Global Soil Salinity Map (GSSmap)
Training on Soil Salinity Mapping
28 November - 3 December 2019
Tunis, Tunisia

DAY 1

Objective:
- (1) To understand soil salinity drivers, indicators and classification methods
- (2) To prepare country-level data for national mapping of soil salinity

Requirements:
- (1) Georeferenced national soil data (soil horizons or layers down to 0-100cm deep): EC, pH, ESP, (OC, Clay, texture, and soluble ions-so4, cl, Co3, Na)[1], administrative boundaries, water bodies, urban areas
- (2) Remote sensing images, elevation, land cover, climate, and (soil map and/or geology map, irrigated areas, hydrogeology)[2]
- (3) Computer at least core i5, 8gb ram, and enough storage (at least 100 GB)
- (4) Installed software: R, RStudio, QGIS, ILWIS

Output
- (1) Understanding of soil salinity and mapping requirements
- (2) GIS database for national mapping of soil salinity

TIME	TOPIC
8:30 – 9:00 am	Registration, Introductions, and Workshop Opening
09: 00 - 9:30 am	Introduction to training, expectations, and procedures Checklist of training requirements
9:30 – 10:30 am	Lecture 1: Basics of soil salinity (Understanding soil salinity, distribution, characteristics, and classification)
10:00 – 10:30 am	BREAK
10:30 - 11:00 am	Lecture 2: Input data requirements (indicators of salinity, mapping covariates)
11:00 – 11:15 am	Discussions on country-level data availability by participants Presentation of country-level data (2 slides: soil data, covariates) (Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Lebanon, Libya)
11:15 – 11:30 am	Presentation of country-level data (2 slides: soil data, covariates) (Morocco, Oman, Palestine, Sudan, Syria, Tunisia, Yemen, Mauritania)

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[1] If EC is not determined from extract from saturated soil paste. Soluble ions and TSS are optional
[2] Soil map and/or geology map; hydrogeology and irrigation zones are optional

11:30 – 12:00	Lecture 3: Database structure and preparation
12:00 – 13:00 pm	Soil data preparation
13:00 - 14:00	LUNCH
14:00 – 16:00	Covariates preparation (Land cover, geology, climate, and relief)
15:00- 15:30 pm	BREAK
15:30 - 17:00 pm	Covariates preparation (Remote sensing images)
17:00 – 17:30 pm	Short quiz

DAY 2

Objective:
(1) To harmonize input data
(2) To develop spatial maps of EC indicator of salinity (0-30 cm and 30-100 cm)

Requirements:
   (1) Input GIS database (soil EC, predictors, country boundary)
   (2) Installed R, QGIS, spreadsheet software
   (3) Internet connectivity
   (4) Computer (at least i5, 8gb Ram, and sufficient storage)
   (5) Lecture materials

Outputs:
   (1) Harmonized predictors of salinity
   (2) Spatial maps of EC indicator of salinity (0-30 cm and 30 – 100 cm)
   (3) Spatial maps of uncertainty of EC map
   (4) Documentation of EC map and accuracy assessment

TIME	TOPIC
8:30 – 9:00 am	Registration, Recap of Day 1. Questions and answers
09: 00 - 10:00	Short introduction to mapping software (QGIS and ILWIS)
10:00 – 10:30 am	BREAK
10:30 – 11:30 am	Short introduction to mapping software (R and RStudio)
11:30 – 13:00	GIS database development
13:00 - 14:00 pm	LUNCH
14:00 – 15:00 pm	Spatial Mapping of soil indicators of salinity
15:00- 15:30 pm	BREAK
15:30 - 17:00 pm	Spatial mapping of soil indicators of salinity
17:00 – 17:30 pm	Short quiz

DAY 3

Objective:
 (1) To develop spatial maps of pH indicator of salinity (0-30 cm and 30-100 cm)

