GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

20 - 22
October, 2021
Virtual meeting

National contribution: Mexico

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ALIANZA MUNDIAL
POR EL SUELO

AGRICULTURA
SECRETARÍA DE AGRICULTURA Y DESARROLLO RURAL

Focal point: Dra. Sol Ortiz

Dirección General de Política, Prospección y Cambio Climático

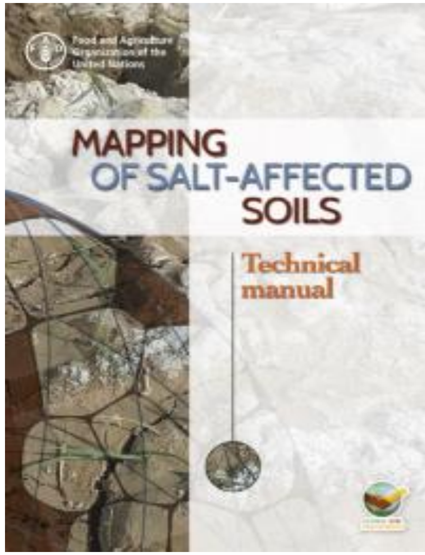
Secretaría de Agricultura y Desarrollo Rural de México

Increase the quality, quantity and access of soil salinity information across Mexico

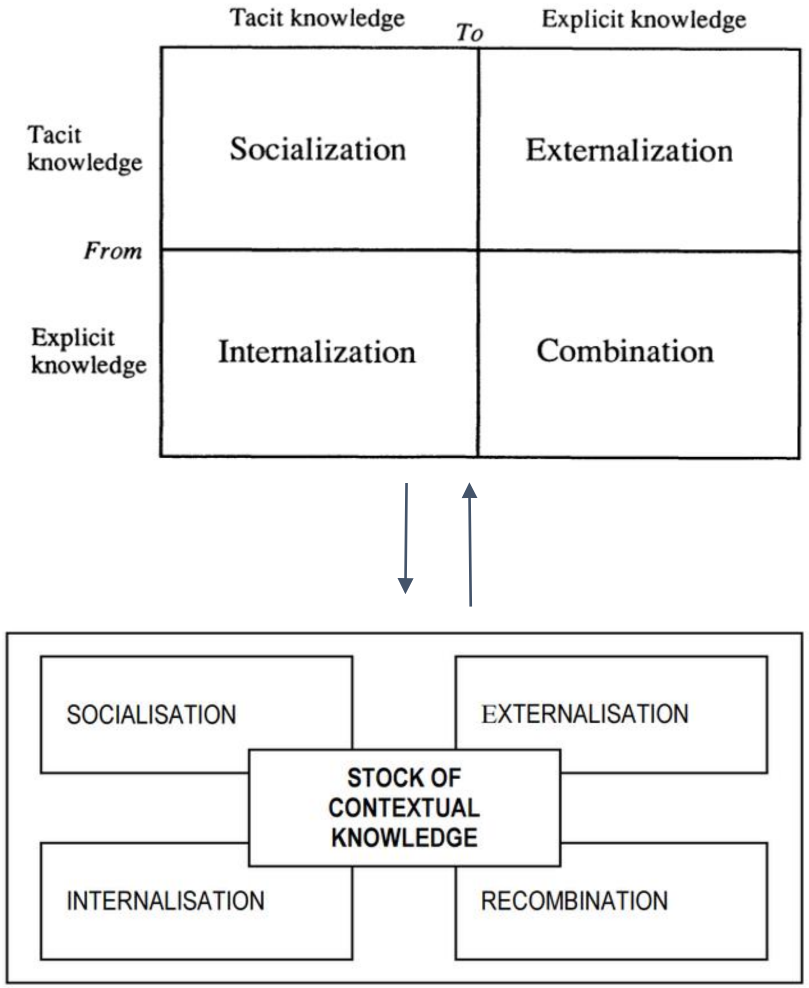
- Build technical and institutional capacities for soil salinity mapping and monitoring

- Update soil salinity estimates to support sustainable soil management

Organizational knowledge creation systems

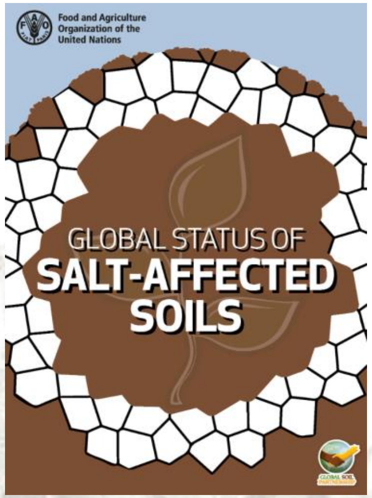


Digital soil mapping



Nonaka, 1994

Increase diversity of soil information users



Digital soil evaluation

Digital soil mapping

$$\mathrm{SA}\left(z, p_x, t_c\right) = f\left\{\sum_{j}^{n}\left(S_j\left(z, p_x, t_c\right), T_j\left(p_x, t_c\right), E_j\left(p_x, t_c\right), P_j\left(p_x, t_c\right)\right)\right\},$$

$$\int_{i=0}^{m}\left\{\sum_{j}^{n}\left(A_j\left(p_x, t_i\right), W_j\left(p_x, t_i\right), B_j\left(p_x, t_i\right), H_j\left(p_x, t_i\right)\right)\right\}, \quad (4)$$

