

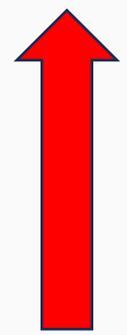
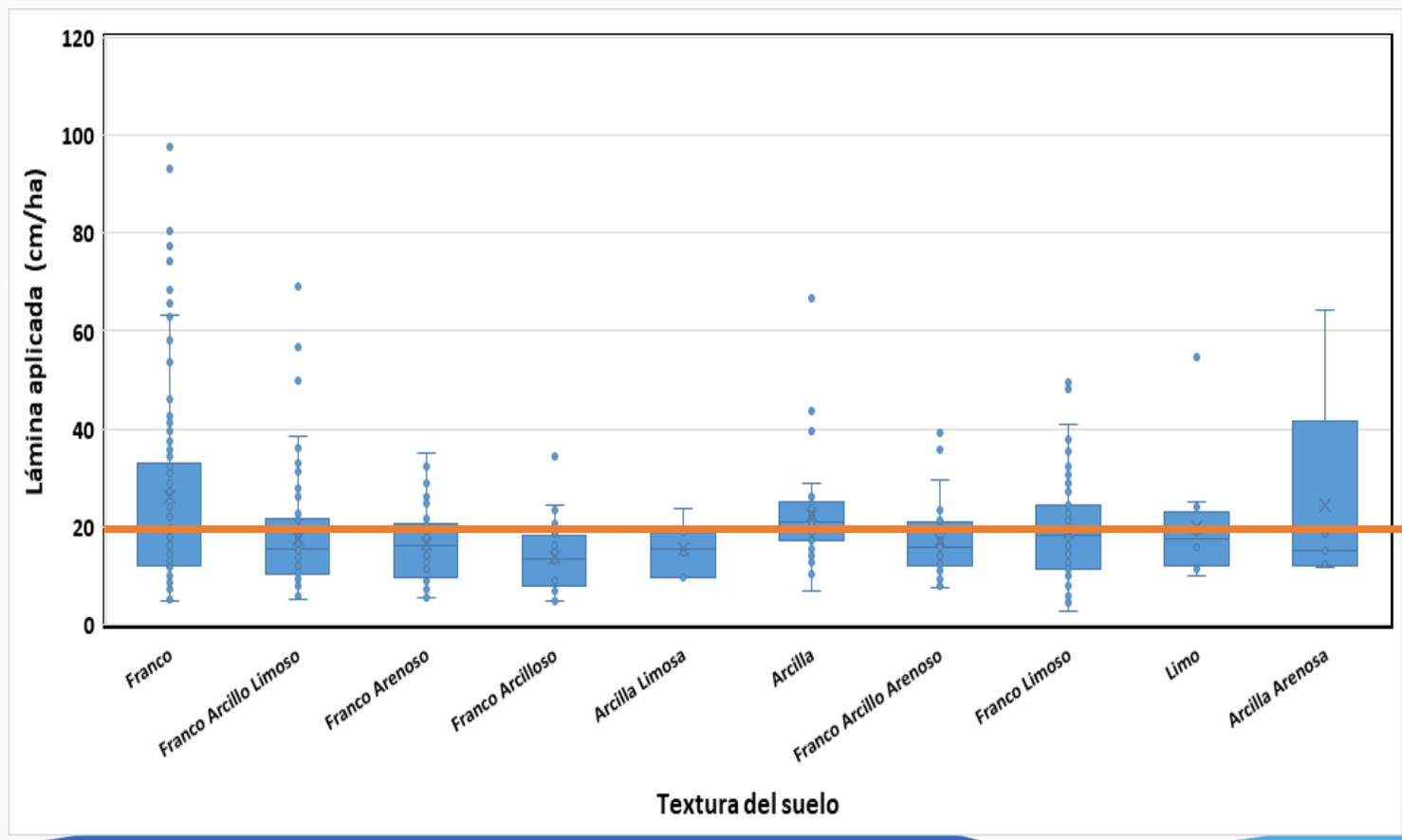
¿Cómo?, ¿Cuándo? y ¿Cuánto Regar?



