Soil salinity is defined as the total salt concentration in the soil solution (i.e., aqueous liquid phase of the soil and its solutes). The accumulation of salinity in the soil root zone can have adverse effects on crop yields by making it more difficult for plants to obtain water, upsetting the nutritional balance of plants or causing toxicity by a specific ion (e.g., sodium and chloride), and by affecting physical properties of soils (e.g., tilth and permeability) that influence plant growth. The global impact of soil salinity is extensive. Squires and Glenn (2009) estimated the global extent of saline soils to be 412 Mha, which closely agrees with the FAO (http://www.fao.org/soils-portal/en/) estimate of 397 Mha.

Because of the potential detrimental impacts of soil salinity accumulation, it is a crucial soil chemical property to measure and monitor, particularly in arid and semiarid agricultural regions. A chapter of the recent online publication from Corwin and Yemoto (2017) presents a thorough discussion of the measurement of soil salinity at scales of < 200 m³ with focus on the measurement of soil salinity in the laboratory using electrical conductivity of aqueous extracts from soil samples and measurement of total dissolved solids in the saturated soil extract (Corwin and Yemoto, 2017). The chapter provides background, principles, equipment, and current accepted procedures and methodology for measuring soil salinity.

As noted by Corwin and Yemoto (2017), there are a variety of techniques to measure soil salinity. Three different laboratory approaches are discussed: (i) the measurement of the mass of total dissolved solids (TDS, mg L⁻¹), (ii) the electrical conductivity (EC, dS m⁻¹) of soil water extracts, or (iii) the proportion and composition of salt species using spectrophotometry. Figure 1 shows the three steps involved in the preparation of a soil solution extract: (a) preparation of a soil paste, (b) extraction of the water from the soil paste, and (c) the measurement of the salt concentration of the extract using electrical conductivity (EC).
involved in the typical determination of the EC from a soil extract: (i) preparation of a soil paste, (ii) extraction, and (iii) measurement of EC of the extract. At scales ranging from 2 to 200 m$^3$ (e.g., soil lysimeter columns to field plots) soil solution extractors, salinity sensors, capacitance sensors or frequency domain reflectometry (FDR), time domain reflectometry (TDR), and combinations of EC$_a$ and solution extracts from soil samples are used. Discussion is given to the use of suction cup extractors, porous matrix/salinity sensors, electrical resistivity, and electromagnetic induction to measure salinity in soil lysimeter columns and small field plots ($< 10 \times 10$ m).

REFERENCES