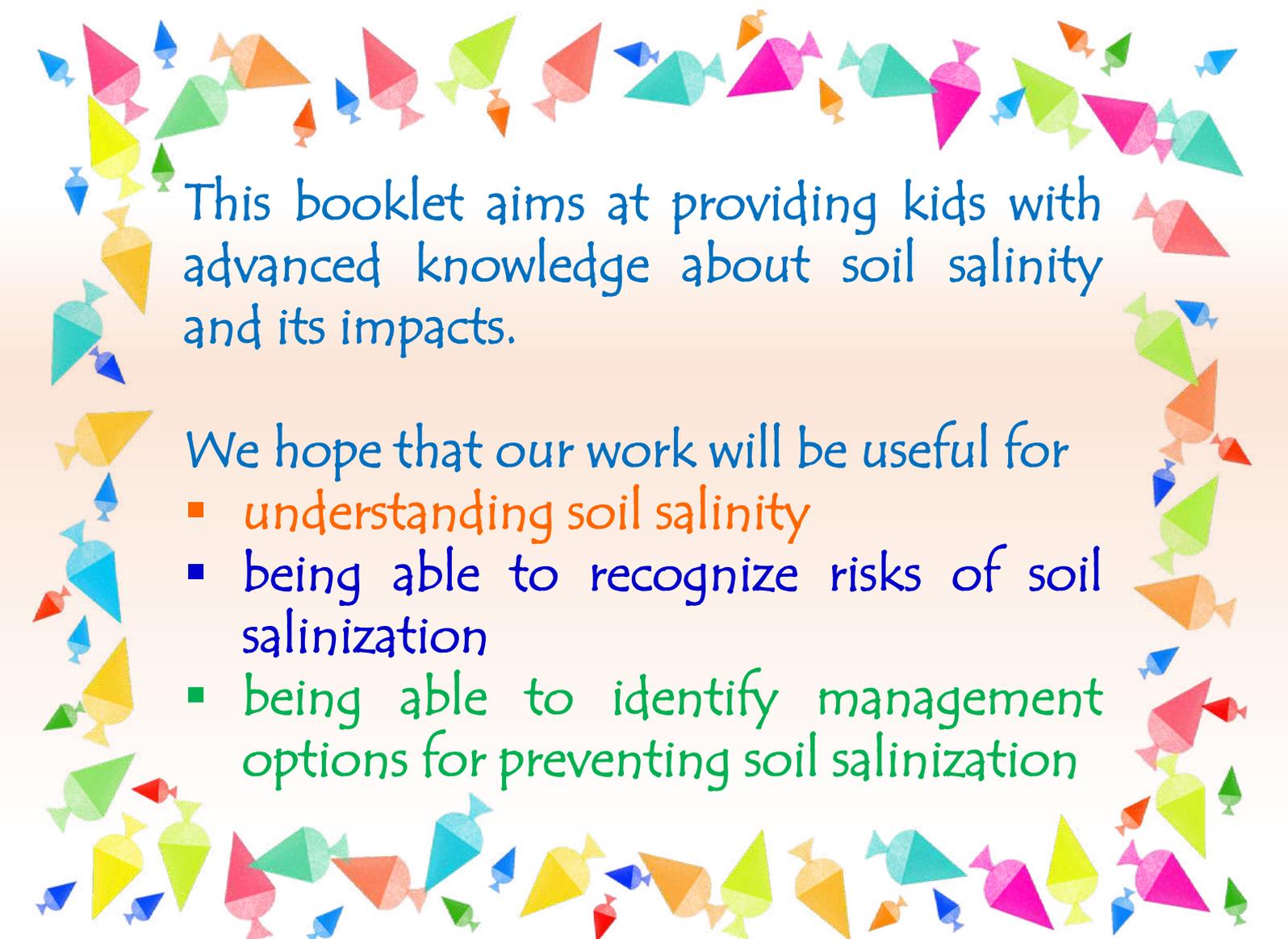


# SOIL KNOWLEDGE FOR KIDS

**"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!

A boy with blonde hair, wearing a green shirt and blue pants, stands on the left. A girl with brown hair in pigtails, wearing a light blue dress, stands on the right. They are in a garden with trees having orange and red autumn leaves. A wooden fence and a birdhouse are visible in the background.