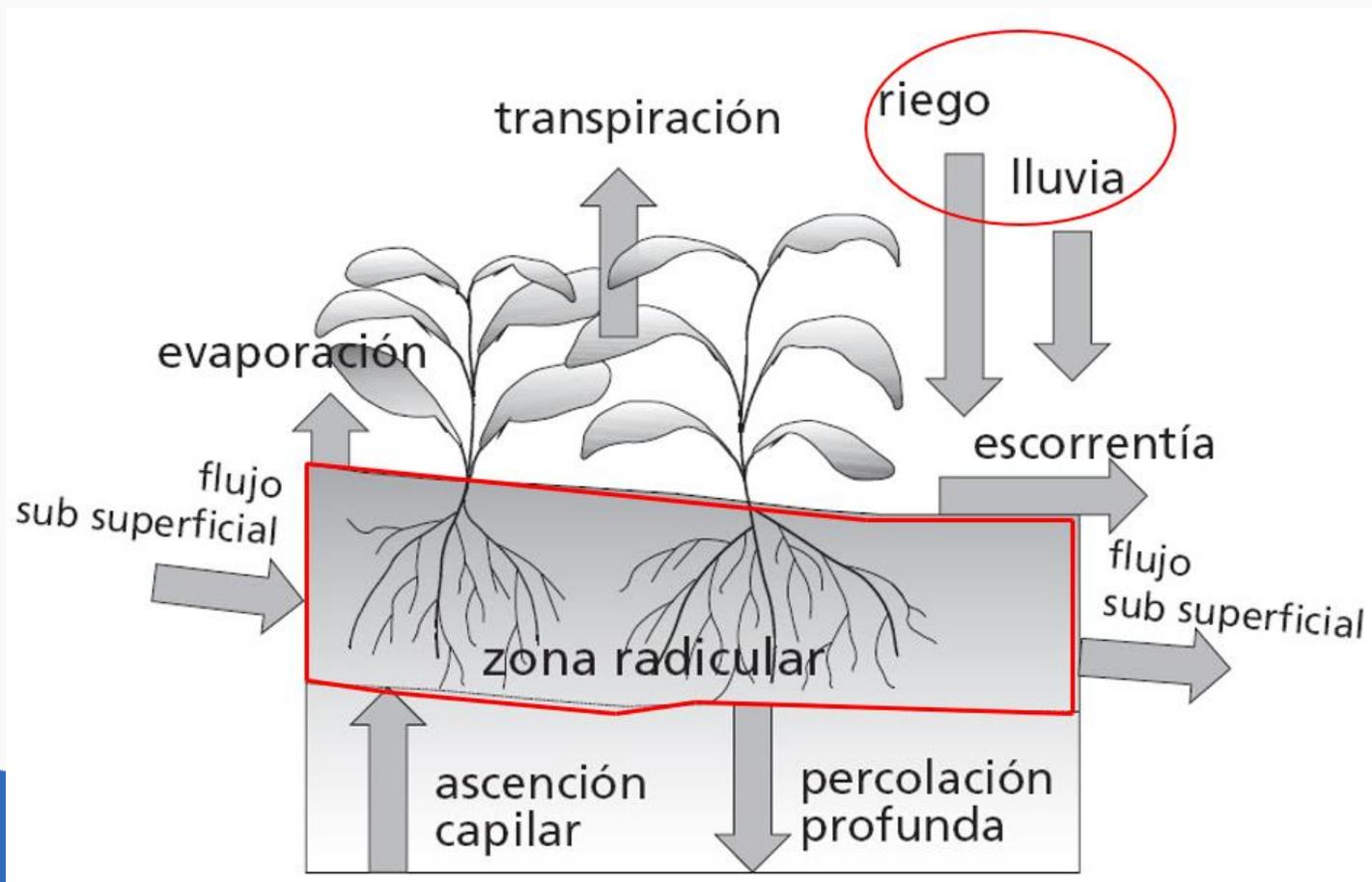
Deficiencias del poco conocimiento de los requerimientos de riego



