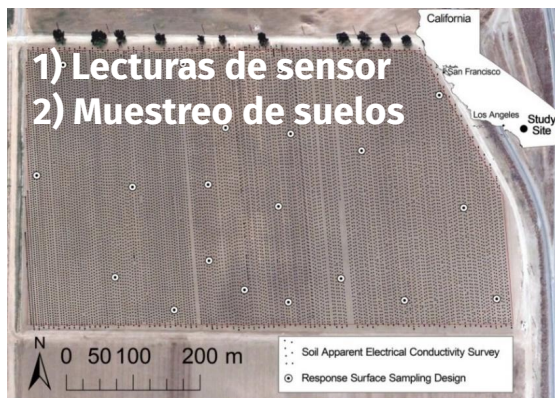


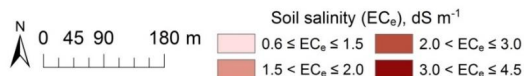
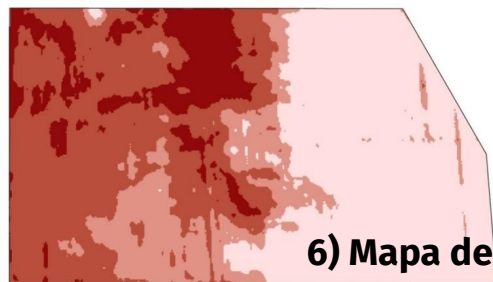
Fig. 1 Salts excess in Latin American. Modified from FAO/IIASA/ISRIC/ISSCAS/JRC (2012)

Escala de campo : De observaciones de EC_a a mapas

Protocolos, métodos, datos, periodos de tiempo



3) Muestreo 4) Análisis de laboratorio



5) Calibración requerida

- Regression modeling
- *Machine learning*
- *Geostatistics (co-Kriging)*

Level 0

FLD001Pro

.XLSX



Archivo Editar Ver Insertar Formato Datos Herramientas Ayuda Accesibilidad El 7 de agosto de 2020 se realizó la última modificación.

100% \$ % .0 .00 123 Predetermi... 11 B I S A

fx ID

5	30	24.55	88.25	37.80
5	60	26.48	82.60	36.39
5	90	23.48	81.70	35.17
5	120	21.91	84.75	35.53
384	30	16.11	81.70	37.02
384	60	19.79	85.80	38.44
384	90	23.90	86.20	35.44
384	120	19.00	88.50	35.81
683	30	9.06	62.65	26.50

A	B	C	D	E	F	G	H	I
ID	X	Y	EMh	EMv	ECe	In_EMh	In_EMv	In_ECe
247	584325.3	3703287.6	40.750169	25.000104	1.27	3.70746	3.21888	0.2390169
324	584315.5	3703157.5	30.379866	20.630075	2.104	3.41378	3.02675	0.7438402
411	584304.5	3703011.5	25.500039	15.749994	1.372	3.23868	2.75684	0.3162695
1205	584160.9	3702988.7	36.630088	26.879932	1.416	3.60087	3.29138	0.3478359
1225	584143.6	3703116.8	31.129938	20.879963	0.738	3.43817	3.03879	-0.3038114
1254	584140.3	3703281.4	24.750111	17.879950	2.004	3.20883	2.88368	0.6951451