Requirements:
    (1) Input GIS database (soil pH, predictors, country boundary)
    (2) Installed R, QGIS, spreadsheet software
    (3) Computer (at least i5, 8gb Ram, and sufficient storage) and Lecture materials

Outputs:
    (1) Spatial maps of pH indicator of salinity (0-30 cm and 30 – 100 cm)
    (2) Spatial maps of uncertainty of pH map
    (3) Documentation of pH map and accuracy assessment

TIME	TOPIC
8:30 – 9:00 am	Registration, Recap of Day 1. Questions and answers
09: 00 - 10:00	Short introduction to mapping software (QGIS and ILWIS)
10:00 – 10:30 am	BREAK
10:30 – 11:30 am	Short introduction to mapping software (R and RStudio)
11:30 – 13:00	GIS database development
13:00 - 14:00 pm	LUNCH
14:00 – 15:00 pm	Spatial Mapping of soil indicators of salinity
15:00- 15:30 pm	BREAK
15:30 - 17:00 pm	Spatial mapping of soil indicators of salinity

DAY 4

Objective: To develop spatial maps of ESP indicator of salinity (0-30 cm and 30-100 cm)

Requirements:
    (1) Input GIS database (soil ESP, predictors, country boundary)
    (2) Installed R, QGIS, spreadsheet software
    (3) Computer (at least i5, 8gb Ram, and sufficient storage) and Lecture materials

Outputs:
    (1) Spatial maps of ESP indicator of salinity (0-30 cm and 30 – 100 cm)
    (2) Spatial maps of uncertainty of ESP map
    (3) Documentation of ESP map and accuracy assessment

TIME	TOPIC
8:30 – 9:00 am	Registration, Recap of Day 1. Questions and answers
09: 00 - 10:00	Short introduction to mapping software (QGIS and ILWIS)
10:00 – 10:30 am	BREAK
10:30 – 11:30 am	Short introduction to mapping software (R and RStudio)
11:30 – 13:00	GIS database development
13:00 - 14:00 pm	LUNCH
14:00 – 15:00 pm	Spatial Mapping of soil indicators of salinity
15:00- 15:30 pm	BREAK
15:30 - 17:00 pm	Spatial mapping of soil indicators of salinity

DAY 5
Objective:
    (1) To develop national soil salinity map

Requirements:
    (1) Salinity indicator maps (0-30 and 30-100cm)
    (2) Salinity classification model
    (3) Lecture materials
    (4) Installed QGIS, R and libraries
    (5) Computer i5, 8 GB ram, sufficient storage

Outputs
    (1) National indicator maps for mapping salinity and uncertainty maps
    (2) Uncertainty map for salinity
    (3) Documentation of salinity map

TIME	TOPIC
09: 00 - 10:00	**Recap of Day 4. Questions and answers.**
10:00 – 10:30	**BREAK**
10:30 - 13:00	Soil indicator modelling (ESP 0-30 and 30-100 cm) and uncertainty assessment:
13:00 - 14:00	**LUNCH**
14:00 – 16:00	Soil indicator modelling (ESP 0-30 and 30-100 cm) and uncertainty assessment:
15:00- 15:30	**BREAK**
15:30 - 17:30	Soil indicator modelling (ESP 0-30 and 30-100 cm) and uncertainty assessment:

DAY 6

Objective: To contribute to GSS map
Requirements:
  (1) National salinity indicator maps
  (2) Validation statistics
  (3) Sample validation data
  (4) National salinity maps
  (5) Lecture materials
  (6) Internet connectivity

Outputs

Submitted maps, validation statistics, and validation sample set to GSS map

TIME	TOPIC
09: 00 - 10:00	Recap of the course. Questions and answers.
10:00 – 10:30	BREAK
10:30 - 13:00	Submission and Presentation of final maps and reports by participants (alphabetical order of NENA countries) Wrap-up of training program
13:00 - 14:00	LUNCH
14:00 – 17:30	Meeting and discussion between soil and water productivity experts