Mediciones realizadas en campo



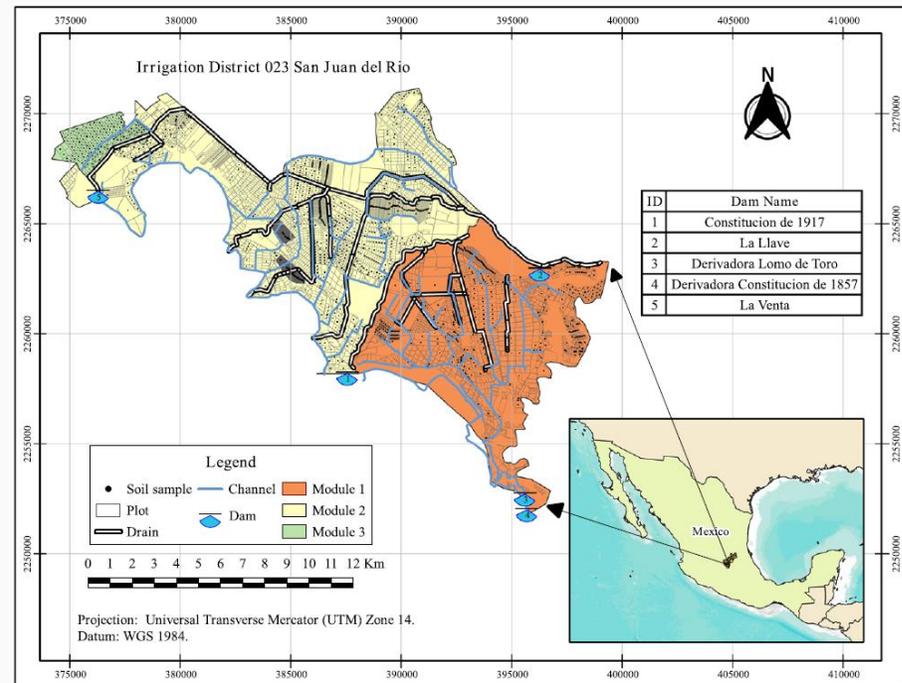
El riego vs ¿Qué debemos analizar?



- Textura
- Densidad Real
- Porosidad
- Infiltración
- Conductividad hidráulica

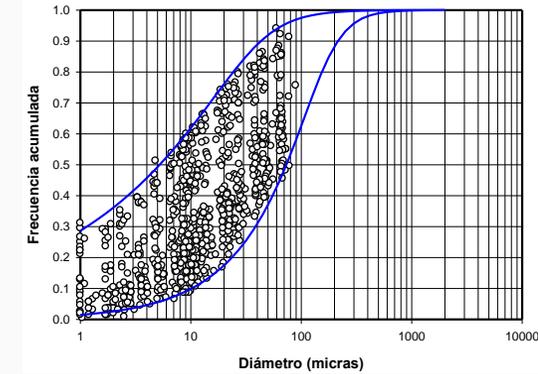
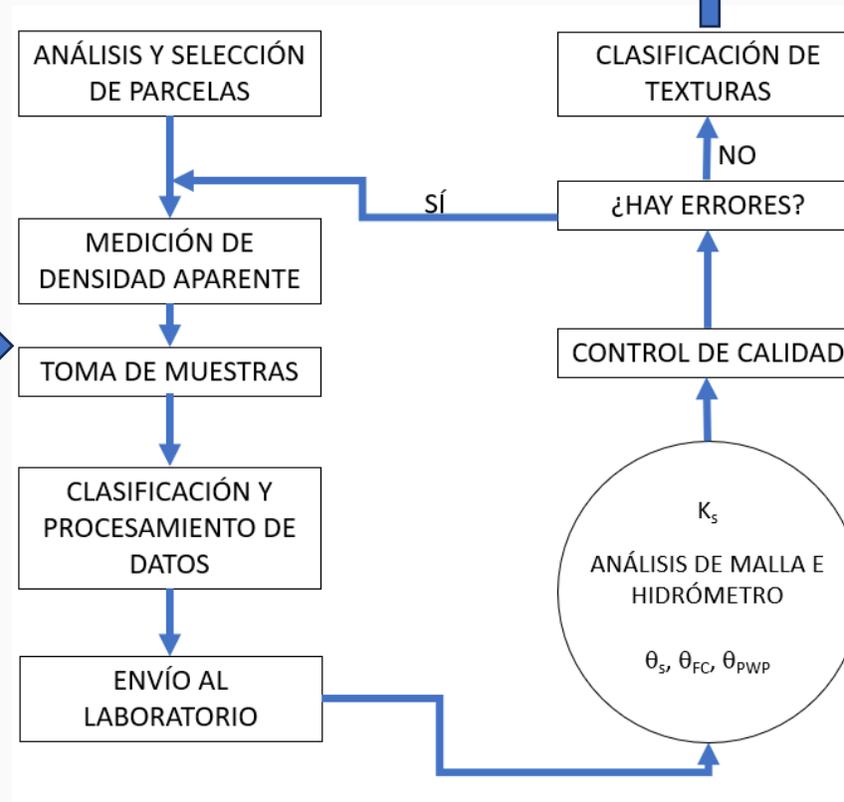