SoilLabAnalyses

.XLSX



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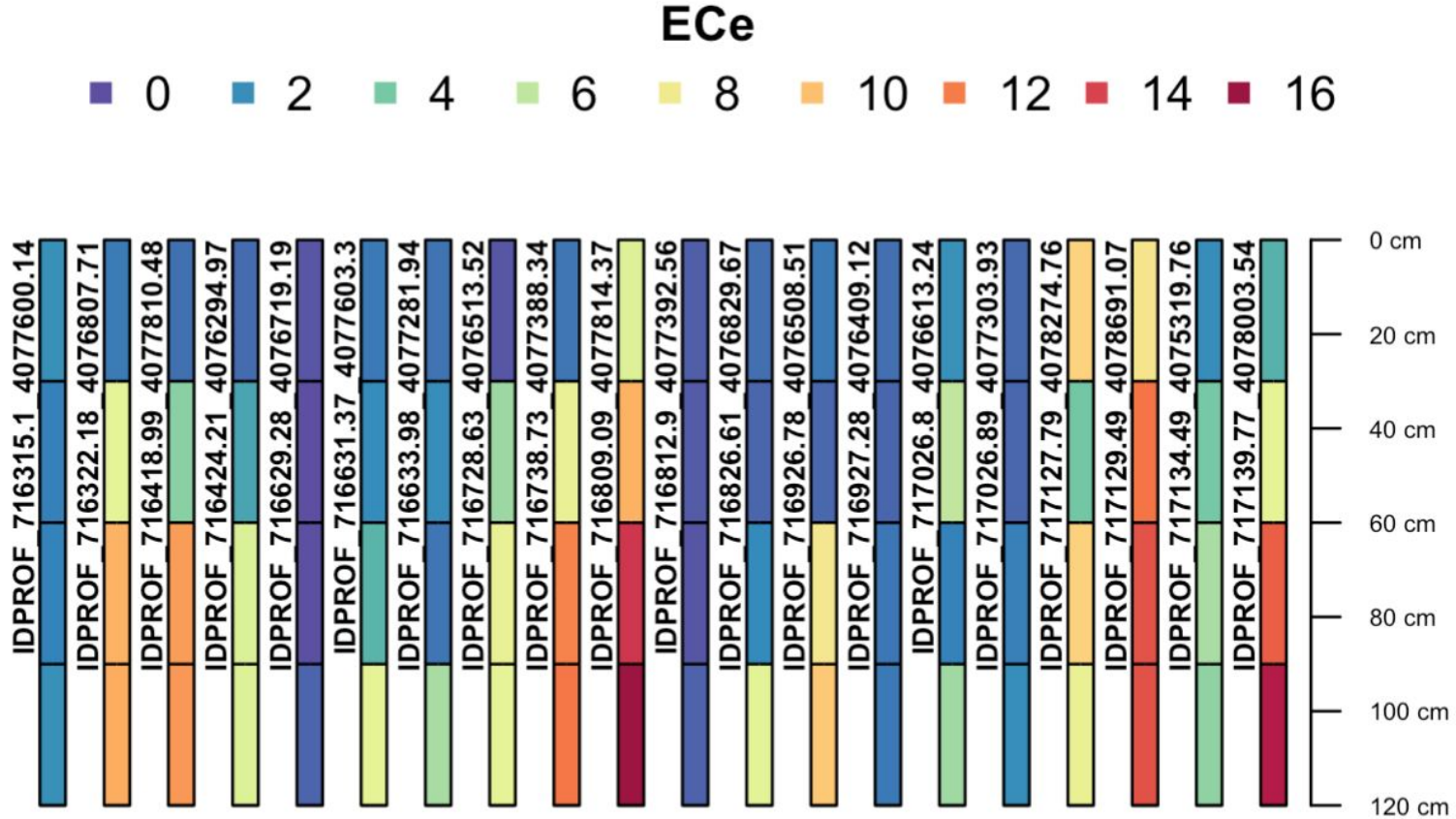
fx ID