Before starting this adventure, we can introduce ourselves, and then begin to explain what the soil salinization is.

Good idea !

A boy and a girl are in a classroom. The boy is on the right, wearing a green shirt and blue pants. The girl is on the left, wearing a light blue dress. There are several desks and chairs in the room. A blue backpack and a small owl-shaped backpack are on the floor in the foreground.

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!

# What is soil?

The first thing we are going to tell you is what the soil is. Pablo tell it yourself

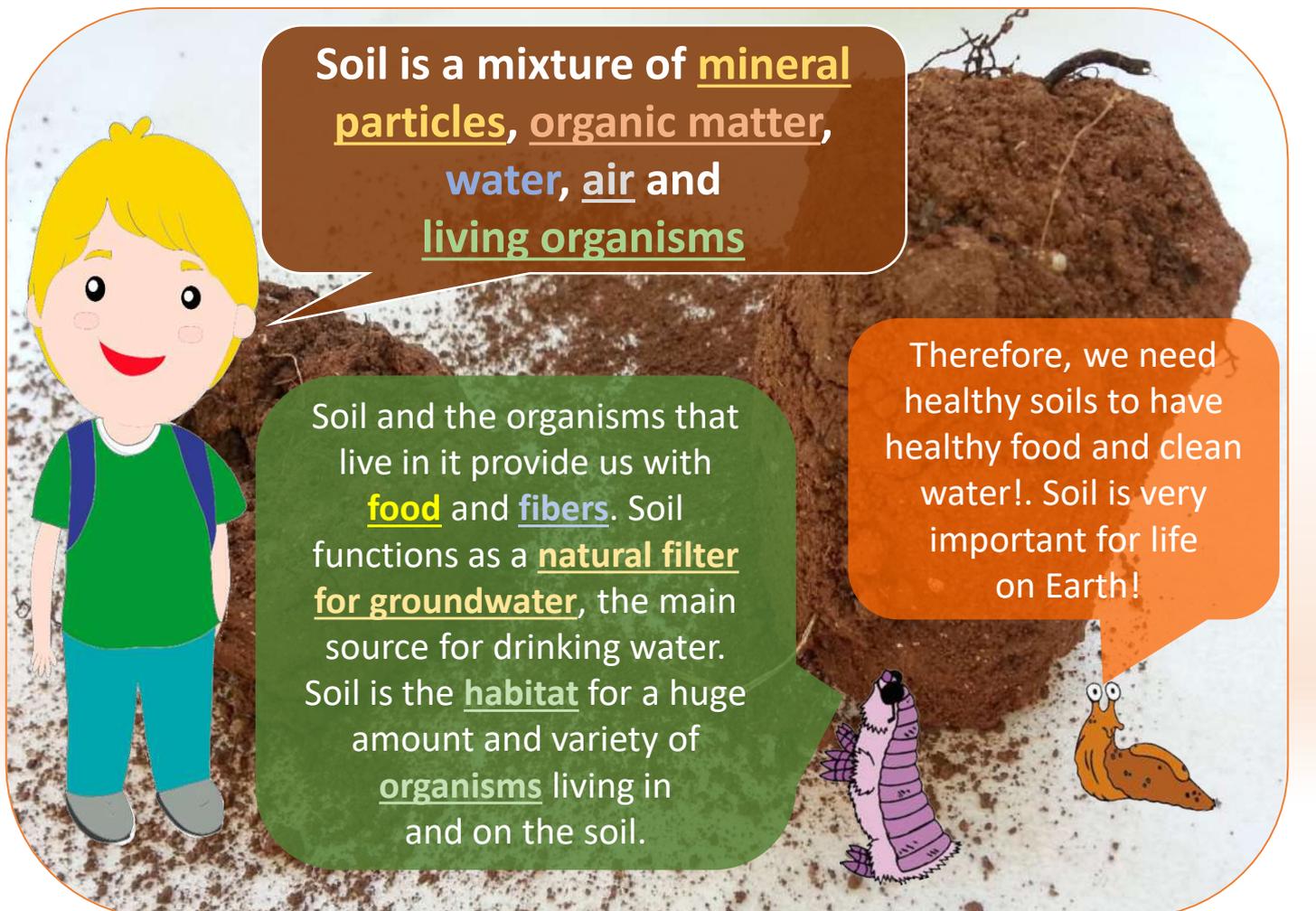
Soil is the upper layer that covers the surface of our planet and where plants grow and animals and people live