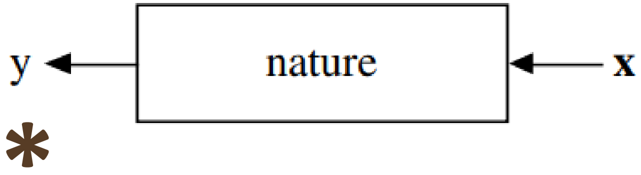
SA	=	ECe, pH, ESP
z	=	0-30 and 60-100 cm of soil depth
p_x	=	lat, long
t_c	=	period of time
t_i	=	specific period of time

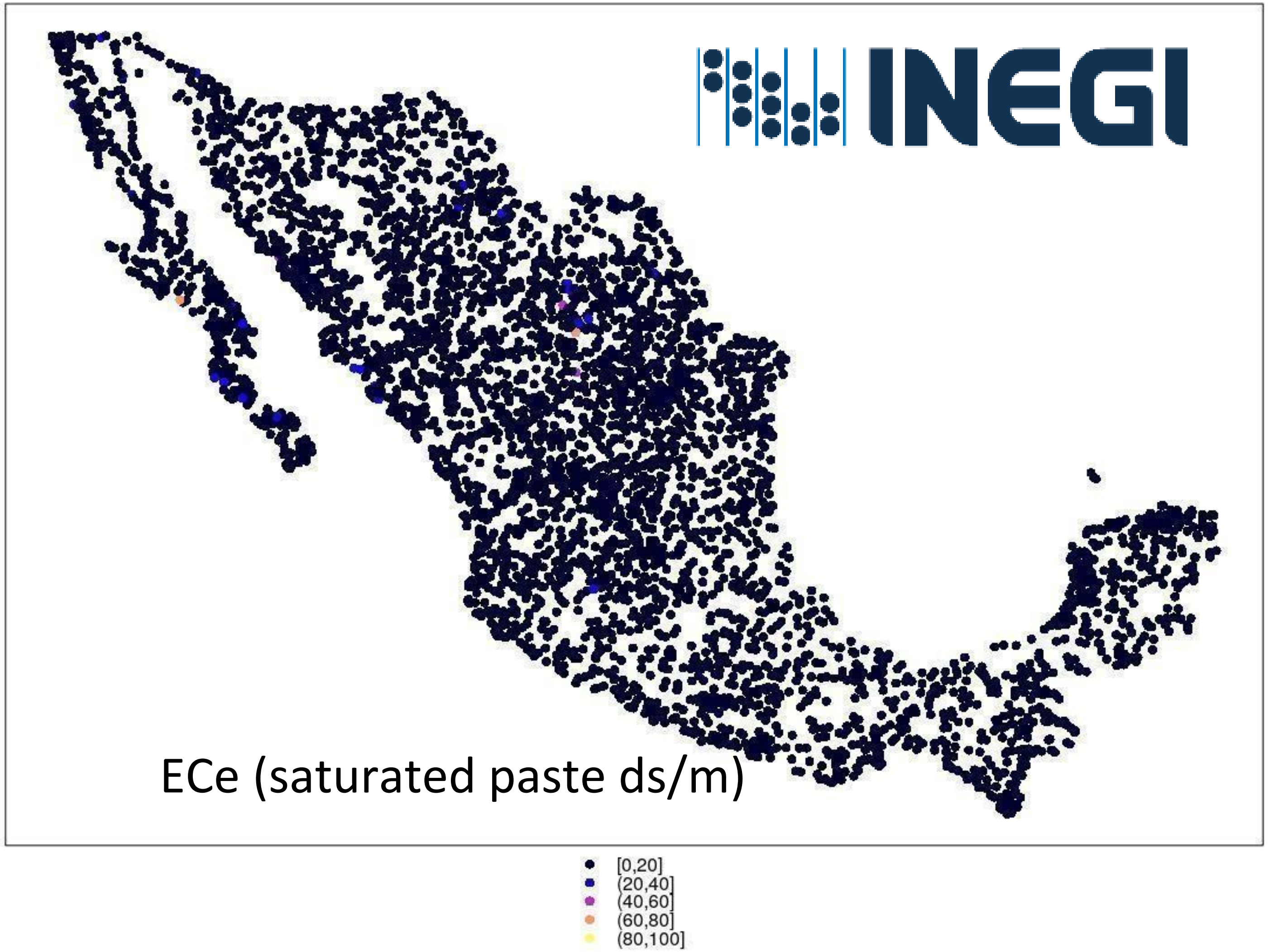
Static predictor:
S=soils, E=ecosystem type, P=parent material,

Dynamic predictors:
A=atmosphere, W=water, B=biology, H=human

Moore et al., 1993; Scull et al., 2003, Hengl 2003;
McBratney et al., 2003; Grunwald et al., 2011

