Food and Agriculture Organization of the United Nations

World Soil Day 2021

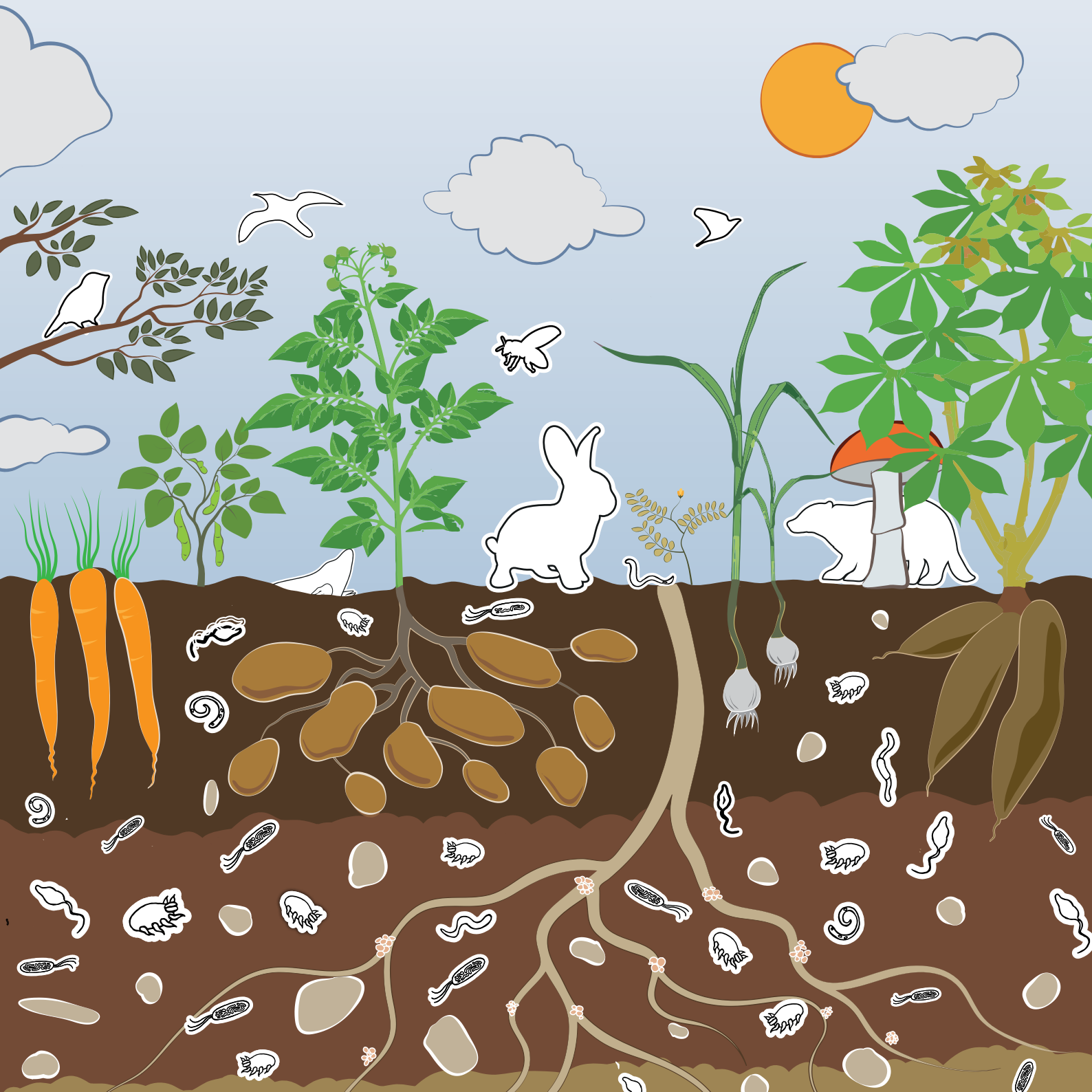
Salty experiments with soil for children

and guide for teachers

GLOBAL SOIL PARTNERSHIP

NOTES FOR TEACHERS

BACKGROUND INFORMATION ON SALINITY



Why soils matter?