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!



# Is salt found in soil?

I like salty popcorn!



The answer is **YES**.  
In the soil we can find salt minerals like halite, sylvite, anhydrite, and many more

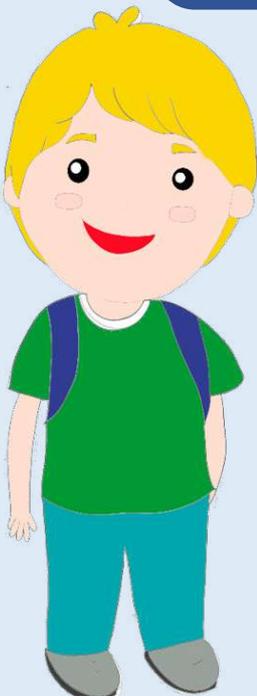
Halite is the mineral name for the substance that everyone knows as "table salt." Its chemical name is sodium chloride



Table salt



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



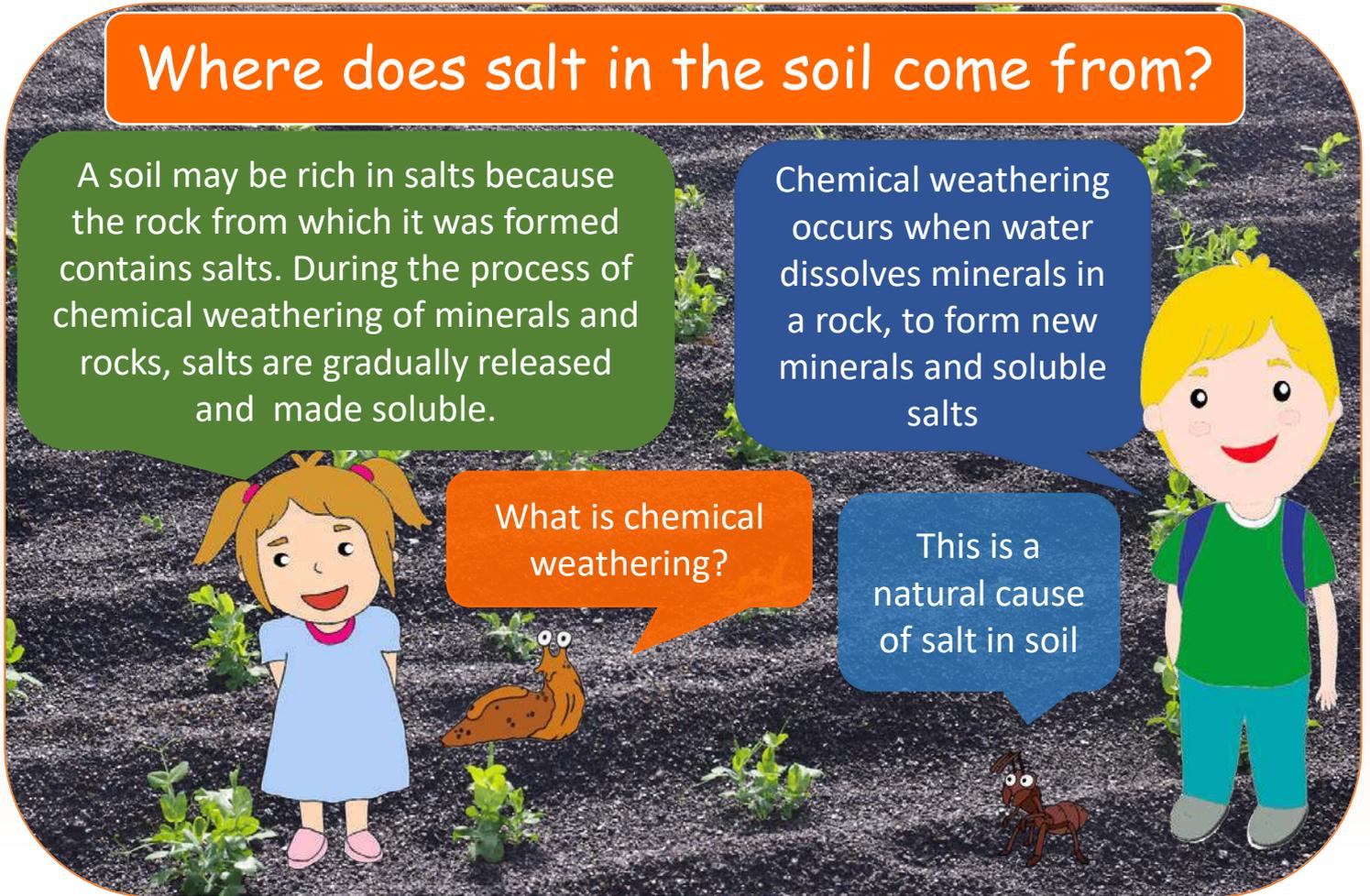
# Where does salt in the soil come from?