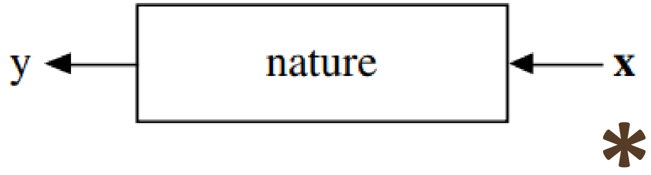
Training dataset

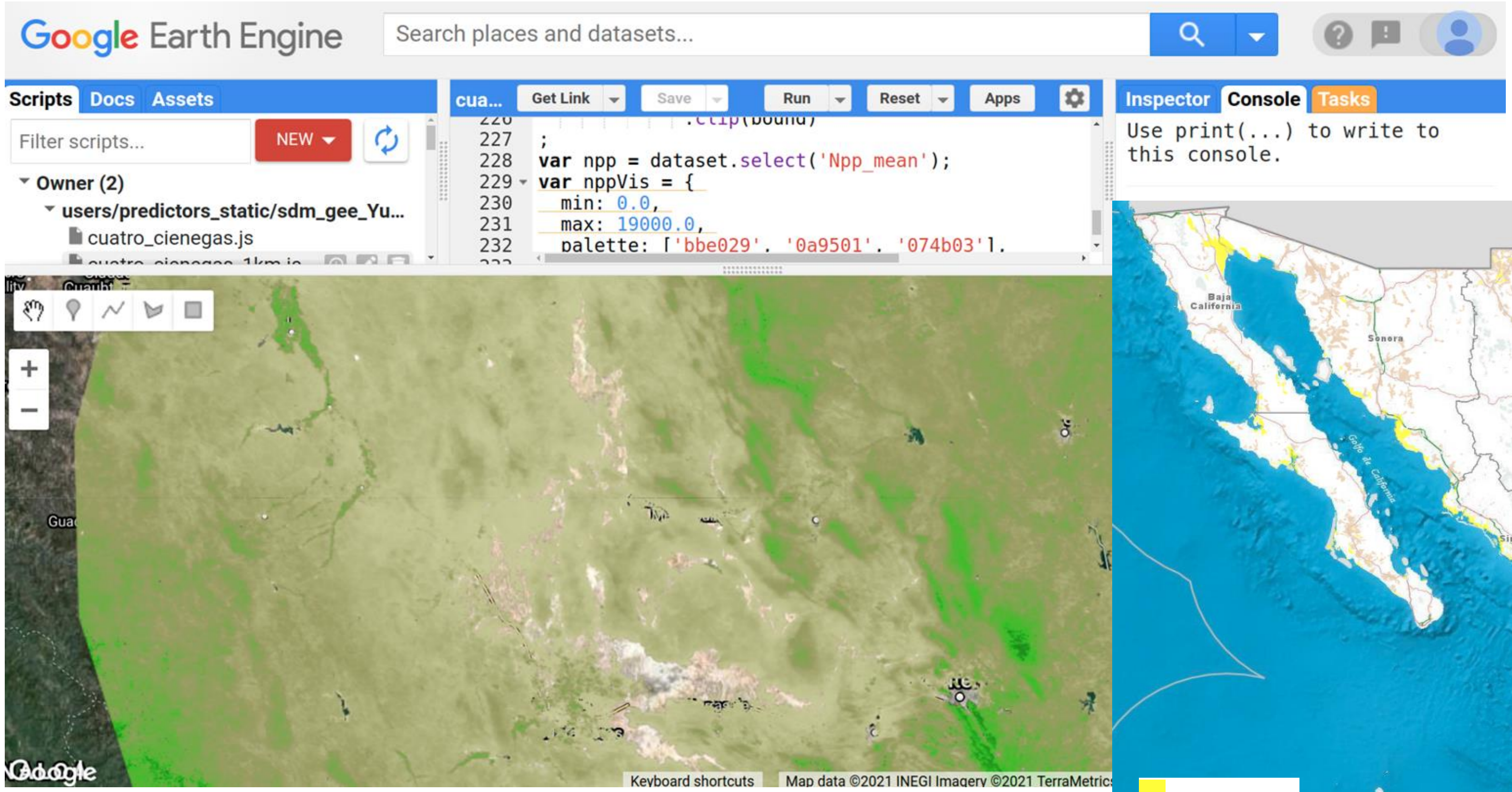




INEGI, Serie 2; 2852 data / sites collected > 1999

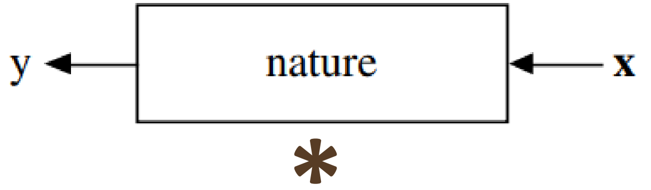
The covariate space