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
ID	x_UTM10N	y_UTM10	Field_ID	EMv	EMh	ECe_1	ECe_2	ECe_3	ECe_4	SP_1	SP_2	SP_3	SP_4	WC_1	WC_2	WC_3	WC_4	
1	3104	718713.56	4079034.6	31A	1.527	1.014	2.248	5.672	8.209	8.155	70.441	71.832	68.664	69.085	0.1522	0.2397	0.3194	0.3084
2	3109	718823.51	4079475.7	31A	0.989	0.675	2.661	2.631	4.52	4.633	64.433	71.316	70.913	67.591	0.2052	0.2738	0.2685	0.3233
3	3121	718921.51	4079145.9	31A	0.784	0.528	1.105	1.881	1.93	1.537	61.46	53.55	48.87	42.63	0.153	0.1907	0.2152	0.1896
4	3127	719035.49	4079287.3	31A	0.954	0.71	2.891	3.664	2.733	4.304	59.086	53.442	49.96	52.83	0.1768	0.1781	0.2593	0.2333
5	3132	719034.84	4078792.7	31A	0.95	0.639	1.599	3.02	2.603	2.864	53.135	52.754	52.957	33.611	0.1579	0.2017	0.2796	0.1578
6	3146	719268.67	4078939.2	31A	1.21	0.893	4.55	6.1	7.62	6.25	52.81	52.49	49.06	48.58	0.1421	0.264	0.2497	0.2486
7	3158	719484.04	4079379.4	31A	0.639	0.402	2.442	3.184	2.209	2.127	44.524	44.232	34.697	32.103	0.1273	0.1263	0.132	0.1273

Level 1

##	X	ID	x_UTM10N	y_UTM10N	Field_ID	EMv	EMh	ECe	PS	top	bot
## 1	1	3104	718713.6	4079035	31A	1.527	1.014	2.248	70.441	0	30
## 2	2	3109	718823.5	4079476	31A	0.989	0.675	2.661	64.433	0	30
## 3	3	3121	718921.5	4079146	31A	0.784	0.528	1.105	61.460	0	30
## 4	4	3127	719035.5	4079287	31A	0.954	0.710	2.891	59.086	0	30
## 5	5	3132	719034.8	4078793	31A	0.950	0.639	1.599	53.135	0	30
## 6	6	3146	719268.7	4078939	31A	1.210	0.893	4.550	52.810	0	30

Consultas de informacion (e.g., selección por ID, xy)



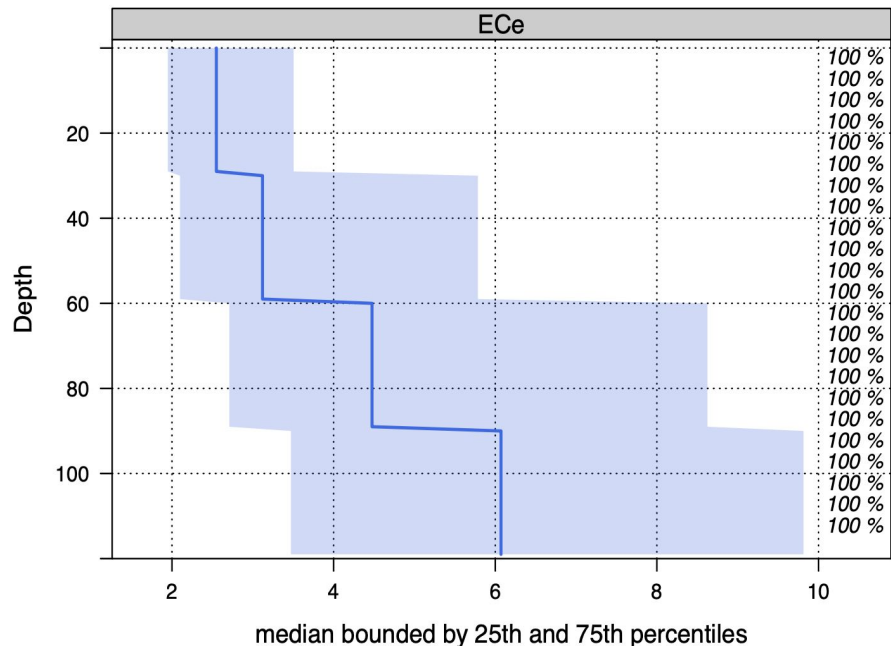
Consulta de informacion

(e.g., relación suelo profundidad)

- Promedios
- Funciones de suavizado

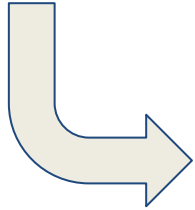
Valores a profundidades específicas:

0-5, 5-15, 15-30, 30-60,
60-100 and 200 cm



Level 1

##	X	ID	x_UTM10N	y_UTM10N	Field_ID	EMv	EMh	ECe	PS	top	bot
## 1	1	3104	718713.6	4079035	31A	1.527	1.014	2.248	70.441	0	30
## 2	2	3109	718823.5	4079476	31A	0.989	0.675	2.661	64.433	0	30
## 3	3	3121	718921.5	4079146	31A	0.784	0.528	1.105	61.460	0	30
## 4	4	3127	719035.5	4079287	31A	0.954	0.710	2.891	59.086	0	30
## 5	5	3132	719034.8	4078793	31A	0.950	0.639	1.599	53.135	0	30
## 6	6	3146	719268.7	4078939	31A	1.210	0.893	4.550	52.810	0	30



##	ID_PROF	X	Y	EC0100	S P	0100	EMh	EMv
## 1	IDPROF_716315.1_4077600.14	716315.1	4077600	2.904232	65.11253	1.121	1.520	
## 2	IDPROF_716322.18_4076807.71	716322.2	4076808	7.436878	85.87479	1.539	2.163	
## 3	IDPROF_716418.99_4077810.48	716419.0	4077810	6.882521	80.43772	1.481	1.938	
## 4	IDPROF_716424.21_4076294.97	716424.2	4076295	4.731468	86.74359	1.330	1.839	
## 5	IDPROF_716629.28_4076719.19	716629.3	4076719	1.417181	72.43173	0.972	1.431	
## 6	IDPROF_716631.37_4077603.3	716631.4	4077603	3.600367	82.14331	1.292	1.776	

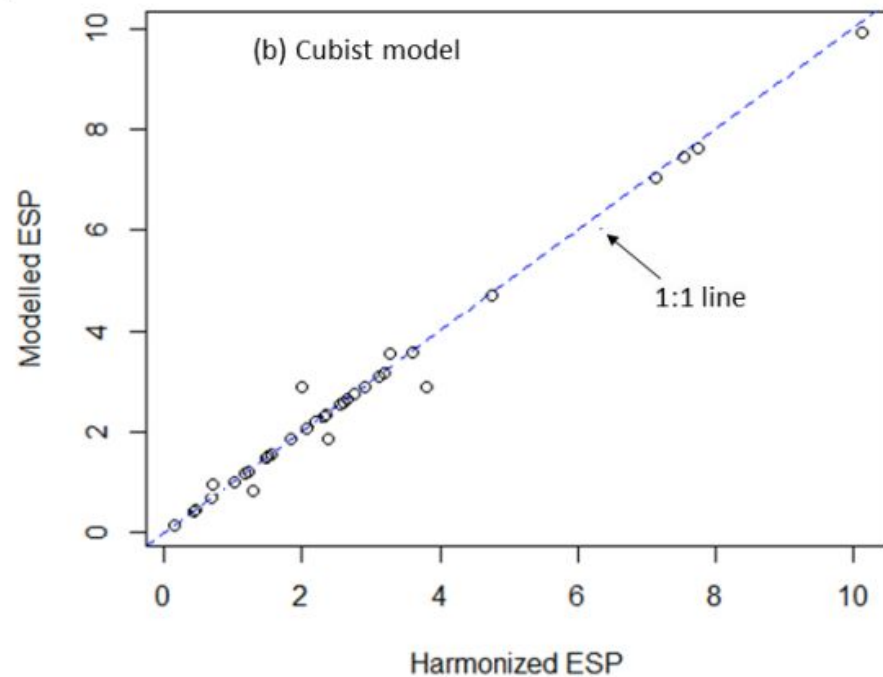
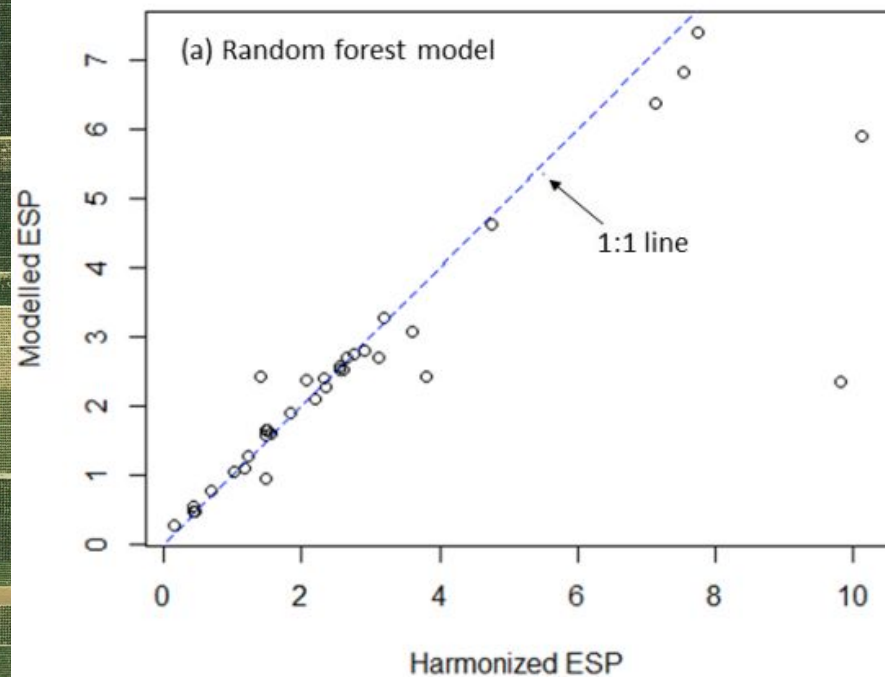
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## 2	84A	1991
## 3	82A	1991
## 4	84A	1991
## 5	84A	1991
## 6	82A	1991