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

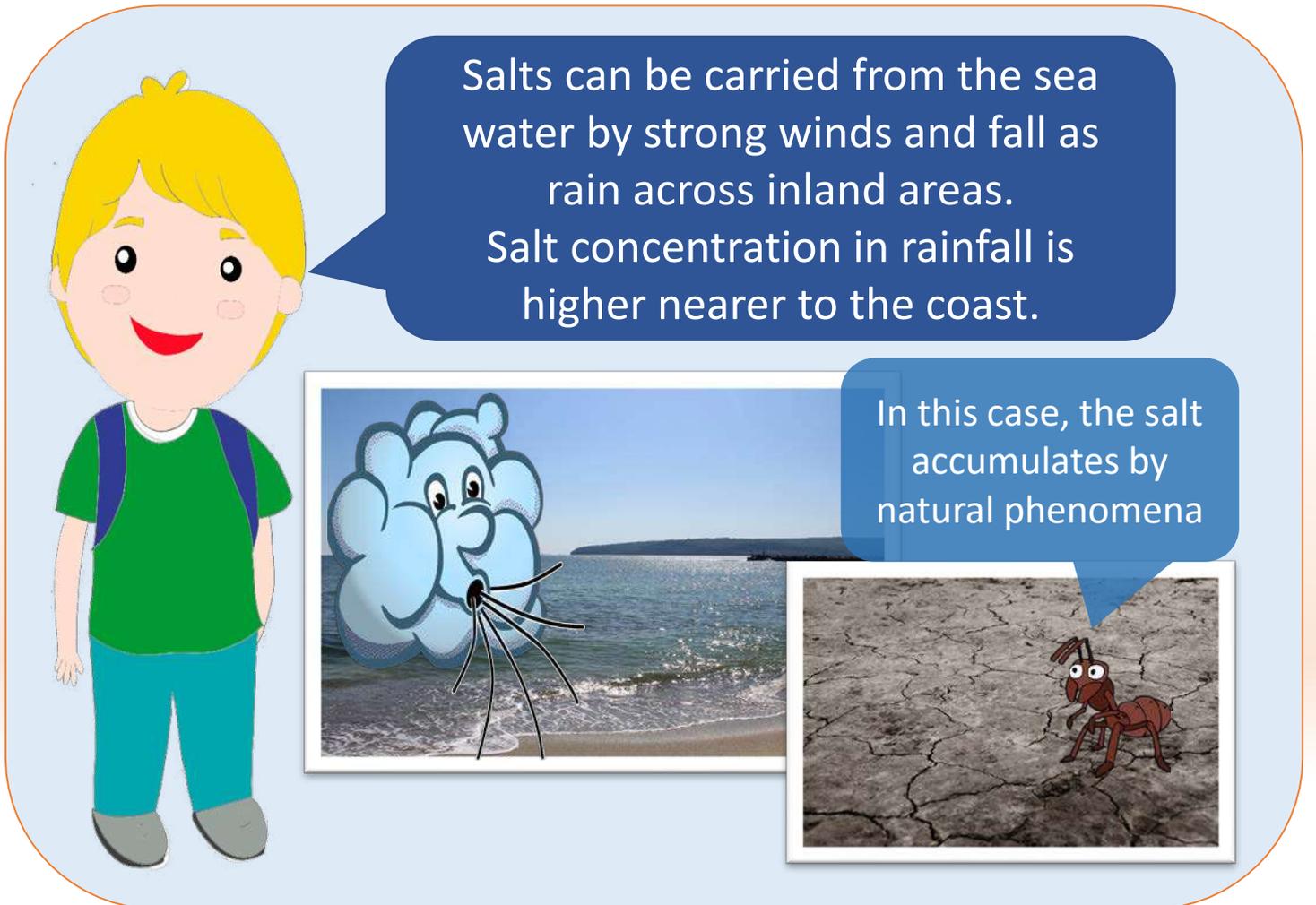