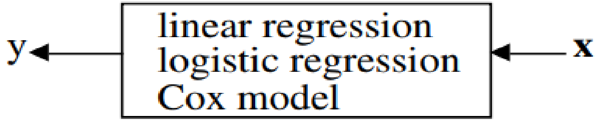


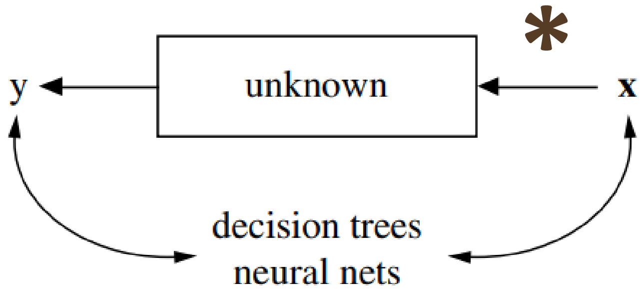


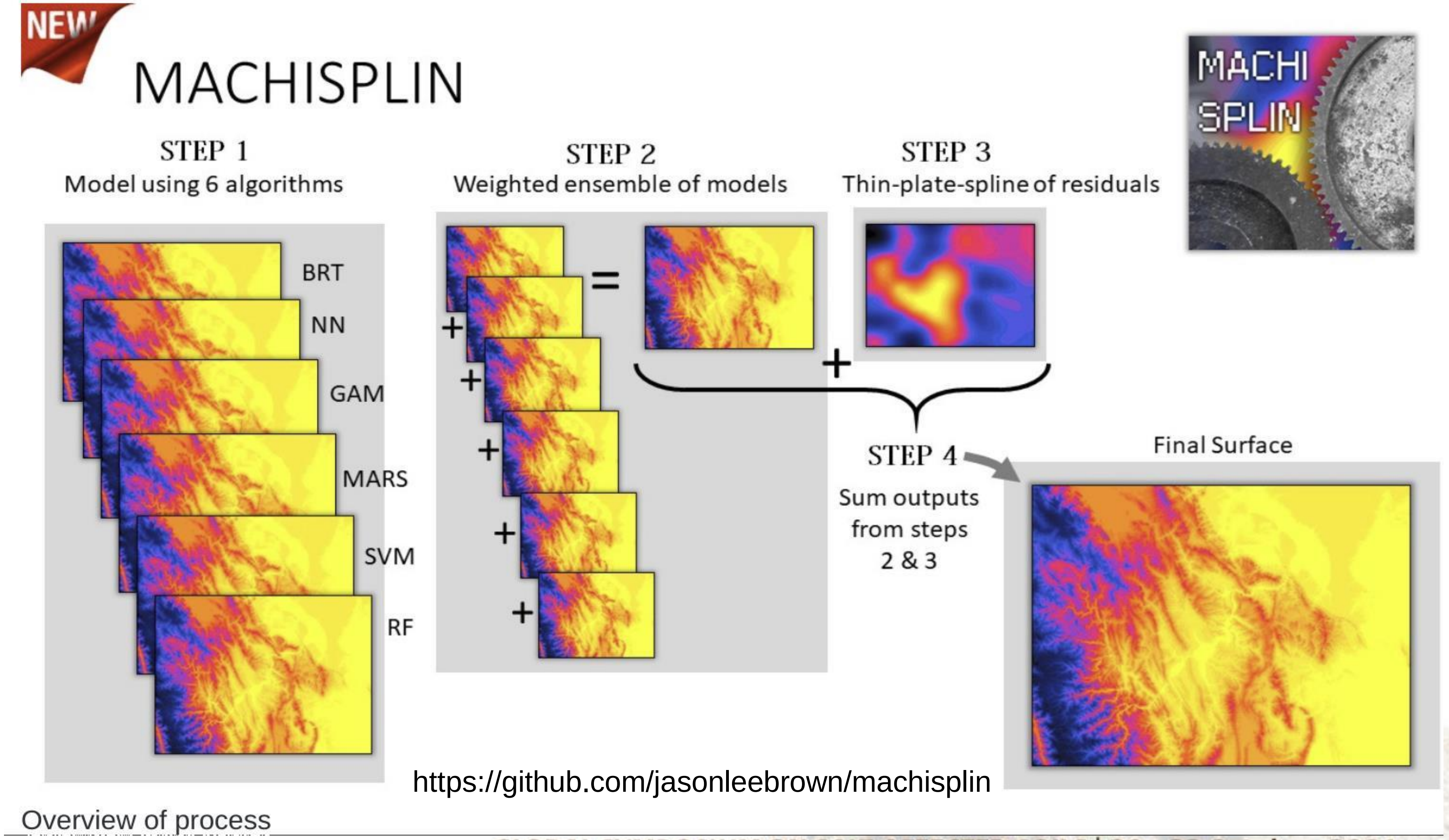
- Remote sensing
- Terrain attributes
- Climate surfaces
- Thematic maps