- Soil is vital to life on the Planet – it is capable of supporting plant and tree life by providing them with nutrients, water and minerals. It is home to millions of insects, bacteria and small animals.

- It is no secret that children and soil pretty much go hand in hand. Children usually love to find a dirt patch and make some mud and dig or jump about in the muck. While they might find playing in it fun, they may be surprised to learn that soil is the basis for life and growth!

- Teaching children why, "*halt soil salinization, boost soil productivity*" is one of the major goals of the World Soil Day 2021 communication campaign. This Soil-Lab Activity Book is designed to give children an insight into soil knowledge. Our young scientists – who are by nature curious children – will learn that without healthy soil we would not be able to grow crops or other useful plants, support livestock, or have materials to build shelter! Healthy soils also store and filter water, recycle nutrients and help us deal with the negative effects of climate change by storing large amounts of carbon.

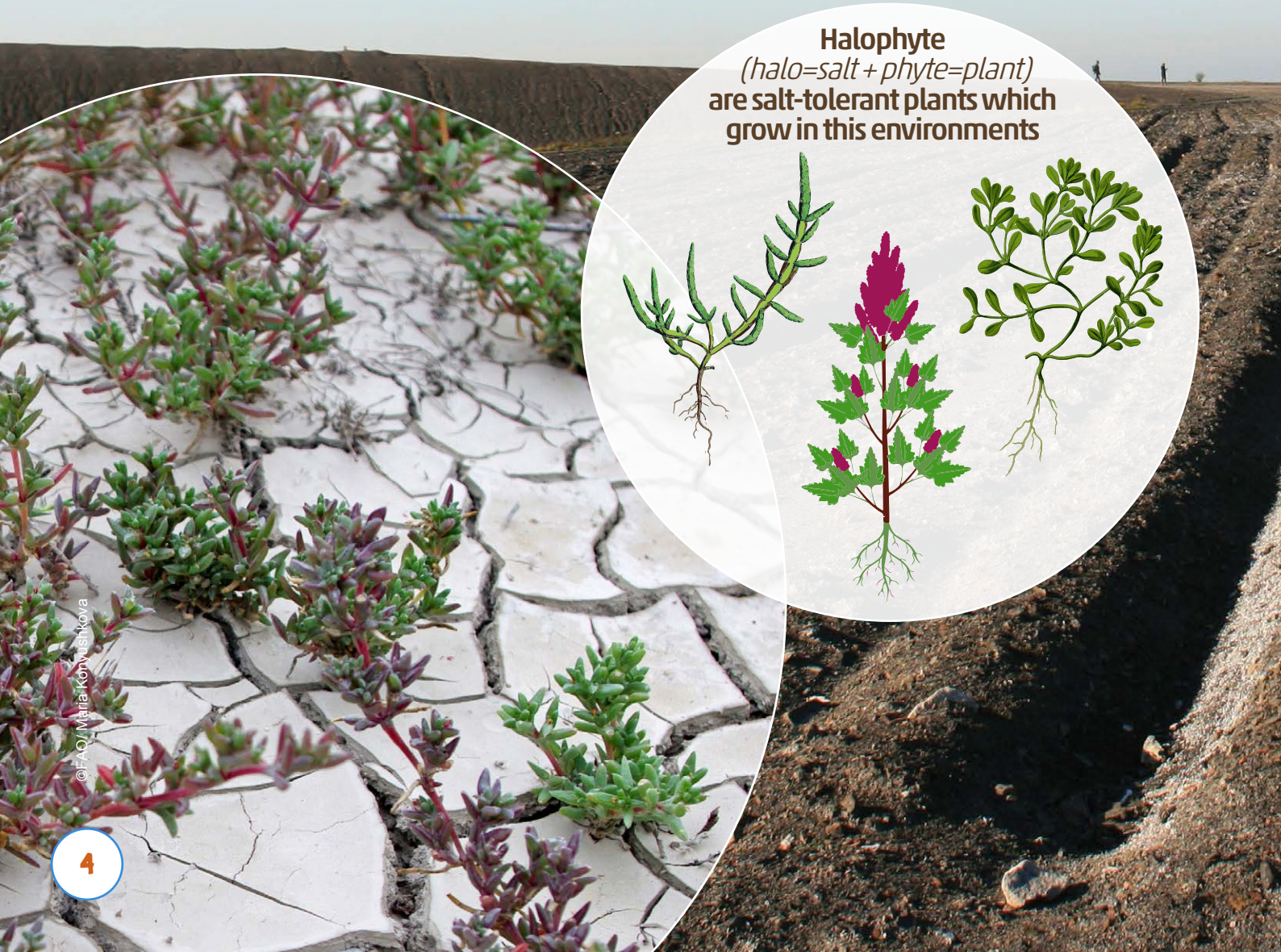
- Salinity is a natural part of the landscape in many parts of the world. It is important that everyone understands the problem and the difficulties faced, not only by farmers but also by the whole community, in controlling it. We owe it to future generations to do our best to manage this problem. Learning about salinity, its causes, its significance and its management is the start of the process of doing our best... and children play a key role in this!