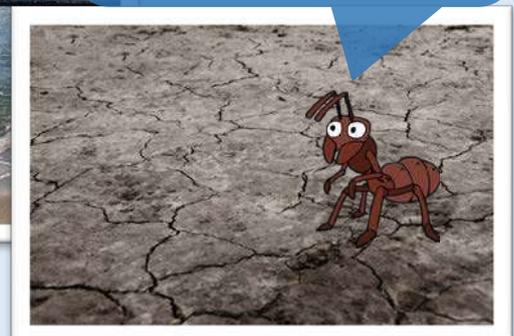
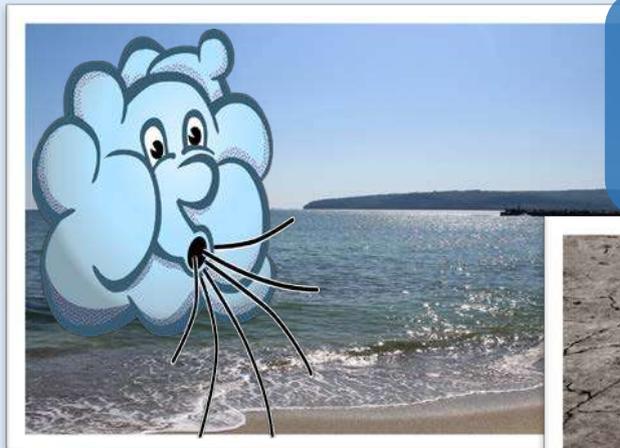
What is chemical weathering?