Modeling framework









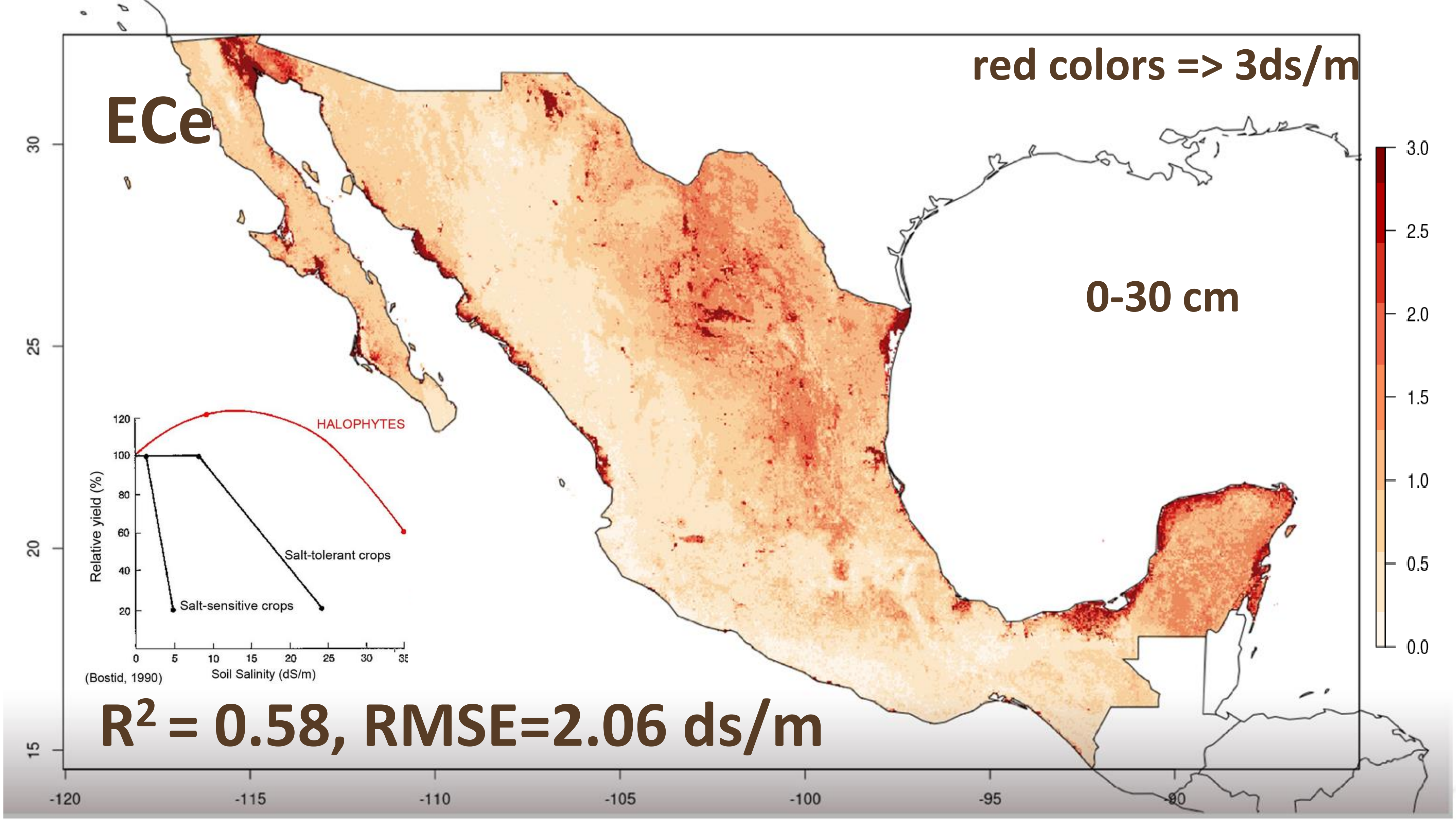
https://github.com/jasonleebrown/machisplin

