SOIL KNOWLEDGE FOR KIDS

"Halt soil salinization. Boost soil productivity"

Soil salinity in the classroom
This booklet aims at providing kids with advanced knowledge about soil salinity and its impacts.

We hope that our work will be useful for

- understanding soil salinity
- being able to recognize risks of soil salinization
- being able to identify management options for preventing soil salinization

Hello! Do you want to learn with us about soil salinization?

Aren't you curious about salty or saline soils? Come with us, it will be fun!
Before starting this adventure, we can introduce ourselves, and then begin to explain what the soil salinization is.

Good idea!

I'm Claudia and he is my older brother, Pablo.

Claudia and I always have a great time learning about nature. Have fun while learning more about soil!
The first thing we are going to tell you is what the soil is. Pablo tell it yourself.

Soil is the upper layer that covers the surface of our planet and where plants grow and animals and people live.

We live here!

Soil is a mixture of **mineral particles**, **organic matter**, **water**, **air** and **living organisms**.

Soil and the organisms that live in it provide us with **food** and **fibers**. Soil functions as a **natural filter** for **groundwater**, the main source for drinking water. Soil is the **habitat** for a huge amount and variety of **organisms** living in and on the soil.

Therefore, we need healthy soils to have healthy food and clean water! Soil is very important for life on Earth!
The answer is **YES**. In the soil we can find salt minerals like halite, sylvite, anhydrite, and many more.

Halite is the mineral name for the substance that everyone knows as “table salt.” Its chemical name is sodium chloride.

In the photo you can see white salt crusts on the soil surface.

Soil salinity is not good for us. How odd! No plants have grown here.
A soil may be rich in salts because the rock from which it was formed contains salts. During the process of chemical weathering of minerals and rocks, salts are gradually released and made soluble.

Chemical weathering occurs when water dissolves minerals in a rock, to form new minerals and soluble salts.

What is chemical weathering?

This is a natural cause of salt in soil

Salts can be carried from the sea water by strong winds and fall as rain across inland areas. Salt concentration in rainfall is higher nearer to the coast.

In this case, the salt accumulates by natural phenomena
The two major sources of salts resulting from human activities are irrigation and fertilization.

Irrigation is what farmers do when they add water to their fields to help plants grow when there is not enough rain. Irrigation water contains certain amount of salts.

Also recycled wastewater contains salts. Recycled wastewater generally refers to treated domestic wastewater that is used more than once.

“Synthetic fertilizers” are materials containing one or more nutrients necessary for plant growth (e.g. nitrogen, phosphorus and potassium).

Synthetic fertilizers, biosolids and compost also add salts to soils.

Compost is a type of fertilizer that is prepared by decomposing leaves, food waste, grass clippings, and other recycling organic materials. Compost is rich in plant nutrients.
Soil salinization is an accumulation of soluble salts in the area where the roots of the plants grow, which causes negative effects. Soils that contain a harmful amount of salt are often referred to as salty or saline soils. Soil, or water, that has a high content of salt is said to have a high salinity.

Soils with salinity problems present white crusts on the surface when the soil is dry. In addition to what the snail said, although the plants that grow in a saline soil have enough water, they show symptoms of a lack of water.

Salts in the soil increase the efforts by plant roots to take in water.
Another symptom that appears in plants when there are salinity problems is leaf necrosis. Necrosis due to salinization is when the edges of the leaves dry out and die.

Soil salinity can cause toxicity due to certain ions. The salt that we all know is made up of sodium (Na\(^+\)) and chloride (Cl\(^-\)) ions. **Plants need these ions to grow but in excessive amounts they can be toxic.** As we said at the beginning of the booklet, there are many other salts that can cause soil salinization.

If you don't know what an ion is, you should ask your teacher.

Na\(^+\) is beneficial to many species at lower levels in the water of the soils and toxic for many plants at high concentrations. Let's turn this topic into an experiment!
Let's do an experiment to see what happens to the growth of seeds when salt is added.

**The effects of salt on seed germination**

How does salt affect seed germination? Germination is the growth of a seed into a young plant.

Let's do an experiment to see what happens to the growth of seeds when salt is added.

### Materials
- 4 containers
- Kitchen paper or cotton wool roll
- Lentil/wheat/alfalfa seeds
- Salt and 1 teaspoon
- Water and 4 glasses

### Salt solutions
- Solution 1: Do not add any salt to the glass of water
- Solution 2: 1 glass of water with half a teaspoon of salt
- Solution 3: 1 glass of water with a teaspoon of salt
- Solution 4: 1 glass of water with two teaspoons of salt

### Method
- Step 1. Number the 4 containers: 1–4
- Step 2. Dip four sheets of paper in each of the solutions and place two of them in the corresponding container
- Step 3. Place 6 seeds into each container
- Step 4. Cover the lentils with the other two sheets of paper with the corresponding solution
- Step 5. Cover the containers with transparent plastic

We can also do the experiment in pots. To do this, we will put soil in the pots. Then we will place the seeds on the soil. We will cover them with a thin layer of soil. Later we will water them with the same solutions that we have indicated before. Finally, we will cover them with a plastic bag.

What happened to the seeds in each of the containers? Can you verify the following scientific concept “High concentrations of salt in the soil or water prevent seeds from germinating”.

### Observations
- Record the number of lentils that have sprouted
- Record the height of the lentils
- Analyse the results using an appropriate instrument (e.g. graph)

Both experiments can take over 3 to 7 days and more.
From previous experiments we have learned that there are plants that do not like large concentrations of salts in the soil. However, there are other plants that grow very well in soils with high concentrations of salts. They are called halophytes.

**Halophyte**

*Limonium santapolense*

Saline soils constitute natural ecosystems of great interest, characteristic of marshes, coastal plains and inland areas, in the latter case in arid and semi-arid environments. The conservation of these ecosystems is very important for the preservation of the environment.
How can salinity problems be managed?

We can add enough low-salt water to the soil surface to dissolve the salts and move them below the root zone.

You know a lot. As salts are soluble in water, when you add water to the soil, the salts will dissolve, as sugar dissolves in water, and will go down to deeper areas.

We need to remove salts from the plant root zone.

Crop plants differ a great deal in their ability to survive when grown in saline soils. We can choose salt-tolerant crops.

We can plant crops or forages that are able to grow under moderate saline conditions.

Search for information on whether potato and pea plants are salt-tolerant crops.
We say goodbye. We hope you enjoyed this introduction to saline soils.

With this booklet, we want to contribute to achieving the Sustainable Development Goals, including SDG 2 and 15.

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<th>SDG 2. Zero Hunger</th>
<th>SDG 15. Life on Land</th>
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<td>Improve the quality of land and soil to end hunger.</td>
<td>Protect, restore, and promote sustainable use of terrestrial ecosystems.</td>
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Few plants grow well on saline soils. Therefore, salinization often restricts options for cropping in a given land area.

The ant and the snail have been designed by Francisco Javier Galán Onrubia.