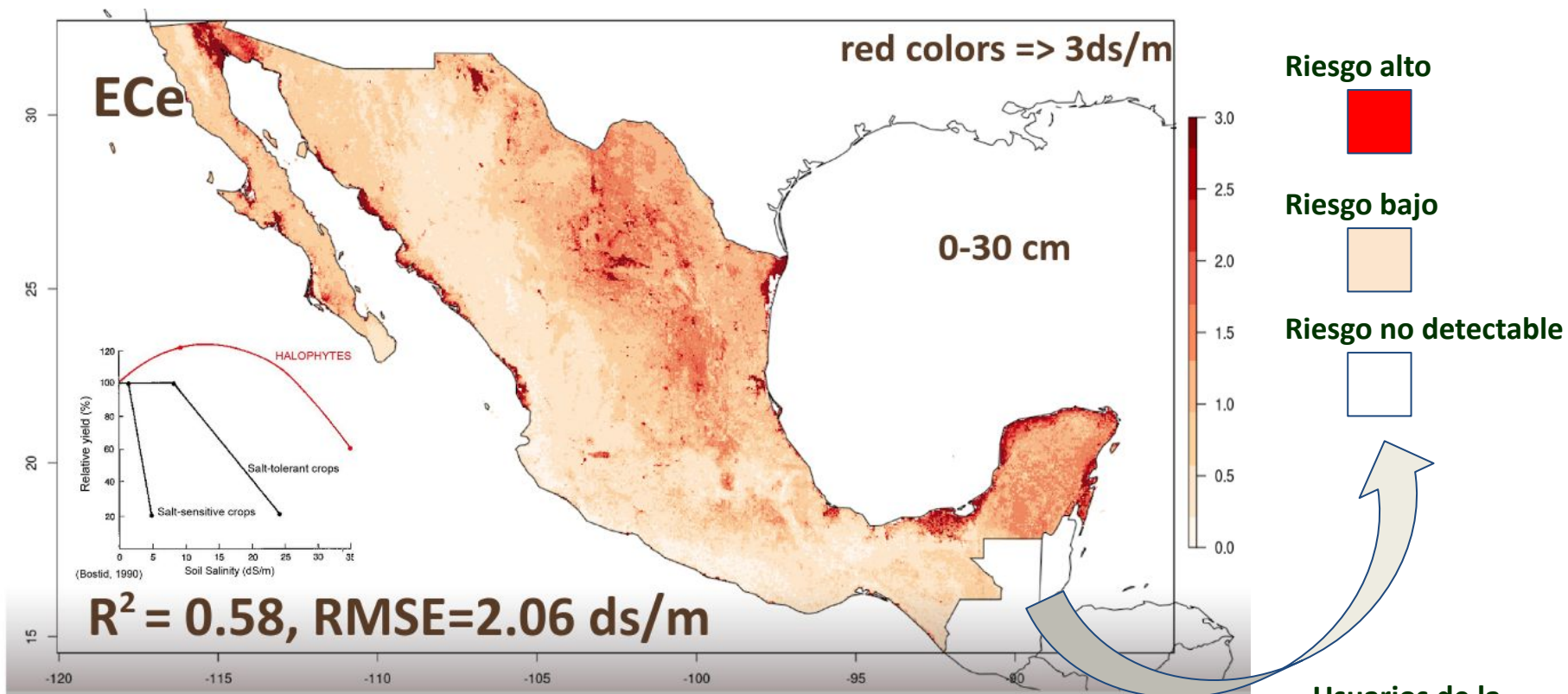
Level 2

	ME	RMSE	R ²	NSE
RandomForest	0.15535268	0.2730253	0.9231544	0.9762591
Cubist	0.06507252	0.2102831	0.9543207	0.9835552
Ranger	0.17893447	0.3056874	0.9031748	0.9770586
QuantRandForest	0.06884600	0.2660837	0.9157335	0.9779208
.....				



Holdout validation outputs for selected models





AGRICULTURA