Breiman, 2001; Brown 2021

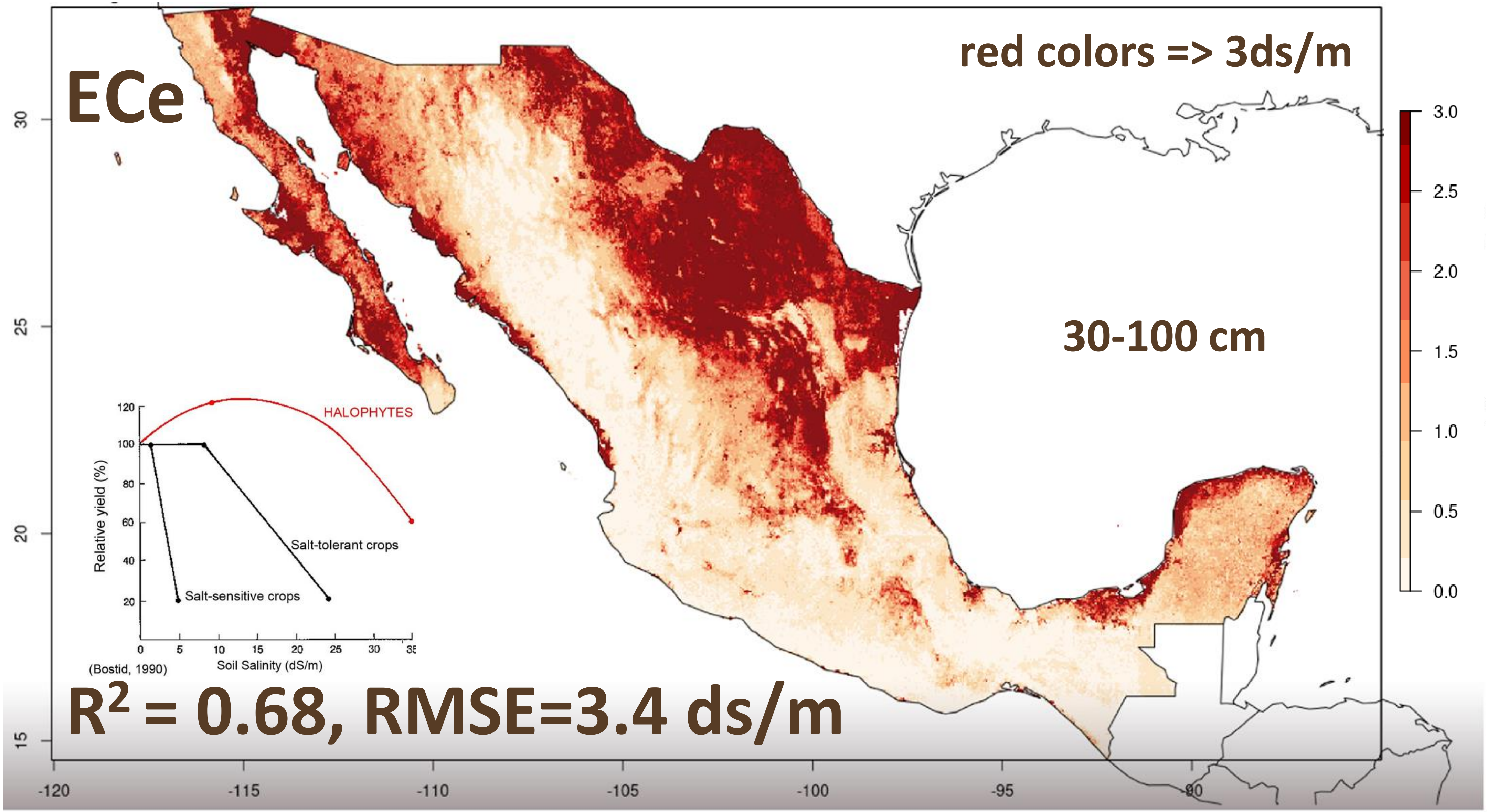
ECe

red colors => 3ds/m

0-30 cm



R^2 = 0.58, RMSE=2.06 ds/m



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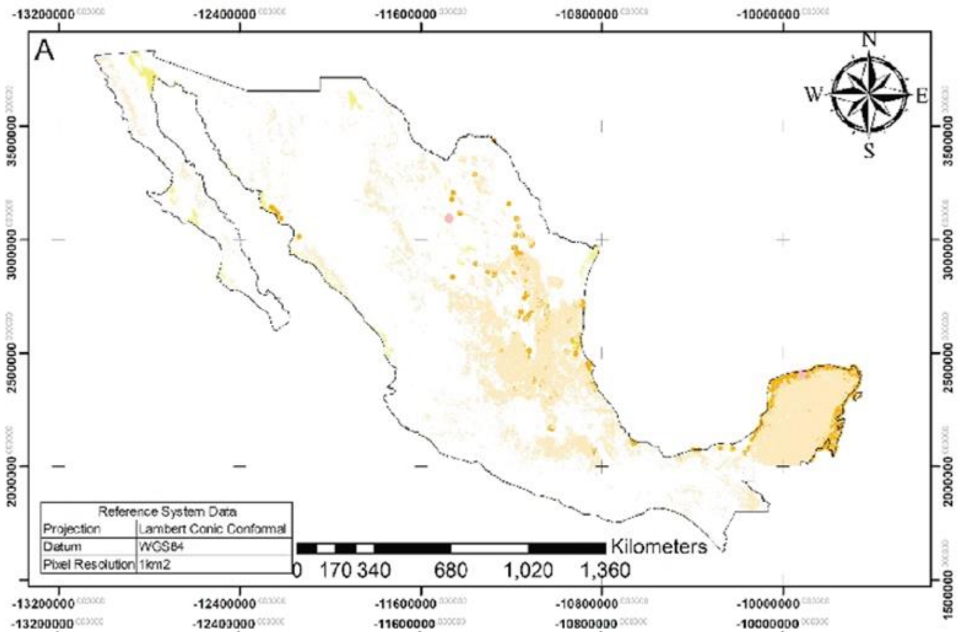
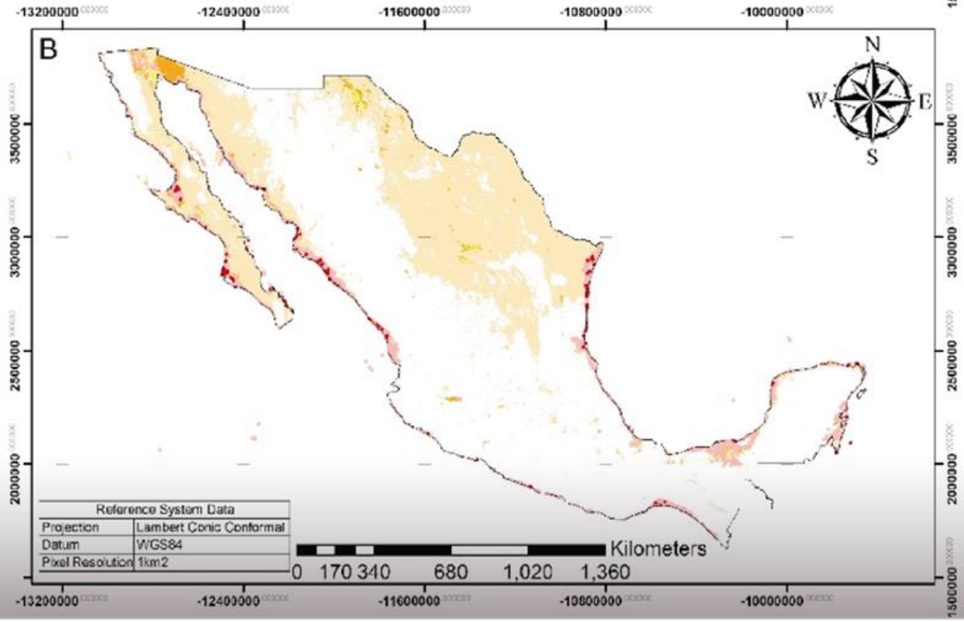