What are salt-affected soils?

There are two types of salt-affected soils:

- **Naturally salt-affected soils**. In arid, semi arid and coastal areas, these soils are not degraded but typical of these landscapes. They host valuable adapted ecosystems.

- **Human induced saline and sodic soils**. Unsustainable agriculture practices and climate change are the key drivers. They affect soils and their organisms, destroy vegetation and transform fertile and productive soil into barren lands.



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Saline soils contain an excessive amount of soluble salts which makes it difficult for plants to absorb water from the soils.

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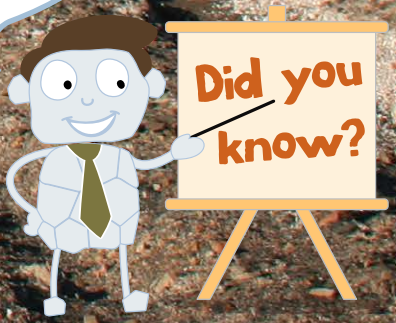
Sodic soils carry high amounts of adsorbed sodium ions that damage soil structure. The soil disintegrates and becomes much more compact for roots and other organisms.

Salt-affected soils are less productive and fertile

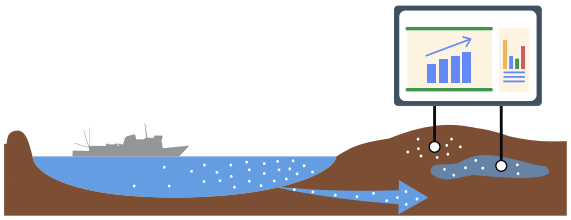


What can farmers do to halt salinization?

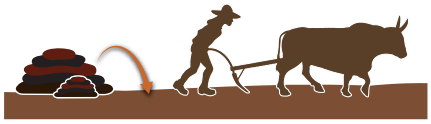
- Cultivate plants that can grow on saline soils