SECRETARÍA DE AGRICULTURA Y DESARROLLO RURAL



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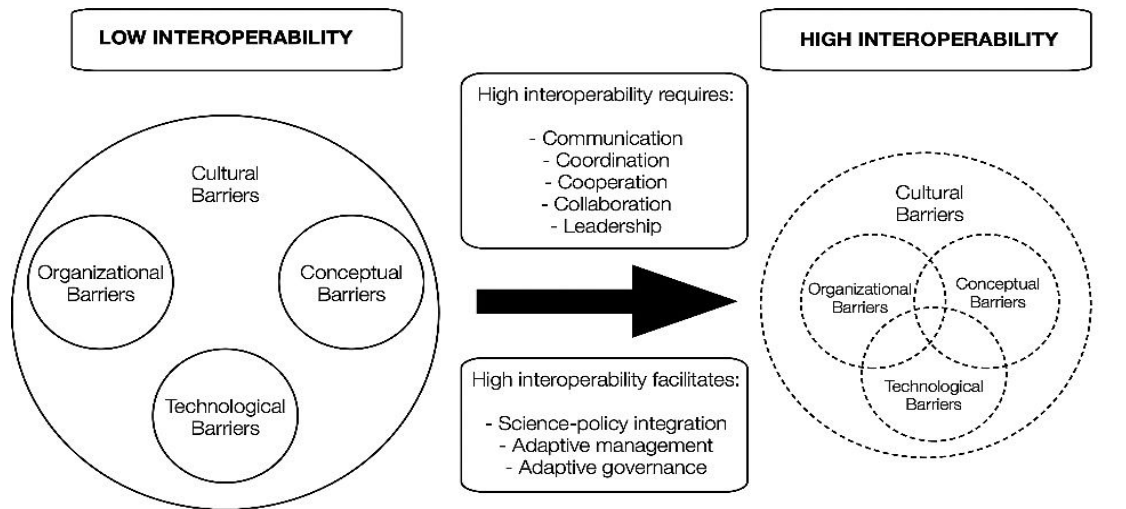
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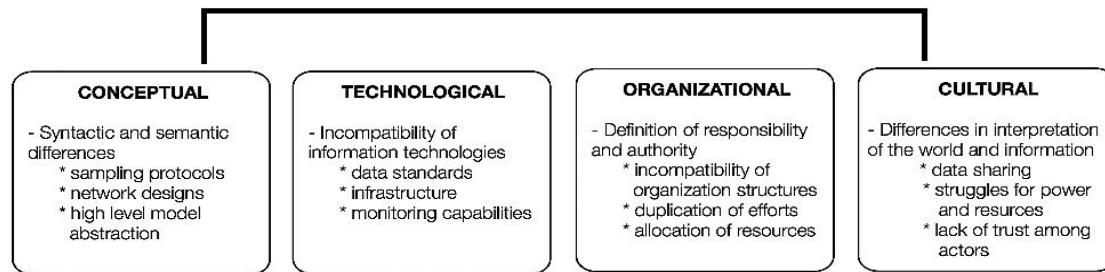
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- 0.5
- 0.8
- 1
- 2 dS.m-1
- 3
- 4
- 8
- 20
- 40
- 40+