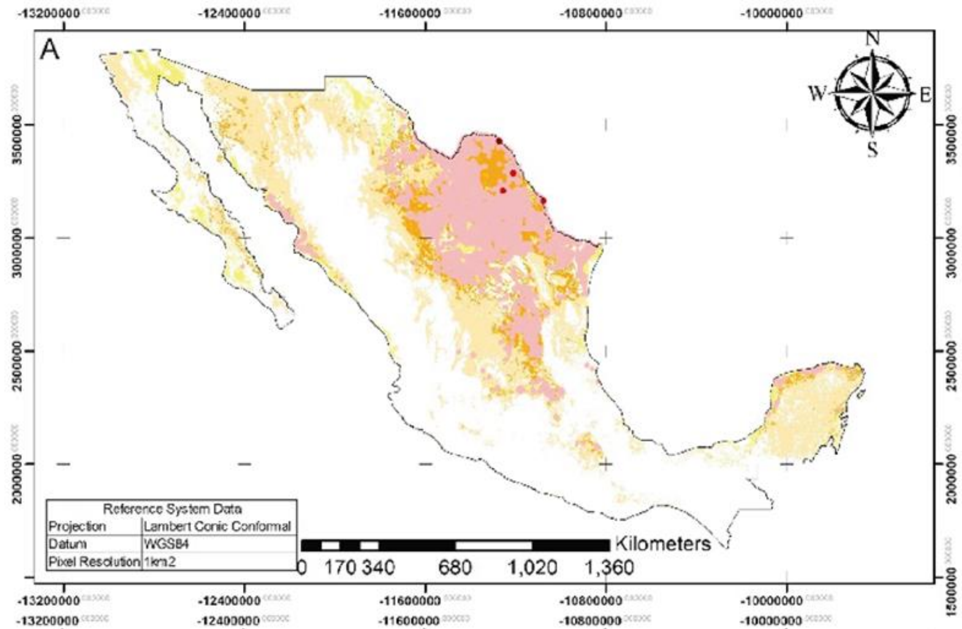


34% of the territory



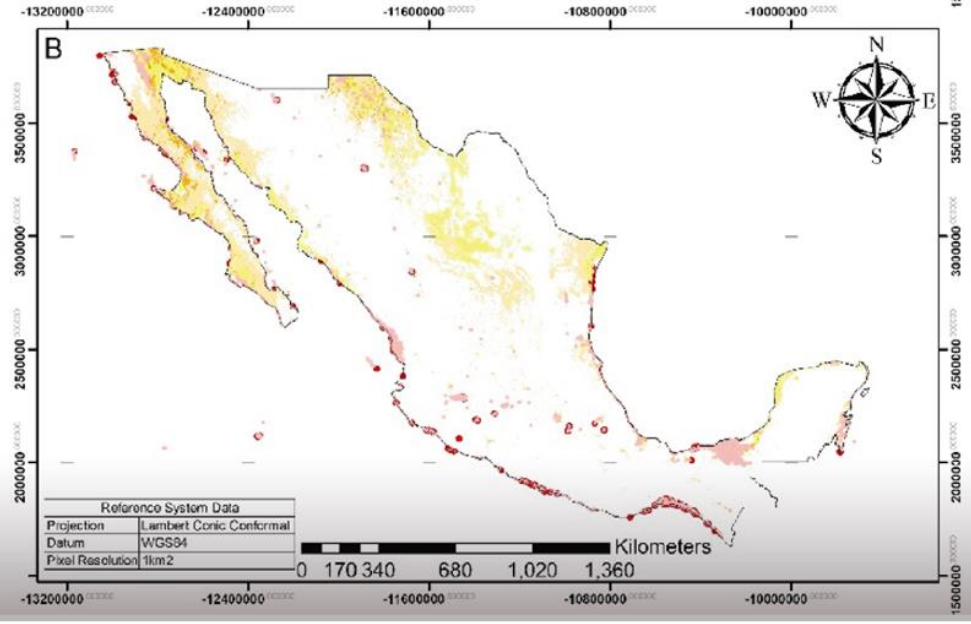
60% of the territory



40% of the territory

Salinity affectation 30-100 cm

- None
- Saline Sodic
- Slight Salinity
- Moderate Salinity
- Strong Salinity
- Very Strong Salinity