- Use good quality water for irrigation with low level of salts

- Be attentive to salinity of soil and ground water at the coastal area

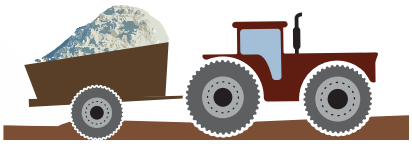


- Make sure that organic matter is added to soils



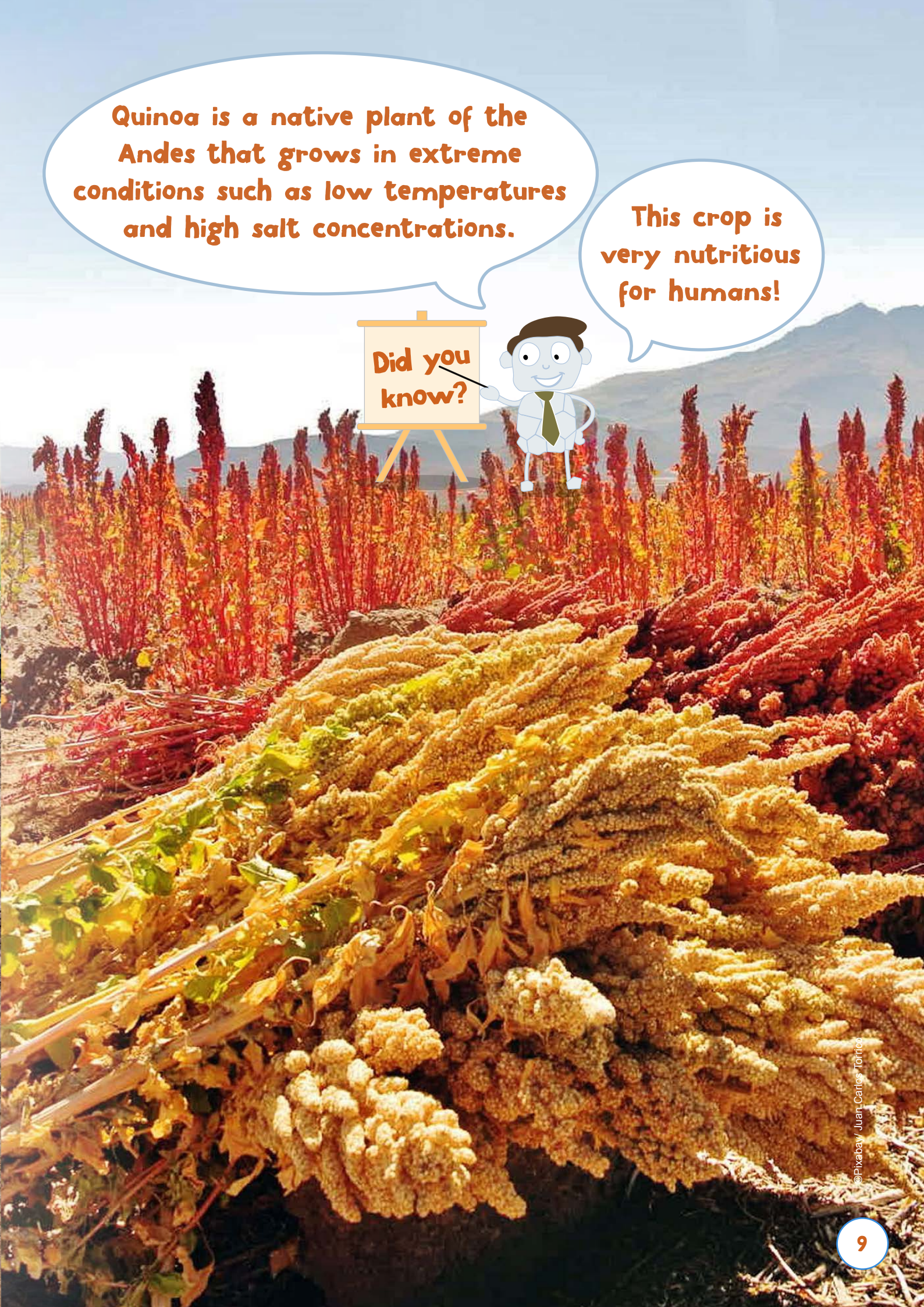
- Use mulch to decrease evaporation

- Add gypsum into sodic (dispersive) soils

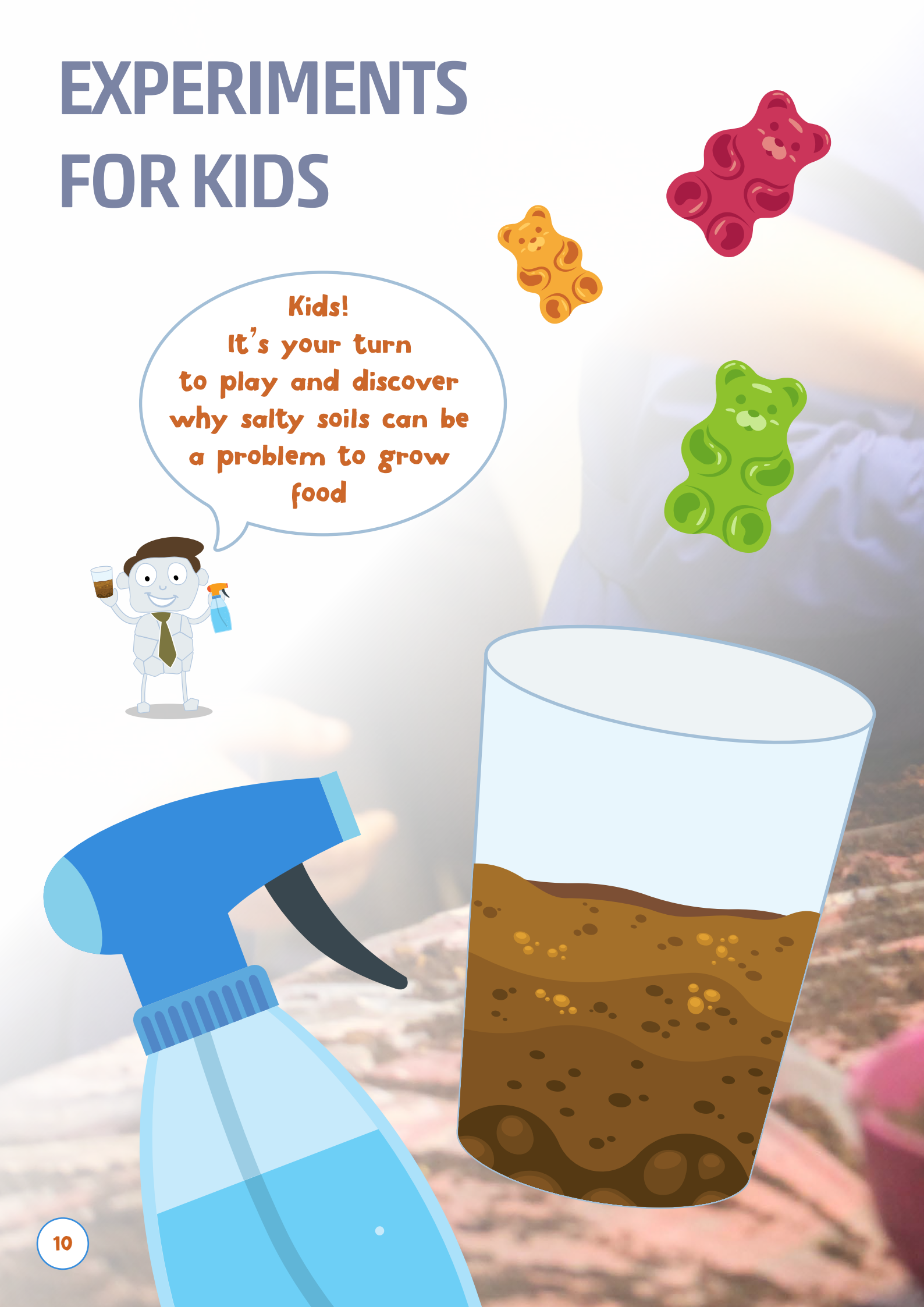