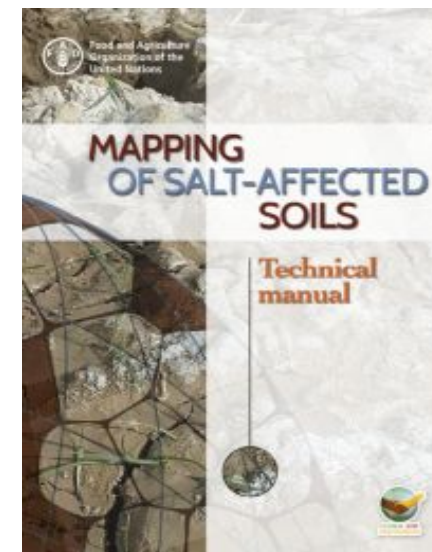
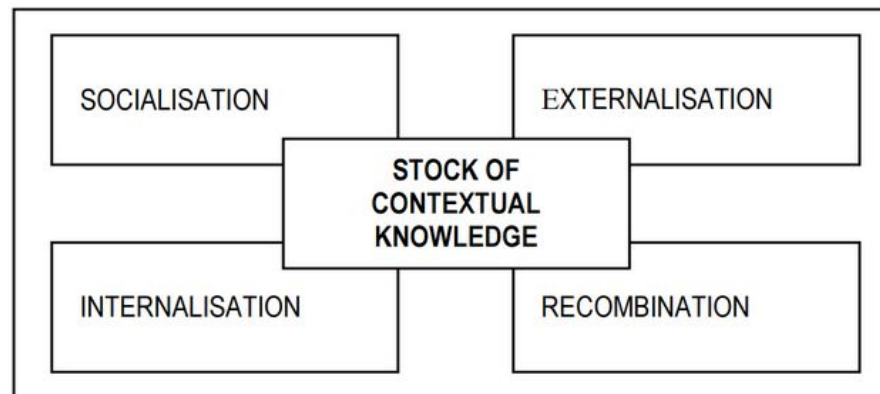
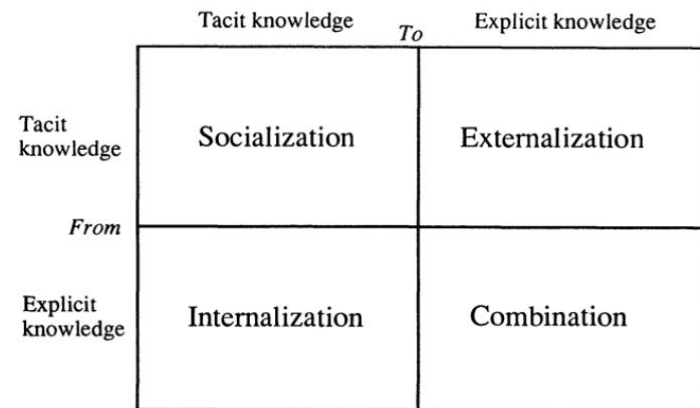
Interoperabilidad (el gran reto?)