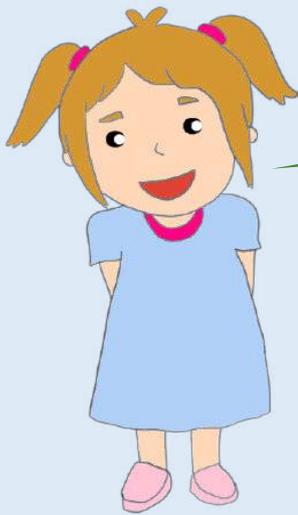
This is a natural cause of salt in soil



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





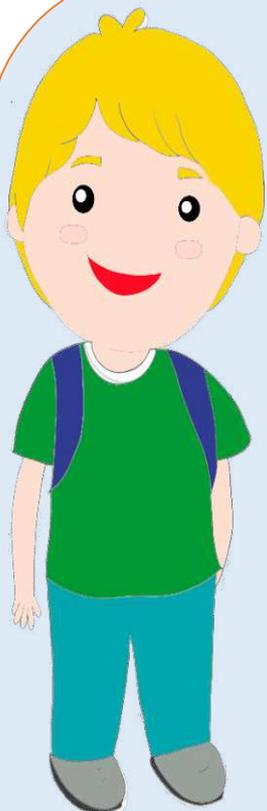
The two major sources of salts resulting from human activities are irrigation and fertilization



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, biosolids and compost also adds salts to soils



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



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.



# What is soil salinization?

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.



These plants are healthy



This soil does not have large amounts of salts



Soil salinization is a serious soil degradation problem worldwide. Let's look at the negative effects

Soils with salinity problems present white crusts on the surface when the soil is dry. I don't like being on this soil

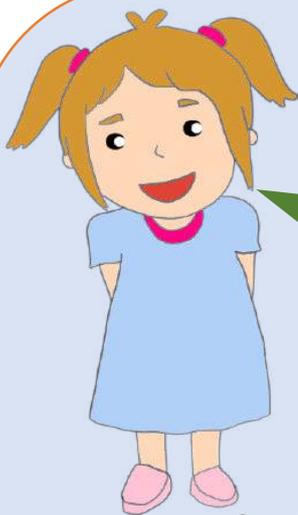
In addition to what the snail said, although the plants that grow in a saline soil have enough water, they show symptoms of a lack of water



Salts in the soil increase the efforts by plant roots to take in water

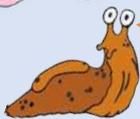


Another symptom that appears in plants when there are salinity problems is leaf necrosis. Necrosis due to salinization is when the edges of the leaves dry out and die.

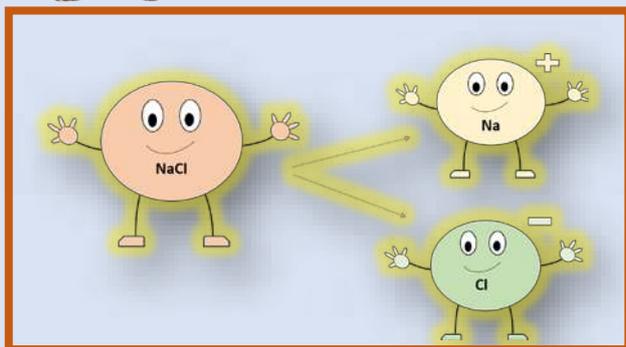


Soil salinity can cause toxicity due to certain ions. The salt that we all know is made up of sodium ( $\text{Na}^+$ ) and chloride ( $\text{Cl}^-$ ) ions. Plants need these ions to grow but in excessive amounts they can be toxic. As we said at the beginning of the booklet, there are many other salts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

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



$\text{Na}^+$  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!



# 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
- Lentils/ 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

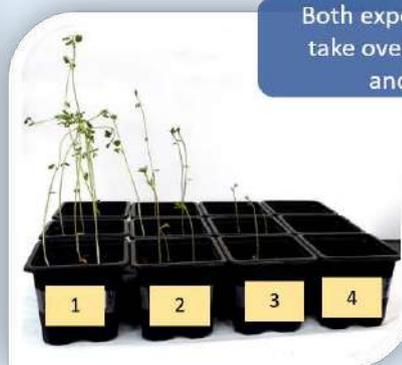
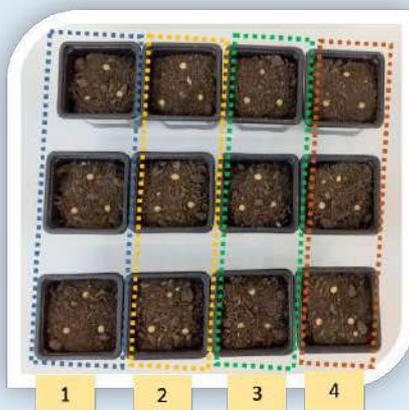
- Step 1. Number the 4 containers: 1 - 4
- Step 2. Dip four sheets of paper in each of the solutions and place two of them in the corresponding container
- Step 3. Place 6 seeds into each container
- Step 4. Cover the lentils with the other two sheets of paper with the corresponding solution
- Step 5.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