- Reduce pumping when salinity starts growing

- Ensure that salts are removed



EXPERIMENTS FOR KIDS



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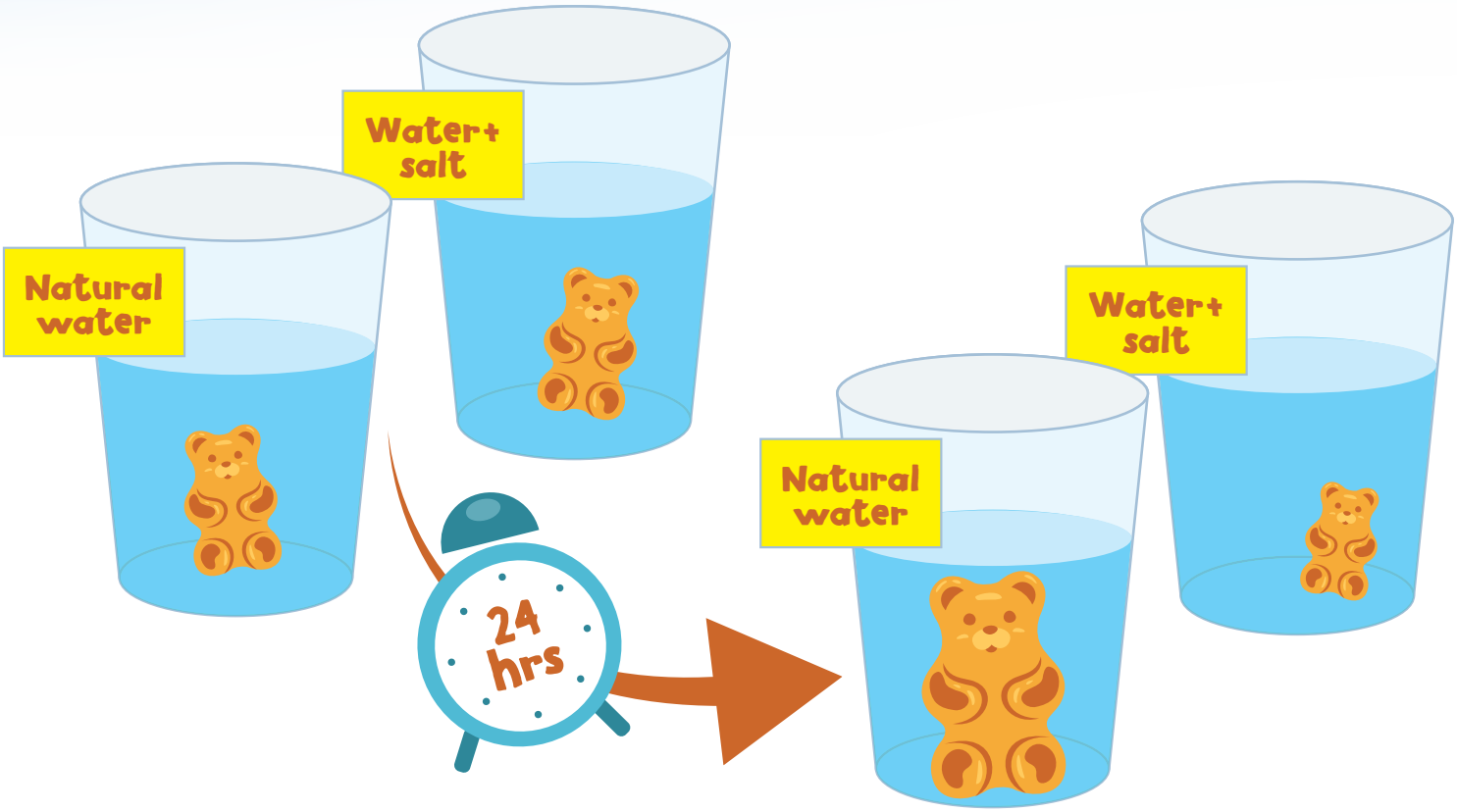
Gummy bear experiment



Material

- 2 glasses
- Gummy bears
- Water
- Table salt
- Comparative results table

Method

1. Fill each glass half full with water.
2. Put two tablespoons of salt in one of the glasses.
3. Stir until the salt is diluted.
4. Put a gummy bear in each glass
5. Leave them for 24 hours.
6. Take the gummies out of the glasses of water and compare the size.

Salt "spraying" experiment

Material

- 2 Glasses
- 2 Sprayers
- Water
- Salt

Method

1. Put around 5 centimeters of soil in both transparent glasses

2. Fill two sprayers, one with natural water and the other one with a mixture of water mixed with 5 to 7 teaspoons of salt.