METODOLOGÍA



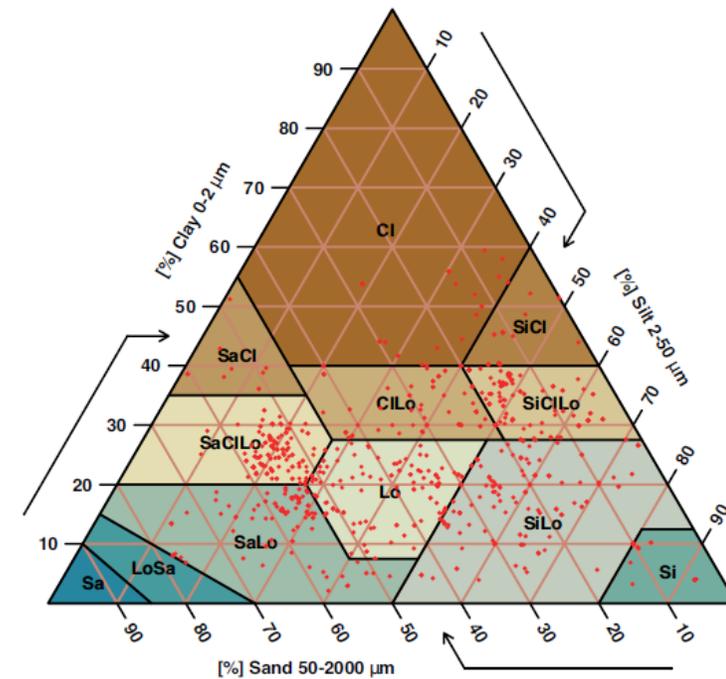
sorgo, trigo, avena, frijol, cebada, zanahoria y alfalfa

2016 - 2018



¿QUÉ CONTIENE NANESOIL?

Columna	Información	Unidades
A	Identificador de la muestra	
B	Coordenada Este	UTM zona 14
C	Coordenada Norte	UTM zona 14
D	Área representativa	hectáreas
E	Contenido de arena	%
F	Contenido de limo	%
G	Contenido de arcilla	%
H	Clasificación textural	--
I	Densidad aparente	g/cm ³
J	Contenido de humedad a saturación	cm ³ /cm ³
K	Contenido de humedad a capacidad de campo	cm ³ /cm ³
L	Contenido de humedad a punto de marchitamiento permanente	cm ³ /cm ³
M	Conductividad hidráulica saturada	cm/h



Morales-Durán *et al.*, (2023)