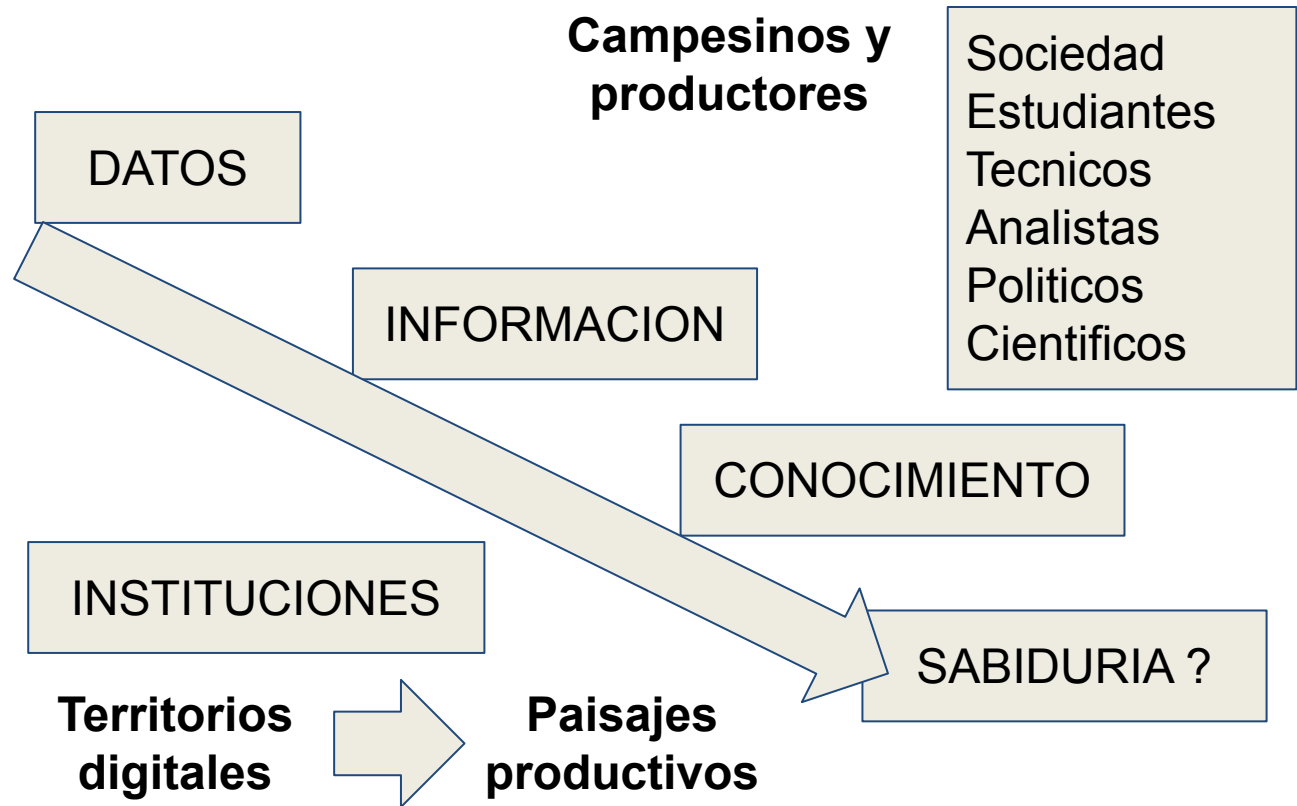
INTEROPERABILITY BARRIERS



Construcción de capacidades técnicas e institucionales



Generación de conocimiento hacia dentro y hacia fuera de las instituciones y diversos usuarios



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Gracias

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