3. Spray on the soil of each glass until it is fully soaked, one with natural water and the other one with the mixture of water and salt.

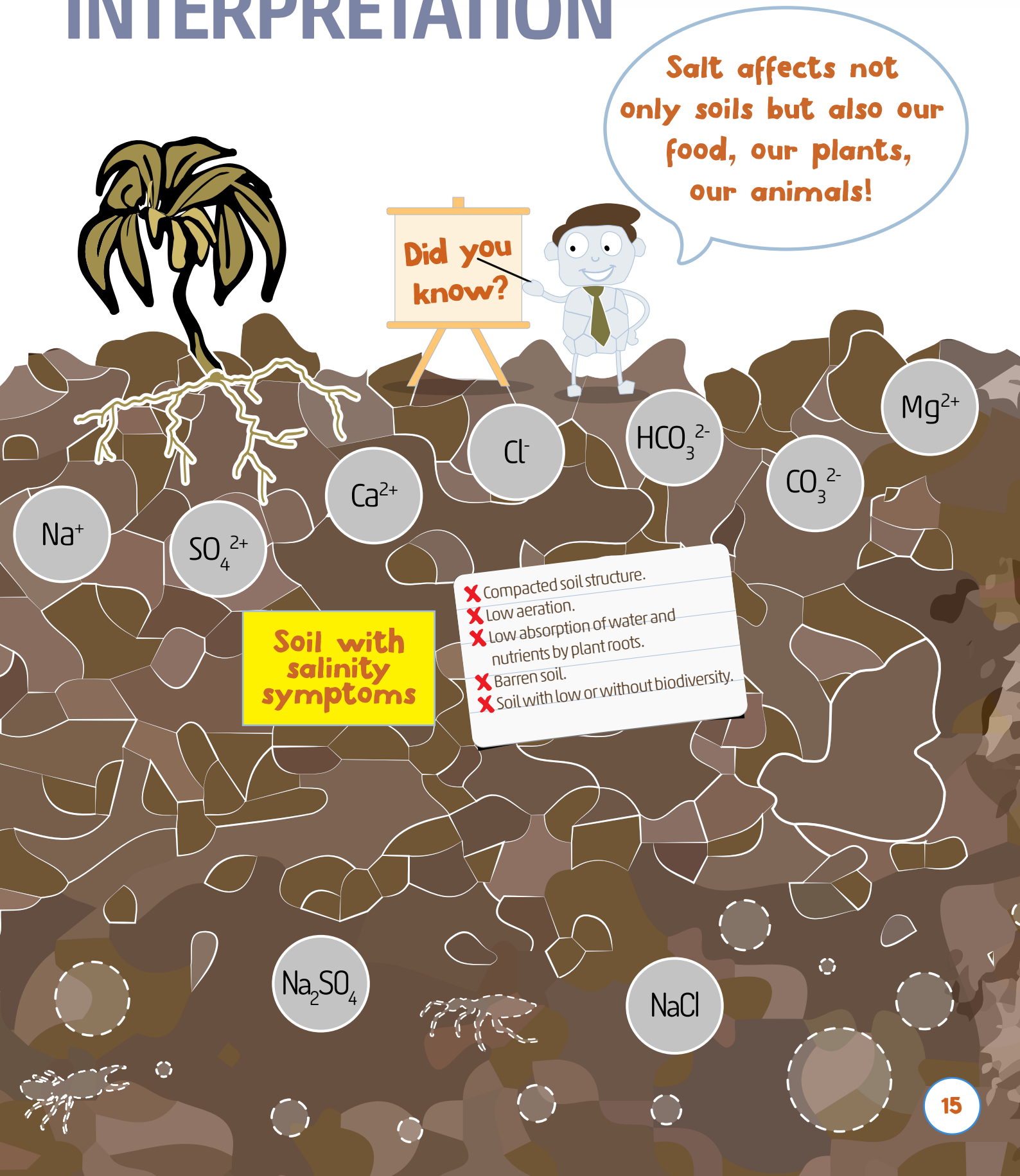
4. Leave them in the warmth of the sun and wait for the soil to become dry (about 7 days).