<https://doi.org/10.6084/m9.figshare.22190185.v2>

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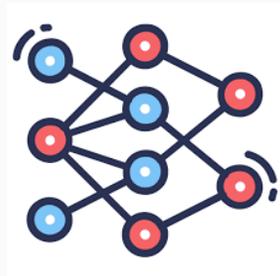
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	ID	UTM: X	UTM: Y	Area (ha)	Sand (%)	Clay (%)	Silt (%)	Texture	Bulk Density (Mg/m³)	Saturation Moisture Content (cm³/cm³)	Field Capacity (cm³/cm³)	Permanent Wilting Point (cm³/cm³)	Ks (cm/h)
2	1	390299.922	2258719.813	4	56.76	24.78	18.46	Sandy Clay Loam (SaClLo)	1.335	0.468	0.253	0.156	0.44
3	2	390495.027	2258560.058	2.41	54.62	28.35	17.03	Sandy Clay Loam (SaClLo)	1.305	0.479	0.278	0.167	0.32
4	3	393180.747	2257831.125	4	48	23	29	Loam (Lo)	1.23	0.472	0.263	0.147	0.58
5	4	393090.856	2257952.96	4.04	45	19	36	Loam (Lo)	1.288	0.464	0.252	0.122	0.92
6	5	392799.857	2258347.32	2	57	21	22	Sandy Clay Loam (SaClLo)	1.279	0.46	0.244	0.139	0.66
7	6	393031.351	2258033.061	4.31	56	16	28	Sandy Loam (SaLo)	1.338	0.445	0.233	0.11	1.21
8	7	392879.415	2258251.115	4	54	21	25	Sandy Clay Loam (SaClLo)	1.317	0.46	0.249	0.13	0.68
9	8	392922.924	2258190.41	4	56	19	25	Sandy Loam (SaLo)	1.356	0.453	0.233	0.127	0.84
10	9	392564.506	2260515.621	5.06	51	24	25	Sandy Clay Loam (SaClLo)	1.325	0.472	0.269	0.143	0.51
11	10	391528.014	2260474.252	4	54	18	28	Sandy Loam (SaLo)	1.356	0.453	0.233	0.126	0.96
12	11	391980.813	2261102.02	4	52	25	23	Sandy Clay Loam (SaClLo)	1.306	0.472	0.26	0.157	0.45
13	12	392607.936	2260273.801	4	58.87	21.79	19.34	Sandy Clay Loam (SaClLo)	1.279	0.46	0.243	0.14	0.59
14	13	391900.56	2260430.645	4	56.34	22.54	21.12	Sandy Clay Loam (SaClLo)	1.345	0.464	0.243	0.149	0.56
15	14	391667.709	2260434.369	4	58.74	22.9	18.36	Sandy Clay Loam (SaClLo)	1.35	0.464	0.249	0.141	0.52
16	15	392332.399	2261404.555	4.62	55.69	17.75	26.56	Sandy Loam (SaLo)	1.453	0.453	0.233	0.124	0.97

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ALGUNAS RELACIONES Y POSIBLES USOS POTENCIALES

- Funciones de pedotransferencia
- Redes Neuronales
- Diseño del riego
- Recomendaciones de gestión
- Requerimientos de los cultivos
- Gasto óptimo
- Meta Análisis