Watch the seed grow!



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.



Both experiments can take over 3 to 7 days and more



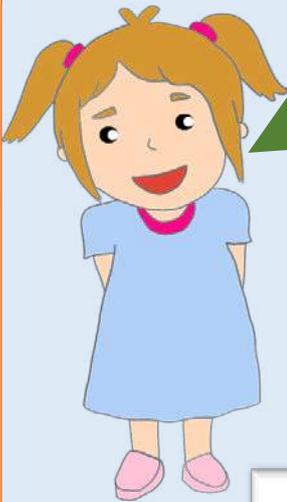
What happened to the seeds in each of the containers? Can you verify the following scientific concept "High concentrations of salt in the soil or water prevent seeds from germinating"



## 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)

# Halophytes or salt-loving plants



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.



How interesting!



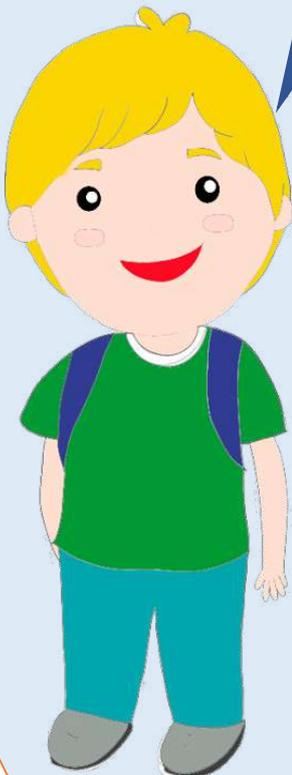
*Halophyte*



*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

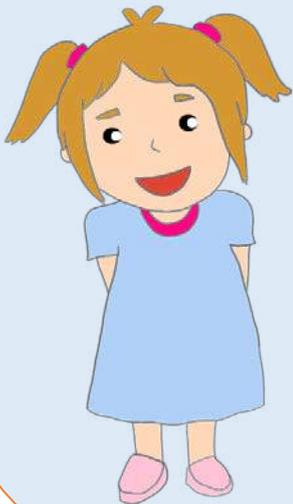


# How can salinity problems be managed?

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

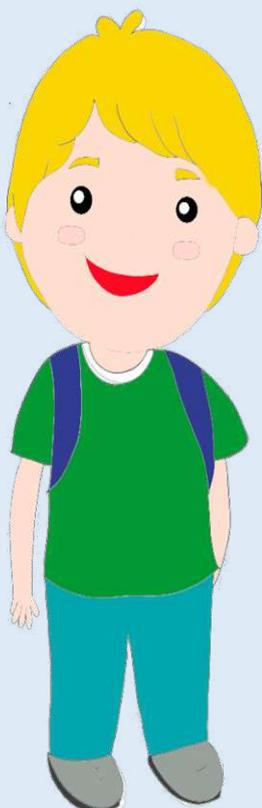


Crop plants differ a great deal in their ability to survive when grown in saline soils. We can choose salt-tolerant crops.

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.



| SDG 2. Zero Hunger                                  | SDG 15. Life on Land   |
|---|--|
| Improve the quality of land and soil to end hunger. | Protect, restore, and promote sustainable use of terrestrial ecosystems. |

Few plants grow well on saline soils. Therefore, salinization often restricts options for cropping in a given land area.