5. See, smell and compare the two glasses, especially the appearance of the soil surface. You can also pour the soils on the paper and compare!


Healthy soil
Good aeration.
Strong soil structure.
Good absorption of water and nutrients by plant roots.
Fertile and productive soil.
Soil with high biodiversity.
S
SULPHUR
Ca
CALCIUM
B
BORON
Cl
CHLORINE
Ni
NICKEL
Fe
IRON
N
NITROGEN
K
POTASSIUM
Zn
ZINC
P
PHOSPHORUS
Mo
MOLYBDENUM
Na
SODIUM
Cu
COPPER
Mg
MAGNESIUM
Mn
MANGANESE

NOTES FOR TEACHERS

RESULTS INTERPRETATION



Gummy bear experiment

Objective

Kids will understand the effect that salts have on plants and soil animals.

Related concepts

You can relate this experiment to various concepts depending on the level of the students. For example, you could link this experiment to concepts such as osmosis, dissolution, availability of water, low quality water, how plants absorb nutrients from soil, what happens to the roots or to an earthworm when they grow on saline soils and how and which ions are dissolved in the soil solution.

Guiding questions

Before starting the experiment, you can ask the children some questions to have them reflect on salinity. This will help them better understand the results of the experiment.

- When we add salt to water, what happen with it? Does it disappear?
- What would happen if we add more salt? (you can even add another glass and repeat the experiment with a water saturated in salts!)
- What do you think will happen to gummy bears?
- Imagine that gummy bears are plants, do you think they will prefer natural or salty water? Why?

Place your gummy bears here and analyze/compare the results!

Salt "spraying" experiment

Objective

Help the kids to understand the impact of low quality water for irrigation on soil salinization.

Related concepts

Spraying water on soils is intended to simulate sprinkler irrigation, which has high evaporation rates.

You can relate this experiment to various concepts depending on the level of the students. For example, you could link this experiment to concepts such as evaporation, dissolution and concentration, water quality. For more advance soil science students, you can also take this opportunity to explain the role of different ions in the soil solution and soil structure, and aggregation and disaggregation concepts.

Guiding questions

Before starting the experiment, you can ask the children some questions to have them reflect on salinity. This will help them better understand the results of the experiment.

- We are going to spray the soil with water, what does this spraying remind you of? Have you ever seen it in gardens and parks?
- Do you think that if instead of spraying we poured a whole glass of water the effect would be different? Do you want to try it and see the difference?
- Why do you think we need to leave the soil in the sun and with warm temperature? What will happen if it is raining and cold?
- Let's put our hands on the dirt, touch the soil before and after the experiment and think if you can feel some differences!

Conclusions

We learned that soil salinization:

- Reduces crop yields.
- Damages soil structure.

In addition, it also:

- Contributes to the degradation of the environment, wildlife and habitats.
- Is a threat to plants and animals due to saline soils and water.
- Reduces the oxygen available to plant roots which impedes their growth.
- Causes the deterioration of water quality, which limits the use of water for stock and domestic water supplies and increases the cost of water treatment.
- Leads to the loss of production causing social, psychological and economic hardships
- Can damage roads + other infrastructure used to pump or transport water.

World Soil Day 2021

CERTIFICATE

This certificate is awarded to

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for successfully completing
a range of activities and experiments.

You are now a mini-expert and have
the knowledge and understanding
to help fight salinity issues.

GLOBAL SOIL PARTNERSHIP

The Global Soil Partnership (GSP) is a globally recognized mechanism established in 2012. Our mission is to position soils in the Global Agenda through collective action. Our key objectives are to promote Sustainable Soil Management (SSM) and improve soil governance to guarantee healthy and productive soils, and support the provision of essential ecosystem services towards food security and improved nutrition, climate change adaptation and mitigation, and sustainable development.

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