* Salt: ionic compound made of anions and cations.
* Soluble salt: salt that are more soluble than gypsum (2.4g/L)
* Table Salt: has solubility 150 times more than gypsum.
* Measuring Salinity:
* Conventional method consists of making a saturated soil paste, waiting, vacuuming out the water and measuring salt in the saturated soil extract.
* Electric conductivity: Measured in Siemen/meter, at low concentrations, Salt concentration and EC are directly proportional.
* Osmotic effect: High salt concentrations increase the force holding water in the soils, plants therefore expand more energy to absorb the water, reducing growth.
* Specific ion effect: Some ions are toxic to certain plants, therefore making certain salts toxic.

PART II: Classifying saline soils:

* Based on ESP and TS
* ESP: The exchangeable sodium percentage is the portion of total exchangeable sodium basic cation. It is used to indicate sodium-induced soil dispersion that can greatly hinder hydraulic conductivity.

ESP>15 = Sodic soil

$$ESP= \frac{Exchangeable Na}{Total exchangeable cations}×100$$

* SAR: Sodium adsorption ratio is used to determine soil sodicity if water of known SAR is used for many years in the soil.

$$SAR= \frac{Na^{+}}{\sqrt{Ca^{2+ }+Mg^{2+}}}$$

* Salt affected soils are classified in 3 types:

-Saline

-Sodic

-Saline-Sodic

* Saline Soil: Soil with enough salt at some point to interfere with plant growth.
* Causes of saline soils:
* Soil minerals weathering products
* Saline irrigation water
* Upward migration of salty groundwater from water tables
* Sodic Soil: Non-saline, caused by salt imbalance where sodium is the dominant cation rather than calcium. Has SAR >= 13 ---- ESP >= 15.
* Same causes as saline soils but mostly due to groundwater migration since sodium travels more readily through soils than other salts do.
* Saline-sodic soils: Soils high in salinity and in sodium proportion comparing to calcium and magnesium. These soils have the osmotic effect from saline soils and the toxic effect from sodic soils.
* Salt balance: When outgoing salt is equal to incoming salt. Successful salt management depends on adequate leaching. Leaching occurs when irrigation and rain water exceed soil water storage, assuming we have drainage.

PART III: Managing Saline & Sodic soils:

* Rules for salty soil reclamation:
* Establish internal drainage
* Replace excess exchangeable sodium
* Leach out most of the soluble salts
* Reclaiming saline soils:
* Leach salts downwards and out of the root zone
* Artificial drainage is required when a high-water table is present.
* Applying surface organic mulch since it reduces evaporation and therefore salt movement upwards due to evaporation is reduced. Net downwards movement of salts is increased.
* Reclaiming sodic and saline-sodic soils:
* Sodium must be replaced by another cation and then leached down out of the root zone.
* Calcium from gypsum (CaSO4 2H2O) via cation exchange replaces sodium, leaving soluble sodium sulfate to be leached down.
* Salty water can be used to keep sodic soils flocculated, allowing leaching water to penetrate. After most of the exchangeable sodium is removed, less-saline water is applied to lower salinity.
* Gypsum Requirement: Calculated amount of gypsum needed to reclaim the soil
* Managing saline soils:
* Water control: Maintain high water content near field capacity to dilute the salts and reduce toxicity and osmotic effect.
* Planting position: Salty water will accumulate in the surface soil or furrow ridge tops as salt and water move upwards due to evaporation. Sprinkler method can wash salts deeper into the soil profile
* Brackish water
* Saline seeps
* Salt-tolerant crops

LAB:

$$Organic matter\%= \frac{O.D soil mass-Furnace dried soil mass}{O.D soil mass}×100$$