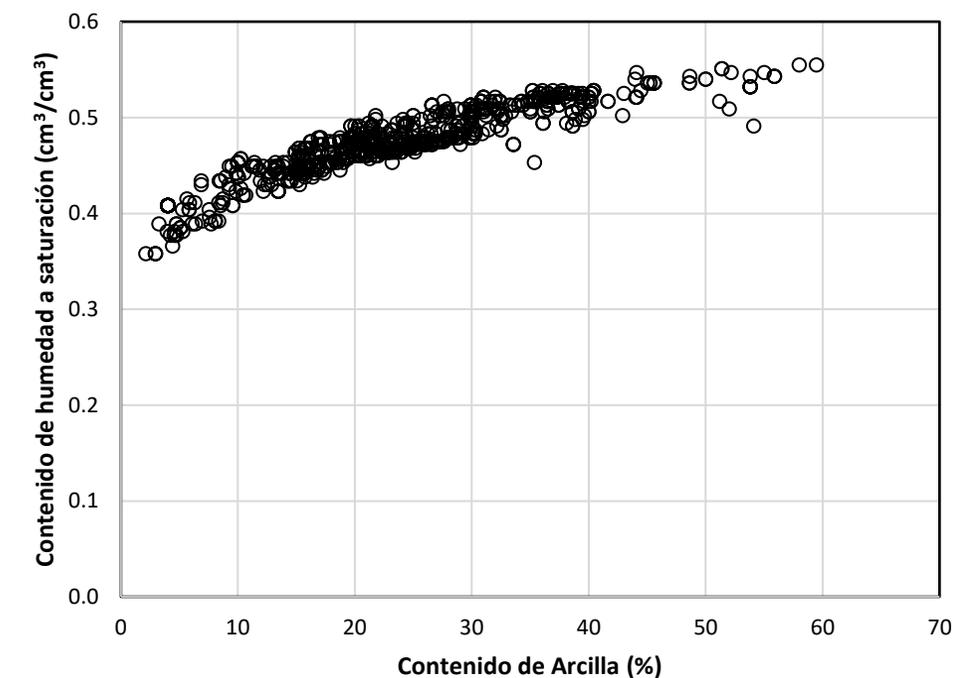
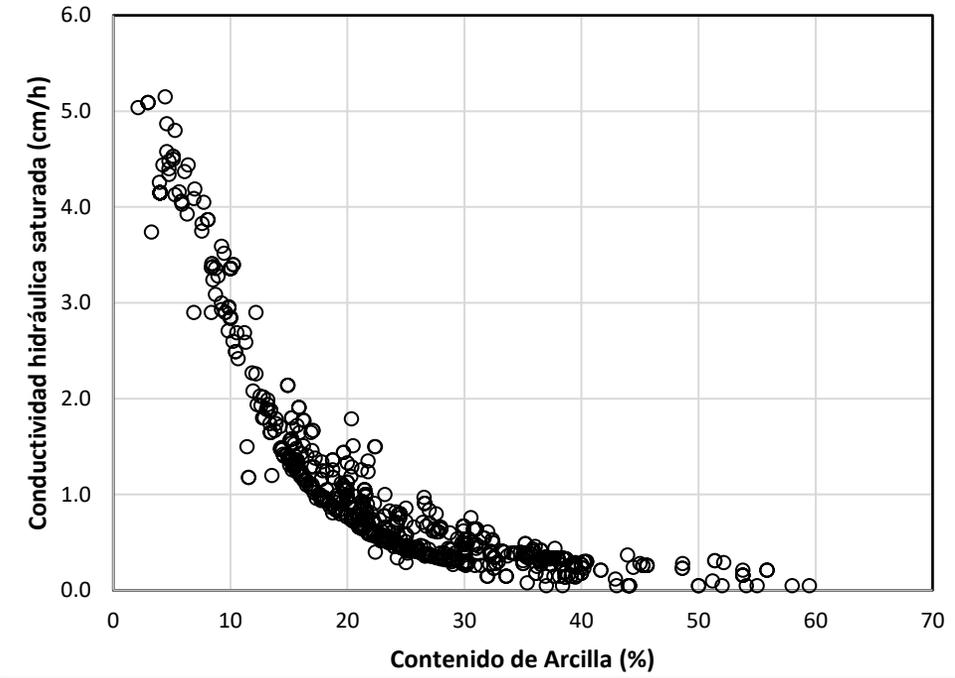


Y muchos más..

$$q_0 = \alpha_u K_s L, \quad \alpha_u = \frac{\ell_n}{\ell_n - \frac{S^2}{2K_s} \ln\left(1 + \frac{2K_s}{S^2} \ell_n\right)}$$

$$K_s = a / \{1 + \exp[b - c \cdot (Cl/\theta_s)]\}$$

$$\theta_s = a + b \cdot Cl^2 + c \cdot Cl + d \cdot BD + e \cdot Sa$$





<https://www.nature.com/articles/s41597-023-02332-7>

A soil database from Queretaro. x +

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A soil database from Queretaro, Mexico for assessment of crop and irrigation water requirements

[Nami Morales-Durán](#), [Sebastián Fuentes](#) & [Carlos Chávez](#)

Scientific Data **10**, Article number: 429 (2023) | [Cite this article](#)

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Abstract

Several studies have assessed crop water requirements based on soil properties, but these have been on a small scale or on soils with similar textures. Here, a data base of soil measurements in the field and laboratory from sites across Irrigation District 023, San Juan del Rio, Queretaro, Mexico was sampled, collected, analyzed, and integrated. The data base, named, *NaneSoil*, contains information on 900 samples obtained from irrigated plots. *NaneSoil* cover 10 of the 12 textural classes with the following information: sand, silt, clay contents, bulk density, saturated volumetric water content, field capacity, permanent wilting point and

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Dr. Carlos Chávez

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*PARA PODER BRINDAR UNA ASESORÍA ADECUADA, DEBEMOS ENTENDER EL
RIEGO POR GRAVEDAD: TEORÍA, PRÁCTICA Y HERRAMIENTAS
QUE PODEMOS USAR.*

La Ciencia y la Tecnología al servicio del productor 😊

Fecha de presentación: 05 de octubre 2023