35% of the territory

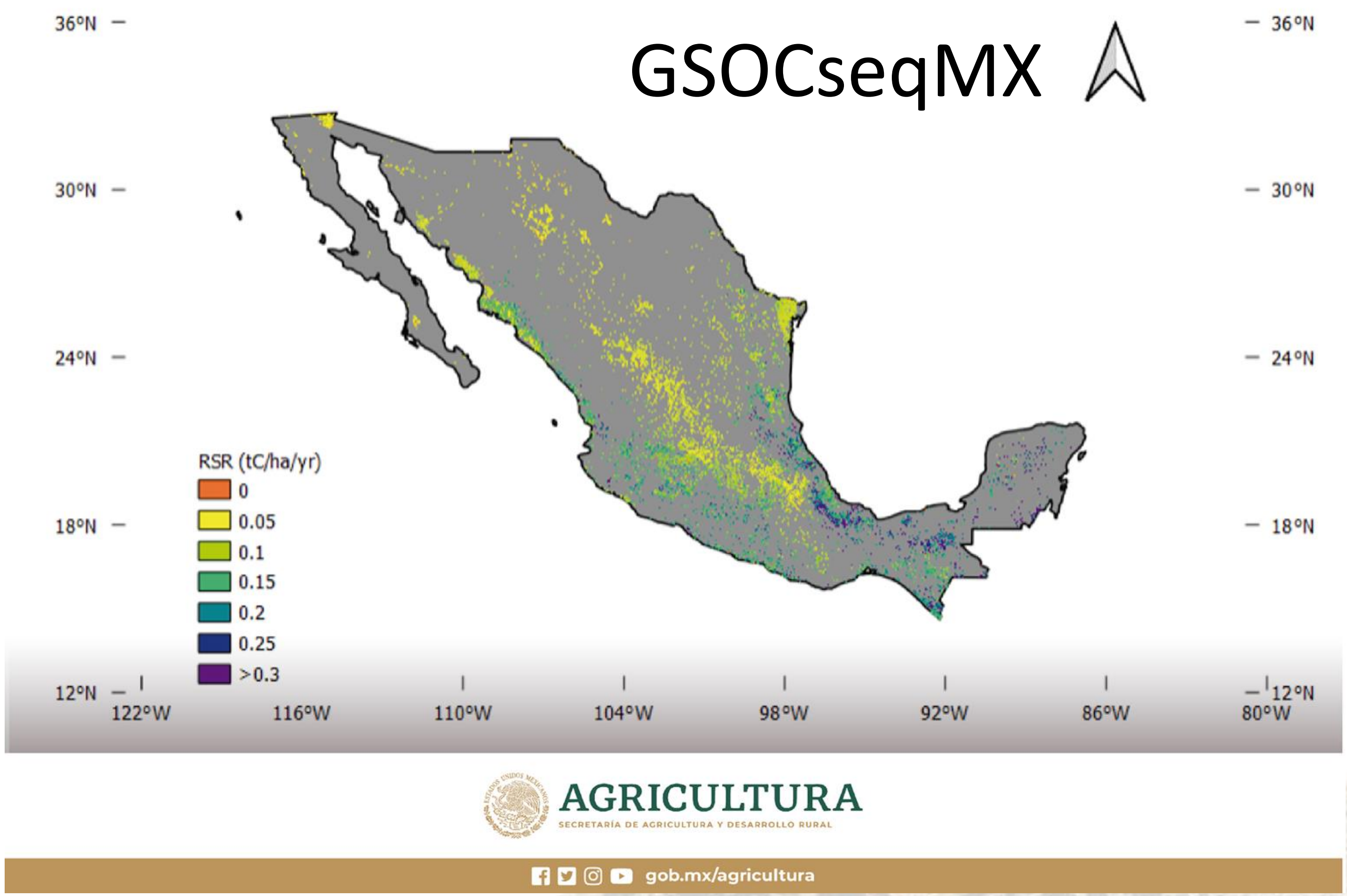
Sodicity affectation 30-100 cm

- None
- Slight Sodicity
- Moderate Sodicity
- Saline Sodic
- Strong Sodicity
- Very Strong Sodicity

Salt affected soil across agricultural land

- 0-30 cm
  - 46.94% rainfed
  - 53.06% irrigation agriculture
- 30-100 cm
  - 44.15% rainfed
  - 55.85% irrigated agriculture

Implications on SOC stocks



Our results highlight the pressing need to reverse land degradation by soil salinization

- Areas of salt affected are present across all ecosystems, larger affected areas are below 30 cm of soil depth

- ~ 50% of agricultural soils are affected by some degree of soil salinity including both irrigation agricultural systems and rainfed agriculture

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